Chapter 56
Science, Religion, and Naturalism: Metaphysical and Methodological Incompatibilities

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56.1 Introduction

In many countries, children receive both science education and religious education.[1] "Religious education" is here understood as an education under denominational auspices, however liberal. That is, students are not taught some unbiased comparative, historical, cultural, and social aspects of religion, but are expected to accept and internalize the doctrines of a particular religious belief system, usually the one their parents are affiliated to.[2] From a nonreligious perspective, this situation is unfortunate as it appears that an education emphasizing the need for empirical tests and evidence is incompatible with an education that allows for, or even encourages, the acceptance of factual beliefs without or even contrary to evidence. In other words, learning to accept statements only if there is sufficient evidence for them and learning to accept claims on sheer faith appear to be antagonistic educational goals (Mahner and Bunge 1996a; Martin 1997).

Evidently, this concern rests on the assumption that science and religion are mutually incompatible, whereby "incompatible" means that one cannot rationally accept both a scientific and a religious world view. Though common among (consistent) naturalists and secular humanists,[3] this view is of course contested by many

[1] This contribution uses material published earlier in the journal *Science & Education*, namely, from Mahner and Bunge (1996a, b) and Mahner (2012).

[2] Of course, there are approaches to teach religion in a very general sense of "spirituality," whatever that exactly means (see, e.g., Stolberg and Teece 2011). Even so the presupposition is that this spirituality comprises more than what can be obtained in a comprehensive scientific worldview.

[3] See, e.g., Clements (1990), Dawkins (2006), Dennett (2007), Edis (2007, 2008, 2009), Kanitscheider (1996), Kitcher (2004), Kurtz (2003), Mahner and Bunge (1996a, b), Martin (1997), Provine (2008), Rachels (1991), Smart (1967), Stenger (2007, 2011), and Suchting (1994).

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religionists and even some naturalistically inclined scientists and philosophers.[4] Therefore, it will be necessary to defend it. If we succeed in showing that science and religion are incompatible, it is a mere corollary that science and religious education are also incompatible.

Any argument for either the compatibility or incompatibility of science should work with a reasonably clear definition of both *science* and *religion*. However, the very existence of such definitions has been contested for a long time (see, e.g., Glennan 2009). There have been arguments to the effect that there is no reasonable demarcation between science and nonscience, in particular pseudoscience (Laudan 1983), and that, similarly, religion is so diversified that any attempt to formulate a definition that covers all religions is futile (Platvoet and Molendijk 1999). As this is not the place to review these arguments,[5] it will be helpful to narrow down what we take science and religion to be, so that we can focus on those aspects that may or may not be compatible. Before we get to this point, however, it will suffice to work with the undefined everyday usages of "science" and "religion." So we start with the question of how to avoid conflict between religion and science.

56.2 How to Avoid Conflict Between Religion and Science

Claims, theories, or world views may be in mutual conflict only if there is an at least partial overlap in their subject matter. Indeed, traditionally religions have offered general cosmologies (or metaphysics) helping to explain the major features of the world, in particular the place of humans and their relationship to the various supernatural entities allegedly populating the world alongside humans. After all, "[a]ll religions do share a feature: ostensible communication with humanlike, yet nonhuman, beings through some form of symbolic action" (Guthrie 1995, p. 197) – and this requires some factual background assumptions. While science has emerged from such a religious cosmology, it has now superseded the latter, it has significantly changed its metaphysical framework, and it has taken over the explanatory function of the old cosmologies. It appears therefore that, concerning matters of fact, religion has ceded this explanatory role to science, focusing now on other tasks. And it appears as if this concession has removed any former conflicts. While we shall see later on that this appearance is deceptive, let us first take a look at the attempts at reconceptualizing either religion or science to prevent them from being in conflict.

[4] See, e.g., Alston (2004), Barbour (2000), Clayton and Simpson (2008), Drees (1996), Gould (1999), Harrison (2010), Haught (1995), Peacocke (1993), Polkinghorne (1987), Rolston (1987), Ruse (2001a, 2011), Stenmark (2010), and Wentzel van Huyssteen (1998).

[5] For critiques of Laudan's view, see Mahner (2013) and Pigliucci (2013). For a comparison of concepts of religion, see Guthrie (1995). As for the demarcation of science in general, see Mahner (2007) and Thagard (2011).

56.2.1 Science and Religion Deal with Different Aspects of the World or Even with Different Realities

There are several ways to render science and religion independent so that they cannot be in conflict. One way is ontological. It splits the world into two radically different parts: a material world (nature) and a transcendent world (supernature). Whereas nature is studied by science, supernature is studied by religion.[6] A historically important example of this approach is deism, which allowed scientists to study the natural world without resorting to supernatural interventions (apart from the initial act of divine creation). However, conflict with science can only be avoided if these two worlds are causally independent: if there are causal interactions, we sooner or later face conflicting explanations. Yet if such a supernature is causally independent of the natural world, there can be no evidence for its existence so that it remains merely a conceptual possibility, moreover, one without any explanatory function as its existence or nonexistence would make no difference to our world. Such a radical split then is not very attractive to most religious believers, who usually long for a connection between themselves and the divine.

A second ontological possibility is to assume that supernatural agents are not agents in the familiar sense, but only "underlying" causes. While natural causes are (merely) "secondary causes" studied by science, God works as the "primary cause" behind the scenes. Indeed, according to some authors, God has been rather busy pulling the strings behind quantum physics and evolution, for example (Freddoso 1991; Barbour 2000; Plantinga 2011). The concepts of agency and cause involved here are best understood from the viewpoint of Scholastic metaphysics, which, though long superseded in science, is still going strong in Catholic philosophy. From a naturalist perspective, the involvement of supernatural agents "behind" natural causes is an unparsimonious and hence superfluous add-on to natural causes.[7] Assuming sustaining supernatural causes behind the web of natural causes does avoid conflict at the superficial level of the daily business of science and religion, but it does not avoid conflict at the deeper metaphysical level.

A third way of keeping science and religion separate is methodological and referential. Science and religion have different tasks, and they study different objects, or different properties or aspects of the world. For example, Rolston (1987) claims that religion is concerned with morality and meaning (not in the semantic sense of course, but in the sense of "purpose"), not material facts.[8] Following this

[6] It may be argued that attempts to split the world into two or more "worlds" are incoherent because, by definition, the world is everything that exists (Worrall 2004). However, if our metaphysics requires that not any old collection of causally unconnected things is itself a material thing and hence a real entity, worlds are real things (or, more precisely, systems) only inasmuch as their parts are causally connected, however weakly. Two causally unconnected universes would then be two different things, and there would be no supersystem of which they would be physical parts.

[7] For the metaphysical and epistemological problems of the idea of divine intervention, see Fales (2010).

[8] For an analysis of the various meanings of "meaning" in this context, see Martin (2002). For a critique of related noncognitive concepts of religion, see Philipse (2012).

idea, the evolutionary biologist Stephen J. Gould devoted an entire book to the "nonoverlapping magisteria" (NOMA) of science and religion (Gould 1999). Of course, if two areas have different referents, goals, and methods, they can hardly be in conflict. Dancing tango and doing science are not in conflict because they are quite different pursuits. Moreover, the NOMA approach allows for the claim that science and religion are not just compatible, but even complementary: morality and the search for purpose belong to human life just as the factual study of the world.[9]

The average religious believer, however, has to pay a high price for NOMA, because the concept of religion has to be redefined in a major way; so much so that no ordinary believer may recognize it afterwards.[10] For example, Gould considers as religious "all moral discourse on principles that might activate the ideal of universal fellowship among people" (Gould 1999, p. 62). This definition is so wide that it even applies to secular ethical discourse. So if an atheist engages in such discourse, he would be religious. While being too wide on the one hand, this definition is too narrow on the other, because it presupposes that religion has no factual content. For example, whatever people have said about the soul and the afterlife, or about the existence and properties of gods or cosmic forces, is illegitimate because it involves factual, not ethical, discourse. As a consequence, most traditional religious "truths" are excluded from the legitimate business of religion. Worse, without some factual assumptions about gods (for instance, god's will) or the order of creation (natural law doctrine) or the karma, moral values and norms cannot even be justified in a religious world view (Nowell-Smith 1967). As McCauley states:

> Religions certainly do try to make sense of our lives and of the world in which we find ourselves. The problem, though, is that that process of making sense of things inevitably involves appeals to explanations about the origins, the makeup, and the behavior of things generally and about our origins, makeup, and behavior in particular. (McCauley 2011, p. 229)

Last but not least, it can be argued that ethics cannot even be based on religion (see, e.g., Rachels 1995; Martin 2002). Thus, the identification of religion with ethics fails and hence also the "different domains" approach.

