

An Interview with Reverend George V. Coyne, S.J.

FORMER DIRECTOR OF THE VATICAN OBSERVATORY

At every turn during our science in seminaries project, we found ourselves inspired and encouraged by the life and work of Reverend George V. Coyne, S.J., an astrophysicist and former director of the Vatican Observatory for almost 30 years (1978–2006). Father Coyne was not only on the front lines promoting the need for dialogue between scientific and theological communities, but he also unrelentingly advanced the cause of scientific literacy as a critical component of seminary formation. We contacted Father Coyne at Le Moyne College in Syracuse, New York, where he is McDevitt Chair of Religious Philosophy and McDevitt Chair in Physics. He graciously agreed to be interviewed by Reverend John Kartje, Rector-President of Saint Mary of the Lake/Mundelein Seminary near Chicago — who also, fittingly, is an astrophysicist.

Following are excerpts of the dialogue between these two distinguished scientist-theologians.

DORIS DONNELLY, PH.D.

Project Director | Re-Engaging Science in Seminary Formation

JK: Father Coyne, let's start at the beginning. You served as director of the Vatican Observatory for almost three decades, and have been honored for your work in the field of stellar astrophysics. What readers would likely want to know is what originally sparked your interest in astronomy?

GC: I entered the Jesuits at age 18. Back then, Jesuit formation included two full years of Latin and Greek after two years of the



George V. Coyne, S.J. at the Vatican Observatory Advanced Technology Telescope at the Mt. Graham International Observatory, Mt. Graham, Arizona. (Photo by Christopher Corbally, S.J.)

novitiate. My Greek professor who, in addition to a doctorate in ancient languages and culture, had a master's degree in mathematics and a really serious interest in astronomy.

He would be expounding on a Greek ode, and all of a sudden would interject, "Gentlemen, do you realize that tomorrow is the beginning of Spring? Do you know what that means?!" He would then trace the ecliptic and celestial equator and the equinoxes and solstices on the board. A week later, he'd get distracted again and proclaim, "We just got the first radio signals from Jupiter!"

I was called into his office, I thought, to review my Greek themes, but he asked instead, "Why, whenever I start talking about astronomy, are you sitting on the edge of your chair?"

"Father," I said. "Everything that you're talking about — radio signals from Jupiter, solstices, seasons — all of it is fascinating!"

"We've got to get you reading," he said. Then he paused. "Damn it, we have this dumb rule that when you're studying Greek and Latin, you can't study anything else. You can't take any books out of our library except the ancients."



After his tenure at the Vatican Observatory, Fr. Coyne continues to teach in Physics and Philosophy departments at Le Moyne College in Syracuse, New York., and to lecture world-wide. (Photo courtesy of Le Moyne College)

He picked up the phone and called another library. “Margie, there’s a student of mine, here at the Jesuit seminary; could we arrange for him to use my library card?”

He provided me with the required note for the library. He also gave me a flashlight. I pulled the blankets over my head at night to read because it was forbidden. It was forbidden fruit, and it was good fruit. That’s what fed my interest in astronomy. After I received my bachelor’s degree in mathematics, my Jesuit superiors put me on a track for studies in science. Eventually, I got a doctorate in astronomy, and it went on from there.

JK: Settled for some time at the Vatican Observatory, John Paul II addressed a letter to you in 1988 on the 300th anniversary of Newton’s Principia, that, in some ways, seemed to set the tone, at least in the public imagination, for the ongoing dialogue on faith and science. Could you say something about the influence of John Paul II on that dialogue?

GC: I was named director of the Vatican Observatory about the same time as John Paul II became Pope. I retired as director in 2006 about the same time as John Paul II’s death. For 28 years, John Paul II was Pope, and I was director of the Vatican Observatory.

During those years, we opened a research institute in Arizona, built a two-meter telescope there, and then opened summer schools in astrophysics at Castel Gandolfo. We invited 25

students every year from around the world who intended to go into graduate science programs. John Paul II supported that to the hilt right from the start.

From the very beginning of his papacy, John Paul II wanted to establish a dialogue between the culture of religious faith and the culture of the natural sciences. In his first year, speaking to the Pontifical Academy of Sciences, he said that we have to address the myth of the “Galileo situation” because it continued to suggest that there’s an intrinsic conflict between faith and science.

Two years later, he established his Galileo Commission to do a quiet historical reflection upon that whole Ptolemaic/Copernican controversy. That was a sign that he was extremely interested in clearing the ground for an honest and productive dialogue. So that was the beginning.

