

*Zachary Hayes, O.F.M.*

## **New Cosmology for a New Millennium**

Seminary training, as it was commonly known prior to the 1960s, included a course that was called “cosmology.” In the broadest sense of the term, cosmology is understood to be a discipline that attempts to explain the universe precisely as an orderly system, and hence as a cosmos and not just as an accidental juxtaposition of many pieces that are basically unrelated. This course in the seminary was given in the context of the philosophical program; that is, prior to and independently of any theology of creation.

In the typical handbook used in seminaries at that time, this would have been the point at which students would have studied some of the key ideas and theories of the Aristotelian vision of the universe. This would have involved issues such as the nature and structure of material bodies commonly dealt with in terms of the Aristotelian theory of hylomorphism. At that time for many Christian thinkers, such a theory was practically normative for Christian thought. Not only was it practically a metaphysical dogma, but it seemed to many to be necessary as a condition for explaining certain Christian doctrines such as sacramental theology and, above all, the theology of the Eucharist. As a theory that explained not only the structure of bodies but the possibility and limits of change, it would become an important tool for some authors to prove for philosophical reasons that any theory such as Darwin’s theory of evolution was metaphysically impossible. Such a course could be taken with virtually no knowledge of the insights and theories of the physical sciences; and, indeed, it could easily become an argument against the very possibility that such viewpoints might have some validity.

In my own seminary experience, the course called cosmology was approached from a very different perspective. Working on the assumption that the sciences were important sources for a descriptive picture as to what the universe looks like and how it operates, this course was constructed in relation to the then most contemporary theories about the physics of the universe. This included such things as quantum theory, relativity, and the earliest form of big-bang cosmology. From this scientific understanding of the universe nine major questions were drawn out to become the subject matter for the rest of the course. Questions such as: How big is the universe? What is space and time? What is the nature of matter? What is life?

For many of us, this was one of the most exciting experiences of our seminary education. It was done as a philosophy course. And when we began the study of theology, we were promptly told to forget all that sort of material. We would now study the really important things, including a course on the theology of creation that seemed to be about a totally different cosmos.

#### THE MEDIEVAL PROJECT

It was not until I arrived in Germany to do my doctoral studies that I discovered why there should have been such a dramatic contrast between the experience of philosophical cosmology and the theology of creation. This had to do with discovering in a personal way something of the genius of the great scholastics of the thirteenth century. What I discovered in doing research for my doctoral thesis was the way in which the physics of the universe entered into the construction of the scholastics' understanding of spirituality and theology. The physics of Aristotle or Ptolemy was indeed a matter to be reflected on philosophically. But it was dealt with not only in philosophy. It was also a very important element in the creation of the scholastics' religious and theological worldview as well.

In a fascinating text in his *Breviloquium*, for example, St. Bonaventure first tells his readers what Christians believe about creation by reason of revelation. "In brief, the following is to be held. The entire fabric of the universe was brought into existence in time and out of nothing, by one first Principle, single and supreme, whose power, though beyond measure, has 'disposed all things by measure and number and weight'" (II, c. 1, n. 1).

Following this (II, c. 3, n. 1) Bonaventure goes on to describe what the world of God's creation looks like. He describes the earth at the center with the four elements then understood to be the building-blocks of all created bodies. From there, he takes us on a cosmic journey outward to all the planetary spheres as then known, then to the three heavens, and finally to the dwelling place of God and the elect. This clearly reflects the physical cosmology of Aristotle and Ptolemy in great detail. And it will provide the framework for discussing the theological issues involved in the principles of faith already laid out.

Two things can be pointed out here. The first is that this physical cosmology is not that which seems to lie behind the opening chapters of the biblical book of Genesis. The second is that from our perspective today, this physical cosmology is completely archaic. Yet at that time in the thirteenth century it could be taken as the normal, self-evident description of the cosmos. And some of the big questions for a medieval theologian would be: How are we to understand this as God's creation? What is the place and the role of humanity in such a cosmos?

It was by bringing together the depth of a faith tradition, the best physics known at their time, and the metaphysical implications of that physics that the great scholastics succeeded in creating a road-map of reality which could help describe the world in which they lived and to delineate the place of humanity in that sort of world. In simple terms, they created a theological cosmology which brought together their understanding of the biblical tradition and the best natural knowledge available to them and allowed them to come to important insights as to humanity's place in the cosmos and humanity's responsibility for the future of the cosmos.

