

## **8. Toward a Clear Frontier between Science and Religion in Education**

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**T**he longstanding science-religion conflict continues to be a highly topical subject—for two reasons especially. First, advances in science and technology often force religion to revise old opinions and adopt new ones. And second, education is an arena in which science and religion may conflict. (And it will likely remain so.)

My intention here is not to review the science-religion conflicts, but rather to clarify the roots of these conflicts, and provide some tools to facilitate the delimitation of scientific and religious competences. Additionally, I shall offer some thoughts on how the above-mentioned situation can affect children's education.

Finally, I will describe the current science-religion conflict in Spanish schools, where religion is part of the curriculum. The particular religion of reference is Catholicism, although I think that the example of Spanish schools applies to all situations in which religion is taught alongside science as part of the general curriculum.

### **Toward the Root of the Conflict: Philosophical Presuppositions of Science and Religion**

Defining religion and science—the scope and characteristics of each—is difficult and complex. Since there is little agreement among philosophers and other thinkers on the subject, I shall focus on delimiting a clear frontier between science and religion with respect to issues of direct educational interest. In an outstanding article, Martin Mahner and Mario Bunge<sup>1</sup> approached the epistemological roots of the possible conflicts between science and religion by establishing some basic philosophical premises that seem widely agreed upon. To

understand the conflict between science and religion, we must first understand these philosophical (and generally tacit, not explicit) presuppositions and the origin of the diverse modalities of the science-religion relationship.<sup>2</sup>

### Philosophical Presuppositions of the Science

Science rests upon several core philosophical presuppositions. These include the belief that a reality exists (ontological realism); the belief that we can know that reality (gnoseologic realism); the idea that some propositions are about facts, and they are true in some measure (semantic realism); and the belief that the observable events in nature can only be explained by natural causes (methodological naturalism).

The methodological aspect of science is, of course, essential, and has been validated thousands of times in books and articles by philosophers of science. Yet with regard to methodological naturalism, I disagree with Mahner and Bunge,<sup>3</sup> who assure us that science assumes not only methodological, but *ontological* naturalism. In contrast, I think that in principle science cannot exclude the reality of unnatural (or supernatural) beings. On the other hand, I believe that we must clarify the limits of science's philosophical premises. Although this issue is very controversial, there is extensive agreement that science cannot make aesthetic valuations or moral statements. Science can *study* the artistic and the moral, but it cannot be "contrary" to them. Therefore, no "conflict" should exist in such areas (but more on this later).

Is science, then, unaware of, or external to, morality and "values"? This question usually causes confusion, for often the absence of a normative capacity in science is interpreted as an absence of values. But if we think deeply about this, we will see that some internal rules, and some very restrictive rules, do exist, and that some are moral rules. Where do these rules originate? The short answer is that science does not offer a morality but works with what Mahner and Bunge<sup>4</sup> characterize as a system of "internal values" (endoaxiology).

### The "Internal Values" of Science

Science has internal values, which Mahner and Bunge highlight in their article. Those values include exactness, systemicity, and logical consistency (i.e., logical values); definiteness, also known as clarity, and maximal truth, also known as adequacy of ideas to facts (i.e., semantical values); testability and the possibility of scrutinizing and justifying the very methods employed to test ideas (i.e., methodological values); and, finally, critical thinking, open-mindedness (but not blank-mindedness), veracity, and giving credit where credit is due. These are attitudinal and moral values.

I find this list eminently sensible, but somewhat brief. Some important values are missing because it seems to me, there is no desire for completeness in Mahner and Bunge's enumeration. Thus we can add the following:

- Simplicity, explanatory power (i.e., logical values).
- Objectivity, creativity, self-correction (i.e., methodological values).

Still other values are missing because they are so taken for granted in the scientific field that they are almost invisible. These include freedom of thought, freedom of expression, and non-violence—that is, attitudinal and moral values.

I will elucidate the importance of these aspects of attitudinal and moral values to science. But first, one wonders just how significant these values are in the world outside science. These values are especially linked to what, in the modern world, we usually consider the most precious and specifically human values: critical thinking, freedom of thought, and freedom of expression. These are different “values,” but they are closely interrelated. They are what make us free, make us responsible, and make us human. Along with non-violence, they are values that everyone hurries to proclaim nowadays; but they are rarely sustained or sincerely promoted. I think these free thought values are assumed to be part of science—as part of the scientific method—much more than in other areas of life, although we find those freedoms undermined by the natural anti-libertarian trends of certain authoritarian scientists themselves. In short, critical reason and the internal values of science in general can be the best weapons against the new forms of domination and manipulation in society.

