SCIENCE AND FAITH FROM THE VIEWPOINT OF THE SCIENTIST

Guy Consolmagno
Astronomer and Director of the Vatican Observatory,
Castel Gandolfo, Vatican City State

Abstract: The lived experience of scientists and their opinions about the role of faith in their lives provide a key insight to both contemporary issues and possible future trends in popular attitudes towards faith. Scientists' attitudes both reflect and shape the attitudes of the communities where the scientists live; thus, for instance, at the moment it is quite common for scientists to be skeptical of organized religion while valuing very much the understanding of God that they have learned from that religion. I perceive a large shift over the past fifty years in the behavior of scientists — both believers and non-believers — in their attitudes towards religion, with a former reticence or suspicion being replaced by an appreciation of openness and diversity among our colleagues, though many scientists remain puzzled by the diversity of so many different religions, all seeking the same truth. One modern development fostered by social media is the realization that the assumptions of faith are meta-axioms that make the pursuit of science possible.

Keywords: Religious Beliefs, Astronomy, Scientists, Science and Faith, Tanzella-Nitti.

Riassunto: L'esperienza vissuta dagli scienziati e le loro opinioni sul ruolo della fede nella loro vita forniscono una chiave di lettura sia delle questioni attuali che delle possibili tendenze future negli atteggiamenti diffusi verso la fede. Gli atteggiamenti degli scienziati riflettono e modellano quelli delle comunità in cui vivono; così, ad esempio, attualmente è abbastanza comune che gli scienziati siano scettici nei confronti della religione istituzionale mentre apprezzano la comprensione di Dio che da essa hanno appreso. Negli ultimi cinquant'anni ho percepito un profondo cambiamento nel comportamento degli scienziati — sia credenti che non credenti — verso la religione: la reticenza o il sospetto di un tempo sono stati sostituiti da un apprezzamento dell'apertura e della diversità di posizioni tra i nostri colleghi, anche se molti scienziati rimangono perplessi di fronte alla grande varietà di religioni, tutte alla ricerca della stessa verità. Uno sviluppo moderno, favorito dai social media, è la consapevolezza che i principi della fede sono meta-assiomi che rendono possibile la ricerca della scienza.

Parole chiave: Credenze religiose, Astronomia, Scienziati, Scienza e Fede, Tanzella-Nitti.

ANNALES THEOLOGICI 2 (2024), vol. 38, 615-625
ISSN 0394-8226
DOI 10.17421/ATH382202410

The opinions that scientists hold about the role of faith in their lives provide a key insight to contemporary issues of faith and science and portend possible future trends in popular attitudes towards the issue. What I propose to present here is merely the outline of some ideas based on my own experience as a scientist of faith; it is a topic that deserves a thorough academic study, beyond the scope of this note.

The "scientist" in the title is not myself, but rather the scientists whom I have come in contact with and spoken to on this topic over the course of many years. Like Fr. Tanzella-Nitti, my position in both the world of science and the world of the Church means that those of my fellow scientists who are people of faith feel free to talk to me about their faiths; and those of my fellow scientists who do not practice a faith nonetheless feel comfortable talking to me with honest questions about the faiths that they see in society around them. It is a privileged position that we hold as scientists of faith, and one that carries with it a responsibility to report to our fellow members of the Church the actual state of the faith-science questions within the scientific community.

A scientist's attitude on these matters strongly reflects the attitudes of the community where the scientist lives. Thus, for instance, I have found that these conversations have been different in Cambridge, Massachusetts than in Cambridge, England, reflecting the differences in attitudes towards religion in the US versus the UK. But because most scientists have a more immediate experience than non-scientists of both the world of science and of fellow scientists who are religious, the questions they pose can be significantly different from those of the members of the general public. My experience is that scientists can be less likely to hold the popular opinion that faith and science must be incompatible, because they have first-hand experience of knowing many fellow scientists who do not fit this stereotype. Their understanding of how faith and science interact will depend on their own experience with faith, of course; but they recognize that the issue is not settled.

