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Cosmic Proportions and Human Significance

JIM SLAGLE
University of Portland
slagle@up.edu
ORCID: 0000-0003-1511-795X

Abstract. A common misperception, both within academia and without, is that the premodern, Judeo-Christian picture of the universe was of a small, cramped one. This allowed people to believe that the Earth and its inhabitants were the most important thing in it. But this misfires in several ways: First, the premodern cosmos is only small in comparison to what contemporary science has discovered, not absolutely. Second, the premoderns felt just as insignificant as we do in light of the universe's size, but we cannot translate this into a scientific or philosophical argument. Third, it assumes that the Judeo-Christian view is that humanity is the most important thing (rather than God) and that God created the universe for us (rather than himself). Fourth, whatever value human beings have in the Judeo-Christian tradition is derivative, based on being created in God's image, and the size of the universe has no bearing on it.

Keywords: medieval cosmology, size, value, Ptolemy.

Introduction

Premodern cosmology was characterized by a series of concentric spheres, with a spherical Earth at the center, and with each successive sphere embedding the Moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn. Beyond that was the sphere of the fixed stars representing the limits of

the universe. Yet this is smaller than our solar system since it does not take Uranus and Neptune into account. In fact, it is worse than this since they severely underestimated the distances. Ptolemy calculated the distance to the outermost sphere to be 19,685 earth radii—about 80 million miles or 130 million kilometers—although he also states this is the minimum distance (Goldstein 1967, 7–11). That is less than the distance from the Earth to the Sun. But even if they had accurately assessed the distances to the other planets, we have learned that the universe is larger than our solar system by many orders of magnitude.

Many academics and non-academics alike take the discovery of the unimaginable vastness of the universe to be incongruent in some way with religion, and specifically with the Judeo-Christian tradition. The thinking is that medieval people could have thought the universe was made for us because they thought the Earth was the biggest thing in a small cosmos. The discovery of the vastness of the universe takes this away, since it shows that nearly all of it is completely irrelevant to our existence and that we are completely irrelevant to it. This is one more example of science showing that religious views of the world and our place in it are simply wrong. Carl Sagan describes it as one of "the series of Great Demotions, downlifting experiences, demonstrations of our apparent insignificance, wounds that science has, in its search for Galileo's facts, delivered to human pride" (Sagan 1997, 20).

This idea is often expressed in popular culture, such as in the mythoi of Monty Python and The Hitchhiker's Guide to the Galaxy, but it is also the received view in academia. In addition to Sagan, scientists such as Stephen Hawking (1988, 133) and philosophers such as Nicholas Everitt (2004, 215–28) have affirmed this position. Its best expression comes from the opening to Friedrich Nietzsche's essay "On Truth and Lies in a Nonmoral Sense":

> Once upon a time, in some out of the way corner of that universe which is dispersed into numberless twinkling solar systems, there was a star upon which clever beasts invented knowing. That was the most arrogant and mendacious minute of 'world history,' but nevertheless, it was only a minute. After nature

> had drawn a few breaths, the star cooled and congealed, and the clever beasts had to die. (1873)

Unfortunately (or fortunately depending on your point of view), this is based on misunderstanding. Misunderstand*ings*, actually, for they are legion. However, they all share the same basic premise: premodern people could believe humanity was significant because they were unaware of how small we are in comparison to the vastness of the cosmos. I call this urban legend the Big Fish in a Small Pond Myth.

1. Comparing sizes

Of course it is true that the Ptolemaic universe was small *in comparison* to how large we have discovered it to be, but that does not mean that they thought the universe was small in some absolute sense. In fact they thought the universe was larger than we can imagine and the Earth was so small that, for mathematical purposes, it should be treated as a point of zero volume. If we take an unimaginably large number, call it *A*, and multiply it by itself, we reach another number, *B*, which is not only unimaginably large, it is unimaginably larger than *A*. Then we multiply *B* by itself and reach *C*. We can keep squaring numbers as long as we want and stop at some random point, say *R*. *R* is an unimaginably large number as well as being unimaginably larger than *Q*, which is unimaginably larger than *P*, etc. So how much larger is *R* than *A*? Unimaginabilities upon unimaginabilities. In comparison to *R*, *A* is so tiny as to be infinitely small.