56.2.2 Religion Is Not Necessarily Bound to Supernaturalism

If science is tied to naturalism, whereas religion is based on supernaturalism, as is widely held, there is ample room for conflict at both the metaphysical level and the level of scientific explanation. But is religion really tied to a supernaturalist metaphysics? According to quite a number of scientists and philosophers, it is not. Indeed, Auguste Comte, John Dewey, Henry Wieman, Julian Huxley, Charles

[9] In science education, Sinatra and Nadelson (2011) follow this approach by postulating different epistemologies for science and religion, that is, "epistemologies that have different roles and explain different aspects of the human condition" (p. 175). Obviously, and sadly, this is an instance of epistemological relativism.

[10] See McCauley (2011), Orr (1999), and Worrall (2004).

Hardwick, and others have argued for religious naturalism.[11] Thus, "God" is redefined as the unity of our ideals, or as a cosmic process unfolding for the benefit of humans, or as the creative exchange among humans, etc. Often feelings of awe towards nature or the universe are regarded as religious feelings or as a feeling of the "sacred." For example, Einstein (1999) believed that the scientist's religiosity lies in "the amazement at the harmony of natural law."

Whether pantheism is a form of religious naturalism remains unclear. In an everyday understanding according to which the world is God, pantheism does appear to be a naturalist conception. In this sense, however, Schopenhauer's criticism applies: "to call the world 'God' is not to explain it; it is only to enrich our language with a superfluous synonym for the word 'world'" (Schopenhauer 1951, p. 40).[12] Levine (2011) rejects Schopenhauer's criticism for resting on a misunderstanding of what the pantheistic "divine unity" of the world means. However, Levine's own characterization of "unity" is fuzzy to the point of being incomprehensible, and he regards "divine" simply as experiential: whatever someone experiences as numinous is divine. Thus, the divine is turned into a subjective category.[13]

With the exception of traditional pantheism, it appears that the common motif of such non-supernaturalist approaches is to redefine "religion" in terms of either feelings or experiences, leaving no room for any factual content of religion. As Barbour (2000, p. 159) rightly remarks, religious naturalism thus simply conflicts with "most of the heritage of religious traditions."

56.2.3 Defining Religion in a Merely Functional Way

Psychologists and sociologists usually refrain from defining "religion" in a substantive way, that is, with regard to its content. Instead, they define it in terms of the functions religious beliefs, practices, and institutions have in human life and society

[11] See, e.g., Alston (1967), Drees (1996, 2008), and Hardwick (2003).

[12] To the consistent naturalist, the attempt to naturalize religion reduces to a game of words:

> The bogus procedure is this: When there is something that clearly does not exist, but one wishes that it did exist and wants to be able to say that it does exist, then choose something real that is similar in some respects and give it the name of the nonexistent entity. Voilà! You have now proved the existence of something that doesn't exist. Suppose one wants to prove that God exists. Find something awe-inspiring, or powerful, or infinite, or fundamental …. and call it "God". Now God exists, and the various practices with respect to that God are "religious". Unfortunately, in reality, all you've done is play with words and, thereby, pull off a shabby, unconvincing trick. (Pasquarello 2002, p. 51)

This applies not only to religious naturalism but also to the various hermeneutic approaches in modern theology, such as Paul Tillich's definition of God as "ultimate concern" (for a criticism of hermeneutic theology, see Chap. 5 in Albert 1985).

[13] Peacocke's (1993) panentheism does not seem to be a consistent naturalism, as it makes God only partly natural, so I shall not discuss his view here.

(see, e.g., Yinger 1970). That religious beliefs and practices have evolved along with humankind and that they have various functions for individuals and groups is of course nothing but a scientific description and explanation of religion.[14] It is exactly these functions that remain once the cognitive content of religion is removed for being illusory. Obviously, a naturalist, scientific view of religion cannot be in conflict with science. Yet again, the problem remains that such characterizations do not match the self-conceptions of most religions.[15]

56.2.4 The Argument from Religious Scientists

Another psychological and sociological argument to consider is the claim that science and religion cannot be in conflict because there have been many religious scientists. Indeed, quite naturally there is no shortage of historical examples, which are often used to reject the historical conflict view (see, e.g., Russell 2002). And even today the number of religious scientists is high.[16] Interestingly, average scientists tend to be more religious than elite scientists (Gross and Simmons 2009). According to the latest study of Ecklund (2010), about 64 % of elite US scientists are atheists or agnostics.

The argument from religious scientists, however, is a weak one at best. At worst, it is an *argumentum ad populum*. It would come as no surprise that a large number of people can be mistaken about something. And as we know from psychology, many people hold inconsistent beliefs. This applies also to scientists. For example, it is quite telling that most religious scientists have not used religious concepts in their scientific work (Mahner and Bunge 1996b). There are no variables referring to supernatural entities or processes in scientific theories. If someone believes in the reality of the supernatural, it is inconsistent to not make use of religious entities and methods in science. Rather, we should expect religious scientists to defend a theistic science, as Ratzsch (1996) and Plantinga (2001) consistently (though of course unsuccessfully) do. But this is rarely the case. Therefore, pace Ratzsch (2004) and others, it is not implausible to suspect the world views of religious scientists to be inconsistent.

So the problem of whether science and religion are compatible or not is not a matter of psychology and sociology but of philosophy, more precisely, of metaphysics, epistemology, and methodology. If there is no conflict at this level, then the world view of religious scientists may be consistent; otherwise, it is not.

[14] See Boyer (2001), Dennett (2007), and Guthrie (1995).

[15] Further criticism of religious functionalism in Guthrie (1995).

[16] See, e.g., Ecklund (2010), Gross and Simmons (2009), Larson and Witham (1998), and Margenau and Varghese (1992).

56.2.5 Religious Discourse Is Nonsense

According to neopositivism, metaphysical sentences including religious ones are semantically nonsensical because they are not verifiable (Ayer 1990). If religious discourse is nonsense, it can be neither compatible nor incompatible with scientific discourse. So there is no conflict with science. As a consequence, however, atheist discourse is nonsensic too: if "God exists" is nonsense, its negation "God does not exist" is also nonsense.

It is rather obvious that the neopositivist answer is not a good option for religious believers. After all, they believe that they make meaningful statements about nature or supernature or both. Indeed, the neopositivist meaning criterion of verifiability has long been abandoned: in order to verify or falsify a statement, it must be semantically meaningful in the first place, not the other way round. So we cannot keep religion away by declaring it nonsense *tout court*. However, in particular academic theology does have meaning problems, as it often resorts to an irrationalist, fuzzy discourse that helps to immunize theology from factual criticism (Albert 1985; Bartley 1984). And as we shall see later, it is not at all clear what the very term "God" exactly means.

56.2.6 Distorting Science

Removing the cognitive content of religion is not the only way to avoid conflict between science and religion. There are also attempts to remove all truth claims from science by adopting antirealist views of science, such as instrumentalism or relativism. If scientific theories are not attempts at approximating truth by stating something about how the world really is, but only more or less useful tools for systematizing or predicting empirical statements, or if scientific theories are nothing but yet another way at looking at the world, on the same par as any other, even mythical way, then science may of course peacefully coexist with religion (Byl 1985; Stenmark 2010). A less radical view is constructive empiricism, which replaces truth by empirical adequacy, but it too is a view that castrates science. Given the fact that both instrumentalism and constructive empiricism are still popular in the philosophy of science, at least much more so than relativism, it may appear bold to charge them with distorting science, but this is not the place to defend this view.[17]

56.2.7 Conclusion

As we have seen, there are many ways to construe "religion." Some of them would indeed be compatible with science. But as we have also seen, the believer has to pay a high price if he accepts them. Religious entities are either rendered causally

[17] More on this in Vollmer (1990), Psillos (1999, 2003), Worrall (2004), and Ladyman (2012).

inefficacious and hence irrelevant, or religion is emptied of any factual content so that it can no longer make any (objective) truth claims. Notwithstanding the attempts of modern theology at immunizing religion from criticism by obfuscating and subjectifying its concepts (Albert 1985), the vast majority of believers of all ages has believed that their religion does make some true factual statements about the world, in particular about humans and their relation to the divine or at least to certain spiritual entities (McCauley 2011). That is, real life religions have always included a cosmology.[18] The following characterization reflects this situation. Accordingly, religion can be seen as

> …the belief in numinous personal or impersonal entities - gods, spirits, demons, angels, or divine powers - which have certain causal powers, and which therefore are relevant to human fate and salvation, as well as […] an associated practice of the believers, which is adequate to make allowance for the powers of these entities and to influence them for the benefit of the believers' salvation, that is, a cult characterized by a salvation technology. (Albert 2000, p. 142, my free translation)

Both religion and science thus have an overlap in that they are epistemic enterprises. Both search for truth, partly in the same, partly in different domains. We can therefore construe both as epistemic fields.