#### IMPLICATIONS

Aware of the richness of the scholastic project, it is only fair to point out a major problem involved with it. It is clear that for the scholastics, physics was one of the building blocks of their theological vision. But physics involves scientific investigation that develops over time, and is not under the control of theologians. As Pope John Paul II has pointed out on a number of occasions and most recently in his new encyclical, any talk of conversation between theology and science must recognize the autonomy of both disciplines with respect to each other (*Fides et ratio*, no. 48). The scientist, precisely as a scientist, should not venture to tell the theologian how to engage in theology. On the other hand, the theologian, precisely as a theologian, cannot tell the scientist how to engage in science. Nor can theology tell the scientist what can and cannot be discovered by empirical investigation. Scientific investigation involves at least two levels. There is the reality of empirical study, and there is the level of theoretical constructs which attempt to make the empirical data more intelligible.

What this means is that science is, by its nature, an open-ended process which is not complete until all the data have been gathered and accounted for. But, if new and unexpected data are discovered, this may lead to a change in the theoretical constructs in which scientific information is organized. Science, by reason of its very nature, is susceptible to significant change. But if the scientific picture of reality changes, what will happen to the theology that is constructed in relation to that science? This must mean that a theology which attempts to take scientific insights seriously will not be a final and definitive theology. We are, therefore, talking about an ongoing theological project, not about a final, definitive system of theological truth.

Another important implication of this is the fact that science, precisely as science, can describe those things which it finds actually existing in the cosmos. But, precisely as science, it cannot talk about what might be the deepest meaning of existence. Yet, it is hard to read the descriptions of scientists without feeling questions of meaning emerging

through it all. And the cosmos described by science will raise important questions for the thinking believer. This means that if theologians and believers in general in today's world were to do here and now what the scholastics did for their time and place, they would be striving to create a road map of reality in which the descriptions and models of science can be brought into contact with a framework of religious meaning and values. Such a project would enable believers to come to a more effective understanding of the nature and role of humanity in such a cosmos and thus to live with a deeper sense of meaning and purpose.

#### ASPECTS OF TODAY'S COSMOLOGY

The point here is not to draw readers into an introductory course of contemporary physics. Nor do I intend to argue for one particular theoretical model currently used in scientific cosmology. Rather, the intent is simply to sketch some of the characteristics of the cosmos as seen by the sciences today, regardless of the model used to hold these characteristics in a more intelligible relation with each other.

##### *Immense*

The cosmos as viewed in medieval terms was a relatively small and comfortable place in which to live. Time was understood to be a few thousand years. Even as recently as the seventeenth century, the act of creation was calculated by Archbishop Ussher to have taken place in the year 4004 B.C.E. And space was limited to the planetary spheres surrounding the earth in the geocentric vision of an Aristotle or a Ptolemy. Within such a universe, it would be relatively easy to envision the entire thing in anthropocentric terms. Not only is the planet earth at the physical center of things, but humanity stands at the center of things in terms of meaning. All exists for our sake and has been created primarily to serve us in some way.

Today, one of the more common scientific estimates places the age of the cosmos at about 15 billion years, plus or minus a few billion. Numbers such as these can be laid out easily as a mathematical statement, but what such numbers might imply stretches the human imagination almost to the breaking point.

And if the issue of time were not enough, there is connected with this the issue of size. The pre-modern cosmos, as suggested, was a small and relatively cozy place in which to live. The cosmos as envisioned today is unimaginably large, containing not only billions of stars, but billions of galaxies as well.

##### *Unfinished*

As if this immensity were not enough, it remains to be said that the cosmos, as seen today through the sciences, is not yet finished. Not

only is it unimaginably immense already, but it is getting bigger even as we speak about it. This is the question of the expanding universe commonly associated with the big-bang model of cosmology. This model envisions the cosmos somewhat like a funnel or a cone. In its earliest stages it was small in space, but great in terms of highly concentrated energy, and therefore in terms of heat. As it expands, space comes to be within the expansion. As this expansion proceeds, energy levels and therefore heat levels are adjusted. Stars are born, live, and die. And the cosmos continues to expand, perhaps even more quickly now than in the past. The cosmos as we know it now is basically unfinished.

#### *Interrelated*

When we look at the cosmos through the eyes of science today, we quickly move beyond the level of every-day experience; we are drawn into the world of atomic physics and quantum physics. Think, for example, of the work being done at CERN (European Lab for Particle Physics) in Europe and at Fermilab in the United States. Already in ancient Greece it was believed that there must be an ultimate piece or particle of matter. And if it was the ultimate piece, it must be indivisible, and hence could be named with the Greek word "atom."

Yet in our own lifetime we have experienced the splitting of the atom, presumably the indivisible particle, and the incredible release of energy involved in that process. And it is commonplace today to speak of subatomic particles in great numbers, and of the ongoing search for the ultimate particle of matter. Quark research lies in that area. Even more puzzling is the conviction among scientists that perhaps 90 percent of the universe is something called dark matter. That is, it is matter that we do not see. This means that most of the universe is invisible.