The problem with this is that we *started* from the premise that *A* is unimaginably large. Saying that all the numbers after it make it seem as if it were nothing does not take away from the fact that it is still larger than we can fathom. Just because there are larger numbers does not make *A* small in an objective sense, only small in a subjective sense when contrasted with those other numbers. And when it comes to unimaginably large sizes or distances or masses or whatever, we are only able to differentiate them from each other mathematically, not imaginatively. That is what makes them unimaginable.

So Ptolemy estimated the universe's radius as 80 million miles. Over the next 1,500 years or so, there were plenty of corrections, recalculations, and adjustments made, but for the most part they were all in the same general ballpark. But these distances were larger that we can imagine so they were starting with an unimaginably large universe, and the fact that we have discovered that it is unimaginably larger to an unimaginable degree does not suggest they thought the universe was a small place. None of this, incidentally, reduces the incredible value of how contemporary science has discovered the vastness of the universe, it just repudiates using these discoveries in the way described.

That the ancients and medievals thought the universe was larger than we can fathom and the Earth a mathematical point in comparison is not controversial. Aristotle wrote that, "Observation of the stars also shows not only that the Earth is spherical but that it is of no great size" (*On the Soul* 2:14, 297b31–33). Ptolemy wrote, "the earth has sensibly the ratio of a point to its distance from the sphere of the so-called fixed stars" (*Almagest* 1:6). Boethius wrote, "You have learned from astronomical proofs that the whole circle of our earth is but a point in comparison with the extent of the whole heavens; that is, if it is compared in size with the celestial sphere, it is judged to have no size at all" (*Consolation of Philosophy* 2:7, 10–14). This was part and parcel of the cosmology of ancient Greece and Rome which was accepted by ancient and medieval theism, and it was acknowledged by everyone across the board (Van Helden 1986, 15). "The spatial insignificance of Earth, [was] asserted by Christian philosophers, sung by Christian poets, and commented on by Christian moralists for some fifteen centuries, without the slightest suspicion that it conflicted with their theology" (Lewis 1960, 53).

More than this, though, is the fact that we are spatial beings and cannot imagine the absence of space (the same goes for time).

> Whatever space may really be, it is certain that our perceptions make it appear three dimensional; and to a three-dimensional space no boundaries are conceivable. By the very forms of our perceptions therefore we must feel as if we lived somewhere in infinite space: and whatever size the Earth happens to be, it must of course be very small in comparison with infinity. (Ibid. 53–54)

Psychologically, we are naturally inclined to think that the universe is so big that we are as nothing in comparison to it. So the very idea that the ancients and medievals would have thought that the Earth is the biggest thing in a small universe collapses right out of the gate.

2. Objections

A potential counterargument is that, even though they thought the distances between objects were vast, perhaps they thought the Earth was still the largest object in the universe, and important in that sense. But this is false: in the Ptolemaic system, only Mercury, Venus, and the Moon were thought to be smaller than Earth: everything else was bigger (Goldstein 1967, 8–9). So they actually thought that the Earth was one of the *smallest* objects in an incredibly large universe. Regardless, all those vast distances were not just empty space since they did not believe a vacuum could naturally occur. Instead they thought that, above the sphere of the Moon, the universe was completely filled with the quintessence, and this is what formed the concentric spheres. This means that each sphere was an object in its own right. The Moon was smaller than the Earth, but the *sphere* of the Moon in which the Moon was embedded was much, much larger. And that is the innermost sphere. As they went further out to Mercury, Venus, etc., the spheres of each object were absolutely enormous, and simply dwarfed the Earth.

Another potential objection is that in premodern literature, characters are sometimes taken outside the Earth to the sphere of the Moon, or even to the sphere of fixed stars. From this vantage point, they then look down upon Earth and see all kinds of details which would be impossible to see from a great distance. Doesn't this suggest that they did not really conceive the distances to be very great? But this does not make the case either.