When it came time to celebrate the 300th anniversary of Newton’s *Principia* in 1987, he asked our advice. We said, rather than having a parade with floats and balloons, let’s have a conference on the interaction between faith and science. So we did. A book that came out of that conference was *Physics, Philosophy, and Theology*. John Paul II wrote the preface to that book. He was actually supposed to give a major talk about the anniversary celebration, rather than write a book preface, but he never gave the talk he had planned. He went to the United States on one of his major trips. When he came back, the finished talk that he had left on his desk had been substituted with another talk, thanks to the cardinal theologian who is supposed to keep the Pope from going into heresy.

The substituted talk was a disaster. John Paul II called me and a Polish cosmologist, Michał Heller, who was a close colleague of the Pope, to a dinner. He asked us what we should do next, since the talk, as he admitted, “certainly didn’t promote dialogue.” So he wrote the book preface instead.

The preface to the book, published separately in the form of a letter, accurately reflects Pope John Paul II’s thinking on the need for theologians, at least some theologians, to have enough knowledge of science that they can deal with the culture of science.

Ed. Note: Excerpts from the letter of Pope John Paul II to Reverend George V. Coyne follow in this issue of the Newsletter. Full text may be found at tiny.cc/lettertocoyne

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JK: Why do you think it is historically it is that there haven't been more scientifically trained theologians, outside of a few notable exceptions? Do you think there's something in the tradition that may account for that?

GC: The Catholic tradition, over the past two centuries, has been, how shall I put it? Incurious. Not just about the culture of science, but about culture in general. "Preserve the faith." "Keep the good name of the Church." Those kinds of attitudes — they're not universal by any means, but they're dominant enough to have repressed curiosity about the sciences.

JK: You don't expect clergy, generally speaking, to be able to solve a differential equation. But the basic concept of quantum understanding of reality and 'Big Bang' are in common parlance. Are there not implications when priests are not scientifically literate enough to know about them?

GC: My experience is that there were times within the past 30 years or so that, at least in parishes where I worked, the parish population was well-educated. My surmise from homilies and other sources, for example, was that parishioners were often more scientifically and technologically informed than the priests.

JK: I think that's a very fair assessment. Hence the need for programs like this initiative ["Re-Engaging Science in Seminary Formation"].

In all the questions from audiences around the world that you've fielded over the years, are there some, in particular, that seem to be more prominent than others?

GC: Well, there's one remark that continuously appears, and that's the phrase "It's only a theory."

To many, the word "theory" suggests "only a theory." There's no appreciation for the fact that "theory" means "the best scientific explanation for all the data we have." Of course we don't have the final answer — the final truth, if there is such — but science is a constant voyage, a constant journey toward getting better and better explanations. Revising our Big Bang cosmology, for example, because of what we have learned about quantum theory.

So many people are missing a basic understanding of what science is, how passionate scientists are in their search for truth, and how uncertain they are as they search for truth.

Another question I'm asked very often is, "do you really believe that _____?" People confuse belief with knowledge.

"Do you really believe that the universe began in a kind of singularity in the Big Bang?" I can truly say, "I don't *believe* it, I *know* it." My knowledge is limited, of course, but the use of the word "belief" reveals a kind of inability to distinguish between knowledge and faith. I constantly hear that from my students.

A third question is, "Can you both believe and accept this as a good scientific result?" So many fail to understand that there is a coherence, that we're seeking a coherence, a dialogue that is productive.

JK: I don't know if this is something you see in your students today, but — would you say that you see a fear or a reluctance in trying to open their faith to that same kind of inquiry?

GC: I think there is a fear. It's a quiet fear, not alarm. Those who had a really traditional Catholic upbringing find it difficult at college age. They've grown up in a culture that is very safe in the sense of church attendance, catechism, all of that. But they lack cultural openness. In their post-college years, they have some job experience, but they do find it difficult, when I talk to them about cosmology or evolution, to absorb it into the way they think as Christians, as Catholics.

I tell them, we are human beings, and our culture has a whole array of beautiful elements. There's sculpture, the arts, music. There's science, philosophy. There's theology. Why should any one of these dominate my life? We all have to eventually specialize in something, but why exclude any one expression of human culture in favor of any one other? But a lot of them do.

JK: I wonder if you could speak a little bit to the question of how science can enrich and advance the ongoing development of theology? Beyond simply respecting each other's realm of influence, into real engagement: what does science bring to the theologian that he or she might not otherwise have?