Finally, it is clear from the philosophical presuppositions proposed that the internal values of science do not admit any kind of faith as an explanation, and do not consider any truth as immutable. In other words, the scientific methods and scientific results are secular and independent of religious beliefs.<sup>5</sup>

### **Philosophical Presuppositions of Religion**

Religion, too, rests upon several main philosophical assumptions. These are the belief that a reality exists (i.e., ontological realism); a belief that that reality is knowable (i.e., gnoseological realism); and the belief that there are supernatural beings and facts (i.e., ontological supernaturalism).

Clearly, the fundamental difference between religion and science is the (religious) belief in supernaturalism. It is also clear that the methodological difference occurs at the point of obtaining knowledge about how the world is, and how it works. The “religious methodology” can be characterized by this so-called connection with the supernatural. This connection is considered the essential

source of knowledge, and includes revelation (which contains sacred scriptures and appearances), tradition, authority, intuition, contemplation, meditation and prayer. In practice, this methodology gives rise to differentiation, owing to very different traditions and experiences in connection with the supernatural. The fact that religious “truths” can not be verified, corrected, or modified means that the practices of some faiths are often radically incompatible with other faiths.

### **The System of “External Values” (Exoaxiology) of the Religion**

In contrast to science, religion posits a system of external values. Religion makes value judgments—judgments that affect natural objects. I will not discuss the broad field of religious values. What is worth mentioning here is that some of the “internal values” (endoaxiology) that characterize science are barely discernable in religion. This can be illustrated by some significant examples of qualities present—and absent—from religion (at the end of the article I will specify the possible confrontations of major educative relevance):

Self-correction (which entails doubt, provisionality): In principle, these features are excluded specifically from the religious realm. For example, it is believed that the word of God written in the holy books expresses unimpeachable truths. In practice, we know that religions are forced to change, to adapt to new times and to new knowledge (brought by science, usually).

Systematicity, logic, clarity of language: Due to one characteristic—the concept of “mystery”—all those features fade. Generally, logical and rational thinking is subordinated to faith and to the dogmatic truths transmitted by the sacred texts and the religious authorities.

Unicity: While there are no differences among scientific disciplines regarding reasons of belief or other ideological premises, there is a multitude of religions that are basically incompatible due to mutually exclusive doctrines. Generally, there is little possibility of agreement (it is rarely tried) among different religious doctrines even though they appear to outside observers to have minor differences.

Now that we know the philosophical presuppositions that can help clarify the differences between the field of science and the field of religion, we can recognize the possible areas of conflict. And we can move forward in the process of delimitating the frontiers between the scientific and the religious.

## **In Search of a Precise Delimitation of Frontiers**

Searching for a neat frontier, we must know what religion says about science—and vice-versa. Of course, in order to do this succinctly, I must again summarize extraordinarily.

### **What Does Religion Say about Science?**

I wish to highlight, in this section, the fact that science has achieved remarkable success in understanding and explaining the natural world. This has progressed to the point where today, most of the followers of the majority of religions in the West declare that the natural world is the proper domain of science.

### **What Does Science Say about Religious Beliefs?**

*Science* usually does not enter into the content of religious beliefs (but see later), so here we are interested in knowing what *the sciences* say about those beliefs, and what scientists themselves believe. In this respect, the most relevant data were obtained in surveys carried out last century by Leuba<sup>6</sup> and Larson and Witham.<sup>7</sup> They reported that the higher the status of the scientists, the less likely they were to believe in a personal God or in life after death. On the other hand, however, most scientists *declare* that science does not conflict with religion. They manifest an enormous respect for religious beliefs, but without ever specifying what these beliefs actually are. We have an example of this in Stephen Jay Gould's celebrated book, *Rock of Ages*.<sup>8</sup> Gould emphasizes the "non conflict" between, and the separation of, scientific and religious "magisteria"; but he does so without ever stopping to consider what we might call "strong" religious assertions about the operation of the natural world, e.g., supernatural interventions in the operation of this world.

This evasive attitude avoids the points of potential conflict, but it is not very useful because it only postpones the resolution of possible problems. For this reason, I believe that, from the point of view of science, it is necessary to move fearlessly ahead toward the delimitation of the scope of science versus religion.