> The impossibility, under the supposed conditions, of such visual experiences is obvious to us because we have grown up from childhood under the influence of pictures that aimed at the maximum of illusion and strictly observed the laws of perspective. We are mistaken if we suppose that mere commonsense, without any such training, will enable men to see an imaginary scene,

> or even to see the world they are living in, as we all see it today. Medieval art was deficient in perspective, and poetry followed suit. Nature, for Chaucer, is all foreground; we never get a landscape. And neither poets nor artists were much interested in the strict illusionism of later periods. The relative size of objects in the visible arts is determined more by the emphasis the artist wishes to lay upon them than by their sizes in the real world or by their distance. Whatever details we are meant to see will be shown whether they would really be visible or not. I believe Dante would have been quite capable of knowing that he could not have seen Asia and Cadiz from the *stellatum* and nevertheless putting them in. Centuries later Milton makes Raphael look down from the gate of Heaven, that is, from a point outside the whole sidereal universe—'distance inexpressible By Numbers that have name' (VIII, 113)—and see not only Earth, not only continents on Earth, not only Eden, but cedar trees (V, 257–61). (Lewis 1964, 101)

3. Irrelevance, part 1

The intuition behind the Big Fish in a Small Pond myth is how irrelevant we are. There are plenty of galaxies billions of light years away, which have billions of stars with billions of planets orbiting them. What does a particular rock on a moon orbiting one of these planets have to do with life on Earth now? The absence of such a connection shows that humanity is irrelevant to the universe and we to it, so we are utterly insignificant.

In response, first, as I have already shown, *the premoderns already believed this*. They thought the Earth was smaller than almost everything else. The smallest star was many times larger. So if we picked a star at random, what did one square meter of that particular star, two-thirds of the way from its surface to its center, have to do with humanity? *Nothing*. This is not a new discovery brought about by the advance of science. If this is an argument against Christianity or Judaism, it would have been just as effective 2,000 years ago.

Second, so what? So what if all that matter has no relevance to us or we to it? Why should it? Why should it have to have relevance to humanity at all? The biblical concept of God indicates he appreciates everything he has created on its own terms. God delights in empty space, inert matter,

living matter, conscious matter, and in whatever else exceeds this. This objection is based on the notion that, according to Judaism and Christianity, God created the universe for humanity. This is incorrect. God created the universe for *himself*. There has never been the thought in Judaism or Christianity that God created the universe *for us* and that therefore we are the most important thing. *God* is the most important thing, and he exceeds us infinitely. Most of his being is not about us at all. The move away from Ptolemaic cosmology was not a move away from Christian theology (Giostra 2021).

Moreover, the premodern universe and its proportions do not come from Christianity, the Bible, theology, or religion in general. It was effectively the science of the day—the day being somewhere between one and two millennia long, depending on whether you start it with the pre-Socratics or Ptolemy. To be sure, Christians, Jews, and Muslims *accepted* Ptolemy's model and did their best to accommodate it within their traditions and teachings. But to suggest that these religions effectively predict Ptolemy's conception of the size of the universe does not follow from this.

In fact, the immensity of the universe was often taken as a reflection of God's greatness. In most languages, the word for "great" starts off meaning "very large" because we subconsciously associate size with importance. Looking at the night sky and recognizing one's own insignificance in light of the vastness of reality is one of the most common triggers of religious beliefs, since it forces one to recognize that there is something much more important than oneself. When drawn out, the idea is that the immense size of the universe, when compared with the size of the Earth and humanity, makes us think of the ultimate reality, and ourselves as nothing in comparison to it. As big as the universe is, God is, if I may put it this way, bigger. The universe reflects God's vastness, his greatness. If we had to predict the size of the universe from the Bible alone (which we do not), we could say that it would probably be larger than our imaginations can handle (see, e.g., Ps. 144:3–4). So the unfathomable vastness of the universe triggers beliefs in a prime reality that is much bigger than we are, and next to which we are as nothing. To use it as an argument *against* religion is more than a little tone deaf.

This is also true of the universe's *age*. As old as the universe is, God is even older. A cosmos billions of years old reflects God's eternity since we cannot imagine billions of anything and just see it as "more than can be counted." But God is even more ancient than that. In fact, the Bible specifically says that God's eternality is seen through his creation: "Ever since the creation of the world his *eternal power* and divine nature, invisible though they are, have been understood and seen *through the things he has made*" (Rom. 1:20). The irony, of course, is that some Christians believe that the Bible obligates them to affirm that the universe is only a few thousand years old. But a few thousand years is *imaginable* and would not reflect God's eternality.