GC: At the Vatican Observatory, we had a series of conferences, spread over 20 years, that produced six volumes, all addressing precisely that umbrella theme of how science can help us understand the divine — a sort of "theology of nature." These addressed various themes, like cosmology, quantum mechanics, evolution, chaos theory, all produced by bringing together theologians and scientists who were willing to dialogue together on those various issues.

I have a very personal point of view of this, since I'm an astrophysicist. I've been teaching a course here at Le Moyne in science and religious belief. I found that the best approach to take with the students here is to start by asking, from a purely scientific point of view, "what do we know about the universe?" We know that it's not a packaged, inert system. Quantum indeterminacy, chaos, and complexity all inform us that the universe is not all predictable. And that it's creative: the universe is expanding and its biological systems are evolving, even now.

If I believe faith is another dimension, why is it not fair for me, as a scientist, to use my knowledge [of astrophysics] to learn about the God who I believe created the universe? What kind of God does this? God did not make a Cheerios box, or a Toyota car, or a washing machine — but a whole universe! This is a marvelous God!

JK: Posing the question that way suggests that science can lend some of itself to theology. In the other direction, what elements are there in core Christianity that can advance our interaction with science?

GC: The middle of the road Christian denominations, including Catholicism, have a strong sort of acceptance that there's a rational structure to the universe, the *logos*. It's worth exploring the universe because the Creator God sent the *Logos*, as we read in the prologue to John's gospel.

In fact, I think, it's fairly well established that science was born out of a culture of belief in the rational structure of the universe. The early scientists, Galileo, Descartes, Leibniz, Newton, were also religious believers within their cultural milieu. They arose in cultural environments that nurtured science. Christian theology has a pretty strong rational component to it. It's really *fides quaerens intellectum* — I'm using my mind, and not just my heart.

JK: Yes! Which is the very nature of the scientific enterprise. Good science, anyway.

As you look in your own field and your subspecialty in astronomy, what do you see as one of the great outstanding problems to be engaged or addressed, in the area of faith and science? What grabs your own imagination, inspires your prayer?

GC: There's a faith dimension to the degree of ignorance that we have still in science (and that people don't fully appreciate). I'm referring to dark matter and dark energy.

I teach a general astronomy course to freshmen. Only partway through the course will I admit to them, "I'm only talking about 5 percent of the matter/energy in the universe here." The other 95 percent relates to what, in the faith dimension, we call "mystery." What I'm saying is, essentially I believe that the universe I study, as a scientist, has a mystery character to it. Not in the sense we can never know, but in a sense that the universe is pulling us and attracting us to know, more and ever more.

That's because, as a creature of God, it [the universe] participates in the mystery of God. I really do think that our degree of ignorance in essential problems is a persistent challenge to us to surmount because the universe itself participates in the mystery of God.

If you believe that God created the universe, then what is faith? I always use the word "a-rational." It's not irrational, it's not completely rational. It has a rational basis, it should be coherent with what we know, but it transcends what we know. If you accept that transcendence, God's love for me and my attempt to return it, as the personal gift of God — if you accept that, then the way to enrich faith, to make it richer and ever more challenging, is by trying to integrate it with what we know. From science, from the arts, from philosophy. It's magnificent! It's a great journey.

IF YOU ACCEPT THAT TRANSCENDENCE, GOD'S LOVE FOR ME AND MY ATTEMPT TO RETURN IT, AS THE PERSONAL GIFT OF GOD — IF YOU ACCEPT THAT, THEN THE WAY TO ENRICH FAITH, TO MAKE IT RICHER AND EVER MORE CHALLENGING, IS BY TRYING TO INTEGRATE IT WITH WHAT WE KNOW. FROM SCIENCE, FROM THE ARTS, FROM PHILOSOPHY. IT'S MAGNIFICENT! IT'S A GREAT JOURNEY.

Letter of Pope John Paul II to Reverend George V. Coyne, S.J. JUNE 1, 1988

The 300th anniversary of the publication of Newton's *Philosophiæ Naturalis Principia Mathematica* provided an appropriate occasion for the Holy See to sponsor a Study Week that investigated the multiple relationships among theology, philosophy, and the natural sciences. The man so honored, Sir Isaac Newton, had himself devoted much of his life to these same issues. The theme of the conference, "Our Knowledge of God and Nature: Physics, Philosophy and Theology," was, according to Pope John Paul II, "a crucial one for the contemporary world" because it addressed issues that the Church and human society are facing with increasing urgency.

