

THE FIRST UNITARIAN SOCIETY OF MILWAUKEE

**WHAT DO YOU BELIEVE?
Part I:**

**“What Is the Nature of the Universe?
Exploring Cosmology”**

**by
The Reverend Andrew C. Kennedy**

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INTRODUCTION TO “WHAT DO YOU BELIEVE?” SERIES

Welcome, everyone, to Part I of our six-part “What Do You Believe?” Sermon Series.

Today, to begin our series, I’d like to take up the perennial question of, “What Is the Nature of the Universe?” which means we’ll be exploring some of the basic questions of cosmology.

In the coming weeks, as we continue our series, we’ll pursue some of the other great perennial philosophical and spiritual questions – questions like:

How do we know what we know? That is, how can we be sure of what we know – what is our source of authority for what we know?

Why do bad things happen to good people?

What are the ways to wholeness, to depth of living, to wisdom, to nirvana, to salvation?

What are the purposes of our lives? That is, for what should we live and for what are we willing to die?

And, finally, what is the meaning of the “End Times?” In other words, if “the end is near,” as it arguably could be from one disaster or another, how shall we live, both personally and as a world community? And in the midst of all this, how do we face the inevitability of our own death?

Please note that on January 17, two weeks from today, we’ll take a break from our series to honor Martin Luther King, Jr. Sunday, when my colleague Dena McPhetres will talk about “Living in a Multi-cultural World.”

So, it should be a great series. I’m certainly looking forward to it, and I hope that you are, as well.

Oh, one other thing: please don’t be put off by the big words associated with this series – soteriology, teleology, eschatology, and so forth. They just happen to be the terms that are attached to these basic questions and areas of exploration. And we’ll do our best to define them as we go along.

II

So, let’s get started here with cosmology and the nature of the universe by joining one of Woody Allen’s characters, a private eye, who takes on a big cosmological assignment.¹

¹ At this point our Chancel Arts Group did a reading from Woody Allen’s *Mr. Big*, about a private eye who goes looking for God, the Creator of the Universe.

WHAT DO YOU BELIEVE?
Part I
“What Is the Nature of the Universe? Exploring Cosmology”
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What kind of universe do we live in? How did it get started? And what is our place in it?

When we talk about cosmology we are talking about that branch of astronomy (and sometimes metaphysics) that deals with these kinds of questions about the nature of the universe in which we live. A little more specifically, cosmology typically deals with the origin, the structure, and the destiny of the universe.

Religions all around the world have long played a huge role in addressing these questions, but in more recent times modern astronomy, astrophysics, and academic cosmology have been superseding some of the older, more traditional, religious cosmologies that often simply centered around a Creator God of some sort who, as we just saw from our Woody Allen sketch, in some quarters is getting harder and harder to find.

So, for our purposes today, I’m going to take the more contemporary, scientific approach to cosmology, which I view as not only good science, but also as a newer sacred narrative.

II. The Big Bang

To get a feel for the big picture of the nature and the origins of the universe and of our place in it, let me start with the Big Bang. The Big Bang is now well established as the theory for how the physical universe came to be. Now, to describe the Big Bang, I’m going to rely primarily on Bill Bryson, a best-selling author, who does a great job of describing the Big Bang in his book called, *A Short History of Nearly Everything*.² Secondly, I’m going to draw on Mark Whittle’s wonderful new three-volume series of books called, *Cosmology: The History and Nature of Our Universe*.³

(Whittle’s series, by the way, is so cool and so detailed that he devotes three separate chapters in Vol. I of his series to the first *second* of the Big Bang! That’s drilling down into the details.)

In any case, Bryson starts his description of the Big Bang with a single proton.

Now, a single proton is really, really small. A proton, as you may recall, is one of the constituent parts of an atom, which in itself is pretty small. Bryson explains just how small a proton is. Protons are so small, according to Bryson, that the dot on the letter *i* in a printed book or in your Order of Service can hold something in the neighborhood of 500 billion protons, which, for perspective, is more than the number of seconds contained in half a million years! So, in other words, that’s a lot of protons! So, if we can put 500 billion protons in the dot of the letter *i*, then protons, let us agree, are really, really small.

So, protons are small.

² Bryson, Bill, *A Short History of Nearly Everything* (New York: Broadway Books, 2003), pp. 9-15.

³ Whittle, Mark, *Cosmology: the History and Nature of Our Universe* (Chantilly, Virginia: The Teaching Company, 2008), especially volume 1. It should be clarified that this three volume set is actually three volumes of transcripts from Whittle’s wonderful DVD class, produced by The Teaching Company called, “Cosmology: the History and Nature of Our Universe.”

Now, imagine if you can, shrinking just one of these protons down to one billionth of its normal size — which, we already agreed, was really, really small. Now pack into that tiny, tiny space — one billionth-of-a-proton-space — about an ounce of matter. Okay?

Excellent! We've got what we need now. We are ready to start a universe.