4. Infinitude and the unbounded universe

During the Renaissance, the idea that the universe's vastness reflected God was taken further by Nicholas of Cusa, Thomas Digges, Giordano Bruno, and others. If God is infinite, they argued, then the universe must be infinite too, otherwise it would not properly reflect him. This was known as the unbounded universe. It is not clear what the motivation for this was: the doctrine that God is perfect does not imply his creation is perfect, so why would God's infinitude imply something similar about the universe? If they took this in a specifically pantheistic direction we can see why anything true of God would be true of the universe since they would be identical. But this was only the case with Bruno; the others remained orthodox theists.

More recently, Alexandre Koyré published *From the Closed World to the Infinite Universe*, which went over the effects of moving away from the premodern cosmology to the Modern, and specifically the change from a finite cosmos to an infinite one. His point was that an infinite universe is not just bigger: it is a different kind of thing than a finite universe, even one that is unimaginably large.

> Let us not forget, moreover, that, by comparison with the infinite, the world of Copernicus is by no means greater than that of mediaeval astronomy; they

> are both as nothing, because between the finite and infinite there is no proportion. We do not approach the infinite universe by increasing the dimension of our world. We may make it as large as we want: that does not bring us any nearer to it. (Koyré 1957, 34)[1]

I think this is absolutely correct, they are totally different beasts. It seems to me that an infinite (unbounded) universe would produce a sense of *horror vacui* or kenophobia since the mind cannot rest in it. There is no absolute standard for reference, everything is always smaller than something else. This sounds like Pascal's famous line, "The eternal silence of these infinite spaces frightens me" (1670, 64). But how would this amount to an argument against God's existence or religion or Christianity?

Well, it doesn't, and I do not think Koyré suggests otherwise. But perhaps there is a subtle point we could make here: in an infinite universe we are small, but so is everything else. The galaxies are small compared with something larger, etc. There is no stopping point. But by the same token, everything is *large* compared to something else. Compared to the microscopic world, we are huge, and compared to the atomic world the microscopic world is huge, etc. This, as I say, is what may produce this inability of the mind to rest, since there is no absolute standard of reference. But the flipside of that is that a finite universe can make our smallness more powerfully felt, since there *would* be an absolute standard of reference (Lewis 1964, 98–100). We are larger than some things, sure, but we are smaller—much, *much* smaller—than the largest thing (viz. the universe itself). So what would this mean for theism? Just that an unimaginably large but finite universe might portray God's vastness better than an infinite universe would. But this is a fine point, and I do not think an infinite universe can be developed into an argument against theism or the Abrahamic religions in particular. At most we could say that it takes away one of our pointers to God, if that, but that does not amount to much of an objection. It would be interesting, though, since it would entail that

[1] I translated Koyré's Latin phrase *inter finitum et infinitum non est proportio* into "between the finite and infinite there is no proportion."

those who thought an infinite God could only be reflected by an infinite universe may have been taking *away* that pointer.

All of this is somewhat academic though, since Big Bang cosmology demonstrates that the universe is spatially, temporally, and materially finite. It is expanding because there is a finite amount of matter taking up a finite amount of space that came into being a finite amount of time ago. To be sure, these amounts are all incredibly (*unimaginably*) large, but "between the finite and the infinite there is no proportion" (Koyré 1957, 34).

5. Irrelevance, part 2

There is a line that is repeated throughout the film *Contact* wherein one character asks another if there are any extraterrestrials out there in the immense universe, and the response is, "Well, if it is just us, it seems like an awful waste of space." Why? Well, because of the points we just went over: the vast majority of the universe is completely irrelevant to our existence, and our existence is completely irrelevant to the vast majority of the universe. It only makes sense if there are other forms of life out there.

