ETERNAL QUESTIONS

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Birth of God, Part 3

> *Knowledge of mathematics and physics renders all creation myths obsolete, including the people who believe in this nonsense.*

I didn't say that. I'm quoting a troll. The troll and I both read a website article about Brahma, the Hindu creator god, and at the end of the article there was a comment section. That's where I read that quote above. It was probably made by an atheist, possibly a Buddhist, but what wasn't in doubt was their contempt for those of us who believe creation stories. Apparently, we're all obsolete.

Trolls. Recently, I was reading a column by Megan McArdle, a journalist for the Washington Post who said this about trolls: "Trolls are not misguided people who accidentally hurt your feelings. They are rage-filled narcissists who want two things: your attention and your pain. Any response you can think of just gives them what they want.

"When you argue, they rejoice that you care about their opinion. When you complain that it hurts, they revel in your agony. When others leap in to explain how traumatizing this all is, they're even more satisfied — now they have *everyone's* attention! The only way to punish trolls is to refuse to acknowledge that they exist. Better yet, don't care."

Well, that may be a bit of an exaggeration about the intention of trolls, but I haven't had to deal with 20 years of verbal attacks as columnist Megan McArdle

has done. She could be right. Are trolls really rage-filled narcissists? Some of them may be, but some of them may just be silly boys and girls who think they know a great deal more than they really do. Or, the troll I quoted a minute ago may have been a credible scientist who is in contempt of all the mumbo-jumbo religious people believe—not realizing that a scientist with a closed mind is also a member of a kind of religion with its own form of mumbo jumbo.

Not everyone who has knowledge of mathematics and physics agree with our troll. Here are some statements of credible scientists who didn't close their minds when they took on the challenge of their profession. Here's a quote made by an extraordinary scientist you probably know:

"All matter originates and exists by virtue of a force which brings the particles of an atom to vibration and holds this most minute solar system of the atom together. We must assume behind this force the existence of a conscious and intelligent mind. This mind is the matrix of all matter."

Max Plank, the father of quantum physics.

Here's a quote from another scientist you may have heard of: "God created the world. God used mathematics to do so. Mathematics can be understood by us because we are made in God's image. Physics is the service of God because it explores his creation."

Werner Heisenberg, a devout Lutheran and Nobel prize-winner in Quantum Mechanics.

I quoted the troll and these two renowned scientists because this is the modern science issue of the birth of God. And, of course, science has a lot to say about the birth of God—if you pair the god-phenomenon with the birth of our universe. As you probably know there are several scientific theories about how the universe was born. But, I'm not a scientist, which means you won't need to be a scientist in order to understand what I'm saying. We will be keeping our scientific investigation to a narrow focus to specifically compare it to what we learned in our earlier issues about the beliefs of Jews, Christians, Hindus, Buddhists, and a fragment of Heraclitus.

We have much more knowledge about the universe than even the most brilliant of our ancestors, including the brightest of our Stoic forefathers. In fact, until about 500 years ago, most western astronomers thought the stars we saw in the night sky were affixed to a kind of shell around the earth. Astronomers were often astrologers then, up to and including Johannes Kepler (1571-1630). Kepler was a key player in the scientific revolution of the 17th century; *and*, he was astrologer astronomer to Archduke Ferdinand and Emperor Rudolph.

If any of you are unsure about those lights in the night sky, let me bring you the current explanation according to contemporary astronomy.

- Stars are huge celestial balls of gas made up mostly of hydrogen and helium that manufacture their own light and heat from an exploding nuclear reaction—very much like a hydrogen bomb.
- Our star, the sun, is just one of 200 *billion* stars in one galaxy, our galaxy, the Milky Way.
- Our nearest neighboring galaxy, the Andromeda, has a trillion stars.
- And to bring these astronomical numbers down to earth, there are more stars in the universe than there are grains of sand on every beach in the world.

And it's only been in the last 100 years that we have learned how and where it all began. It's quite likely that unless you were born into a scientific family you may be the first generation in history to know the facts I just recited about our universe. All of your ancestors, all the way back to the beginning of the human race were mostly ignorant about the universe we live in. And now, you and I get to know what's really going on.

And that's not all. Right now, if you continue reading on, you are going to know even more. All of these billions of galaxies with billions or trillions of stars appeared out of nothing. Out of NOTHING! And it happened 13.7 billion years ago not 6,000 years ago when the Abrahamic God said, "Let there be light." We're also going to find out HOW the universe appeared out of nothing, but we will only touch on the barest facts. It won't take long.

Here we go.

Sorry, before we go I need to acknowledge that there are several theories about how it all began, at least seven, but the one we are going to believe today is the Big Bang theory. Decades of research and mathematical modeling gives this theory the greatest likelihood of being the *real* one.