56.3 Science and Religion as Epistemic Fields

In the following, science and religion are compared by means of a list of criteria that helps to define epistemic fields.[19] By "science" I mean factual science as opposed to formal science like logics and mathematics. Now, factual science is often called "empirical science." However, "empirical" refers to the methods of science, not to the concrete facts it studies. Science studies concrete facts (material things having certain properties and the processes they undergo) by both theoretical and empirical means. So by "fact," I do not mean *statements* about concrete facts but the referents of such factual statements. I shall ignore the question of whether there are formal or abstract facts as these do not exist in the same way as concrete facts. The following questions yield some of the criteria that help to define an epistemic field:

[18] This is echoed by Plantinga who has the gall to call naturalism a quasi-religion because it fulfills this world view aspect: "It offers a way of interpreting ourselves to ourselves, a way of understanding our origin and significance at the deep level of religion. It tells us where we come from, what our prospects are, what our place in the universe is, whether there is life after death, and the like. We could therefore say that it is a 'quasi-religion'" (Dennett and Plantinga 2011, p. 16f., see also Plantinga 2011). Needless to say, it is disingenuous to call a world view that has overcome religion a quasi-religion. A similar theological ploy is to compare the philosophical underpinnings of science to religious faith.

[19] Modifiyng earlier analyses by Bunge (1983), Bunge and Mahner (2004), Mahner (2007), and Mahner and Bunge (1996a).

1. Which objects does it refer to? What is the domain of facts it is concerned with?
2. What is its fund of knowledge?
3. Which background knowledge does it use in the study of its domain?
4. What are the aims of the given field?
5. Which methods does it work with?
6. Which are the philosophical background assumptions presupposed in its work? That is, what are its metaphysical, methodological, axiological, and moral foundations? Finally, which general attitude or mind-set is considered to be exemplary for those who work in the given field?

56.3.1 Science

1. The domain of factual science comprises everything existent, i.e., the whole world. Although there are certainly things that are de facto beyond scientific investigation for lack of information, there is nothing natural that could not be de jure studied scientifically. As a matter of principle, the domain of science also includes, for instance, the how and why of subjective feelings and emotions in general, as well as the origins and functions of morality and religion – fields of inquiry that are sometimes believed to be beyond scientific understanding.
2. The fund of scientific knowledge is a body of factual knowledge, in particular law statements, which grows along with research. (More on laws in Sect. 56.4.1.)
3. The background of a specific scientific field is the collection of up-to-date well-confirmed knowledge (data, hypotheses, theories) borrowed from neighboring fields. Each scientific discipline connects thus to other scientific fields. Science consists of a network of subfields or disciplines, aiming at a consilient description of the world.
4. The aims of a basic science are purely cognitive. They include, for example, the discovery of the laws of its referents, the explanation of the facts it studies, the systematization of its knowledge base (e.g., by constructing general theories), and the refinement of its methods. By contrast, the aims of technology are practical: it is concerned with design and application.
5. The *methodics* of a scientific field is the collection of its specific and general methods, where specific methods are often called "techniques." (The term "methodology" is reserved here for normative epistemology.) For example, scanning electron microscopy is a specific method, whereas the scientific method is the most general method of the sciences. Specific methods must be scrutable and objective, and we must be able to explain, at least roughly, how they work. The scientific method in general may be conceived of as consisting of the following ordered sequence of cognitive operations: Identify a problem–search for information, methods, instruments–try to solve the problem with the help of those means; if necessary, invent new means, produce new data, or design new experiments–derive the consequences of your solution (e.g., predictions)–check

the solution (e.g., try to replicate your findings by alternative means)–correct the solution if necessary in repeating the cycle–examine the impact of the solution upon the body of background knowledge and state some of the new problems it gives rise to. The structure of any scientific paper roughly reflects these steps and is thus an instance of the scientific method. Of course, there is no single specific method that could be applied to each particular case of research.

6. The philosophical background assumptions of science comprise a naturalist ontology (or metaphysics), a realist epistemology, and a system of values that is particularly characterized by the ethos of the free search for truth.[20] The value system of science includes such logical values as exactness, systemicity, and logical consistency; semantical values such as meaning definiteness (hence clarity) and maximal truth (or adequacy of ideas to facts); methodological values such as testability and the possibility of scrutinizing and justifying the very methods employed to put ideas to the test; and, finally, attitudinal and moral values such as critical thinking, open-mindedness (but not blank-mindedness), veracity, giving credit where credit is due, and more.

These philosophical assumptions are by no means generally accepted in the philosophy of science, so each of them would need further justification. Since there is no room to justify all of them here, the focus will be on the two most important aspects: the metaphysics and methodologies of science and religion. But let us take a closer look at religion first.

56.3.2 Religion

1. In addition to all religiously relevant parts of nature and society, the domain of religion comprises also supernature. Of particular interest are of course the relations of natural things (especially humans) to supernatural entities, and vice versa.
2. The fund of knowledge is a fixed or at most slowly changing collection of (mostly untestable) doctrines and beliefs, whether conveyed by means of an oral tradition or through sacred scriptures. Whatever change in religious beliefs may appear to take place is not due to research and hence newly discovered facts but is almost entirely a result of either (a) a change in the exegesis and interpretation of traditional doctrines, which, if taken literally, often are unpalatable to modern people, or (b) squabbles or even wars between rival factions in the same religious community. Hence, any substantial changes in the belief system are due to authority or external influence, not research. If genuine research takes place, such as historical investigation, this research is not accomplished by religious but scientific means even if undertaken by theologians. Accordingly, it has to be regarded as an external influence.

[20] "Ontology" is used synonymously with "metaphysics" in this paper.

3. The factual background of religion contains at best ordinary knowledge, not scientific knowledge. This is just because most religions are older than science. Some scientific knowledge may be compatible with religious doctrines up to a certain point, and some theologians may make use of scientific knowledge in certain arguments, but in the end this should not be necessary for the (alleged) truth of any religious doctrine.
4. The aims of religion are foremost practical. Moreover, they are ultimately, though mostly tacitly, a matter of self-interest in that they consist in attaining personal advantage such as salvation or eternal life (individual or cosmic). Religions are salvation technologies after all. To obey and worship the divine, or to live a virtuous life, though the explicit goal of the religious person, is, in the end, only a means to attain the blessings expected from the supernatural. All religion is ultimately anthropocentric.
5. The methodics of religion is a collection of practices, such as prayer, incantation, fasting, meditation, and other rituals that are supposed to connect human beings to the supernatural. As far as a cognitive aim is pursued, the religious person may make use of intuition, contemplation, meditation, or revelation. There is neither use for the scientific method in general nor use for specific scientific techniques.
6. The philosophical background assumptions of religion consist of a supernaturalist metaphysics, which is a collection of doctrines about the supernatural and our relations to it. Supernatural entities may be impersonal forces such as karma or more or less anthropomorphic "persons" such as gods. The epistemology of religion is usually a realist one, though religion may be consistent with any epistemology. The value system of religion seems to have only one item in common with science: the quest for truth. However, whereas the truth looked for by religionists is absolute or ultimate, scientific truth is partial or approximate. Neither exactness nor logical consistency and neither clarity nor testability are strong in religion. Moreover, it can be argued that many religious beliefs can only be upheld by disregarding such values. Otherwise, it would not be possible to cherish the mysterious or to confess *credo quia absurdum*. A religious value that is alien to science is (blind) faith, which allows the religionist to always retreat to commitment or fideism if pressed by rational analysis (Bartley 1984). Finally, religion contains an ethos of acceptance and defense of unquestionable doctrines, i.e., dogmas. As for the latter, witness Augustine's dictum, "Greater is the authority of Scripture than all the powers of the human mind," or Paul's injunction "Beware lest anyone cheat you through philosophy and empty deceit, according to the tradition of men, according to the basic principles of the world, and not according to Christ" (Col. 2: 8).