On the other hand, we can look outward through telescopes. We have not only land-based observatories, but marvels such as the Hubble telescope. With such instruments, as we look outward into space, we also look backward into time. We look out into a cosmos made up of billions of galaxies, so large that we have yet to see its outer perimeter. And whether we look down through microscopes or outward through telescopes, we seem to be confronted with systems within systems within yet other systems. That is, we seem not to find a lot of isolated realities, but realities that seem to be remarkably interrelated at a variety of levels.

#### *Conscious Life*

And in this immense, unfinished cosmos of richly interrelated systems, on this planet in this particular galaxy, a particularly complex form of being has emerged out of this cosmic process. For here the cosmos

has brought forth life in a rich variety of forms. And of particular significance for our concerns here, the cosmos has brought forth a particular form of life; intelligent, conscious life in the form of human beings.

It is tempting to speculate about the possibility of life elsewhere in this cosmos. Such speculation has been carried out in the past as it is in the present. Medieval scholars asked surprising questions about the possibility of other forms of creation or about the possibility of intelligent life elsewhere in the cosmos, and of the possible relation of such hypothetical life forms to human life on this planet and what such forms of life would mean in relation to the Christian doctrines of sin and salvation.

Probably the reasons for asking about extraterrestrial life and intelligence vary in different historical periods. Very likely one reason for such speculation is the human sense that all this space cannot be empty. We might compare the cosmic situation to a person who has spent most of his or her life in a large city where there is some form of human structure at every turn. When such a person drives out of the city to a rural area and sees mile after mile of open prairie and wooded terrain, one of the first reactions is to say: "What a pity. There is nothing here." There is nothing but . . . prairie grasses, wild flowers, numerous small animals and birds, beautiful trees, etc. But nothing manufactured by human beings. And just think what a developer could do with this land, and the money that could be made by "developing" this to become something really important. But right now, "There is nothing here."

At the cosmic level, in a similar way, many find it hard today to think of this immense cosmos as devoid of life and intelligence. Therefore, the questions about extraterrestrial life and intelligence are common enough. The fact is, as of now, we have no empirical evidence of life elsewhere. But the size and complexity of the cosmos as we now perceive it, and the temptations that lie in working with mathematical probabilities, can easily lead people today to think that human beings simply cannot be the "lonely hearts of the cosmos" (Overbye, 1991).

#### SOME QUESTIONS

When we look at the world in this way, we need to think back to the time of the scholastics and realize that they too were confronted with a new and disturbing worldview. The difference was largely that between a theological and spiritual worldview shaped for some centuries by a deeply neo-Platonic vision, and the invasion of Western Europe by the philosophy of Aristotle. While both of these are connected with classical Greek history, they are profoundly different worldviews. That of Platonic inspiration has a more spiritual tone and can more readily be thought of in relation to religious concerns. That of Aristotle, by way of contrast, is a far more secular style of thought with a more obvious

empirical base. This included an impressive sense of logic, a physics, an ethics, and a metaphysics. That is, it presented an alternate worldview that was abrasive for much of Platonism and for much of the biblical tradition as well.

Keeping that in mind, we get some sense of what may be involved when the Holy Father asks theologians today to be as courageous as Thomas Aquinas was at his time. For Aquinas did not turn his back on the new worldview, problematic as it may have seemed. Rather, he engaged it in a critical way and used it to shape his own systematic theology. He did, in fact, write a number of commentaries on the writings of Aristotle, including one on the physics and one on the metaphysics. We take this to mean that Christians today should do something similar with the current worldview. This will be difficult, and it will involve significant changes in theology. But it will also be enriching.

#### *What Kind of God Are We Dealing With?*

Does such a worldview destroy the possibility of even thinking of God? Against the backdrop of such a cosmology, the familiar image of the elderly gentleman up in the sky who created the cosmos at some point of time "at the beginning" just a few thousand years ago and who sustains it in existence, perhaps intervening from time to time with exceptional demonstrations of power, will be a problematic way of thinking of God.

On the other hand, the texture of this worldview can certainly open the believer ever more deeply to awe and wonder. Most of us have our God pretty tightly boxed in. But when we look at the world through the lens of the sciences, we must ask: What sort of God are we dealing with? And what is God doing in creating such an awesome world? Rather than destroy our faith in God, this can be a powerful stimulus to new and deeper reflections on the richness of the creative knowledge and love of God that is reflected in this world. The problem, then, may not necessarily be a problem of God, but a problem of God-images that are too small and too narrow to cope with this vision of creation.

