

Where does your faith fit in the cosmos?

Interview with Brian Swimme

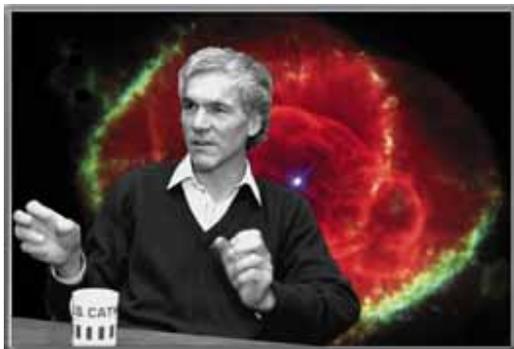
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What is the place of your faith in the cosmos?

Ask physicist Brian Swimme about the universe, and he'll light up the sky with his enthusiasm. He has an infectious curiosity about the cosmos and all that is in it. With each new scientific discovery—how the sun produces light, how fast the universe is expanding, or how human genes differ only infinitesimally from those of other primates—Swimme finds more clues about the nature of God. Why?

"In the spirit of Aquinas, I would say that the universe itself is the primary revelation of God, and the universe is made in the image and likeness of God."

*Swimme holds a Ph.D. in mathematical physics and is a professor of cosmology at the California Institute of Integral Studies. He is the author of several books, including *The Universe is a Green Dragon* (Bear and Company, 1984) and, with Thomas Berry, *The Universe Story* (HarperSanFrancisco, 1992), and producer of two video series, "Hidden Heart of the Cosmos" and "Canticle of the Cosmos."*



*What is cosmology, and why should Catholics care about it? Cosmology is the study of the birth, development, and the destiny of the universe from a scientific point of view, but more traditionally it is the study of the universe and the role of the human in the universe. What I like about the word *cosmology* is that it has meaning in both the scientific world and the religious world. Saint Thomas Aquinas and the medieval poet Dante Alighieri are two of the great cosmologists of Christian tradition, and physicists Stephen Hawking and Carl Sagan would be two of*

the most famous cosmologists of our time.

This tie-in of science and religion seems unusual in this day and age.

Normally people do separate them. It's part of the whole split in science and religion beginning with the birth of modern science. In the 16th century Copernicus announced that the earth is actually moving around the sun. This was the opposite of what Catholic tradition was teaching that the earth was stable, and the sun was moving around the earth. Copernicus was a canon of the church and knew that his discoveries would be dangerous, not only for him personally, but for the culture as a whole because what

he was saying was disrupting a very ancient tradition. In the 17th century, when Galileo came to the conviction that the earth was moving around the sun, he was persecuted by the Inquisition and eventually had to recant his claim.

Since that time, science has really separated itself from religion, and this separation has not been healthy for science, religion, or for the human species as a whole.

What is it about an objective fact becoming known that would send terror into the hearts of people?

Because it's more than just fact. If you had this idea that the earth is the center of the universe, there's a tremendous sense of the earth's importance. If you take that worldview and say, no, the earth isn't at the center, in fact, we're just a planet going around the sun, and the sun isn't that big a deal, it's just one of 100 billion stars of the Milky Way, then suddenly that deep sense of significance is taken away. If the human being is cut off from a real sense of being at the center of things and watched over and helped and part of this whole vast community of being, then what happens is the human moves ahead on its own materialistic agenda. There's no common context anymore. No sense of purpose or direction.

How do we develop a common cosmology?

After 400 years science has deepened its understandings of the universe and has now arrived at a place where it can enter into a conversation with Christian tradition. If we can begin to think about the universe from the perspective simultaneously of Catholic traditions—or religious tradition more broadly—and scientific empirical knowledge, we can come to some amazing discoveries and insights.

Can you give us an example?

For example, we know now that 15 billion years ago, the universe flared into being. This alone changes the whole discussion between science and religion because during the whole history of science, there was never any thought by Albert Einstein or other great scientists that the universe had a beginning. The universe was regarded as an eternal place.

Within a situation where things are always here, the existence of order, such as the development of a human being, is not any surprise because, with an infinite amount of time, things can eventually gather together and form interesting aggregations. But in 15 billion years, there's no way there'd be time to develop even amino acids, much less anything as complex as a human. In other words, scientists now recognize that for there to have been this emergence of order, the universe was aiming toward this point. That's a vast shift away from the idea of a mechanical, random universe.