56.3.3 Conclusion

The above listed several commonalities and differences between science and religion, among them some obvious incompatibilities. Both science and religion aim at gaining knowledge about the world. Both operate from a realist perspective,

and both are truth seekers. While, today, most of the world is left to science to study and explain, there is an area of overlap the closer we get to the description and explanation of the place of humans in the world. The differences concern the nonnaturalist metaphysics of religion as well as, among others, the methodological status of evidence versus faith and the role of authority versus the free search for truth. And these differences will turn out to be the major incompatibilities.

56.4 The Metaphysics of Science and Religion

Modern science emerged from a mixture of prescience, philosophy, and religion. These areas were strongly intertwined during Scholasticism, but developed apart from the early sixteenth century on (Schrader 2000; Matthews 2009). The emancipation of science from theology is thus one of the characteristic features of its development. Mainstream philosophy also emancipated itself from theology, although even today philosophy in general is still so diverse that it ranges from materialism to quasi-religious thinking and even obscurantism. Even authors who come to a rather conciliatory conclusion concerning the historical relationship between science and religion admit that the main area of conflict concerns metaphysics: "The famous episodes of conflict between science and religion are not strictly conflicts between science and religion. Rather, they are instances of a more general conflict that arises within the process of changing metaphysical frameworks" (Schrader 2000, p. 400). For example, science superseded Scholastic metaphysics, in particular the teleology inherent in its Aristotelian foundation. It also abandoned the intentional teleology of the long-respectable argument to design. Indeed, the result is that, today, the metaphysics of science is consistently naturalist, which is incompatible with any supernaturalist metaphysics, however minimally furnished it may be.

This raises the question of whether the naturalism of science is just the result of a contingent historical development or whether this historical development has just brought forward what had applied all along: naturalism as a metaphysical condition of science. This latter thesis will be defended here.

Now, metaphysical conditions or presuppositions are not exactly popular in contemporary analytic philosophy because they smack of Kantianism. Kantian apriorism is the very antithesis of the aposteriorist approach of epistemological and methodological naturalism, which is widespread in contemporary analytic philosophy. However, metaphysical presuppositions need not be apriorist in the Kantian sense. But what is meant then by "condition" or "presupposition"?

A presupposition is often understood in the sense of a statement that is entailed by a set of premises or in the sense of a necessary condition implied by some antecedent statement. Is metaphysical naturalism entailed by science in one of these senses? From a formal point of view, it is not. It is not part of a deductive argument in the sense that if we collected all the statements or theories of science and used them as premises, then metaphysical naturalism would logically follow. After all, scientific theories do not explicitly talk about anything metaphysical such as the

presence or absence of supernatural entities: they simply refer to natural entities and processes only. Therefore, naturalism rather is a tacit metaphysical *supposition* of science, an ontological *postulate*. It is part of a metascientific framework or, if preferred, of the metaparadigm of science that guides the construction and evaluation of theories and that helps to explain why science works and succeeds in studying and explaining the world. As such, it is the best framework available yet, justified by its very success and its unifying and heuristic power.

56.4.1 The Metaphysical Presuppositions of Scientific Research

> …what Kant and Hume show, I think, is that limiting oneself to seeking natural causes for natural effects is not […] a metaphysical principle with no inherent grounding in science but rather a disciplinary condition of doing science, the only way to get the particular kinds of answers that science seeks within the terms of the evidentiary warrants it demands. (Loesberg 2007, p. 96f.)

A popular view among scientists maintains that science need not bother with philosophy, let alone metaphysics, at all; scientists should just apply and follow the scientific method or, if preferred, the collection of scientific methods. Somewhat more sophisticatedly, if science is ultimately about finding the truth, all that counts is evidence. Whether it confirms the natural or points to the supernatural, we should follow the evidence wherever it leads (Fishman 2009; Monton 2009). This antimetaphysical stance is importantly wrong because it rests on the assumption that both scientific methods and the evidence they produce are free of metaphysical presuppositions.

To show that there is quite a number of metaphysical postulates of science (Bunge 1983), we take a look at the three (overlapping) general empirical methods in science by means of which we gain data, which, in turn, may function as evidence: observation, measurement, and experiment. The question is whether these methods can work in a metaphysical vacuum, or whether their successful application rests upon certain metaphysical assumptions. In other words, could these methods work successfully in just any world, or can they work only in a world with a particular nature? A simple experiment chosen from a high school biology textbook will function as an example (Fig. 56.1, following Mahner 2007).

Let us focus here on the question of how much metaphysics is hidden in this simple experiment, addressing possible objections mostly in footnotes so as not to interrupt the exposition.

First, we assume that this experiment involves real entities in a real world, not just objects existing in our mind. That is, we work on the basis of ontological realism, which helps to explain not only the success but in particular the failure of scientific theories.[21]

[21] A very general ontological realism is probably the least controversial metaphysical presupposition of science (Bunge 1983, 2006; Alters 1997; Gauch 2009; Ladyman 2012), although there is an ongoing realism/antirealism debate in philosophy. However, this debate concerns mostly epistemological

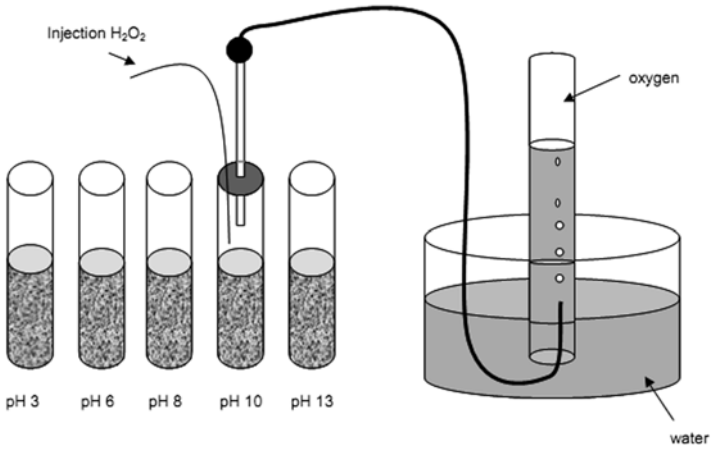

Fig. 56.1 By determining the pH optimum of the enzyme catalase, this experiment is used to demonstrate that the functioning of enzymes is pH dependent. The experimental setup is as follows. Five test tubes are halfway filled with water. We add a piece of yeast to each of them. By adding different amounts of hydrochloric acid (HCl) or caustic soda (NaOH), we arrange for a different acidity or alkalinity, respectively, in each tube, say, pH 3, pH 6, pH 8, pH 10, and pH 13. The yeast cells contain the enzyme catalase, which enables them to break down hydrogen peroxide into water and oxygen (i.e., $2\ H_2O_2 \rightarrow 2\ H_2O + O_2$). We inject a certain amount of hydrogen peroxide solution into the test tubes (e.g., by means of a syringe). Each time, we close the tube and measure the amount of gas produced after 2 min by collecting it in a measuring tube, which is connected to the given test tube by a thin rubber hose. We do not need to specify the precise amounts and conditions here, because the basic setup of this experiment will be clear anyway (from Mahner 2007; redrawn and modified from Knodel 1985, p. 39). The result of this experiment: the oxygen production is highest at pH 8 (in fact, at pH 8.5, which can only be discerned by refining the experiment)

Now that we are talking real test tubes with real yeast and real chemicals, we may ask why an experiment like this is found in a textbook. Obviously, we assume that we can repeat this experiment as many times as we see fit, and that we will obtain (roughly) the same results, provided we do not make any mistakes. The gas produced is always oxygen, neither nitrogen nor carbon dioxide. The test tubes remain test tubes, and do not spontaneously transform into chewing gum or thin air. It appears then that things and their properties remain the same under the same conditions. Certain properties of things seem to be constantly connected, so that they change together: they are covariant. In other words, certain properties of things are lawfully related.