At the end of his book *A Brief History of Time*, Steven Hawking concludes that after scientists have completed their task of giving a complete account of what the world is and how it operates, we can then take up the question "Why?" (Hawking, 174). Hawking himself does not explain what he means by that question, but it can be taken to mean the following: Why is there a world at all? And why this sort of world? And why are there human beings in this world? Can we really look at the cosmos in contemporary, scientific terms and not ask with a deep sense of awe: Why? What is it all for?

At this point we experience what David Tracy has called one of the great "limit" questions (Tracy, 91ff.). We have to ask at that juncture,

what does science have to say, if anything? As scientist Edward Tryon once remarked after giving a paper concerning the meaning of vacuum fluctuations in his account of cosmic beginnings, "Our universe is simply one of those things that happen from time to time" (Guth, 14). Is it pushing to the outer limits of rationality to say that the cosmos is simply something that "just happens to be" as has been suggested by Jacques Monod? And to go further and say that in such a cosmos humankind realizes it is alone within an immense universe and that human beings emerged by sheer happenstance (Monod, 1972). From this Monod concludes that it is impossible to believe in any concept of a Creator. Hearing of this position taken by Monod, Francois Mauriac is reported to have said: "What this professor wants to inflict on us is far more unbelievable than what we Christians were ever expected to believe" (Ratzinger, 37).

The real issue can be put in the following way. When we have listened attentively to all that science has to tell us about the nature of the world, we are still left with one of the deepest questions that confront humanity. Why does any of this exist when there seems to be no clear reason for it? As Aristotle would ask: What is it for? This, in Aristotle's philosophy, was the question of final causality.

If we attempt to answer such a question, we do so not on the basis of some clear empirical data, but on the basis of some prior form of faith. This may be an atheistic faith, or it may be a theistic faith. But whichever it is, we are dealing with faith and not with clear, rational knowledge. Mauriac seems to be on target. Monod and others with similar viewpoints seem to test our credulity far more than the Christian faith which opens us to the vision of an intelligent, loving, creative power that we name "God." This is not to say that science proves that God is the Creator of the cosmos. But it is to suggest that Christian faith does offer a way of looking at the cosmos described by science and a way of taking up life with a sense of meaning and purpose.

#### *Who Are We in Such a World?*

Medieval cosmology thought of humanity as a microcosm that contained within itself something of all the elements that constituted the macrocosm. All the four elements that entered into the constitution of all created bodies were present in humanity. And the rhythms of human life were interrelated with the movements of the planetary spheres. In a sense very different from contemporary thought one could say that humanity contained in itself in a representative way everything that makes up the cosmos.

More specifically, for medieval cosmology, if we view the human being in its development from conception to maturity, it contains within its own history the mineral, vegetative, animal, and rational di-

mensions of the cosmos. Through the body, humanity is integrated in the material world. And through the soul, humanity is integrated into the world of created spirits. Humanity itself is the point at which these two dimensions of creation converge.

Having said this, we must still say that the human creature has developed peculiar functions such as consciousness, knowledge, and freedom. Classical theology accounted for these by associating them with the spiritual principle that animates us. Thus they were seen to be functions of the soul; and the human being was understood to be an embodied spirit. While scientists today puzzle over these same functions, they tend to explain them in terms of the complexification of chemical structures, particularly that of the human brain. And while modern science sees the human creature to be embedded in the chemical process more deeply than was the case with medieval thought, it still remains true that humanity possesses a distinctiveness which raises important moral, ethical questions.

#### *The Moral Implication*

The cosmos, as we have seen it in the light of the sciences, is an unfolding, chemical process that eventually generates life in the form of intelligent, free agents, at least on this planet. And when intelligent life emerges, it is a form of life which, as Karl Rahner once wrote, is capable of taking into its own hands the very chemical process that begot it and of adjusting and manipulating the structure of the process itself, at least on this planet. One can hardly think of this seriously without being struck by the immense ethical questions which emerge out of such an understanding.

What are we to make of the fact that the cosmos itself brings into being a form of life that is capable of such intervention not only in its own life, but in the life of all other living creatures on this planet? We suggest nothing as to how far beyond this planet such intervention might eventually reach. It seems inevitable that one must eventually ask about the implications of contemporary cosmological insights for our understanding of human ethical activity. Those familiar with studies on environmental problems are aware of the widespread conviction that a fundamental shift in values is crucial to the solution of the major problems in this area. Only when our picture of reality moves beyond mere empirical description and analysis to the metaphysical and theological level does it become more adequate and begin to provide a basis for arguing against the deadly position of total moral relativism.