Doesn't Stephen Hawking say that matter was always here?

Hawking is one of the principal discoverers of contemporary cosmology. In the first part of his life, he worked hard demonstrating that the universe came from a singularity, this vast eruption. Recently, however, he's been wondering whether we can somehow learn more about the singularity. He has raised the question of where the singularity came from. If you have a universe that's always been around, you don't have to deal with the question of where everything came from, but if the universe is only 15 billion years old, then you have that deep cosmological question rising up. When Einstein first suspected that the universe had a beginning, he tried to find some way to get around it. A beginning in time was too much for him to deal with. Other physicists found the idea that the universe had a beginning abhorrent.

Now they know how the church felt after Copernicus' and Galileo's discoveries.

Exactly. The scientists were committed to a worldview that was alien to the notion of a beginning. That's why in a certain sense science's discovery that the universe has a beginning is even more powerful. If it had been something they wanted to discover, we'd be suspicious of the discovery. But they tried every way they could to avoid thinking about the universe having a beginning, because now the question is, Where does the universe come from?

For some, the scientific answer is that we don't know, but there's another line of thought within science that has an amazing resonance with Catholic and other religious traditions. It has to do with the nature of the vacuum.

In quantum physics, we have discovered that the vacuum is a very mysterious realm. A vacuum is what you have when you take everything out of a place. So in this room, for example, if you take out all the books, the people, the table, all the air and air molecules, all the particles of energy, then you have a vacuum. In the vacuum—devoid of any matter or energy—particles spontaneously emerge. It is one of the most bizarre discoveries in the history of science. We've discovered in science that what is utterly empty is also simultaneously utterly full because it's a realm that gives birth.

When physicists try to somehow make sense of this, they'll say that the particles that emerge, that didn't exist before, are *virtual particles*.

What's a virtual particle? A virtual particle is not a particle. We don't know what more to say.

Science is brushing up against a very powerful and ancient idea that was appreciated by, for instance, Meister Eckehart, the 13th-century Dominican theologian, who spoke about the "super-essential darkness of God." That was his way of designating what is at the root of reality, which he and other mystics also called the "Godhead."

Thus, scientists, simply by pursuing their investigations of the universe, have arrived at an understanding of a realm that has been celebrated and cherished in Catholic tradition. Thomas Aquinas, for instance, will

talk about the universe as being created *ex nihilo*, out of nothing. Well, that is almost the exact phrase for discussing what we know about the universe from the standpoint of physics. So this deep understanding of the realm that gives birth to the universe, which had been discovered previously in an intuitive, mystical sense, has been discovered in an empirical scientific sense. This is an amazing opportunity for dialogue between science and religion.

Are scientific leaders open to this discussion?

Yes. Last summer, for example, I was part of an annual meeting of scientists that has been held for decades investigating questions about the origins of the universe. These are scientists from such places as Massachusetts Institute of Technology, Washington University, and Harvard.

The entire meeting was on this question of the Epic of Evolution and whether we have appearing in our midst a vast new synthesis that is rooted in science and in the spiritual tradition simultaneously. That was the discussion for an entire week at the very highest level of scientific inquiry. This is a conversation that's going to increase. Science is moving out of its mechanistic phase and is now groping into a new phase where it is exploring what it has to offer to the question of wisdom. It's the wisdom phase of the scientific enterprise.

What part do religious leaders play in the discussion?

I find it absolutely remarkable that the pope came out recently with a declaration on the importance of evolution. That is a major event in the history of humanity because here is the spiritual leader of the largest institutional, religious gathering on the planet saying that this scientific theory requires attention.

Of course, Teilhard de Chardin, the Jesuit theologian and paleontologist, was a fountainhead in this modern discussion of science and religion. After a lifetime of study and reflection, he came to the conviction that the discovery of the evolutionary nature of the universe is the most significant transformation in human intelligence in 2 million years.

Although over the centuries, the Catholic Church has condemned some scientific findings, many of the findings themselves came out of the Catholic scholastic tradition, didn't they?

Absolutely, and that tradition goes back to the incarnational nature of Christianity. Catholicism sees creation as good. Aquinas said that we needed to pay attention to matter, or nature, because causes don't originate just in God, they also originate in the creature. This deep appreciation of nature led directly to science. That's why it is so amazing that we've had this period of separation because the scientific enterprise grew directly out of that theological attention to nature.