As Bryson suggests, it is natural, but it is wrong to visualize our starting point for the Big Bang as a kind of pregnant dot hanging in a dark, boundless void. It's wrong because at this point — prior to the Big Bang — there *is* no space. Why? Because space, as Einstein proved, is inextricably bound up with time and matter, and at this point (before the Big Bang) we have neither. In other words, our "point of singularity," as it is sometimes called, has no "around" around it. We can't even ask how long it has been there — whether it has just lately popped into being, like a good idea, or whether it has been there forever, quietly awaiting the right moment. Why? Why can't we ask how long it has been there? Again, because at this point, like space, time doesn't exist yet either.

You *with* me? In any case, basically, from essentially nothing our universe begins.

In a single, blinding pulse, in "a moment of glory much too swift and expansive for . . . words," as Bryson puts it, the "point of singularity" — that initial tiny, tiny space — assumes gargantuan dimensions — flowing outwards. This Big Bang, according to the inflation theory of Alan Guth, then at Stanford University, was actually not an *explosion* in the conventional sense. Rather, it was a vast, sudden *expansion* on a whopping scale. (So, the "sound" of the Big Bang was more like a "whoosh!" than a gigantic "boom!")

The whole initial Big Bang episode may have lasted no more than 10 to the negative 30 seconds. For those of you who are counting, that is one million million million million millionths of a second. (That's *not* a very long time.)

So, from that really, really small "place" one billionth the size of a single proton we get a universe in a really, really short time!

Now, moving forward from the Big Bang, in the first fulsome second of the universe's young life is produced gravity and the other three basic forces that govern physics — namely, electromagnetism and what are called the "strong" and "weak" forces that bind protons into atomic nuclei and electrons to atoms. That's within the first second.

In less than a minute the universe is at least a hundred billion light-years across — and it is growing fast. There is a lot of heat now, too — ten billion degrees of it — enough to begin the nuclear reactions that create the lighter elements — principally hydrogen and helium, with a dash of lithium. That's within the first minute. Within three minutes, 98 percent of all the matter there is, or ever will be in our universe, has been produced. In short, within three minutes, or so, we have a universe.

III. What Caused the Big Bang?

That's the Big Bang Theory.

Indeed, according to the best of the inflationary Big Bang theories, this is how the universe came to be. But another big cosmological question is: what caused it? What caused the Big Bang? What set it off? After all, it seems impossible that we could get something from nothing. But there is very good evidence that once there was *nothing* — or that once there was essentially nothing anyway. And now there

clearly is *something*. But how in the world did this come about? What caused the Big Bang? Or, another way of asking the same question might be, what was *before* the Big Bang?

Well, one notion is that perhaps the point of singularity was the relic of an earlier, collapsed universe — that our universe is just one manifestation, in other words, of an eternal cycle of expanding and collapsing universes.

Others attribute the Big Bang to what they call “a false vacuum” or a “scalar field” or a “vacuum energy” — some quality or thing, at any rate, that introduced a measure of instability into the nothingness that was.

Or it may be that our universe is merely part of many other universes — the so-called “multiverse” — some in different dimensions, and that Big Bangs are actually going on all the time all over the place.

Or it may be that space and time had some other forms altogether before the Big Bang — forms too alien for us to even imagine — and that the Big Bang represents, then, some sort of transition phase, where the universe went from a form we cannot understand to one we almost can understand.

In short, what caused the Big Bang? What was before the Big Bang? Nobody really knows.

IV. The Earth and the Moon

Okay, let's bring this down to earth a bit and try to begin to understand our place in the universe. If the Big Bang occurred about 14 billion years ago, then two other key cosmological questions (for human beings anyway) are: when and how did the Earth come about?

The answer goes something like this.⁴ About 4.6 billion years ago, a great swirl of gas and dust some 15 billion miles across started to gradually accumulate in space in what would turn out to be our vicinity of the Milky Way galaxy. Virtually all of this gas and dust — 99.9 percent of the mass of what eventually would become our solar system — went into making up the Sun. Out of the remaining material that was left over, two microscopic grains eventually floated close enough together to be joined by electrostatic forces. This, friends, was the moment of conception for our planet.

All over the inchoate solar system, the same thing was happening. Colliding grains of dust formed larger and larger clumps. Eventually the clumps grew large enough to be what scientists now call planetesimals. As these small planetesimals (these budding planets) endlessly bumped and collided with one another, they split apart or recombined in endless random permutations. But in every such encounter there was a winner, of sorts, and some of the winners grew big enough to eventually dominate the orbit around which they traveled.

To grow from a tiny cluster of grains to a baby planet some hundreds of miles across is thought to have taken a few tens of thousands of years. In about 200 million years, possibly less, the Earth was essentially formed, though still molten and subject to constant bombardment from all of the debris that remained floating around, circling the sun.

Continuing our narrative of Earth's history, at this point, about 4.5 billion years ago, an object about the size of Mars crashed thunderously into Earth, blowing out enough material into space to form a

⁴ Again, I will rely primarily on Bryson, op. cit., pp. 38-39, and Whittle, op. cit.,

companion sphere, which we now know as the Moon. Within weeks, it is thought, the flung material had reassembled itself into a single clump, and within a year it had formed into the spherical rock that continues to orbit the Earth and to light up our night sky.