### **The Scope of Science and Religion**

Based on my earlier arguments, I believe that the vast majority of scientists and religious people would actually agree that claims regarding natural reality fall into the sphere of science. It is a key point. From it follows, logically, that religious claims about natural reality can be subjected to skeptical—i.e., scientific—doubt.

The key word is "can." Since although it "can" be done, almost nobody does it. (In my opinion, it is with the "can" that the "conflict escapist" usually fail.)

Speaking in ethical terms, can we say that science “must” evaluate any relevant assertion about the functioning of the natural world, and that therefore science “must” consider the relevant religious assertions about the natural world?

Whatever the answer is, it seems clear that science “should not” hide its conclusions about the natural world simply because these conclusions would upset some collective. To put it more starkly, science should not hold any “respect” for religious beliefs about natural reality.

This idea, this declaration of principles, is what allows us to continue towards delimitating the frontier from the scientific point of view. To accomplish this, we must continue to clarify and classify the assertions made from outside science. Is science able to say something about the truth of any assertion? We know when it is not—but when is it able, and are there degrees in the response capacity?

I will try now to offer a first classification (which is amenable improvement and expansion, of course) of the types of assertions that science faces. I will speak explicitly of statements of religious character, which is what concerns us here, but the classification could apply to any type of assertion.

### **The Character of (Religious) Assertions from the Scientific Point of View**

I propose the following classification of statements from a scientific point of view:

1. Proven true and explained by science.
2. Not proven true, but compatible with science.
3. Proven true, but unexplained by science.
4. Unscientific (unverifiable/unfalsifiable, fictitious, without factual content, moral, aesthetic).
5. Proven false.
6. Scientifically false: not proven false, but not compatible with scientific knowledge.
7. Anti-scientific.

Of course, in each type there can be degrees, mainly in types 1 and 3. In fact, if we follow Popperian thinking, then any assertion cannot be assumed as definitively proven scientifically.

To clarify this incipient classification, I will illustrate it with real examples relating to the arena of human health. I shall also discuss some of the more outstanding possible sources of conflict:

1. Proven true and explained by science: "Patients for whom doctors have given up hope have recovered thanks to new medicines."
2. Not proven true, but compatible with science: "Some people terminally ill recovered after being touched by Jesus." (Jesus of the Gospels.)
3. Proven true, but unexplained by science: "Patients for whom the best doctors had given up hope have recovered."
4. Unscientific / Moral: "Patients exhibit exemplary behavior when the doctors had given up hope of their recovering."
5. Proven false: "Patients that the best doctors had given up hope for and then have recovered are all Christians."
6. Scientifically false: "Some people are raised from the dead."
7. Anti-scientific: "Patients for whom the best doctors had given up hope of recovery have recovered in a way that is and will be inexplicable scientifically."

In the proposed classification, the only type of assertions in which science has no competence is the unscientific (4). For example, in assertion 4, science has nothing to say once it has corroborated the facts. And there are many religious assertions that are unscientific, e.g., all moral norms and judgments. Science by itself cannot pass judgment about goodness or evil. Only if the terms are defined externally can science conclude that something concrete is one thing or another. It can decide if it is fit for a purpose, but it can't assess the moral quality of that purpose.

Regarding holy texts that depict fictitious or symbolic events, science cannot make judgments. Science does not have the authority to make moral judgments. However, it is essential for science to address any discussion where a believer supports an assertion *that he himself regards as factual*. One complication is that in a religious thesis (theological, for example), there are often mixed assertions of several types, so it is important to dissect the speech by sorting the assertions, and to ask the writer or speaker for relevant clarifications when necessary.

From the side of science, the main conflicts arise, obviously, with claims of types 3, 5, 6 and 7 (although type 5 should make the case trivial). Type 7 relates to miracles that clash with science in a radical way, by denying its competence within its own sphere: the natural world. When someone says, of a miracle, that "science is not able to explain it, nor *will it be* able to," the speaker is denying that science can know and explain aspects of the functioning natural world, a key assumption of science. Therefore, the affirmation of a miracle is essentially anti-scientific.

The stories of miracles can sometimes be considered unscientific (type 4); e.g., when they are “enlightening” stories without pretension to factual truth. But very often they are considered true, objective accounts of facts affecting the natural world and therefore confront scientific expertise.