How can Catholic thought contribute to the scientific understanding of the universe?

The main contribution of Catholicism is its sacramental tradition and its view of the universe as revelatory—as a direct revelation of God. One example of this would be our sun. Our sun creates light by an amazing process where 600 million tons of hydrogen are transformed into 596 million tons of helium. The 4 million tons left over become light. Every second our sun is transforming 4 million tons of itself into light. Now that ongoing transformation of itself is irreversible, the sun doesn't get back the energy. Once it transforms itself into light, the light disperses in all directions. Everything that's happened in the life of this planet is directly dependent upon that light. We're moving here and talking and thinking only because coursing through our bodies is the energy from the sun. If the sun were not there, earth's temperature would be 400 degrees below zero. The whole biosphere would shrivel up and die.

In other words, all of human activity is powered by the generosity of the sun. Our existence directly depends upon the giveaway of the sun; this is a real sacrificial, ongoing event. The Catholic way of interpreting this event would be to see the sun as a revelation of God—thus, this act reveals part of the nature of God. God is constantly bestowing gifts; the sun is a primary exemplar of that, and without this generosity, life itself would cease.

Another area I would say that Catholicism will inform the dialogue between religion and science is in terms of community—the Catholic sense of community. The universe is primarily a community affair; the whole community of earth rises together out of the birth of the sun.

As a theologian and scientist, have you had trouble integrating religion and science?

I was educated in Catholic schools and went to Santa Clara, a Catholic university. I was reading Teilhard de Chardin and learning about science and theology at the same time. It wasn't until I got to graduate school that it became strange because the religious cosmological questions were no longer being asked. My difficulty wasn't with Catholicism, it was with secular science. I couldn't believe that people could learn about the universe and not wonder about these deeper questions. When I attempted to bring them up, they were a source of embarrassment because as scientists we were trained not to ask these deeper questions.

Just last night I was speaking with a scientist whose life work was designing guidance systems for nuclear weapons. He did this until he was in his 40s before he ever thought about what he was actually doing. When it really hit him—the horror of it, the blasphemy of it—he resigned from his position, which caused all kinds of upset and turmoil with his family and his relationships. He went off into chaos just by asking the question, What am I doing here? That's how carefully we've organized things to keep these ultimate questions out of our minds.

How are we able to stay in such denial?

When I wonder how it happens, I just turn on the TV set. Advertisements are so good at channeling all of

our energy into the direction of acquiring things, getting more commodities, focusing on our careers to get more money, so we can have more things—that's the cosmology of our time.

When I was teaching physics to undergraduates in college, one student was so taken with the topic that he decided to change his major. I asked what his major was now? "Music," he said, and I worried whether I should be swaying people out of music into physics. I told him he should go home and think about it because for years he wanted to study music. What were his parents going to say? It really bothered me.

Years later it struck me: here I had had all these scruples—and so did many of the teachers I worked with—yet the advertisers have no difficulty whatsoever preaching to kids about the choices they should make. We say "advertisements," and it sounds so superficial, but an advertisement is a small, powerful, compact sermon for materialism and consumerism. The average 3-year-old in America is taking in 10,000 advertisements a year. It's inevitable that after ten or fifteen years, the advertisers have made another convert; the world has yet another person who unconsciously is dedicated to the path of consumerism which eventuates in all the destruction we're seeing around the planet, **not** only in natural systems, but also in families and communities.

How can cosmology help counteract consumerism?

By giving our children the whole story of the universe and our role in it. The whole story is that our universe came into being 15 billion years ago—this great eruption out of the Godhead—and has been developing ever since. The question then is: What's the fundamental role of humans in this creative development? The insight of our religion that we're here for love would be deepened by our understanding of science. The way in which our solar system is rooted in generosity is an image of what it means to be human. So in a certain sense, we have to participate in the drama—in its ever increasing complexity, in its move toward community.

I'll give you another way to think about this from the scientific point of view. Through the work of the Human Genome Project, we are mapping out all of the genes of human DNA; there are around 100,000 of them. We will eventually know every gene. It's an impressive little project, and here's one of the surprising facts we've already discovered: over 98 percent of the genes of the human are identical to the genes of the chimpanzee— it could be as close as 99.9 percent. Now some people hear this and grow depressed. But Catholic tradition, in particular, would have a different way of looking at. If the universe as a whole is a revelation of God, chimpanzees, and fish are all revelations of God. So our discovery of our genetic relatedness is a great new insight into how the universe as a whole reveals community, which is the essence of God.