Here we go.

The Big Bang: Our universe started from a single point of infinite density and temperature called the singularity. It exploded, and then its expansion into the cosmos allowed it to cool, which led to the formation of galaxies, stars, and other astronomical objects.

So, there you have it. In the beginning there was a big bang, and 13.7 billion years later we're here talking about it, And, we're actually close to seeing it happen with our traveling telescopes.

Sorry, I'm beginning to have second thoughts about the troll who commented on the birth of Brahma. What did he say? "Knowledge of mathematics and physics renders all creation myths obsolete, including the people who believe in this nonsense."

Despite his contemptuous tone and faulty assumptions, there is some truth to what he says. That truth is, some of the greatest minds our kind has ever produced *have* made remarkable discoveries about the cosmos with math and physics. Kepler, Maxwell, Einstein, Plank, Heisenberg, Dirac, Lamb—these are truly astonishing people, and their work, the parts of it we mere mortals can comprehend, is as amazing as they are. I don't use the word "wonderful" very often, but the discoveries I'm going to barely, BARELY mention right now can only be called wonderful.

Here's a problem scientists worked on for a long time. This question has been asked even back to pagan times and can summarized as follows:

"What is nothing?"

We won't even begin to account for all the faulty answers scientists believed at one time or the other. We will only glance at the one theory that dominated all others in the century before we discovered what's *really* going on. The most popular theory, the one held by the scientific community with almost religious certainty, was what they called "luminiferous ether."

Apparently, this ether was believed to be a settled conclusion of the great majority who believed there had to be *something*, because *something* was necessary to carry the particles of light traveling in space. There just had to be something. Light couldn't possibly travel through nothing. What would hold it up? If there wasn't something to hold it up, a beam of light would just fall to pieces on the ground, or wherever.

Then, in the early 20th century the scientific belief in luminiferous ether disappeared with the discovery of quantum physics. We're not going to spend any time on this discovery except to give respect to Max Plank, Albert Einstein, Niels Bohr, Werner Heisenberg, and all the remarkable minds who gave us the physics we live in today. Of these men, it's Heisenberg we want to talk about now. It's Heisenberg's "Uncertainty Principal" that leads directly to an astonishing understanding of the foundation of the reality of physical existence.

So now I have to apologize to Heisenberg and the principal itself, because there is simply no way I can describe it fully. I can barely skim the surface. But that's OK. It makes it possible for all of us to appreciate such a remarkable discovery. And

this is it. At a very fundamental level, nature is based on uncertainty. For the rest of the issue, keep this sentence uppermost in mind:

At a very fundamental level, nature is based on uncertainty.

Let's be clear about what is uncertain. What we're talking about is the subatomic world of the very, very tiny. We all know this, right? So, what *is* happening deep down inside of everything? We actually know what is happening inside of everything because subatomic particles are being tracked and measured by mathematics. This is the mathematics and physics the troll was talking about.

Anyway, that's what science does best, measure things, and in the subatomic world, when you try to measure both the position AND the speed of a particle, such as a photon or electron, the more we know about the POSITION of the particle the less we know about the SPEED, and vice versa. Therein lies the uncertainty. We are *always* uncertain about the particle's position or speed because we can't measure both with perfect accuracy *at the same time*.

All righty then!

Can you even imagine making a discovery like that? Showing the world with the language of mathematics that at the very essence of reality, the very foundation of nature is uncertain to us?

OK. But, what does it tell us about the beginning of the universe? Well, what we find out is that when you apply the same math to small quantities of *energy* and *time* we get the same result, uncertainty. That is, if we examine a small volume of empty space in a box we can measure how much *energy* it contains; but, when we measure an interval of *time* slowed down to that tiny space, then we can't measure the energy with perfect accuracy.

If you find this difficult to follow and don't know why we need to know this kind of stuff, be patient. We're almost there. You should be glad that this is as difficult for me as it is for you—maybe even more so. That's why I'm breaking it down into small, bite-sized pieces that are easier to digest.

Just remember this: Heisenberg's uncertainty principal rules in the subatomic world. And, our uncertainty applies to pairs of quantities such as the *position* and *speed* of particles in the subatomic world as well as *energy* and *time* in tiny volumes of empty space.

And now we're going to go even further down the rabbit hole. If we take our tiny volume of empty space and mathematically make it even tinier, things get very weird indeed. What we find out is that we become so uncertain about how much

energy there is in that tiny volume of space that it could literally create particles out of nowhere.

