The Beginning and the End: Christ, the Big Bang, and Entropy

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(For introduction, see the text of the workshop December 30.)

As you may have heard, the world was supposed to have ended last week. As you may have noticed, it didn't.

On the internet you can find a listing of all the hundreds of predictions that have been made over the years that specified exactly when the world was going to end. And they have all been equally correct. So far.

But sooner or later, in one way or another, the world will indeed end.

I don't just mean our life, or the lives of all humans, or the end of planet Earth, or even just the death of our star, the Sun. The entire universe appears to be doomed, if you're willing to wait long enough.

For example, from how astronomers measure the motions of distant galaxies we now are able to calculate backwards to the beginning time, which some call the Big Bang, and to extrapolate forwards into a universe that will expand, and get colder, forever and ever.

The "Big Bang" is the popular name for the widely accepted cosmological theory that posits that the universe formed from the expansion of an initially singular state that contained all of its mass, space, and time. The standard version of the theory starts with the assumption that the distribution of matter in the observable universe is essentially uniform over distances of hundreds of millions of light years (much larger than clusters of galaxies), and it proposes that this uniformity results from everything in the observable universe starting its outward expansion at a specific time and from a very hot, dense state.

In 1916 Einstein described his general theory of relativity where space, time, matter, and energy were interrelated, and he suggested that the force of gravity could be understood as how mass warps the interrelated dimensions of space and time we call space-time. A key point of his theory was dramatically confirmed in 1919 when Arthur Eddington observed a star very near the Sun – he looked during an eclipse so the starlight was visible – and he saw that the apparent position of that star was slightly shifted from where it should have been. The rays of light from the star had been bent by the Sun's gravity; which is to say, the shape of space near the Sun had been warped by the Sun's mass.

Given that such a warping should tend to attract all matter together, this observation revealed a paradox: assuming (as had been done since Aristotle) that the universe is infinite and eternal, why hadn't all of this mass in the whole Universe had time to warp itself together into one point?

Einstein suggested that there could exist another force, previously unknown, that held mass apart and allowed the universe to be divided into individual galaxies, stars, and planets. He noted that such a force could be introduced into his equations as a "cosmological constant."

But then in 1922 the Russian physicist Alexander Friedmann showed that Einstein's equations were also compatible with a universe that was expanding, and he demonstrated mathematically how that expansion could be related to the possible curvatures of space. Friedmann proposed that if the universe started out at the beginning with a sufficiently large expanding velocity, it could continue to expand indefinitely, even against the force of gravity, thus removing the need for a cosmological constant.

The concept of building an entire cosmology based on such an expansion of the universe from a single highly dense quantum state is generally attributed to a 1927 paper by the Belgian mathematician and astrophysicist Georges Lemaître. He was one of those scientists who could read mathematical equations as if they were poetry; and he read into the equations of Einstein's General Relativity, the idea that the universe grew from one immensely dense energetic point he called the "cosmic egg" and that you could even calculate the point in time when this cosmic egg was hatched: the beginning of the universe.

A couple of things to note, here. This expansion of space that he predicted should take place between clusters of galaxies. Within a galaxy, however, or indeed on Earth itself, space itself is not changing. But it predicts that every galaxy cluster moves at its own rate, and so those that travel the fastest also travel the furthest. So if all matter in the observable universe started from the same point at the same time, then one would predict that the velocity of any galaxy away from any point within the universe should be proportional to its distance from that point: the faster it's moving, the further it has traveled. For an observer on Earth, in the Milky Way galaxy, the galaxies in clusters furthest away should thus be the ones moving the fastest… and if you think about it, this would also be true for any other observer in any other galaxy cluster in the universe.

This expansion should not be thought of as material spreading out into an empty void, but rather space itself is expanding. Because the entirety of the universe, both space and time, was contained within the initial state, there is no physical meaning in speaking of anything “outside” this state; nor can one necessarily speak of a time “before” this expansion. Because the expansion occurs between bits of space itself, in principle some of these pieces of the universe can be moving away from each other at faster than the speed of light but such pieces of the universe are, by definition, unable to be observed, because the light emitted from them could never reach Earth. Instead, the “observable” universe consists of all matter inside the “horizon” of matter that is receding from the vantage point of Earth at less than speed of light.