Is human life created only for domination and control, or are there ways of relating to other human beings and to the wider created world which might be more life-giving? Here the argument could be made that the Christian vision opens the challenge of a way of relating that

emphasizes empathy, compassion, and self-sacrificing love rather than power, control, and domination. It might lead to what appears in St. Francis of Assisi to be a more familial sense of living within creation.

A way of human life characterized by such a religious vision coheres with the relational nature of the universe as perceived by the physical and the social sciences. And because, ultimately, it is grounded in the moral character of God which shines through in the moral sensibility of humankind, such a mode of relationship may be foundational for the spiritual life in any form.

*What Direction May We Move in the Future?*

It has been said in the past that the cosmos could be seen as a revelation of God; indeed, as the very first revelation of God. In the medieval world, St. Bonaventure could compare it to a book or to a stained glass window. If we think of it as a book, then the questions will be about the language in which the book is written, for each word of that language will echo something of the mind of God. If we think of it as a stained glass window, then we will be concerned with the light that pours through the glass and the patterns that are cast on the floor of the cathedral, for that light is the divine light. To say that the cosmos is a revelation is to underscore its depth and its value as a sacrament of the divine. It is to emphasize that each creature as an individual, and all together, can be seen as signs of the goodness, truth, and beauty of God. The cosmos truly speaks to us of God. But the language in which it speaks may have become a foreign language for us. We may find it difficult to hear what it is saying.

It would certainly be a retrieval of something precious in our tradition to envision a spirituality and a theology which take seriously the best scientific insights available today. Can a person who believes in the Christian God look at the physical cosmos with the lens of contemporary science instead of with the lens of an archaic physics? We are not concerned with arriving at some sort of scientific proof for the existence of God. We are concerned with the possibility that a person who, in fact, believes in God might discover something to deepen and enrich that faith by contemplating the qualities of the cosmos uncovered for us by the sciences.

To see the cosmos as a revelation means that we come to see the various forms and rhythms of nature as at least distant reflections of divine qualities. This will surely mean moving beyond the limiting images of God that are so familiar to us and that remain irretrievably tied to an archaic understanding of the cosmos. Truly the rich variety of creatures with their remarkable qualities may be seen as a reflection of the richness of the divine source from which they flow. The deeply, almost organic interrelatedness of all things within the cosmos may well be seen

as a reflection of the relational nature of the divinity as this has been understood for centuries in the mystery of the Trinity.

Not only will the cosmic revelation suggest new insights into the mystery of the Creator, it will also mean coming to a more nuanced understanding of who we are and how we fit into this sort of world. Geocentrism has long been gone. Beyond that, in terms of contemporary cosmology, there really seems to be no physical center in the cosmos; and we do not seem to live in a particularly privileged place in the cosmos. We seem to inhabit an out-of-the way neighborhood in our galaxy. This may make it difficult to come to any clear sense of how humanity fits into the whole. Yet we do possess a distinctiveness which is important. We are the only instance we know of at the present time where the cosmos has become self-conscious with all that may imply.

To look at the cosmos through the eyes of science today is to look at the concrete processes through which God brings us into being and sustains us. To know nature more deeply is to gain a richer sense of its remarkable mystery. The cosmos, today as always, can truly speak to us of God. But what it says may be difficult for us to discern. We can still see. Yet we see "through a glass darkly" (1 Cor 13:12), and many find it difficult to see at all. In the words of Henry D. Thoreau: "The morning wind forever blows, the poem of creation is uninterrupted; but few are the ears that hear it" (Thoreau, 83).

## REFERENCES

- Bonaventure, St. *Breviloquium*. Paterson, N.J.: St. Anthony Guild Press, 1963.
- Guth, Alan. *The Inflationary Universe*. Reading, Mass.: Addison-Wesley Publishing Co., 1997.
- Hawking, Steven. *A Brief History of Time*. New York: Bantam Books, 1988.
- John Paul II, Pope. *Fides et ratio*. Vatican City, 1998.
- Monod, Jacques. *Chance and Necessity*. New York: Vintage Books, 1972.
- Overbye, Dennis. *Lonely Hearts of the Cosmos*. New York: HarperCollins, 1991.
- Ratzinger, Cardinal Joseph. *In the Beginning: A Catholic Understanding of the Story of Creation and the Fall*. Huntington, Ind.: Our Sunday Visitor Press, 1990.
- Thoreau, Henry David. *Walden*. New York: Time, Inc., 1962.
- Tracy, David. *Blessed Rage for Order*. New York: Seabury Press, 1975.

---

*Zachary Hayes, O.F.M., is professor of systematic theology at Catholic Theological Union.*