Ignoring the issue of extraterrestrial life, we have already seen that these concerns are not an issue since God would delight in whatever he creates. To say that all that universe is a waste of space ignores this point. Moreover, waste only has meaning when there is scarcity (Reppert 2003, 124). An unlimited, omnipotent God would not have any need to keep an eye on his expenditures when creating the universe unless he had some other motive for doing so.

Of course, our irrelevance to the universe certainly prompts feelings of inadequacy in the face of ultimate reality. But what exactly is the argument? That bigger things are inherently more important than smaller things? I think that we tend to *feel* this is the case—again, in many languages, the word for "great" (as in important) starts off as the word for "large"—but we cannot work from this to an actual argument about value or significance.

> There is no doubt that we all *feel* the incongruity of supposing, say, that the planet Earth might be more important than the Great Nebula in Andromeda. On the other hand, we are all equally certain that only a lunatic would think a man six-feet high necessarily more important than a man five-feet high, or a horse necessarily more important than a man, or a man's legs than his brain. In other words this supposed ratio of size to importance feels plausible only when one of the sizes involved is very great. And that betrays the true basis of this type of thought. When a relation is perceived by Reason, it is perceived to hold good universally. If our Reason told us that size was proportional to importance, the small differences in size would be accompanied by small differences in importance just as surely as great differences in size were accompanied by great differences in importance. Your six-foot man would have to be slightly more valuable than the man of five feet, and your leg slightly more important than your brain—which everyone knows to be nonsense. The conclusion is inevitable: the importance we attach to great differences of size is an affair not of reason but of emotion—of that peculiar emotion which superiorities in size begin to produce in us only after a certain point of absolute size has been reached. We are inveterate poets. When a quantity is very great we cease to regard it as a mere quantity. Our imaginations awake. Instead of mere quantity, we now have a quality—the Sublime. (Lewis 1960, 56–57)

Our feelings of insignificance in light of the size of the cosmos is based on our commonsense standard of measurement. If we really wanted to make some kind of argument, especially if it is supposed to be an argument based on science, we would have to use an objective standard of measurement; and the only one available is the logarithmic scale, basing it on the smallest and largest things in the universe. I will use base 10 and meters but we could use any base number and any unit of measurement. The smallest thing is the Planck length at 10^{-35} meters. The largest thing is the universe itself at about 10^{25} meters. The Earth's diameter is about 10^{7} meters, while the human being is approximately 10^{0} meters. This puts the Earth about 70% of the way up the scale and human beings about 60% of the way up. So using an objective standard of measurement does not communicate the same sense of our spatial insignificance.[2]

[2] I owe this point to science historian James Hannam.

Of course, the response should be another "so what?" This does not assuage our sense of how insignificant we are, nor should it. But it is not trying to. It is just showing that we cannot convert the feelings that the universe's immensity sparks in us regarding our own irrelevance and insignificance into anything like a scientific or philosophical argument. And even if we could, it would be making a point that no one has ever denied: that compared to the vastness of the universe, we are insignificant.

6. Value

So the premoderns knew we are spatially insignificant in contrast to the cosmos and that God created the universe for himself, not for humanity. But they obviously still thought that human beings had value, since they believed they were created by the source of value. More than this, though, they believed humanity was created *in the image of* the source of value. Other forms of life (on Earth, at least) were not so created. Exactly what this image of God consists in, is wide open to interpretation, but it has always included moral and epistemic value. Aquinas goes so far as to say that intellect, the conduit for epistemic value, is the primary way in which we are created in God's image (*Summa Theologica* 1.93.4; 1.93.6). This, incidentally, does not impute any merit to us: another consistent biblical theme is that God usually chooses the lowliest things to be the vehicles of his revelation and grace, where "lowliest" can refer to the least significant (Ezek. 16:4–14; 1 Cor. 1:26–29) or the worst (Mark 2:17; 1 Tim. 1:15–16).

Moreover, the value that comes with being created in the image of God is derivative. It is because it is the image of *God*. The image bearers contribute nothing to it. These combine to form a complex picture. On the value spectrum, we are at both ends simultaneously. In Pascal's words, "What a chimera then is man! What a surprise, what a monster, what chaos, what a subject of contradiction, what a prodigy! Judge of all things, weak earthworm; repository of truth, sink of uncertainty and error; glory and garbage of the universe!" (1670, 36) We are wonderful and horrible at the same time. And while the wonderful part is derivative, we own the

horrible part. We are wonderful because of what God has given us, and we are horrible because of what we have *done* with what God has given us.