Now, the thought that the observable universe began from a single point at a certain fixed time was strongly resisted by many astronomers. They felt more comfortable with a universe that was eternal and unchanging. That this theory was developed by Georges Lemaître, who was not only an astrophysicist but who also happened to be a Catholic priest, may also have led some other astronomers to suspect his motivation. Was Father Lemaître just trying to find a “scientific basis” for the idea of a Genesis point? Father Lemaître himself denied this. When Pope Pius XII noted in 1951 the interesting fact that scientists were seriously talking about a beginning point to the Universe, Father Lemaître himself personally urged the Pope not to promote his theory as a proof of Genesis. (And in fact the Pope was careful not to do so. After all, who knows what our cosmology theories will look like in a thousand years?)

In fact, both atheists and apologists have attempted to read a theological significance into the Big Bang theory, either as a confirmation of the biblical story of creation or a substitute for divine creation. So it's important to remember that that's a foolish thing to do. As a scientific theory, the Big Bang will always be open to further development, and at some future date it may be replaced by a different theory that better fits the data.

Perhaps the most important philosophical implication to take from cosmological theories such as the Big Bang is the realization that humanity's common-sense understanding of how the universe behaves is a woefully incomplete picture of physical reality. As each new advance in cosmology poses new questions, there is also a fuller appreciation of both the complexity and the beauty of the universe.

This theory of an expanding universe was proposed at an opportune time. Along with relativity, the 1920s saw the development of quantum mechanics, which describes the interior state of subatomic particles even at extreme conditions, such as the enormous pressures and energies at the proposed initial state. Further, it was in 1929 that the American astronomer Edwin Hubble reported that galaxy clusters showed exactly the kind of motion predicted by the theory of an expanding universe. The confluence of these three breakthroughs both motivated the cosmological theory and gave cosmologists the tools they needed to predict of the kinds of effects that could be observed if the theory were correct.

But it was at this time that the British astronomer Fred Hoyle came up with an alternative theory to explain the observed expansion that suggested the universe was infinite in space and time but expanding as new matter was being continuously created in the spaces between the galaxies. In this way, you wouldn't need a starting point.

Hoyle was the one who coined the term “Big Bang” to mock Lemaître’s idea. Add in the fact that Hoyle was quite anti-clerical, a professed atheist, and you can imagine what happened when Hoyle and Lemaître actually met: they became best of friends. They took vacations together; on one occasion for several weeks one summer in the late 1940s, Dr Hoyle and his wife and Father Lemaître toured Switzerland together.

Like all good scientific theories, both the Big Bang and the Continuous Creation theories were theories that could be tested. In particular, the Big Bang predicted a number of traits about the universe in addition to the expansion observed by Hubble that should be observable if this were true. Astronomers could look for “echoes” of the Bang, so to speak.

For example, the expanding energy at the beginning of the universe should eventually turn itself into matter, in accord with Einstein’s famous equation $E=mc^2$. This matter should be in the form of hydrogen and helium atoms, the two simplest forms of matter, in proportions that could be calculated by the theory. The observed ratio of hydrogen and helium in the universe fits these predictions.

Another condition predicted by this theory is that the leftover radiation from the expansion should be detectable in the background of the universe as radio waves that are isotropic (the same in every direction), with an energy equivalent to only a few degrees above absolute zero, as the immense heat of the beginning state has now been spread out over the immense dimensions of the universe in its current state.

It was precisely this type of radiation that was discovered by Arno Penzias and Robert Wilson in 1965. The discovery of this background radiation, which competing theories such as Hoyle’s “continuous creation” could not account for, was the conclusive evidence in favor of the Big Bang. And so today, the Big Bang is now the basis for modern cosmology.

In the last fifty years, the development of the Big Bang theory has been focused on making theories consistent with our ever more detailed observations of the distant universe. Because light travels at a finite speed, the current view of distant objects is in fact the observation of light emitted from a very long time ago, and thus one can actually look “back in time” to earlier epochs in the universe to constrain these theories.

Among the most exciting observations of recent times is that the expansion has not been slowing down, as might be expected as gravity counters the initial expansion velocity, but actually accelerating. Apparently Lemaître and Einstein were both correct, and along with the initial expansion, a “cosmological constant” to accelerate the universe also does exist.

Furthermore, various data, including the detailed observations of acceleration of the universe and its apparent lack of curvature, has led cosmologists to infer that only four percent of the mass in the universe is made of visible matter such as stars and planets. Instead, the essence of the universe appears to be dominated by poorly understood entities called “dark energy” and “dark matter.”

But the effect of all this material, the initial bang and the acceleration of dark energy, is that the Universe ought to keep expanding forever. We started out hot and dense and energetic; we ought to end up very cold, very thin, very dead.