What science has discovered at this level is a profound interconnection; we are just embedded in one amazing web. The idea that the human is somehow separate from the rest of nature is part of what drives the destructive consumerism. Right now, we're using 40 percent of the earth's life entirely for the human and why? Because we have the notion in the consumeristic culture that it's all here for us, but from the

genetic point of view, we realize, no, the earth is one vast community; it's a family. So our activities have to be congruent with this whole earth community.

If we are so close to chimpanzees, what's the difference between us?

The difference between ourselves and our primate ancestors is the rate at which development takes place—ours is slower. For instance, if you compare the chimpanzee with the human, at every stage of development, our time of occupying that development is longer. Exactly the same DNA is used to grow the human brain as a chimpanzee brain except we stay with that process of growth longer—even as embryos—so our brain is larger.

In young chimpanzees and in young mammals of all types, there's a period when they give themselves over to play; they're dedicated to playing and exploring—that's the juvenile stage. Then at a certain time later on, they are genetically programmed to move beyond that into the adult stage. Our understanding from a biological point of view of the difference between the human and the earlier hominoids is that we remain in that period of play. We never get to the instinctive fixed-action programs that the adult chimpanzee gets to. This retention of childlike characteristics is called *neoteny*.

So you're saying human beings never grow up?

Yes, isn't that awesome? If you think about it from the point of view of the discussion of science and religion, you can see the significance. It means that as humans we become deeply fascinated, and we remain fascinated through a lifetime. Chimpanzees can get just as fascinated as we do by certain things, especially when they're young, but we're fascinated and we remain fascinated—we can't get over it. Chimpanzees walk; we walk. But we can't get over it, so we work with it; we develop it; we dance. That freedom of staying in a period of play through a lifetime is what develops the human consciousness.

So people who are more fun loving are more evolved?

Absolutely. People who are more fun loving are closer to the essential nature of what it means to be human. This understanding is something that is deeply expressed in Catholicism—this notion of play, of fascination, of mystical contemplation, of prayer, of joy. It is directly related to what Jesus was talking about when he said we had to become as children to enter the kingdom of God. All of this is possible precisely because we are neotenic creatures.

How fun!

Isn't that great?

It is.

Now that's the way in which science and religion can come together. I remember when I first started as a professor, I couldn't understand why everyone was always exhausted. Finally it dawned on me that people were not only exhausted, they were proud of it. There's a certain sense of making ourselves miserable because we feel that it justifies who we are. But the idea of driving ourselves into exhaustion so that we can feel good about who we are is a false understanding of the human. The human, rather, is a creature that was really created for delight, for a sense of astonishment. What would our culture be like if we took this understanding as our grounding? Your purpose and worth wouldn't be the amount of commodities you have; it would be the way you could enter into the delight of life.

A lot of people would argue that consumerism is a good thing because the more we consume, the more jobs we create, and the more we improve people's standard of living. And many people have the mentality that "I deserve this. I've worked hard. I go to church every week, I'm living happily in this world and speak as a consumer."

We have to be realistic about how profoundly entrenched we are in consumerism. It's a religion; so that when you begin to discuss other ways of being, you're involved in a very deep religious argument. The only way we can move forward is to understand that we have to have a larger, vaster, and deeper context—a deeper cosmology. We must think in terms of the planet as a whole. I don't just mean trees; I mean humans and trees—all of it, the whole, vast complexity of our earth in 1997.

What's taking place today is the fact that we have around 13 million children under the age of 5 dying every year from malnutrition, and at the same time, we are destroying 25 billion tons of topsoil every year. As long as you remain within the economic model, the consumeristic model, you can't understand what that means. It's just topsoil, it's just dirt, right? But how many of us realize that it took the planet earth 3 billion years to create topsoil?

Topsoil is an extremely advanced form of earth life. There's no topsoil on Mars, there's no topsoil on Jupiter, there's no topsoil on Mercury. There's no topsoil anywhere in the solar system, and there wasn't any on the earth until very, very recently. It takes 1,000 years for the earth to create an inch of topsoil. Topsoil is a cosmological happening, and if we destroy the topsoil, we can't find any for a trillion miles, forget it. We've looked.