Although religions claim that miracles are produced by “transcendent” beings outside of the material world, those claims become subject to science as soon as they enter the realm of physical reality. Science cannot absolve itself from studying the causes of the physical facts. They cannot fail to be physical! In other words, when the “transcendent” or “supernatural” beings act in the natural world, they cease to be transcendent or supernatural and fall within the sphere of science. If religion claims that a supernatural entity has performed a physical marvel, this marvel, and its cause, is subject to scientific analysis.

In the example of a scientifically false assertion (type 6), science may rule that assertion false with a high degree of probability. It’s an assertion that lacks evidence, and contradicts scientific experience, laws and theories. Science never has absolute certainty, and it is often impossible to quantify this degree of probability. In spite of this lack of absolute certainty, science is not obligated to add to each factual or explanatory assertion, a clause of extreme caution and provisionality.<sup>9</sup>

On the other hand, we have rare cases of gravely ill people who—against staggering odds—recover. These rare cases—often called miracles—are not sufficiently explained by science (type 3), although that does not mean that it is unexplainable (type 7) or incompatible with science. Indeed, one hopes that science will eventually supply an explanation. There is a popular tendency to interpret some unexpected (or simply fortunate) facts as supernatural interventions. In these cases, the claim may belong in fact to type 7 and 1 assertions.

The characterization and classification proposed here can be applied to other controversial issues, such as Intelligent Design. As the Intelligent Design doctrine denies science its ability to explain the natural world through natural causes, it clearly falls into the anti-scientific Type 7 claim. Besides that, in this doctrine there are assertions of both the proven falsity (type 5) and scientifically false (type 6).

We can now conclude that the inevitable and radical conflict between science and religion occurs when science moves onto unscientific ground. This occurs when someone intends, on behalf of science, to dictate moral standards or ways of life.

Conflict is also inevitable when religion enters the scientific field particularly through claims concerning miracles. Here we would not only include the



“minor” miracles but also those proclaimed by the religions as major acts of creation made by a supernatural entity: for example, the origins of life or the origins of humans.

To ignore this radical conflict, as Stephen Jay Gould and so many others have done, involves closing one’s eyes to the obvious reality. Based on my previous arguments, I think that one cannot maintain scientific thought (knowledge, methods and philosophical premises) alongside a belief in miracles. Note that I do not speak of an incompatibility between science and all the aspects of religion, but only with its consideration of miracles (in a broad sense) as true, real facts.

### **Educational Implications**

What are the educational implications of the arguments presented so far? Is it possible for schools to harmonize serious scientific education alongside religious indoctrination?

A scientific education should consider and encompass two aspects of science: content and methodology. This means it must not only demonstrate scientific results but also an understanding of how science works—the “scientific method.” This is based on the internal values of science. An essential part of the method is the idea that dogmatic beliefs about how the world is and how the world works cannot be assumed. It is the opposite of blind faith. The scientific method is grounded in doubt and skepticism; it demands verifiability, falsity, and self-correction. It seems clear that the scientific method is the best tool that humankind has devised to prevent and correct common errors such as superstition and magic.

If there is essential agreement with the arguments made here, a religious instruction that inculcates belief in miracles is not compatible with a scientific education. If we accept that miracles such as resurrections, virgin births, and divine interventions are radically anti-scientific and fail to explain the origins of life, we cannot accept them as compatible with science.

On the other hand, it is obvious that education is more than just delivering knowledge. Among other things, it includes learning how to acquire reliable knowledge, a way to face life’s reality. Science represents a way to face reality based on its own “internal values” and philosophical premises. However, one must remember that these values do not extend from science “outward.” Because scientific values are not universally shared, they will continue to produce conflict. (At the same time, if scientific values are considered positive, then they cannot, at the same time, be considered equal to or inferior to any opposing values.)

In order to clarify and systematize, I will outline some possible pairs of antithetical values that are especially important for delineating positions in

education. Each pair is composed of a creedal value (c.v.) and a scientific value (s.v.). For example, one pair of contrasting values is uncritical acceptance of beliefs (c.v.) versus provisionality and verifiability (s.v.). Another example is the principle of authority (c.v.) versus demand for evidence (s.v.). A third is the immutability of beliefs (c.v.) versus the willingness to rectify in view of new evidences (s.v.). A fourth is faith (c.v.) versus critical thinking (s.v.). And a final value-pair is the recourse to “mystery” to solve logical inconsistencies (c.v.) versus rationality, which entails logical consistency (s.v.).