Continuing forward, for the next 500 million years, or so, our young Earth continued to be relentlessly bombarded by comets, meteorites, and other galactic debris, which sounds nasty and inhospitable, but actually was very fortunate because it brought water to fill the oceans and it brought many other components that were necessary for the successful formation of life. So, just as in our own lives some of our greatest growth experiences come in times of turmoil, so, too, it was in a singularly hostile and chaotic environment that the components necessary for life came together, and somehow life got going. As Bill Bryson understatedly puts it, "Some tiny bag of chemicals twitched and became animate. [And] we were on our way."⁵ That was the beginning of life.

Continuing forward, four billion years later, through the wonders of evolution, life somehow took another giant step – and gained consciousness – and people began to wonder forevermore about how and when the universe ever began.

V. Our Place in the Universe

Okay, so now that we have some idea for how and when the universe and the Earth began, let's try to put it all into some perspective, so that we can get an even better understanding of our place in the universe.

Again, let me draw on Bill Bryson.⁶ Bryson says that if we imagine not the whole history of the universe, but if we imagine just the 4.6 billion odd years of Earth's history compressed into a normal earthly 24 hour day, then, interestingly, life begins very early, at about 4:00 a.m., with the rise of the first simple, single-celled organisms. But, oddly enough, life then advances no further for the next 16 hours of our 24 hour day!

Not until almost 8:30 in the evening, with the day five-sixths over, has Earth anything to show the universe but a restless skin of microscopic microbes. Then, finally, around 8:30 p.m., the first sea plants appear, followed twenty minutes later by the first jellyfish and the so-called Ediacaran fauna. At 9:04 p.m. trilobites swim onto the scene, followed more or less immediately by various other curious simple creatures.⁷ Just before 10:00 p.m., plants begin to pop up, not just underwater, but on the land. Soon after, with less than two hours left in the day, the first land creatures arrive.

Thanks to ten minutes, or so, of balmy weather, by 10:24 p.m., the Earth is covered in the great carboniferous forests, whose residues give us all of our coal and carbon. It's at this point that the first winged insects start flying around. Dinosaurs then plod onto the scene just before 11:00 p.m. and hold sway for about three-quarters of an hour. At 21 minutes to midnight the dinosaurs vanish, and the age of mammals begins.

⁵ Bryson, *op. cit.*, p. 39.

⁶ The following 24 hour day image is paraphrased from Bryson, *op. cit.*, pp. 336-337.

⁷ Bryson references the curious shapely creatures discovered at Burgess Shale, which is one of the world's most celebrated fossil fields located in the Canadian Rockies of British Columbia.

Meanwhile, throughout this greatly speeded-up day, we must imagine, as Bryson suggests, that continents are sliding about and banging together at a clip that seems positively reckless. Mountains rise and melt away, ocean basins come and go, ice sheets advance and withdraw.⁸

And, finally, one minute and seventeen seconds before midnight — tah dah! — humans emerge. But, astonishingly, approximately 98% of human developmental history occurs before the invention of agriculture.⁹ In other words, most of our existence as human beings was before we ever planted crops. Another way to put it is that the whole of our recorded history and civilization — all of our art and science, all of our music and dance, all of our literature and technology, and all that we personally hold dear — on this 24-hour scale, has lasted, so far anyway, no more than a *few seconds* in duration, bringing us to midnight and to the present, in 2010.

So, let us clearly acknowledge that we are but newcomers to the cosmic scene.

VI. Dénouement

Now, admittedly, the vastness of space and time are sometimes mind-numbingly daunting, causing us to feel somewhat small and insignificant perhaps. Nevertheless, I invite you to consider that stars and galaxies and super-galaxies, while clearly impressively large and distant, are, nevertheless extremely *simple* things as compared, say, to an integrated circuit, or to a human cell, let alone to a human brain. Indeed, as professor Mark Whittle suggests, if things were made to shine with a brightness proportional to their *complexity* rather than to their *size* or *energy*, then the stars and galaxies and super-galaxies would be but dim, 15 watt light bulbs, while our brains alone would shine out like blinding quasars visible across the entire universe.¹⁰

So, friends, in short, while clearly we are relatively new to the cosmic scene, it is equally clear that in an amazingly short time, through evolution, we have achieved an astonishing complexity, a complexity that has brought matter to consciousness — a subtle and intelligent consciousness capable of reflecting upon itself, a consciousness capable of asking deep cosmological questions, and a consciousness capable, moreover, of reveling in the glory of the incredibly wondrous universe that is our home.

⁸ Bryson, Bill, op. cit., pp. 336-337.

⁹ Christian, David, from an online advertisement for “Big History: The Big Bang, Life on Earth, and the Rise of Humanity,” The Teaching Company, course # 8050.

¹⁰ Whittle, op. cit., Vol 1, p. 33.