That's one heck of a shopping spree. So topsoil is on back order?

Major back order. Maybe way out there there's some topsoil, but not in the nearest trillion miles. And we're not just destroying an inch, we're destroying 25 billion tons every season because of the way in which the corporations are tending to our food. We're being told that this is the way in which to feed the world. It's not the way to feed the world; it's the way to drive the earth further into exhaustion.

Right now we could feed the entire planet without topsoil loss, it would actually be topsoil restoration. We know how to do this, but it wouldn't be by depending on the consumer-capitalistic-economic model. It would be by returning the control of the land to the people who are living there, and they would enter into a process of growing their own food in a bio-intensive way.

What would city dwellers do?

One of the ways we're driving the planet to exhaustion is that we are feeding 80 percent of our grain to our animals, to our cattle. This is while starvation is taking place all around the world. A very simple and practical suggestion is this: if Americans as a whole reduced their meat intake by just 10 percent, that would free up enough grain to feed the entire planet.

So my point here is that moving away from industrial foods and towards more community-based foods helps your personal health, and it helps curb starvation and the destruction of the topsoil. There are so many different ways in which we can move forward to address these problems.

I'd like to recommend a book that is one of the most important books published in our time—*When Corporations Rule the World* (Kumarian Press, 1995) by David C. Korten. Korten was committed to the corporate world and the economic model for raising up the standard of living on the planet. Only through a long period of experience and study did he realize that actually the opposite is taking place. Instead of raising the standards, our economic order is driving people further into debt and raising the standard of living of only the small groups who own the corporations. It's a searing indictment. When we talk about cosmology, we tend to think of the universe and stars and so forth, but it includes economics within it.

In your opinion, then, it is essential for human beings to consider the universe as a whole in every human endeavor.

Going back to Catholic doctrine, I would say that we don't understand ourselves as isolated individuals. We see ourselves as part of a community. Our identity is in a community, and in a vaster sense, it's not just a community of humans. To truly understand who we are, we have to understand our cosmological dimension. We are 15 billion years of creativity in the form of one particular human body, and we remain directly related to the vastness of the community. This is the doctrine of the Mystical Body of Christ. Unless we have an appreciation for this mystical dimension of the whole, we don't really know who we are.

Einstein said, "Science without religion is weak, and religion without science is blind." Science has tremendous knowledge, but it's unable to really make a difference unless there's religious conviction. On the other hand, there may be tremendous religious conviction, but unless there's knowledge, it can turn into fanaticism.

Our situation right now isn't going to change unless it's grounded in deep religious energies. That's what motivates us, that's what moves us forward. Only that will have the power to replace this false consumeristic story.

Wouldn't some people say that Christianity is part of the problem?

Some people do blame Christianity for the ecological crisis, mainly because of a tendency Christians have to concentrate solely on the human and the human relationship to God without a concern for the rest of the community, but that is a distortion of the Judeo-Christian tradition.

One of the questions that Thomas Aquinas asked himself was, Why are there so many things? Why didn't God just give birth to one thing? Aquinas' answer was that no single being alone is capable of reflecting the divine experience. It's only in the vast multiplicity of the whole community that the fullness of the divine experience can be revealed.

How did life as we know it come to be?

There would be a variety of interpretations possible here; I'll give you one explanation. When the earliest life forms first came about, they generated their own food. The sun would activate chemical interactions in the oceans, which created a number of molecules, and these molecules were consumed by the life forms, but after a while, there was not enough food for all the life forms. The life forms would have died off if not for a mutation event that enabled life forms to actually capture sunlight. This is way back 3.5 billion years ago, and it is really a feat.

Light's moving at 186,000 miles a second and a life form has to capture a piece of it. But the even trickier part is that light comes in chunks called *photons*, and when you touch a photon to capture it, it disappears. Amazingly life forms fashioned a molecular net that, when it captures the light, actually transforms its shape and holds it until it needs energy, at which point it goes back to its original form.

Are you talking about photosynthesis?

Precisely. This is an amazing moment in the development of life on this planet. And what's even more amazing is that great moments like this are remembered genetically—they become part of the DNA which is passed down. So right now we have lots of creatures that can draw in sunlight. Look at the way in which the human eye captures light; it uses the same type of molecule that was invented 3.5 billion years ago; it's exactly the same process.