Any system of beliefs can be evaluated to see whether it is closer to creedal values or to scientific values. Of course, every person should have the freedom to choose his or her own values. Although religion is characterized by its support for beliefs and dogmas, this does not mean that religion only appeals to faith and lacks critical thinking. However, in contrast to science, there are important occasions on which faith prevails over critical thinking, and, in general, in which creedal values prevail over scientific values.

It is interesting that when we talk of religious education, we are talking, in fact, about a range of very diverse possibilities that can be, and often are, mutually incompatible. It behoves us to must remember the extent to which religions clash with one another, both today and in the past.

Likewise, it is relevant to note the importance of educational decisions affecting the schooling of young children. This is a complex matter, but it seems obvious that in their exposure to descriptions of natural reality and to the tools used to grasp it, science and its method should have the hegemonic role from the beginning (while of course adapting educational methods to age). Science education must demand that children be specially protected against the inculcation (based on the authority and other methods of indoctrination) of false scientific or anti-scientific assertions.

### **The Situation in Spain**

Finally, I would like to comment on the science-religion conflict in Spanish schools. Until now, in Spain, there have not been episodes of religious intervention in scientific matters of the type seen in recent decades in the U.S. For example, there has not been a Creationist movement against the study of evolution in Spain, nor has any group tried to promote Intelligent Design as an alternative to natural evolution.

However, the structure of education in Spain explains why there is so little intervention from the religious sphere. Spanish public schools are legally required to offer the subject of “Religion” using public funds. Nowadays, attendance at religion classes is voluntary, but it is predominantly Roman Catholic, and the

vast majority of students choose to attend from an early age. As a result, many students take many more hours of Religion than, say, biology. Naturally, in these Religion classes there is freedom to explain and instill the Church's view of creation and its belief in miracles. Religious instructors, as religious people guided by religious authorities and theologians, very rarely admit that evolution was and is a purely natural process. Therefore, a conflict occurs within the school because of the existence of religion classes where the curriculum can invade the field of science. In the religious private schools, the great majority of which are Catholic, the weight of religion is (as one might expect) even greater, as is the "invasion" of the scientific arena.

Therefore, most Spanish children learn in school to make the two subjects and approaches compatible through a variety of ways of "double thinking." Scientific knowledge and scientific thinking exist alongside knowledge based on a religious ideology that is not only unscientific (which is not such a problem) but is, from the scientist's point of view, false and anti-scientific. I fear that this confusing situation is not unique to Spain; rather, it exists in any nation where children receive religious indoctrination and science education at the same time, in the same school.

## Conclusion

Building on the basic philosophical presuppositions of science and religion, I have attempted to delimit the frontier between them. As a consequence, I have clearly identified areas where the conflict is inevitable. This delimitation and identification is essential from the educational and pedagogic point of view. In the author's opinion, an indoctrination that is based on faith and belief in miracles is incompatible with a scientific education that is based on weighing evidence and critical thinking.

## ENDNOTES

1. M. Mahner and M. Bunge, "Is Religious Education Compatible with Science Education?" *Science & Education* 5 (1996): 101-123.
2. See, for example, Chapter 7 of C. Haynes and W. Nord, *Taking Religion Seriously Across the Curriculum* (Washington, DC: Association for Supervision and Curriculum Development, 1998).
3. Mahner and Bunge (1996), 103.
4. Ibid.

5. T. Jayaraman, "On Science and Secularism," <ftp://ftp.csrd.uiuc.edu/pub/misc/mehrotra/bits/jayaraman.ps.gz>. (Based on a talk delivered at the VII State Conference of the Tamilnadu Science Forum in January 1993); B.A. Kosmin, "The Congruence between the Scientific and the Secular," *Science Education & Secular Values—A Symposium* (Special Supplement to *Religion in the News*, summer/fall 2007).
6. J. H. Leuba, "Religious Beliefs of American Scientists," *Harper's Magazine* 169, 1934, 291-300.
7. E.J. Larson and L. Witham, "Leading Scientists still Reject God," *Nature* 394 (1998): 313; S.J. Gould, *Rocks of Ages: Science and Religion in the Fullness of Life* (Ballantine Books, New York, 1999).
8. For an illustration and more detailed presentation of this type of assertions, see J.A. Aguilera, "La Ciencia frente a las Creencias Religiosas," *Mientras Tanto* 95 (2005): 125-153.