Of course, ordinary experience already indicates that the world is lawful, but the thesis of a lawful world is not a piece of empirical knowledge: it is a necessary condition of cognition. Without things behaving regularly due to their lawful properties, no organism would be able to learn much about the world. Note that

problems regarding the justification of more detailed realistic claims such as the status of unobservable entities and the truth of scientific theories. Thus, someone who rejects more specific forms of realism, such as scientific realism, usually is still an ontological realist. I shall not defend ontological realism in more detail here (for such a defense, see, e.g., Vollmer 1990), because both ontological naturalists and supernaturalists share a basic realist outlook anyway.

what I am referring to here are laws in an ontological sense of lawfully related properties, not general law statements as conceptual representations of such ontic laws (Bunge 1983, 2006; Ellis 2002). This must be emphasized because the view that laws of nature are nothing but universal statements is still popular.[22]

Imagine next that we fail to obtain oxygen in our measuring tube. In this case we would look for mistakes in the setup, like a leakage in the rubber tube. We would check whether the yeast is still alive, whether we have correctly set the pH value of the water, or whether the substance we add is really a hydrogen peroxide solution. No scientist would seriously entertain the idea that somewhere in the experimental setup the gas has literally dissolved into nothing. Conversely, no scientist would assume that we can produce gas out of nothing. There is simply no point in doing experiments and "wiggling parameters" if things simply could pop out of or into nothing. Let's call this the ex-nihilo-nihil-fit principle.[23]

What initiates the production of oxygen? Oxygen does not originate spontaneously: it starts to emerge only after we add some hydrogen peroxide solution. Thus, by meddling with certain parts of the setup, we can produce a certain effect: we can

[22] I submit that the mainstream view of laws in the philosophy of science is inadequate. Science calls for a (neo-)essentialist view of laws, according to which "the laws of nature are immanent in the things that exist in nature, rather than imposed on them from without. Thus, […] things behave as they do, not because they are forced or constrained by God, or even by the laws of nature, but, rather, because of the intrinsic causal powers, capacities and propensities of their basic constituents and how they are arranged" (Ellis 2002, p. 1). Thus

> not even an omnipotent God could change the laws of nature without changing the things on which they are supposed to act. Therefore, the idea that the laws of physics are contingent, and superimposed on intrinsically passive things that have identities that are independent of the laws of their behavior, is one that lies very uneasily with modern science. (Ellis 2002, p. 5)

The lawful behavior of things neither entails that we can always represent them as law statements nor that every scientific explanation is a subsumption under some law. For example, due to the enormous variation of organisms, many biologists believe that there are no laws (= law statements) in biology. But this does not entail that organisms do not behave lawfully: it is just that it often makes not much sense to try to find general, let alone universal, law statements because their reference class is rather small, holding only for some subspecies, variety, or even smaller units, for example, that is, only for those organisms sharing the same lawful properties (more on laws in biology in Mahner & Bunge 1997, Ellis 2002). Finally, even some cases of randomness are lawful because they are based on stochastic propensities such as in quantum physics. That is, there are probabilistic laws. For the neo-essentialist approach to laws adopted here, see Bunge (1977), Mahner and Bunge (1997), Bunge and Mahner (2004), and Ellis (2002).

[23] Note that "nothing" really means "nothing," not some form of radiation or some other massless form of matter. For example, what is called particle annihilation is just a transformation of a particle with mass into one or more massless particles, that is, into some form of radiation. However, it seems that the ex-nihilo-nihil-fit principle is being challenged by cosmologists, who keep entertaining the idea that the universe originated from nothing (see, e.g., Stenger 2011). In particular, according to multiverse cosmology, some primordial "nothing" keeps randomly popping out universes. But since this "nothing" has at least one property, namely, the propensity to pop out universes, it doesn't seem to be a genuine nothing which should have no properties at all and hence be unable to change.

(causally) interact with the setup. Moreover, the steps in this chain of events are ordered: their sequence is not arbitrary. That is, we must assume that causation is for real and hence an ontological category, as well as that there is a principle of antecedence: causes precede their effects in time, so that the present is determined causally or stochastically by the past, but not conversely. In other words, we need to assume not only that the experimental setup (or the world in general) is real but also that we can interact with it and that our actions can trigger orderly chains of events. Otherwise, no deliberate effect could be produced, variables could not be controlled for, etc.

If the results of our empirical methods are expected to be the results of real processes in a real world, we must rule out the possibility that the experimental setup can be causally influenced in a *direct* way solely by our thoughts or wishes (or more precisely our thinking and wishing), that is, without the interposition of motoric actions by our bodies (Broad 1949). Indeed, if the world were permeated by causally efficacious mental forces, we would have no reason to trust the reading of any measuring instrument or the results of any experiment. In other words, the data obtained through observation, measurement, or experiment could not function as evidence if they were literally the telepathic or psychokinetic product of wishful thinking. Worse, we could not even trust our own perceptions and conceptions, as they could be the result of telepathic manipulation. We may call the assumption that no such mental forces exist the "no-psi principle" (Bunge 1983, p. 106).[24] This principle must hold not only for humans but for any organism anywhere that is able to think. Neither humans nor little green aliens from another galaxy must be able to meddle, just by thinking alone, with empirical methods or our perceptional and conceptual processing of their results.

What holds for natural entities applies a fortiori to supernatural entities. We must stipulate, then, that no supernatural entity manipulates either the experimental setup or our mental (neuronal) processes or both.[25] We can even make the case that this holds not only for science but for perception and cognition in general. Indeed, this "no-supernature principle" as we may call it is also needed to avoid Cartesian skepticism. In his *Meditationes*, Descartes (1641) wrote:

> I will suppose, then, not that Deity, who is sovereignly good and the fountain of truth, but that some malignant demon, who is at once exceedingly potent and deceitful, has employed all his artifice to deceive me; I will suppose that the sky, the air, the earth, colors, figures, sounds, and all external things, are nothing better than the illusions of dreams, by means of which this being has laid snares for my credulity…. (*Meditation* 1, §12)

[24] The no-psi principle was one of Broad's (1949) so-called basic limiting principles of science. Being a strong believer in the paranormal, Broad maintained that this basic limiting principle had been refuted by parapsychology. However, Broad was fooled by the sloppy and partly even fraudulent parapsychological research of his time.

[25] This was already acknowledged by J. S. B. Haldane (1934), who stated that his "practice as a scientist is atheistic," that is, when he sets up an experiment, he assumes "that no god, angel, or devil is going to interfere with its course" (p. vi).

Unlike Descartes, we no longer have reason to believe that the supernatural is dominated by an all-good God, who, by his very nature, not only refrains from malicious manipulation but even functions as the guarantor of the truth of our cognition and thus our knowledge.[26] Even in traditional Christianity, there are many other supernatural entities than God, like devils, demons, and angels. Now add the many supernatural entities of other religions and finally everything we can imagine. As the fantasy and horror movie genre shows, the possible inhabitants of supernature are only limited by our imagination. If we admit the supernatural, there is no reason to rule out a priori the existence of a malicious entity that could meddle with the world including our cognitive processes. So we need to start with the postulate that no such entities exist.

Let us summarize then the metaphysical suppositions of the general empirical methods of science:

(a) Ontological realism
(b) The (ontological) lawfulness principle
(c) The ex-nihilo-nihil-fit principle
(d) The antecedence principle and an ontological conception of causation
(e) The no-psi principle
(f) The no-supernature principle

Whoever subscribes to empirical scientific methods and their function to generate evidence must also subscribe to these metaphysical principles: without them, what we are doing would not be scientific measurements or experiments but rather meaningless games. Thus, these principles are part of the ontology behind science's methodology. In a world that has these properties, science is possible.

It may be seen as problematic that the principles (c), (e), and (f) are formulated negatively. It would not be a problem, though, to reformulate the above in positive terms, for example, by offering a full-fledged metaphysical theory, elucidating the notions of property, thing, event, process, lawfulness, etc. (see Bunge 1977; Bunge and Mahner 2004; Mahner 2012). In the sense of an axiomatic definition, we could then claim that everything which works that way is natural, and that the only real existents are such natural things and events. The above negative principles, then, would simply be corollaries of such a metaphysics formulated in positive terms. However, for the sake of simplicity and convenience, I shall stick to the negative formulations.