I use this as a way of seeing how the universe remembers what is valuable, what is important. What is retained is the beauty of a particular life. In death we don't leave the universe. We become part of it again—this is the traditional doctrine of the communion of saints. We become part of a huge community.

Where does that leave the doctrine of the resurrection of the body?

I think the resurrected body is coextensive with the cosmos; it isn't a loss of identity; it's actually like a new hue or a new tone.

Similarly, the presence of the resurrected Jesus in a certain sense is everywhere. It's still a focused identity; yet it's coextensive with the entire cosmos.

When did human life begin?

Our ancestors stood up in Africa around 4 million years ago. That would be one way to talk about the birth of humanity, but we were only four feet tall and our brain was much smaller. A later point was 2.5 million years ago. Some anthropologists say that's when the human began because that's when we began using tools; we even had tools to make tools. Then others will say, no, it isn't really until our ancestors had a brain the same size as ours now, and that would be around 300,000 years ago.

After that, evolution moved more into culture. What I mean by that is that, for instance, when humans invented the fish hook, it enabled them to interact with the world in a new way—as a new species in essence. Before a certain kind of claw would develop on an animal, and you'd call that new species. What happened to the human is that our speciation takes place culturally because our ideas can become new species.

The Internet, then, is this a new species?

In this cultural sense, yes, absolutely. The wheel and the pan and . . .

The weed-whacker?

And the weed-whacker. Our inventions have altered the face of the planet. Precisely because our speciation can take place culturally, it takes place rapidly—it takes place 100,000 times faster than strictly biological evolution.

So where does Genesis fit in to all of this?

I think that the power and the wisdom of Genesis has to do with our relationship with God and not with the literal facts of the evolution of the universe.

But was there ever a first man and a first woman—a point in which humans were instilled with a conscience?

I can imagine that event taking place in a very particular moment. I can imagine the neural capacity slowly

developing, and, then, boom, there's awareness. I can imagine that there was a first human, who we can call *Adam*, who is suddenly aware.

Now the reason I say this with a bit of confidence is that scientists have evoked conscious self-awareness in other creatures. For instance chimpanzees are not, for the most part, consciously self-aware. But in experiments scientists have put a mark on the chimp's face, such as a red dot on the forehead, and then had the chimp wander in front of a mirror. The natural response of a chimpanzee when it sees another chimpanzee with a red mark on his forehead is to run away because it's strange.

But then after a few experiences in front of the mirror, the chimpanzee develops a conscious self-awareness; it will actually see itself in the mirror with the red dot and instead of running away, it will stop and touch the dot on its face.

So I would say that would be one way to talk about the birth of human consciousness. I can imagine that coming about in a single instant. Imagine the first human's thrill and terror all at once when he had an awareness of who he was in relation to the world. Imagine the fear of discovering that he will die, and the knowledge of having to live his life knowing he will die.

In what way are human beings made in the image and likeness of God?

In the spirit of Aquinas, I would say that the universe itself is the primary revelation of God, and the universe is made in the image and likeness of God. It's true the human is, but the human alone can't reflect the fullness of God.

How do you see God active in the universe?

There's something we've learned about the universe that might be of some assistance with that question. The universe is expanding, and if you look at the galaxies in any direction, the universe consists of 50 billion galaxies, and they're moving away. If you go back in time, they all go back to a single point, that point is a flaring forth from an all-nourishing abyss—the Godhead.

Once we discovered the fact the universe is expanding, Stephen Hawking asked the question, How fast is it expanding, and what would happen if it were moving at a different rate? What Hawking learned is that if the expansion had been just slightly slower, the universe would have expanded out and then collapsed back into a massive black hole. If the expansion had been slightly faster, the universe would have expanded out but it would not have been able to form galaxies or atoms. It would just be dust.

Hawking then asked, How much play is there between the two? It turns out that if the expansion of the universe were 1 trillionth of 1 trillionth of 1 trillionth of one percent slower, it would have become a massive black hole. And if it had been 1 trillionth of 1 trillionth of 1 trillionth of one percent faster, it would have been too fast to form the galaxies, stars, planets, and life forms.

So the universe is moving right along the edge of a knife, and it is expanding at exactly the rate that enables it to blossom. The universe has that kind of elegance built into it. One interpretation of this kind of elegance and precision and power is that the universe everywhere is being guided by a divine mind.