Creating particles out of nowhere is where this essay has been going all along—creating a universe, or a god, out of nothing. We are now standing at a place where we can see mathematically that an extremely tiny space would have enough energy to create particles out of nowhere. Heisenberg tells us that *something can come from nothing provided it goes away extremely rapidly*. How rapidly is extremely rapidly? It would have to pop in and out trillions of times per second. In and out trillions of times per second.

OK, now I'm getting a little tired of Heisenberg. I mean, I appreciate what he has done, but we need to move on and find another hero.

And so, we have. His name is Paul Dirac. Remember that name. Paul Dirac. He is going to take us to the very end of our exploration of the beginning of everything from nothing.

Paul Dirac was born in Bristol, England, in 1902, and attended a little school there with another classmate close to the same age, Archibald Leach, better known to the world as the actor, Cary Grant. I only mention this because one small primary school in one small city produced at the same time what some say were the greatest scientist and most famous actor England ever created. But I digress, and before I'm inundated with emails trolling me for suggesting Cary Grant was a great actor, let's move on and find out what Paul Dirac gave to the world.

Here it is. Dirac was able to overcome a huge problem in the scientific community with a single equation. The problem was all about the incompatibility of Einstein's equation, E = mc2, and Max Plank's work in quantum physics.

No, we're not going to go into that, except to say that Dirac UNIFIED the rules of relativity and quantum physics in what is still considered one of the greatest accomplishments in the history of mathematics. This is what it looks like:

$$(iγ^μ∂_μ-mc)ψ=0$$

No, we're not going to discuss that equation except to say that apparently it is incredibly elegant and beautiful to those who understand it. For those who want to know more about that equation I highly recommend this website by Astronoo, https://astronoo.com/en/articles/dirac-equation.html Paul Dirac himself said his equation was much smarter than he was, because it contained more mathematical ideas and solutions than he had ever imagined.

This is what the equation did. It solved the problem of things popping in and out of nowhere by predicting the existence of a new particle. This new particle was like the electron but very different—kind of like an anti-electron. It was almost a mirror image of the electron but with opposite properties. Are you ready? The famous equation Dirac discovered in the 1928 resulted in the first realization that existence began with matter and anti-matter.

Let me say that again. *Existence begins with matter and anti-matter.*

When matter and anti-matter meet they destroy each other, thereby turning their mass into energy when they disappear. Whenever a particle pops into existence, it's opposite, anti-matter, simultaneously does the same.

In other words, we have all these pairs of opposites borrowing energy from the vacuum of empty space popping in, destroying each other immediately, and popping out—trillions of times per second. And all this popping in and out pays back energy to the vacuum where they were born. Space isn't empty at all.

For those who wish to pursue the subject more deeply, what we have just described is called Quantum Field Theory. With this theory we know that at the most fundamental level of reality there is a dynamic continuum of opposites, matter and anti-matter, appearing in a vacuum which they proceed to fill with energy. The cosmos is born, maintained, and thrives on the polarity of opposites, matter and anti-matter.

And here's the rest of the story. This amazing idea was actually realized 2500 years ago by Heraclitus. What the philosopher Heraclitus began, Paul Dirac completed.

We must know that war is common to all, and strife is justice, and that all things come into being and pass away through strife. Homer was wrong in saying: "Would that strife might perish from among gods and men!" He did not see that he was praying for the destruction of the universe...

Heraclitus (frag. 62 and 43, Burnet Trans.)

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Next time, in "The Birth of God, Part 4," we will wrap up our cosmogony of the universe with "God and Heraclitus."

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OUTSIDE . . . .

Cockroaches and Lizards

The other morning I was sitting on the toilet when a fat German cockroach casually sauntered across the floor. I don't know if it was a male or female so I'll call it an it. Anyway, it seemed oblivious to my presence a few inches away as it went on about its business of looking for something, any scraps or crumbs or tiny bits of anything that it could consume in its eternal quest for leftovers. I stomped my foot, and it obediently ran around and hid behind the toilet.

I've noticed that we have fewer cockroaches when the house is clean and there's not much for them to eat. They're like all scavengers, from the vultures of the sky to the king crabs of the sea, and they appear when its time to tidy up. Nature is amazing that way. And, we do appreciate nature's cleaning creatures, we even eat some of them, but we don't want them snuggling up too close.

And speaking of cleanliness, have you ever seen a Western Fence lizard have a bowel movement? I have. Many times. It's quite interesting, because the feces always presents itself as a single, firm turd about a half inch in length, a little bigger around than the lead of a pencil. All black, except for a crown of pure white at the back end. I don't know if that is the final form of one of its favorite foods, the cockroach, but the feces always looks the same. And when the lizard has finished it wipes its bottom on my concrete porch floor, back and forth, back and forth. Then it scampers off.

For the Readers

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