But even beyond the Big Bang, there is another principle of science that tells us that everything, eventually will run down. It is called Entropy.

Entropy is the measure of disorder in a physical system. Consider a drop of red food coloring in a glass of water that quickly disperses through the water. Once the dye is dispersed, it is never seen to gather itself back into the original drop. Why is that so? The energy of the system stays constant as the dye disperses; the temperature of the water is constant; presumably the dye could recombine without violating conservation of energy. But something is changed when the droplet is dissolved. The quantity that describes how the system has changed is entropy.

In 1865 the German physicist Rudolf Clausius devised the word entropy from the Greek *trope* (transformation) to describe how engines are never perfectly efficient, that they never provide as much useful work as the amount of heat they consume. Later, the Austrian physicist Ludwig Boltzmann and the American physicist J. Willard Gibbs provided ways to quantify this entropy with a mathematical understanding of its underlying principles. Boltzmann recognized that nature is made up of individual units (such as atoms or molecules of matter), and that the arrangement of those units can be described with the mathematics of probability. There are many different ways in which all the molecules of a dye could be arranged within the glass of water, but in very few of those ways are all the red molecules gathered next to each other in a droplet. The probability that such an arrangement will happen by chance is so small that effectively we never see it happen.

The concept of entropy plays a similar role in information theory. Information in a message can be divided into individual “bits”: the letters of an alphabet, or the 1’s and 0’s of a computer. Every time an error occurs in the transmission of that message, from a mistype to a noisy connection, information is lost to entropy.

Because there are many more “disordered” states than “ordered” ones, a system that can arrive at any state at random is most likely to exist in a disordered state, a state of increased entropy. But this natural tendency of entropy to increase can be reversed locally. Consider the growth of a tree from an acorn. The final tree is a far more organized entity than all the constituent parts – derived from soil, water, and air – that are assembled within the tree as it grows. The entropy of the tree is much lower than that of its original constituents. This is possible because the tree takes advantage of the energy of the sun to drive chemical reactions that reverse its entropy, locally. Meanwhile, the production of sunlight involves an increase of entropy deep inside the sun that is greater than the reversal of entropy in the tree. Within this system, the growth from acorn to tree is possible; but the total entropy of the universe, including both tree and sun, increases.

Furthermore, though disordered states are more probable than ordered states, probability also admits that on rare occasions a natural system might momentarily find itself by chance in a more ordered state. If that state is also more stable than the disordered state, then the more ordered state can in fact prevail over time.

Returning to the example of food coloring in water, suppose that when a molecule of red dye encounters a breadcrumb in the water it preferentially sticks to the crumb rather than staying dissolved in the water. Eventually all the dye molecules moving at random through the water will encounter that breadcrumb and become concentrated there, rather than remaining dispersed through the glass. This “sticking,” of course, involves a change of energy within the breadcrumb itself; one would have to apply energy to the system (for example, by heating the breadcrumb) to drive the dye back into the water.

Gibbs showed that the minimum amount of energy needed to decrease entropy is equal to the change in entropy times the temperature of the system. The “Gibbs free energy” that determines whether or not a physical change in a system will occur is thus the sum of the energy put into a system minus the energy needed to counter any change in entropy. Note that the Gibbs free energy has two terms, an energy term and an entropy term. Energy can be used to restore order; but the dissipation of energy as waste heat is one consequence of the natural increase of entropy. Because of these two (often opposing) tendencies, you can manipulate a system either to restore order at the expense of using up heat, or to reverse the flow of heat at the expense of increasing entropy elsewhere in the system.

Unlike energy, entropy is not conserved. In practice, a decrease in entropy in one part of the universe is always matched by an even larger increase in entropy elsewhere. Thus, though there can be local reversals of entropy, the entropy of the universe as a whole, itself, is always increasing. Nature as a whole proceeds in one direction, the direction of increasing entropy.

The concept of entropy is sometimes used in philosophical contexts, often by people who don’t complete understand its subtleties. For instance, some people like to cite entropy as a disproof of the theory of evolution; they argue that producing more complex life forms from less complex constituents is contrary to the trend in nature of increasing entropy. But this misunderstands both the presence of local reversals of entropy in nature and the mechanistic and probabilistic assumptions built into its definition. It is also important to remember that the concept of entropy, strictly speaking, is applicable only to a system that operates under natural, mechanistic laws. You can joke that there is a “reversal of entropy” when a teenager cleans up her room or an academic sorts and files paperwork; it certainly involves the energy of physically moving the items to their proper places. But it also involves the free-will decisions that determine what places really are proper. Such decisions are outside the realm of mechanistic physics.