I write as an American raised in the US in the years immediately following World War II. In those times, the outcome of the war was seen as a triumph of godly men supported by the goods of technology that modern science had provided. Both faith and science were seen united in a common good. In this momentary unity, one could hear the

echo of the early days of the Enlightenment, when the new philosophy we now call science was seen as an infallible guide to truth.

During the Enlightenment, many theologians were encouraged to find within the presumed certainties of science various proofs for the existence of God. Alas, often these proofs were of the "god of the gaps" variety. As Michael Buckley SJ has pointed out in his book *At the Origins of Modern Atheism*,[1] once these gaps were filled by subsequent science, what had been thought of as "proofs" of the necessity of God became on the contrary evidence that (to reference a comment attributed to Laplace) one had no need of that "God" hypothesis… leading, ironically, to the rise of atheism. By the whiggish years of the late 19th century, those who wanted to be thought of as smarter than the rest of humanity began to flaunt their radical atheism as a sign of their mental superiority. This stance continues in some circles even to this day.

I entered the world of science with my arrival as a student at the Massachusetts Institute of Technology in 1971. At that time, even given the postwar truce between science and faith among the general public, the 19th and early 20th century whiggism that had suggested that science could replace religion was still an attitude held by many scientists. Over the fifty years since then, however, I have noticed a large shift in the behavior of scientists, both believers and non-believers, in their attitudes towards faith. Where in the past there was a reticence of, or suspicion of, being religious — fifty or thirty years ago, a religious scientist might feel the need to defend the orthodoxy of their science[2] — in recent years this has been replaced by at the very least an appreciation of openness and diversity in matters of faith among our colleagues.

What caused this change? For one thing, the cultural upheavals of the 1960s saw a growth of skepticism towards all authority, including the authorities of both science and religion. Those who wanted to create a priesthood of science were faced with a culture that had turned against all priesthoods. In particular, the horrors of technological warfare (epit-

[1] M.J. Buckley, *At the Origins of Modern Atheism*, Yale University Press, New Haven 1990.

[2] This can be found in the public talks given by my predecessor at the Vatican Observatory, George Coyne SJ; cfr. C.M. Graney, (ed.), *From the Director: Selected Works of Fr. George V. Coyne SJ*, Vatican Observatory Foundation, Tucson 2021.

omized by nuclear weapons) and the ecological damage wrought by unbridled technology robbed science of much of its aura of godliness.

Equally important, it was clear to a generation of physicists now raised within the uncertainties of the quantum universe that the naïve materialism of the previous century simply did not describe reality.

But along with that, another radical cultural change beginning in the last years of the 20th century and the early 21st century is playing an interesting role in shattering the old prejudices against religion among scientists. This was the arrival of cultural diversity in academia.

Consider this example: in 1957, a meeting of the leading astronomers of the world was hosted by the Pontifical Academy of Sciences and the Vatican Observatory to discuss the nature of stellar populations.[3] The participants at that meeting were a who's-who of the biggest names in astronomy at that time. Inspecting those names, it is not surprising (given the times) that all the scientists were white males. But it was actually the case that none of the scientists present even had names that ended in vowels; they were all of *northern* European ancestry. Thus, even though that meeting was held at the Vatican and featured the presence of Fr. Georges Lemaître, one could expect that the prevailing attitude in the field would be that of Protestant, or post-Protestant, Christianity.

Twenty years later this was still the case. Among the ten graduate students in my cohort at the Lunar and Planetary Lab in 1975 (the first students in the University of Arizona's new Planetary Sciences department), there was but one woman, only one non-Christian (but including two Catholics), and only one person whose name ended in a vowel: me. And of course there were no people of color. While some minorities are still underrepresented in that department, today only a quarter of its graduate students are white males.