Now, are these principles also necessary conditions, perhaps even a priori conditions? Or could the scope of at least some of these principles be somewhat restricted while science could still work successfully? In other words, are they just default principles? For example, the traditional metaphysical principle of strict causality (every event has a cause) has been shown by quantum physics to be false, because some events such as radioactive decay are spontaneous (uncaused). This is why a

[26] As Fales (2010) argues, even God may not know whether his thinking is manipulated by some evil demon. Does this require a second-order God of higher power who guarantees the truth of God's knowledge? If so, we would end up with an infinite regress of truth guarantors.

principle of strict causality is not part of the above list. And if the universe had popped out of nothing (however magical this would be), principle (c) would still hold within the universe. This suggests the possibility that some metaphysical principles could be revised. Similarly, it may be argued that even if the universe were initially created by a supernatural being, science would still be possible if there had been no further interventions since or if the number of interventions were very small. As our focus here is on metaphysical naturalism, the principles (a)–(e) will not be further addressed, so that we turn right to this possible objection to the no-supernature principle.

56.4.2 Naturalism or Noninterventionism?

We have just seen that observation, measurement, and experiment must not be subject to supernatural manipulation because they would then lose their status as empirical methods for the generation of evidence. Does this really warrant a no-supernature principle? Prima facie, it does not, at least not without further ado: it seems to warrant at most a principle of nonintervention with respect to scientific research and cognitive processes. How, then, can we justify a no-supernature principle?

To see how, it will be helpful to take a closer look at the definition of noninterventionism. It may be tempting to analyze it as a conditional statement such as "If supernatural entities exist, they do not intervene in the course of the natural world." However, this would turn nonintervention into a necessary condition for the existence of the supernatural. Indeed, by contraposition, we would obtain the absurd statement, "If supernatural entities intervene in the course of the world, they do not exist." Therefore, we better analyze "noninterventionism" as the conjunction of two statements, namely, "Supernatural entities exist really & Supernatural entities do not intervene in the course of the natural world."

This analysis shows that while at first sight noninterventionism appears to be a reasonable minimal supposition, it is in fact not, because it presupposes the existence of supernatural entities. The first statement of the above conjunction, "Supernatural entities exist," cannot be a metaphysical supposition of science because there is no reason why science should postulate the existence of something that, by not intervening in the course of the natural world, plays no part in any scientific explanation of the world.

Indeed, it is common practice in science to adopt the null hypothesis until there is evidence for an alternative substantive hypothesis. The null hypothesis usually negates that something is the case, such as that something exists or that two variables are related. Examples are the following: "Junk food is not the cause of obesity," "Men and women do not perform differently in mathematical tests," or "The Loch Ness monster does not exist." In order to prove some substantive hypothesis, its corresponding null hypothesis must be refuted empirically. The null hypothesis approach is not restricted to science: it is also adopted in modern law where a defendant is presumed innocent until proven guilty. Mutatis mutandis, the null hypothesis

principle may – nay, should – be applied also in metaphysics, in particular when it comes to existential claims. For example, in the philosophy of religion, Antony Flew (1972) was the first to suggest defining "atheism" in this sense, although he did not use the scientific term "null hypothesis." An atheist, then, is not someone who positively and dogmatically denies the existence of gods, but someone who just adopts the "presumption of nonexistence" as a court of law adopts the presumption of innocence. Correspondingly, one way to conceive of metaphysical naturalism is as a metaphysical null hypothesis, stating that a supernature does not exist.[27]

Of course, there is an important difference between scientific and metaphysical null hypotheses; the latter are usually regarded as unfalsifiable by direct empirical evidence. This distinction at least was the upshot of both the neopositivists' and Popper's demarcation efforts. If we disregard the neopositivist view that metaphysics is untestable because it is nonsense, and thus accept Popper's distinction for the time being, we can say that at least some metaphysical hypotheses can be refuted (or, more cautiously, disconfirmed) *indirectly*, for example, by turning out to be incompatible with scientific practice or in being unable to explain it. For example, science could fail as a cognitive enterprise, either in its entirety or in some particular area, so that we would have to reconsider metaphysical naturalism.

In any case, the notion of a metaphysical null hypothesis implies that even metaphysical assumptions remain fallible in principle. At the same time it allows us to consider metaphysical naturalism as a necessary condition of science: if metaphysical naturalism fails, science fails too.

56.4.3 The Metaphysics of Supernaturalism

It appears that the supernatural can be characterized by simply negating most of the metaphysical principles listed in Sect. 56.4.1. Thus, a supernatural entity would be one that:

- May be able to create things out of nothing or annihilate them
- May not be subject to the antecedence principle in that it could make past events undone or change the natural sequence of events
- May not be subject to the lawfulness principle because it may be able to change the lawful properties of (natural) things or the lawful course of (natural) events
- May be able to influence (or to manipulate, if not fully control) natural things, including thinking entities and their perceptions and conceptions

[27] In his debate with Plantinga, Dennett has recently called naturalism a null hypothesis (Dennett and Plantinga 2011, p. 49). Plantinga had argued that science is compatible with theism, because science doesn't explicitly state that there is no God. This shows that Plantinga is not familiar with the concept of a null hypothesis. The same seems to apply to Flanagan (2008, p. 437), who argues against "imperialist naturalism" that we would simply not know everything that there is or is not. Yet this is exactly the reason why we have to start with naturalism as a metaphysical null hypothesis.

This is essentially what is behind the common characterization of a supernatural entity as one that has magical abilities and can thus perform miracles. Whether or not supernatural entities are subject to any supernatural laws (whatever these may be) is irrelevant here. All that matters is that, in principle, they could be able to interfere with the lawful course of natural events, hence also with our brain functions. This is why a supernaturalist ontology invites (and maybe even entails) a nonnaturalist epistemology and methodology in which special forms of cognition, such as revelation, religious experience, a *sensus divinitatis*, or whatever nonnatural ways of communication with the supernatural may obtain, are accepted as legitimate sources of knowledge and means of justification. For example, Ratzsch (1996) and Plantinga (2001) defend the idea of a "uniquely Christian science" or a "theistic science," respectively, so that there is no reason why a Christian should not make use of particular religious "methods" in science. These examples illustrate that methodology is not free of metaphysics. It comes as no surprise therefore that accommodationist scientists and philosophers, who reject metaphysical naturalism to make room for religion yet at the same time want to keep supernaturalism out of science, struggle hard to make a consistent case (see Sect. 56.5.3).

That the supernatural is characterized mostly, if not exclusively, in negative terms has been shown in more detail by Spiegelberg (1951). Even prima facie positive attributes of the supernatural turn out to be negative ones in that they are just denials of known natural characteristics. For example, "transcendence" is the negation of "immanence," that is, *not* being "located" within the confines of our spatiotemporal world. Or being a first cause is nothing but being an *uncaused* cause. And the few positive attributes such as omnipotence or omniscience are actually natural properties raised to an absolute degree. In this regard they are not fully supernatural – a statement that may require some elaboration.

Spiegelberg distinguishes two conceptions of the supernatural, quantitative and qualitative. In the former case supernatural entities are ascribed properties that differ from the natural only in degree, though often to an absolute degree. For example, a supernatural entity is more powerful than a natural entity, perhaps even all-powerful, or more knowledgeable, perhaps even omniscient.[28] The attributes of supernatural entities are then still conceived of on the basis of familiar natural properties. Thus, such conceptions are more or less anthropomorphic, which suggests that the quantitatively supernatural, if any, would still have to be spatiotemporal. By contrast, according to qualitative supernaturalism, supernatural entities are *categorically* different from natural ones, so much so that their properties are essentially mysterious, ineffable, and incomprehensible. God, then, is the *Wholly Other*, not someone or something to be understood even by the faintest analogy with anything known natural. Spiegelberg called these two types of the supernatural *overnatural* and *transnatural,* respectively (1951, p. 343). Whereas the overnatural seems to be somewhat intelligible by analogy with known natural properties, the transnatural is incomprehensible. To obtain or retain a modicum of intelligibility, conceptions of the supernatural usually combine overnatural and transnatural

[28] Despite many theological defenses, the notions of omnipotence and omniscience are incoherent (Martin 1990), so that we have reason to reject characterizations of the supernatural that employ them.

features. This allows the believer to oscillate between these two conceptions, depending on his argumentative needs. Modern theology tends to reject a merely overnatural conception of the supernatural as being too anthropomorphic and seems to prefer a more "sophisticated" conception of the supernatural in terms of the transnatural. Yet the transnatural is defined but negatively.