Full text of Letter may be found at tiny.cc/lettertocoyne

Despite conflicts, there is a drive among persons towards collaboration and unity

More and more frequently, people are seeking intellectual coherence and collaboration, and are discovering values and experiences they have in common even within their diversities. This openness, this dynamic interchange, is a notable feature of the international scientific communities themselves, and is based on common interests, common goals and a common enterprise, along with a deep awareness that the insights and attainments of one are often important for the progress of the other. In a similar but more subtle way this has occurred and is continuing to occur among more diverse groups — among the communities that make up the Church, and even between the scientific community and the Church herself. This drive is essentially a movement towards the kind of unity which resists homogenization and relishes diversity. Such community is determined by a common meaning and by a shared understanding that evokes a sense of mutual involvement. Two groups which may seem initially to have nothing in common can begin to enter into community with one another by discovering a common goal, and this in turn can lead to broader areas of shared understanding and concern.

Progress in establishing better than "cordial" relationship between religion and science

Turning to the relationship between religion and science, there has been a definite, though still fragile and provisional, movement towards a new and more nuanced interchange. We have begun to talk to one another on deeper levels than before, and with greater openness



George V. Coyne, S.J. (Photo courtesy of Le Moyne College)

towards one another's perspectives. We have begun to search together for a more thorough understanding of one another's disciplines, with their competencies and their limitations, and especially for areas of common ground. In doing so we have uncovered important questions which concern both of us, and which are vital to the larger human community we both serve. It is crucial that this common search based on critical openness and interchange should not only continue but also grow and deepen in its quality and scope.

The Christian vision of unity

For the impact each discipline has, and will continue to have, on the course of civilization and on the world itself, cannot be overestimated, and there is so much that each can offer the other. There is, of course, the vision of the unity of all things and all peoples in Christ, who is active and present with us in our daily lives — in our struggles, our sufferings, our joys and in our searchings — and who is the focus of the Church's life and witness. This vision carries with it into the larger community a deep reverence for all that is, a hope and assurance that

the fragile goodness, beauty, and life we see in the universe is moving towards a completion and fulfilment which will not be overwhelmed by the forces of dissolution and death. This vision also provides a strong support for the values which are emerging both from our knowledge and appreciation of creation and of ourselves as the products, knowers, and stewards of creation.

Science bestows gifts of understanding, knowledge, power

The scientific disciplines too ... are endowing us with an understanding and appreciation of our universe as a whole and of the incredible rich variety of intricately related processes and structures which constitute its animate and inanimate components. This knowledge has given us a more thorough understanding of ourselves and of our humble yet unique role within creation. Through technology it also has given us the capacity to travel, to communicate, to build, to cure, and to probe in ways which would have been almost unimaginable to our ancestors. Such knowledge and power, as we have discovered, can be used greatly to enhance and improve our lives or they can be exploited to diminish and destroy human life and the environment even on a global scale.

An early goal of science and religion in dialogue: mutual understanding, common goals

By encouraging openness between the Church and the scientific communities, we are not envisioning a disciplinary unity between theology and science like that which exists within a given scientific field or within theology proper. As dialogue and common searching continue, there will be growth towards mutual understanding and a gradual uncovering of common concerns which will provide the basis for further research and discussion. Exactly what form that will take must be left to the future. What is important is that the dialogue should continue and grow in depth and scope. In the process we must overcome every regressive tendency to a unilateral reductionism, to fear, and to self-imposed isolation. What is critically important is that each discipline should continue to enrich, nourish, and challenge the other to be more fully what it can be and to contribute to our vision of who we are and who we are becoming.

Are we ready for greater dialogue?

We might ask whether or not we are ready for this crucial endeavour. Is the community of world religions, including the Church, ready to enter into a more thorough-going dialogue with the scientific community, a dialogue in which the integrity of both religion and science is supported and the advance of each is fostered? Is the scientific community now prepared to open itself to Christianity, and indeed to all the great world religions, working with us all to build a culture that is more humane and in that way more divine? Do we dare to risk the

honesty and the courage that this task demands? We must ask ourselves whether both science and religion will contribute to the integration of human culture or to its fragmentation. It is a single choice and it confronts us all.

For a simple neutrality is no longer acceptable. If they are to grow and mature, peoples cannot continue to live in separate compartments, pursuing totally divergent interests from which they evaluate and judge their world. A divided community fosters a fragmented vision of the world; a community of interchange encourages its members to expand their partial perspectives and form a new unified vision.

Unity is not Identity.

Yet the unity that we seek, as we have already stressed, is not identity. The Church does not propose that science should become religion or religion science. On the contrary, unity always presupposes the diversity and the integrity of its elements. Each of these members should become not less itself but more itself in a dynamic interchange, for a unity in which one of the elements is reduced to the other is destructive, false in its promises of harmony, and ruinous of the integrity of its components. We are asked to become one. We are not asked to become each other.