Indeed, when I became a Jesuit in 1989, and especially after joining the Vatican Observatory in 1993, I was pleasantly surprised by the reactions to my religious calling that I received from my fellow scientists. Before entering the Order, few of them would have had reason to

[3] At the time this was a significant issue, as the fact that older stars were chemically different from younger stars was undeniable evidence that the universe itself was not in a steady state but evolving… supporting the then radical notion of a universe with a finite lifetime, as suggested by the Big Bang theory.

know of my religious beliefs, nor did I know theirs. But after "putting on the collar" the most common conversations that resulted were my colleagues telling me about the various churches they belonged to. The fact that I was now publicly religious gave them permission to bring the subject of religion up; but in fact, they had already come to an accord about how faith and science worked in their lives, and they simply were delighted to share that experience with me.[4]

What this means for the faith-science situation in science today is simply that no longer is only one sort of background assumed to be the default philosophical identity. Furthermore, diversity is seen as an asset, and that diversity includes a diversity of religious beliefs. Young scientists are proud to claim friends and colleagues who are Buddhists, Hindus, or Muslims alongside all varieties of Christianity and Judaism. It means that being religious is no longer something that young scientists feel they must hide.

On the other hand, they are less likely to take such religions as seriously as earlier generations. Religion is seen more to be a cultural artifact, or a choice not much different than one's favorite brand of coffee.

In April and May of 2005, as a part of a Jesuit program called Tertianship,[5] I spent six weeks at Santa Clara University, the Jesuit university in California's Silicon Valley, interviewing scientists and engineers in the Valley about their religious beliefs. I found a common pattern in my interviews[6]. It is quite typical for many young scientists to be skeptical themselves of organized religion. Like others of their generation, they tend to label themselves as "spiritual, not religious," while valuing very much the understanding of God that they have learned from those religions.[7] But as they get older and start raising a family, they often return

[4] The two exceptions to this reaction were both English white males. As I mentioned above, the attitude toward religion in the UK is still steeped in a prejudice that is foreign to my American experience.

[5] A sort of spiritual sabbatical that we Jesuits take after we have been in the order for a dozen years.

[6] These interviews are described in G.J. Consolmagno, *God's Mechanics: How Scientists and Engineers Make Sense of Religion*, Jossey-Bass, New York 2008.

[7] I have found that attitude typical among young scientists in both Cambridges, US and UK.

to organized religion as a way of passing important values and spiritualities to the next generation.

Indeed, it is rare in recent times to find non-believing scientists to label themselves specifically as atheists; they more commonly describe themselves as "agnostic". Even the more public self-appointed spokespersons of science, who labor to support their bona-fides by not being affiliated with any religion, nonetheless go out of their ways to avoid the atheist tag.

One former graduate student of Carl Sagan once told me that she heard him comment, "an atheist is someone who knows more than I do." Particularly in his later years he went out of his way not to make enemies, and indeed to find allies, of those with religious faith.[8] Likewise, Neil DeGrasse Tyson has made a point of respecting the religious roots of science, for example that of the Gregorian Calendar and the use of "BC" and "AD" in designating years of the common era.[9]

What does remain is that many scientists remain puzzled by the diversity of so many different religions, all seeking the same truth. The same physics textbooks are used in India as in Indiana; why are their religions so different?

During my 2005 interviews I heard many different ways that scientists and engineers come to grips with this diversity of faiths. They ranged from "they can't all be right, so they must all be wrong" or "they are all right, just different descriptions of the same thing"; to "different religions are different approximations to the truth, but some approximations converge on the truth faster than others…" One creative suggestion compared religions to computer operating systems; which one is "right" for you, depends on how you are "wired", depending on your personal history or your internal needs or your genetics or what you're trying to get out of that religion. And like computer systems, some religions have more features than others, but at the cost of a higher overhead and the greater possibility of bugs!

My favorite answer suggested that different religions are like different kinds of physics. Aristotelian physics is less accurate, and much less useful

[8] Evidence of this can be seen in his book and film *Contact*… He contacted the Vatican Observatory at one point for a scene that eventually was not used in the film.

[9] His grasp of the history involved remains somewhat incomplete, however.

or powerful, than Newtonian physics; but at a certain point Newtonian physics fails, and we can see that it is less accurate than Quantum physics. It's much harder, but it comes closest to the truth.

In fact, this question of where one finds truth goes to the core of the puzzlement that underlies the perceived conflict of faith and science: the nature itself of religious and scientific "truths".