But with these caveats in mind, notice what the existence of Entropy tells us. There is a direction to time. Things tend to run only in one direction. And that direction, inevitably, is to a universe that becomes more and more “run down”. Even if the total amount of mass and energy in the universe stays constant, the way that material is distributed should become more and more uniform, more and more random.

Tie this into the Big Bang and you wind up with a view of the far distant universe – we’re talking hundreds of billions of years from now – where everything has been spread out into an inexpressibly thin, cold gruel of basic subatomic particles that are each so far from each other that they can nevermore interact with each other, or even know that the other particles exist. In this view, the universe does not end with a bang, but a whimper.

Now, is that really what’s going to happen?

We can have scientific theories about beginnings, like the origin and evolution of the Universe or, closer to home, the origins of our own planet and solar system. These theories are relatively easy to test, because we have information preserved from the past that we can compare against our theories. Looking deep into space, we are seeing light that left the stars billions of years ago and so we can see what things looked like back then. With rocks from the Moon and the asteroid belt, my precious meteorites, we have samples that have lain essentially untouched since they were formed billions of years ago, and so they can tell us about the conditions that prevailed when they and the planets were made.

Theories about the future of the Universe, however, are much harder to test. We have no samples, we have no data, from the future! Instead, the best we can do is assume that whatever is happening now, will continue to happen the same way into the future. If that works, if entropy is relentless and space continues to expand forever as most versions of the Big Bang predict, then eventually all stars will cool off and die; the universe itself, they say, will suffer a “heat death.”

But experience tells us that such extrapolations are always very uncertain.

And of course, our Christian faith suggests we have a different fate. The Resurrection of Jesus and the Assumption of Mary tell us that God, who created our physical bodies in this universe, intends an eternal, and real, physical future with Him. What will that future will be like?

What does traditional Christianity say about the end of the universe? Actually, less that you might think. (Or maybe more than you might think. It depends on what you think.)

Throughout the ages, many people have spoken of or hoped for an eternal afterlife. Others, of a more practical bent, have looked for immortality of a kind in their achievements, or at the very least in their children. In the global scheme, of course, even this sort of immortality is limited. Just a few streets over from here, you can see the tomb of Julius Caesar in the old Roman Forum. We may still recall Caesar two thousand years after Brutus and Cassius did him in, but sooner or later, every monument, every book with his name on it, will be left on the surface of a cold, lifeless planet orbiting the dead ember of a star, just as the same laws of entropy have by now already turned Caesar's body into dust. If the universe is fated to a heat death, the final cessation of the flow of heat that powers all activity in the universe, then no kind of living eternity is possible in nature.

So, it is easy to infer, such a living eternity must only be possible outside of nature, hence in the supernatural.

This split of our lives into a natural world that runs down, and a supernatural one that continues forever, is so obvious to a modern Christian that few believers are bothered by the contradictory pictures of end time given in science and religion. But this kind of understanding, this simple split into natural and supernatural, is to a large degree a product of the seventeenth and eighteenth century period sometimes called the Enlightenment, which appeared to draw a line between a mechanistic Newtonian universe on the one side, and a the religious universe of God and eternal life on the other. But this is not traditional Christianity.

After all, if our experience after death is supposed to be wholly supernatural, then why does Jesus never speak of life after death but always instead of "eternal life"? And why do the Gospels say that he, in his risen form, came in a body so physical that it still bore the scars of the crucifixion and could still enjoy the pleasures of a fish dinner?

And for that matter, if the physical universe is not what's important, why did Jesus bother to become incarnate in it? Why do we have Christmas? Why are we told that God so loved this universe that he sent His only Son? No… to quote the English physicist and Anglican priest John Polkinghorne, “we are not apprentice angels.” We are physical creatures, created in this physical universe, on purpose.

Yet if this physical world itself does have eternal meaning, how can you reconcile that with the scientific result that predicts at best a gloomy (and utterly boring) view of its eternity?

Our Apostles’ Creed says that Jesus will come to judge the living and the dead, and the Nicene Creed adds that his reign will have no end. If Jesus will be around and reigning eternally, there must be something more than just cold dust in the universe for him to be reigning over. And this also means that not only Christ but we too are expected to be around and alive eternally. Now that you and I have come into existence, it appears that we are going to stick around forever, in one form or another.