Spiegelberg's philosophical analysis is backed by cognitive psychology, which has shown that there is a rift between theological conceptions of religious entities and everyday religion. The latter is inevitably anthropomorphic but needs the counterintuitive features of the theological conceptions as an attention-grabbing potential.[29] It has been shown experimentally, for example, that although everyday believers know the theologically correct properties of God, they do conceive him in anthropomorphic terms when it comes to working with the concept of God in an everyday context (Barrett and Keil 1996). Whatever theology does to transnaturalize religious entities, believers will inevitably revert to overnatural concepts that better match their natural intuitive thinking. If religion is anthropomorphism, as Guthrie (1995) argues, this comes as no surprise.

Now, it may be argued that science faces a similar problem. Scientific concepts are often counterintuitive too, so ordinary people tend to stick to their more intuitive common sense understanding of the world. As McCauley (2011) shows, in this sense there is a divide between reflective attempts at cognition (science and theology) and non-reflective, popular – or as he calls them – "maturationally natural" attempts (commonsense cognition and popular religion). At the same time, however, both theology and popular religion are characterized by an unrestricted use of concepts of (intentional) agency or causality, whereas both science and commonsense cognition make a rather restricted explanatory use of intentional agents, that is, restricting it to the behavior of higher animals including humans. McCauley reminds us to not just compare science and religion simpliciter but in the correct respects. What is relevant here, then, is the metaphysical divide between science and commonsense cognition on the one hand and theology and popular religion on the other – which is the divide between naturalism and supernaturalism. Whereas the metaphysical divide, if any, between science and commonsense cognition is small, it is wider between theology and popular religion – which is the divide between the overnatural and the transnatural. In any case, both the overnatural and the transnatural are incompatible with the metaphysical naturalism of science.

56.5 Metaphysics and Methodology

56.5.1 Evidence Is No Metaphysics-Free Lunch

If metaphysical naturalism is a metaphysical presupposition of science, science should be unable to deal with anything supernatural. By contrast, if one believes that science is free of metaphysical presuppositions, the answer to the question of

[29] See Boyer and Walker (2000), Boyer (2001), and McCauley (2011).

whether the supernatural is testable is quite simply affirmative. For example, if angels descended from the sky and raised the dead or if studies on the effects of intercessory prayer yielded significant positive results, we would have empirical evidence for the supernatural and hence a valid test. (In the first case, we would have *direct* evidence, in the second case *indirect* evidence.) While many authors agree with this view,[30] others maintain that the supernatural is untestable as a matter of principle.[31] This disagreement can be explained by the distinction between the overnatural and the transnatural.

Those who maintain that the supernatural is testable seem to conceive of the supernatural as merely overnatural. That is, the supernatural is intelligible to a certain degree because its properties are not actually categorically different from natural properties: overnatural entities are more or less superpowered entities with quasi-natural properties. By contrast, those who believe that the supernatural is untestable seem to regard the supernatural as transnatural and hence as categorically different from anything known natural – which makes it both inaccessible and unintelligible and thus untestable.

But let us first take a look at the two central concepts of this debate, testability and evidence. In the broad sense, a statement, a hypothesis, a model, or a theory is empirically testable if there is empirical evidence for or against it (Bunge 1983), whereby the evidence *e* is another statement – a datum – that is relevant to the hypothesis *h* (or model or theory) in that *e* either confirms or disconfirms *h.* Now both *e* and *h* must be semantically meaningful (nonsense is untestable), and they must not be logical truths or falsities. For some evidential statement *e* to be relevant to some hypothesis *h*, *e* and *h* must share at least one referent or, if preferred, one predicate. For example, data about the crime rate in Australia in 2011 are irrelevant to quantum theory, because the data and the theory are not (partially) co-referential. Last but not least, we must demand that *e* has been acquired with the help of empirical operations that are accessible to public scrutiny, and – here enters metaphysics – both the empirical operations and our cognitive processes involved in the perception and processing (interpretation and evaluation) of the data gained by these operations must involve only lawful natural processes – that is, they must not be the result of supernatural manipulation.

So for there to be some evidence *e* about the supernatural, *e* would have to share at least one predicate with the respective hypothesis *h* referring to some supernatural entity. This, in turn, would require that the supernatural referred to in *h* possesses at least one property that can be represented by a meaningful (positive) predicate – which could only be a natural or quasi-natural property. But this is possible only if the supernatural is conceived of as *not* qualitatively or categorically different from the natural. For example, if we found reproducible significant positive effects of intercessory prayer and if these empirical data were supposed to function as evidence for a hypothesis involving a supernatural being as the cause of this effect, the

[30] See, e.g., Augustine (2001), Boudry et al. (2010, 2012), Fales (2010), Fishman (2009), Monton (2009), Stenger (2007), and Tooley (2011).

[31] See, e.g., Forrest (2000), Pennock (2000, 2001), and Spiegelberg (1951).

supernatural entity referred to would have to be able to "listen" to prayers, if only telepathically (however this would work), and understand and consider them in a way that is analogous to a human person listening to the requests of others and considering them on the basis of his or her background knowledge including a code of ethics. It is not intelligible how some solely negatively characterized transnatural entity should be able to do any of that; worse, we would not even know or understand what it means that any such entity *does* anything. For this reason, there could be evidence at most for the more or less anthropomorphically defined overnatural, so that only the overnatural may be testable in the broad sense.

Therefore, Pennock (2000, 2009) is right when he says that for the supernatural to be testable, it would have to be understood in a naturalized way, and the supernatural would have to be able to partly naturalize itself (or simply be natural to begin with) so as to interact with the natural world. If some process were actually transnatural, we could not observe it, however indirectly. Think of transubstantiation. Or think of the theological concept of continuous creation, according to which everything is constantly recreated ex nihilo by God, from moment to moment, and thus sustained in its existence. Continuity of existence is therefore just an appearance, whereas the reality behind it is a continuous transnatural intervention.

However, we still have to consider the last condition of evidence mentioned above, namely, the one that prohibits supernatural manipulation. Even if some empirical data fulfilled the formal conditions of evidence – provided the supernatural is construed as overnatural – we are still faced with the paradoxical situation that the empirical operations employed to produce such evidence presuppose the nonexistence of the very entities whose existence is supposed to be confirmed by this evidence. It may be tempting then to retreat to a principle of nonintervention with regard to our cognitive processes. But on what grounds could we defend noninterventionism? Of course, we could come up with various ad hoc assumptions. For example, the powers of the supernatural entities involved could somehow be limited, God could guarantee local noninterventionism with regard to our cognition, or God could even be the ultimate cause of our cognition and thus guarantee its correct functioning. But would it be epistemically warranted to accept any of these ad hoc contrivances, unless they are independently testable, that is, unless they are more than just logical possibilities? I don't think so. For this reason, naturalism remains the metaphysical default position of science, so that we have good reason to reject prima facie evidence for the overnatural as long as not all alternative natural explanations are exhausted.

56.5.2 Scientific Explanations Must Be Naturalist Explanations

Scientific theories are assessed (among others) with respect to their explanatory power. A scientific theory is expected to explain a certain fact or domain of facts. That is, it is supposed to tell us how something came about or how something works. In so doing, it employs law statements or reference to mechanisms (Bunge 1983;

Mahner and Bunge 1997). For example, a theory of photosynthesis informs us about the physiological processes (mechanisms) by means of which plants use light to transform carbon dioxide and water into carbohydrates and oxygen. These mechanisms are specific enough to explain what they are supposed to explain. Thus, they cannot be used to explain, for example, how birds fly or how earthquakes occur, because the respective laws and mechanisms are quite different. Do theories referring to supernatural causes or entities comply with this requirement?

They do not – even if we focus on the supernatural in the sense of the overnatural because transnatural entities devoid of positive properties are incomprehensible and hence nonexplanatory anyway. At first sight, invoking an overnatural cause to account for some fact does seem to have explanatory power. For example, intelligent design creationists claim that the theory of evolution cannot explain how certain complex organs have originated. So they invoke a supernatural entity, an intelligent designer (who allegedly need not be but is in fact considered to be God himself) who either created the organ or at least helped to accrue the given complexity. This answer appears to have explanatory power because, by analogy with human handicraft, we all understand what creating or developing artifacts is about. Yet in fact, it explains nothing because it explains too much. The problem is that an answer like "God made it the way it is" can be applied to all facts.[32] Whatever exists and whatever happens can be explained thus by reference to the will and actions of some supernatural entity. But an explanation that explains everything explains nothing.[33] Thus, supernatural explanations explain nothing because they are omni-explanatory.