One common attack on faith often assumes that faith and science are two competing sources of truth, two big books of knowledge. Thus, a conflict is inevitable if something in one book contradicts the other book. Since presumably scientific "truths" can be "proved", unlike religious truths (which are somehow accepted only on "faith") this spells the doom of religion.

Besides being a complete misunderstanding of both science and religion, this misapprehension is something that had to be countered even during the era of St. Augustine. In his work *On the Literal Interpretation of Genesis* (dating from 400 AD) he warned that "even a non-Christian knows something about the earth, the heavens, and the other elements of this world, about the motion and orbit of the stars and even their size and relative positions, about the predictable eclipses of the Sun and Moon, the cycles of the years and the seasons… and this knowledge he holds to as being certain from reason and experience. Now, it is a disgraceful and dangerous thing for an infidel to hear a Christian, presumably giving the meaning of Holy Scripture, talking nonsense on these topics."[10]

But notice the irony: the "knowledge that he holds to be certain from reason and experience" that St. Augustine cites here is in fact the Ptolemaic cosmology that we have long since abandoned as being untrue.

For those who wish to defend religion from such an attack, a popular approach is what is called "concordism": taking the best science of the day and seeing how one might cleverly interpret sacred writings to make it look as if the information was in scripture all along. For example, the Big Bang posits that the universe began in a flash of energy, while Genesis says the first act of creation was God saying, "let there be light". Light is energy, right? In this way one appears to preserve the infallibility of scripture — while taking for granted, without notice, that science itself

[10] J.H. Taylor, (translated by), *The Literal Meaning of Genesis; Ancient Christian Writers*, vol. 41, Paulist Press, New York 1982.

is of course also assumed to be infallible. The example of Augustine is worth remembering here. Any interpretation of scripture based on the best science of today will be made obsolete as quickly as that science itself goes obsolete. This is precisely what happened in the later Enlightenment, leading to the rise of atheism that Buckley described.

A variant on dealing with this perceived conflict between two sets of truths is an idea promoted by Stephen Jay Gould of "non-overlapping magisteria".[11] Still looking at both science and religion as competing books of infallible facts, Gould escapes the conundrum of contradiction by insisting that these are books that cover such completely different topics that there's no possibility of overlap, hence no conflict. This idea, of course, is but a variant of Averroës's supposition of two independent truths, one for science and the other for religion.

Note that all these arguments take for granted a fundamentalist understanding of scripture. While working scientists are comfortable with the idea that science itself is incomplete and ever growing, it has been my experience that many scientists who live outside a faith tradition are not familiar with the concept, predating even Augustine, that our understanding of scripture is also always growing. Instead, they assume that all religion is based on the naïveté of a relatively modern literalism.

The primary flaw is assuming that any science is perfectly settled, and that any religious belief is perfectly understood. Of course, this both misunderstands the nature of science and of religion. Neither is a closed book of literal truth, nor is anything that we do know about nature, or God, ever fully understood. That is why it is still worthwhile (and a joy) to pursue the study of both.

Indeed, why should one be afraid of a contradiction between some tenet of faith and some finding of science? Within science itself, it often is the case that one well-held idea becomes contradicted by new data. When this happens, one does not reject all of science. Rather, it is a cause for great joy, because it means that we're about to

[11] Cfr. S.J. Gould, *Rocks of Ages, Science and Religion in the Fullness of Life*, Ballantine Books, New York 1999; Idem, *Nonoverlapping Magisteria*, «Natural History» 106 (1997) 16-22. For an interesting rebuttal of this idea, see N. Spencer, *Magisteria*, Oneworld, London 2023.

learn something new, come to a deeper understanding of a principle we thought we had understood, and maybe get a paper published as a result!

It is important to appreciate that while all these arguments are flawed, they also all contain an element of truth. Science and religion do offer very different ways of understanding and interpreting the universe; that is indeed the strength of knowing both. And one needs a way of coordinating those two viewpoints into a more fully dimensional view of reality.