Interaction between science and religion, scientists and theologians, is inevitable.

For the truth of the matter is that the Church and the scientific community will inevitably interact; their options do not include isolation. Christians will inevitably assimilate the prevailing ideas about the world, and today these are deeply shaped by science. The only question is whether they will do this critically or unreflectively, with depth and nuance or with a shallowness that debases the Gospel and leaves us ashamed before history. Scientists, like all human beings, will make decisions upon what ultimately gives meaning and value to their lives and to their work. This they will do well or poorly, with the reflective depth that theological wisdom can help them attain, or with an unconsidered absolutizing of their results beyond their reasonable and proper limits.

Inescapable alternatives

Both the Church and the scientific community are faced with such inescapable alternatives. We shall make our choices much better if we live in a collaborative interaction in which we are called continually to be more. Only a dynamic relationship between theology and science can reveal those limits which support the integrity of either discipline, so that theology does not profess a pseudo-science and science does not become an unconscious theology. Our knowledge of each other can lead us to be more authentically ourselves. No one can read the history of the past century and not realize that crisis is upon us both. The uses of science have on more than one occasion proven massively destructive, and the reflections on religion have too often been sterile. We need each other to be what we must be, what we are called to be.

TURNING TO THE RELATIONSHIP BETWEEN RELIGION AND SCIENCE, THERE HAS BEEN A DEFINITE, THOUGH STILL FRAGILE AND PROVISIONAL, MOVEMENT TOWARDS A NEW AND MORE NUANCED INTERCHANGE. WE HAVE BEGUN TO TALK TO ONE ANOTHER ON DEEPER LEVELS THAN BEFORE, AND WITH GREATER OPENNESS TOWARDS ONE ANOTHER'S PERSPECTIVES. WE HAVE BEGUN TO SEARCH TOGETHER FOR A MORE THOROUGH UNDERSTANDING OF ONE ANOTHER'S DISCIPLINES, WITH THEIR COMPETENCIES AND THEIR LIMITATIONS, AND ESPECIALLY FOR AREAS OF COMMON GROUND. IN DOING SO WE HAVE UNCOVERED IMPORTANT QUESTIONS WHICH CONCERN BOTH OF US, AND WHICH ARE VITAL TO THE LARGER HUMAN COMMUNITY WE BOTH SERVE. IT IS CRUCIAL THAT THIS COMMON SEARCH BASED ON CRITICAL OPENNESS AND INTERCHANGE SHOULD NOT ONLY CONTINUE BUT ALSO GROW AND DEEPEN IN ITS QUALITY AND SCOPE.

PASSANDO A CONSIDERARE IL RAPPORTO TRA RELIGIONE E SCIENZA, C'È STATO UN MOVIMENTO BEN DEFINITO, ANCHE SE FRAGILE E PROVVISORIO, VERSO UN NUOVO E PIÙ VARIATO INTERSCAMBIO. ABBIAMO COMINCIATO A PARLARCICI L'UN L'ALTRO A LIVELLI PIÙ PROFONDI CHE IN PASSATO, E CON MAGGIORE APERTURA VERSO I PUNTI DI VISTA RECIPROCI. ABBIAMO COMINCIATO A CERCARE INSIEME UNA COMPRESIONE PIÙ PROFONDA DELLE RISPETTIVE DISCIPLINE, CON LE LORO COMPETENZE E CON I LORO LIMITI, E SOPRATTUTTO ABBIAMO CERCATO AREE SU CUI POGGIARE BASI COMUNI. NEL FAR QUESTO ABBIAMO SCOPERTO IMPORTANTI DOMANDE CHE CI RIGUARDANO AMBEDUE, E CHE SONO DI IMPORTANZA VITALE PER LA PIÙ AMPIA COMUNITÀ UMANA DELLA QUALE SIAMO AL SERVIZIO. È D'IMPORTANZA CRUCIALE CHE QUESTA RICERCA COMUNE, BASATA SU UNA APERTURA ED UN INTERSCAMBIO CRITICI, DEBBA NON SOLO CONTINUARE MA ANCHE CRESCERE ED APPROFONDIRSI IN QUALITÀ E IN AMPIEZZA DI OBIETTIVI.

**FROM A LETTER OF POPE JOHN PAUL II
TO REVEREND GEORGE V. COYNE, S.J.
Director of the Vatican Observatory • June 1, 1988**

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