The only example we have of this future state of affairs is Christ’s resurrection. But Christ’s resurrection itself is not described in the New Testament. The Gospels only report the discovery, some days after Jesus’ execution, of the empty tomb that his dead body had been put in; and then some appearances of the risen Christ to his friends and disciples. But what actually was this resurrection?

Both the discovery of the empty tomb and the appearances of the risen Christ – eating and drinking, able to be touched (remember the story of doubting Thomas) – is clearly meant to indicate that his resurrection is not something merely spiritual. It concerns him in his bodily reality. There is a fundamental identity between the crucified Jesus and the risen Christ. This recognition and identification happens through the senses: by seeing the Risen One, hearing him speaking, touching him.

At the same time, we cannot understand this resurrection as a kind of zombielike reanimation of Jesus' dead body. The New Testament reports appearances of the risen Christ in which even his closest friends don't immediately recognize him. And he is able to appear inside locked rooms and come and go in ways an ordinary body could not do.

Likewise, in the Christian view, the death of a human individual does not mean that the person is completely dissolved. This is in deliberate contrast to ideas in some Eastern religions that would have the individual subsumed and lost in a mass of "consciousness" like a drop of water falling into an ocean. Instead, the church insists on identity and continuity between the deceased person and the resurrected one. It says that at some point, after we have died and our body has decayed into dust, we too will be resurrected in some bodily form. So what happens to us in between those times?

The key tool in Greek and medieval philosophy that seems to be needed to make this work, this existence while waiting for a body, is the concept of a soul. The scholastic philosophers of the Middle Ages were able to use the rich language of form versus matter from Aristotelian philosophy to describe soul and body in a formal way.

But this division of the human into components of body and soul may be merely a philosophical convention, useful to explain a theological truth in terms of a given human philosophy. It does not presuppose that this same truth could not be expressed in other ways by other philosophies.

Perhaps a more modern analogy might useful for those of us who are not schooled in ancient philosophy. Why not, just for the moment, think of the soul as analogous to the data in a computer. Like all analogies, this one will fail miserably when you push it too far; but at least perhaps it can help illustrate some of the issues involved in defining just what it is that survives after death.

Let’s say you and I own identical computers. But I know mine is different from yours (beyond the fingerprints on the screen and the scratches on the case) because it has a completely different set of files than yours and perhaps even a completely different operating system.

It’s not a matter of a physical difference. The computers could be identical models and be exactly the same in terms of size, shape, weight, and other details. The only physical difference is that certain metal grains representing ones and zeros are arrayed differently on my hard drive than the metal grains on your hard drive.

But remember, even information has entropy. How can I tell the difference between the arrangement of grains on my disk and a random arrangement of grains, like you might get on my hard drive after a long period of time when the medium begins to break down? Even the ones and zeros by themselves have no significance except in terms of the operating system that interprets them, and even the operating system can only translate those ones and zeros into bits of light on the screen, and those pixels only have meaning when we can identify them as letters, words, or pictures, and that requires a human intellect to translate those images into ideas.

Consider how the subtlety of this point has led to all sorts of modern issues involving copyright law. When you buy a piece of software (or a music disk, or a plain old-fashioned book for that matter), no one denies that you now own the piece of aluminum or polyester on which the information is written. But you do not own the ideas encoded on that medium. You own the paper that a book is printed on; you do not own the words themselves. You own the hard drive where the download sits; you don't own the arrangement of the data bits that the download represents. To what extend do you "own" the information you have purchased? What exactly did you get for your money?

By analogy, we can draw a distinction between the "wet ware" of the human animal – our bodies – and the ideas, memories, and emotions, and most essentially, the self-awareness, intellect, and free will, of the human person. Defining the soul as intellect and free will goes back at least to Saint Thomas Aquinas, and the usefulness of this definition is obvious. But in another sense, isn't this division artificial? Isn't it the case that the soul, like the program in a computer, has no physical existence without the physical existence of the body containing and operating on it?

Yet the idea behind a computer program could continue to exist long after every computer designed to run it has been made obsolete and sent to the junk yard. In the same way, couldn't a person's awareness and free will survive the destruction of the body? You might envision some science-fiction scenario with these components stored on some future computer; but who is to say that God even needs that kind of storage device?

(Let me emphasize again, this is an analogy to illustrate the issues. I am not saying that souls are the same thing as computer programs.)