It is worth noting that while these sorts of arguments are in the back of the mind of scientists pondering the roles of faith and science, the more important argument for them is the empirical evidence that scientists of faith do exist. Somehow, we make it work; even if they don't quite understand how we do it, they can grant that a solution does exist. And the result, especially among the younger cohort of scientists, is a much more accepting attitude toward faith and science.

All of these developments in the attitude of scientists may presage similar developments in the future attitudes of the general public towards science and religion. In the past thirty years I have given hundreds of presentations about the Vatican Observatory to the general public, and I find that our message of tolerance toward science and faith has been very widely adapted even in places (such as the deep southern states of the US… or the editorial pages of the *Times* of London[12]) where one might imagine it would be difficult to be heard. In part, I think this may be a result of the information age, and the ability of non-scientist people of faith to encounter science in more places than just a few television presenters (like the aforementioned Sagan and Tyson) who are usually adamant about their non-religious stance.

The internet age has also brought into the public eye a concept that I think is key to a more mature understanding of how science and faith actually do interact. The concept of "meta" has become commonplace in social media. The online Urban Dictionary gives examples of how this term is being used in popular online speech: "[meta is] about the thing itself. It's seeing the thing from a higher perspective instead of

[12] "Faith and Reason: The Vatican astronomer makes a powerful case for religion and science", Leading Articles, *The Times* (November 18, 2024), 27.

from within the thing… Making a movie about the film industry isn't meta. Making a movie about making movies is. Using a footnote to explain another footnote isn't meta. Using a footnote to explain what footnotes are, is."

Gould spoke of science and religion as being "non-overlapping magisteria"; in that phrasing he was still assuming that both operated on the same level of knowledge. But in fact, religion can rightly be seen as operating at a different, meta, level compared to science. Science is the description of reality; religion is the reason why we can have such a description.

Why do I say that very possibility of science is based on religion? Consider the nature of science itself. Science is a system of logic, and every logical system must start out with axioms. Any such set of axioms is itself a faith system.

One can identify at least three axioms that you must accept, on faith, before you can do any kind of meaningful science. And these are axioms that depend on one's religion. First, you must believe in reality: the universe exists, it's not just a dream. Second, if you are going to go looking for the laws of nature, you must believe that there are laws there to be found. And third, you must believe that it is worthwhile to spend your time and fortune in the pursuit of discovering those laws.

All three of these axioms are religious in nature, which is to say that these axioms are supported only by a small subset of religions. A version of Zen that insists everything is illusion goes against the possibility of finding reality in studying the physical universe. A pagan pantheon of nature gods eliminates the need, or possibility, of nature following repeatable laws. A manichean view of the universe as irredeemably evil would find little purpose, or good, to be discovered studying the universe as described by science. Your choice of religion may affect your faith in these axioms. As a result, only certain religions are going to provide the necessary conditions for science to flourish.

Thus, with this understanding, religion and science can be understood not as two rival ways to explain the universe; rather, religion explains why science can explain the universe. It is a "meta" explanation for the possibility of science itself. Faith and science do overlap, in a meta sense, without interfering with each other.

In conclusion, I find that the way that scientists understand the relationship between faith and science has changed over the last half century, and it continues to change. Unlike fifty years ago (when Fr. Tanzella-Nitti and I were beginning our scientific careers) today many scientists are happy to identify themselves as people of faith; even those who reject religion nonetheless find themselves daily working comfortably with scientists who do embrace faith. Younger scientists especially are comfortable in acknowledging the role of faith in themselves or their colleagues. They recognize the importance of rejecting rigid certainties in either faith or science as they pursue their ever-imperfect, ever-developing understanding of the universe and how it works. In addition, those who have become accustomed to the functioning of social media have become more aware of how rational systems are multidimensional, creating a new way to understand the interaction between faith and science.

Historically there has been a lag between the attitudes of scientists and those of the general public when it comes to our understanding of faith and science. But such a shift of attitude is something we should expect, and look for, in coming years. It will be fascinating to see how this realization will percolate into the study of faith and science interactions… and how in retrospect the work of Fr. Tanzella-Nitti will have paved a way for a future understanding of those interactions.