Those who advocate the Big Fish in a Small Pond Myth think they are correcting one of the premodern indicators of value and refuting it on its own terms. The problem, as we have seen, is that the premoderns did not think the size of the Earth in contrast to the universe's indicated that human beings had value—if anything it went the other way since they thought they were insignificant specks in comparison to the vastness of the cosmos. It produced in them, as in us, a feeling of our own irrelevance to the prime reality. And of course they did not think this conflicted with their religious beliefs. On the contrary, it reinforced them.

But this was not an ultimate indicator of value or significance. What indicated value to them above all was being created in the image of the source of value. And how have modern discoveries about the vastness of the universe challenged this at all? They have not. The enormity of the universe, and our spatial insignificance in contrast with it has nothing to say about how important we are to God, how much he loves us, or whether we are created in his image.

Conclusion

Some scientists and philosophers have suggested that, if God really exists, we should expect the universe to just consist of the Earth, Sun, and Moon, maybe with the planets thrown in. In other words, we should expect something like the Ptolemaic universe. Why? Well, because there would not be as much empty space going to waste, allowing us to believe that the whole enchilada was created for us. Not to mention that our planet meeting the necessary conditions for life would be much more improbable in a small universe like that, and so it would best be explained as the action of a supernatural deity who made the universe just for us. As noted, this is wrong on multiple levels: the Ptolemaic cosmology does not come from the Bible or Christian theology, it was the secular science of the day. It conceived the universe as being larger than we can fathom, and human beings as an insignificant speck of zero magnitude within it.

Christianity does not say that God created the universe for human beings, nor have most Christians mistakenly thought otherwise; they have always thought that God created the universe for himself. And from the fact that the Judeo-Christian tradition affirms that the cosmos reflects God's greatness, we would expect a universe larger than we can fathom, not a small one. So these commentators are criticizing Christianity for something Christianity has never said. They are judging its plausibility by constructing a strawman, and then contrasting this strawman with the claims of science.

John Shelby Spong is an Episcopalian minister who argues strenuously against the traditional understanding of Christianity, God, Jesus, the Bible, etc. One comment he has repeated is about the scientific absurdity of Jesus' ascension: after he was resurrected, Jesus rose into the air out of sight, presumably going to heaven. Spong tries to argue that this may have made sense when people believed that heaven was just on the other side of the clouds, but now that we have a clearer idea of the size of the universe, it is scientifically absurd. We have already seen that they did *not* believe that, but just ignore that for the moment. In making this point he refers to a conversation he had once with Sagan who told him that if Jesus had ascended away from the Earth at the speed of light he would still be in the Milky Way Galaxy today, 2,000 years later.[3]

Yet the *South England Legendary*, written in the 13th century expresses a similar sentiment. It says that if a man could travel 40 miles a day, about as fast a speed that people could travel at the time, it would take him 8,000 years to reach the sphere of the fixed stars (D'Evelyn and Mill 1967, 418; Lewis 1964, 98). If Jesus ascended at that speed, he would not even be close today, 2,000 years later. Even if he ascended at four times that speed, he would still be within the Ptolemaic universe. Yet, somehow, medieval Christians did not think Jesus' ascension was still going on 1,200 years later—or even 12 seconds later. It was accomplished. Whatever else one might think about the ascension, however implausible one may think it is, the size of the universe does not add anything to the

[3] For one example, see https://youtu.be/MJ0W7ShGsi8?t=4375.

equation. They already knew perfectly well that the universe was so large that for Jesus to physically, linearly travel to its periphery would have taken a ridiculous amount of time. Since it did not take *any* amount of time, they knew that the ascension did not involve physical, linear travel.

This should not be surprising. It would have been a miracle. No one suggested it may have been a physical, natural event, it was a supernatural event. *Of course* it would not involve physical travel, and the ancient and medieval Christians always knew it would not. So Sagan's point, as related through Spong, is just one more example of the myth that the premoderns thought humanity was the big fish in a small pond.

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