But let's try to push our computer analogy a little further: Is a computer program that's been copied to another disk the same program as the one on the original disk? Is someone transported by a Star Trek transporter beam, disassembled at one point and reassembled out of different atoms someplace else, the same person at the other end of the transporter? What happens if more than one copy gets made? With these speculations, you can begin to appreciate the importance of the physical body, not just the soul, in defining the individual.

Is the body at the end of time the same as the body the person had when death occurred? What do we mean by “same” in this context? We have no difficulty identifying an eighty-year-old woman as being the same person as the baby she was eighty years ago, even if she has not a single atom left in her body from the body she had when she was born. But some software vendors insist that any computer that has had any of its major components replaced cannot legally run software licensed to the “original” computer.

In the time to be passed from the end of a person’s life until the resurrection of the body (at the “end of time”), can the human soul be thought of – does it exist, like the idea of a poem that is not written down – without any kind of materialization whatsoever? Or in the absence of a physical expression, is the whole idea of time itself meaningless?

It’s clear that trying to derive a physical, scientific implication for the end of the universe from religious principles is a hopeless task – as hopeless as trying to derive a sense of our religious end times from studying the Big Bang. But there is one important implication for the science in all this: the realization that physical science by itself isn’t the whole story.

Yes, there is an interaction between the way we look at ourselves and our universe in a philosophical sense and the way we do it in science. Each can learn – by analogy – from how the other operates. But neither should assume that it’s the entire story or that one is able to trump the insights of the other.

Saints walked in this universe before Newton or Einstein explained it. Understanding Calculus is not a prerequisite to gaining the kingdom of heaven. But a God who created the universe of Einstein can be seen to be much bigger and more subtle and more elegant than the nature gods of the Babylonians reflected in the opening pages of Genesis. Philosophy alone could never conceive of the richness of the universe that science has revealed.

And yet by the very fact that it cannot even begin to handle the existence of self-awareness and free will choices, science in its turn has proved to be incomplete. If the point of science, like all other human endeavors, is to provide a reflection of our universe, then science has left out a big chunk of the universe in its reflections. No scientific theory is capable of coming to the most important conclusion of Genesis, that God looked on this creation and said that it was good.

And that's only right. That is the whole genius of art: true art, be it painting or novel or drama or music, selects and arranges. A video is not the same thing as history. The genius of human understanding is to choose what to study and what to set aside. A science that tried to contain everything would no longer be science and would no longer be art. Even in the scientific world, we filter our data so that we can look at one phenomenon at a time.

Vincent Van Gogh made a famous painting of a starry night; I am sure we have all seen it. But Van Gogh's painting is not a photograph. I can't do spectral photometry of the stars imaged in a painting like Starry Night, nor did the artist ever intend it to be used that way. Instead, it is up to us to take his odd colors and splashy bits of paint and add in our own imagination to complete the picture. In that way, the picture – and a bit of the painter – enters into our soul.

In the same way, the scientific painting of the universe has deliberately set aside many of the most pleasing parts about being alive. That's not to criticize it, any more than we would demand that every van Gogh should come with a piece of French bread and a bottle of wine. Because by limiting itself, by removing certain facets of human existence from the picture, the scientific portrait of the universe allows us to bring to the surface other equally pleasing facets of existence that we might have otherwise missed: the order and reassuring predictability in nature and the logic that allows gloriously complicated things like stars and galaxies to arise from the simplest of scientific principles.

Our resolution of how the human person, incarnate in a universe that appears to be destined to an ultimate state of heat death, nonetheless obtains eternal life with a God who is Himself eternal (and incarnate in this universe as well as being outside of space and time) admits to no simple scientific or theological explanation. The best we can do is speak in poetry and paradoxes of bodies that are at the same time the same but different from those we now possess.

It is paradoxical; but that is not to say it is unreal or even unfamiliar to us. We can understand that in some sense, the center of human identity, call it if you wish the soul, can maintain a hypothetical existence even in the absence of a particular physical manifestation; this works in the same way that the idea of a song or a poem can live on even after every copy of it has been destroyed. Perhaps it is in the power of abstract ideas, the nature of words themselves, that give us our best analogy to understand how we can exist even when our bodies turn to dust.

Maybe we've been given our clearest hint from Him who was the first example of that eternal, physical existence. Jesus Himself, before his death and resurrection, put it simply and directly. As He is quoted in Matthew's Gospel, "Heaven and Earth will pass away, but My words will never pass away".