How do you see Jesus influencing the development of the universe?

All of us live within the human world almost exclusively, that's just the way we're raised, and so when we talk about Christ, it's way back there, 2,000 years ago. But when you really understand cosmology, you realize that 2,000 years is really nothing. Our ancestors were standing up 4 million years ago. So from the geological and cosmological standpoint, Jesus was just born. We're living in the moment of the birth of Jesus from a cosmological standpoint and to understand the significance of Jesus, we have to think in terms of possibilities, not exactly actualities. This would be my way of thinking about it.

The mammalian mind took 200 million years to form when we humans burst into conscious self-awareness, we weren't given new brains, new neural wiring or anything else. We're still thinking within this brain and nervous system that has developed over all these years. The early mammals and reptiles and other creatures had to focus on what is happening here and now. Because if you didn't focus on what's taking place right here and now, you would be eaten. So our minds have a natural tendency to focus on the here and now.

That's what drives much of our economics in our consumer culture. We have "local minds." For example, according to biologists, the number of life forms being extinguished in our time is the worst disaster life has experienced in 4 billion years. Think about this from a religious aspect; think about extinguishing God's presence. This is a colossal destruction of the very fabric of life. Yet we hardly think about it. Our newspapers are dominated by local news, by all the urgencies of the here and now.

What Jesus represents cosmologically is the possibility of a breakthrough to another form of humanity that goes beyond and transcends the local mammalian mind. Instead of having the arena of concern being this local region right here, it reaches out. The fulfillment of the mission of Jesus is when the transformation of the human mind reaches a point where our circle of concern extends billions of years into the past, billions of years into the future and throughout the entire community in existence today; that is what the promise is.

Now in certain ways it's utopian compared to the place of evolution today, but evolution is constantly transcending itself. It may take us a million years to fulfill the mission of Jesus, but it is possible in time.

Where does prayer fit into all of this? Does it have energy of its own?

There are different ways of talking about prayer. First of all the primary prayer is one of awe, and it is probably the most effective prayer because through it we turn to our origins and just behold with a sense of gratitude.

By way of thinking about prayer scientifically, however, we can go back to an experiment that Einstein instigated called the Einstein-Rosen-Podolski experiment. In quantum theory there is a way that things are

connected even though they're far apart. Einstein thought the quantum theory was wrong, so he made up mental experiments trying to disprove it, and he came up with one.

He said, suppose you have two particles and they're connected, and then they move apart. According to quantum theory, when you measure the separated particles, they will have spins that are always the opposite. If one's up, the other one's down; if one's down, the other's up.

As soon as you measure one of them and its spin is up, then this one over here has to turn down. According to Einstein there would be no way for that to happen instantaneously. It's a very strange implication. Einstein came to this thought experiment decades ago, but nobody could do anything about it because we couldn't test it.

Recently, however, we've developed the technological sophistication to actually carry out the experiment, and the results showed that the quantum theory was right. When you check a particle in one place and force it into an up state, instantly this one over here goes down. Physicists call this a *nonlocal causality*, meaning that even though things are separated in space and time, they are also connected directly in that moment.

Applied to our understanding of prayer, the impulse towards goodness that a person expresses towards another through prayer has an instant effect. And our inter-connectivity discovered at the atomic level fits exactly into the doctrine of the Mystical Body of Christ.

How should religion step up to the opportunities rather than back off from the dangers of scientific discoveries?

I'll use a metaphor that may relate here. When the small insects first came out of the sea and wandered around the planet on land 400 million years ago, they had to deal with this new situation by figuring out how to cool themselves down. Eventually they developed thermal regulators in the form of fans, or wings, on their backs. The fans worked well, and they got bigger. Then came an amazing moment when the insects actually lifted off. They weren't exactly trying to fly; they were dealing with the heat. But suddenly they're flying, and it opened up an incredible number of new niches for them to explore, awesome opportunities, and great diversity.

But in the process they had to develop a form of insect mentality that grew and changed to deal with their new situation of flying.

It's like that with religion. It needs to open itself up to the changes that science brings because the opportunities are awesome. The English philosopher Alfred North Whitehead thought the great gift that science could give to religion was the freedom to develop creatively as opposed to a fearful rigidity, but then religion has a great gift to offer science—that is, to move forward with a vision and conscience and appreciate the deeper significance of scientific discoveries.