The all-purpose God-did-it explanation is not something naturalists have come up with to ridicule supernaturalism. As a matter of fact, the philosophical doctrine of *occasionalism* seriously held that God is the cause of each and every event because matter is passive and cannot change or bring about anything on its own. If occasionalism, assuming 100 % supernatural causation, were true, there would be no need for natural explanations at all: a single supernatural cause would explain everything. So why do supernaturalists not adopt occasionalism? Why is science allowed to come up with natural explanations in some cases, but not in others? It seems that since the naturalist approach of science has been so successful, many supernaturalists have conceded its explanatory power and retreated to a god-of-the-gaps approach.[34]

Even some philosophers defend this view (e.g., Monton 2009), claiming that it is legitimate *in some cases* to fill an explanatory gap with a supernatural explainer, and that this would refute the charge that supernaturalist explanations are

[32] More on the problems of supernaturalist explanations in Pennock (2000), who also explores the consequences of supernaturalism for the legal system, which would have to reconsider the-devil-made-me-do-it arguments including historically superseded forms of evidence based on "higher insights" and revelations.

[33] Note that the famous "theory of everything" in theoretical physics is a misnomer, because it would not explain everything. It would just offer a unified theory of the fundamental forces of physics. But this would not even begin to explain all the emergent properties of higher-level systems.

[34] Those supernaturalists who dislike the god-of-the-gaps approach for theological reasons have retreated to a transnatural conception of the supernatural, which is immune to any empirical refutation.

omni- explanatory. However, it is doubtful that this rejoinder works. After all, supernaturalist explanations come with two proliferation problems. First, if we admit one supernatural entity into the explanatory realm of science, we are on a slippery slope to admitting as many as we fancy (Kanitscheider 1996). Christian creationists, for example, will of course tell us that the number of supernatural entities is limited by scripture. But if science admits entities from the biblical cosmos, nothing prevents it from admitting entities from other religions as well. There is no a priori reason why a Christian supernatural entity is a better explainer than a Hindu one, for example. The more supernatural explainers we get, however, the closer we get to omni-explanation again. Second, even if science were able to incorporate the overnatural into its explanations, how do we know that reference to such entities provides ultimate explanations? If science could study the overnatural, what would happen if we encountered explanatory gaps in the overnatural world too? The analogous procedure would be to resort to super-supernatural entities to fill these gaps in the first-order supernatural world, and so on, possibly ad infinitum. Just think of the famous question, "Who created the creator?".

In any case, there is another and perhaps better reason for rejecting supernatural explanantia than their omni-explanatory power. As we know nothing about the laws and mechanisms, if any, of the supernatural, we better argue that supernatural explanations explain nothing, not because they are omni-explanatory but because they are pseudo-explanatory. Indeed, to explain the unknown by means of something even more unknown and, worse, something magic and occult is an argumentative flaw known as *ignotum per ignotius* or *obscurum per obscurius*. Of course, believers in the supernatural may object that they do know something about the supernatural, for example, by reading sacred texts, by revelation, by some special form of experience, or by simply having some special insight or epistemic faculty such as a *sensus divinitatis*, as claimed, for instance, by Plantinga (2011). However, all these "methods" are no longer acceptable because they are arbitrary: just any claim could be justified by them, and they are not intersubjective.[35] For this reason, appealing to the supernatural for explanatory purposes is tantamount to saying that we do not know how a certain fact works or has come about. Supernatural explanations are therefore *argumenta ad ignorantiam*: appeals to ignorance (see also Smith 2001). Thus, they cannot, as Clarke (2009) claims, function as inferences to the best explanation: proposing a pseudo-explanation is an inference to the worst explanation.

For those who believe that filling explanatory gaps with supernatural entities is a legitimate instance of an inference to the best explanation, hypothesizing supernatural entities is analogous to postulating unobservable (or theoretical) entities in science. However, this idea faces several semantic, methodological, and ontological problems.[36]

[35] See, e.g., Mackie (1982), Martin (1990), Forrest (2000), Fales (2010), and Philipse (2012).

[36] Philipse(2012) has recently shown that the inference-to-the-best-explanation approach of natural theology faces insurmountable problems, including the failure of Bayesianism, which is also championed by radical empiricists (e.g., Fishman 2009), who believe that scientific methodology has no metaphysical presuppositions.

In science, we must be willing to endow theoretical entities with a definitive set of properties. We cannot infer a best-explaining entity whose properties may vary arbitrarily (Kanitscheider 1996). Yet this is exactly the case with concepts of supernatural entities, in particular the concept of God, which is of course the most employed concept in supernaturalist explanations. Indeed, the properties of "God" vary from theologian to theologian, from tradition to tradition, even from believer to believer, so much so that "God" in theology *A* may have properties contradictory to the ones of "God" in theology *B*. A historical example is the God of Leibniz and Newton (Kanitscheider l.c.). Whereas Leibniz's God has set up the laws of nature at the beginning so that the world has been functioning without intervention ever since, Newton's God had to intervene more or less often in the natural world in order to adjust some imperfections. Thus, both a perfectly lawful and an imperfectly lawful world can be explained by reference to God. Whatever the factual evidence, then, some concept of God can always be applied.[37]

This is not to say that "God" is meaningless in the ordinary language of a certain group, because everyone has a rough idea of what "God" means in his or her religious tradition, in particular since these traditions employ rather anthropomorphic and thus overnatural conceptions of God. But this meaning is very restricted, as it is well known that religious sects have fought each other to death over the proper meaning of "God." However, being possibly meaningful locally and in ordinary language is not enough to qualify as a legitimate scientific concept and not even as a philosophical one. As Flew (1972) put it,

> Where the question of existence concerns, for instance, a Loch Ness Monster or an Abominable Snowman, [the introduction and defense of the proposed concept] may perhaps reasonably be deemed to be more or less complete before the argument begins. But in the controversy about the existence of God this is certainly not so: not only for the quite familiar reason that the word 'God' is used – or misused – in many different ways, but also […] because it cannot be taken for granted that even the would-be mainstream theist is operating with a legitimate concept which theoretically could have an application to an actual being.

This is important to remember because some scientists and oddly enough even some philosophers (like Monton 2009) seem to be so naive to think that the very use of the word "God" already amounts to postulating a legitimate theoretical entity with explanatory power. But it must first be ascertained that a sentence like "God caused some *x*" is more informative than "Tok caused some *x*" (Nielsen 1985).

[37] It may be argued that the variation in the meaning of "God" is not problematic, because scientific concepts often start out with fuzzy and variable meanings too. Think of terms like "gene" or "atom." However, the variations in the precise meanings of these concepts are adjustments guided by empirical research and theory development. These concepts could be made precise enough to even get hold of their referents: today, genes can be sequenced, and atoms can be photographed. The various concepts of God, by contrast, are not constricted and guided by empirical research, so there is no improvement in the sense of an approximation to reality. The conceptual "development" in theology is purely apologetic in that the traditional overnatural concepts of God have been transformed into transnatural ones, so that they can no longer conflict with science, or anything factual for that matter.

Assuming for the sake of the argument that it is possible to make "God" more informative than "Tok" and thus turn it into a meaningful theoretical concept and also into one whose meaning does not vary arbitrarily, an explanation referring to this God would still be arbitrary. For example, the origin of a complex organ such as the vertebrate eye may be explained by reference to some creative intervention by God. But in fact reference to any other supernatural entity would do the same explanatory work, be it a devil, an angel, a demon, or whatever. After all, we know nothing about the possible powers and intentions of such entities. So we have no empirical means for deciding among competing supernaturalist explanations (Augustine 2001). The only commonality supernatural explanantia for some fact x seem to share is this: some supernatural entity chose to do x for unknown reasons. This is hardly superior to "we do not know what caused x."

For all these reasons, postulating supernatural entities is *not* analogous to postulating theoretical entities in science. The semantic fuzziness, if not arbitrariness, of supernaturalist terms makes them useless as scientific concepts.

In sum, the semantic and ontological problems of supernatural concepts and statements affect both the concepts of evidence and explanation. Even if there were highly anomalous data, they would not constitute evidence for the supernatural unless there were scientifically meaningful statements about the supernatural in the first place. Until then, all we could state perhaps is that something spooky is going on, but such anomalous data could not be explained as the results of some supernatural intervention. This holds a fortiori when we are not even faced with anomalies. For example, a sentence such as "Due to its complexity, the human eye was intelligently designed by a supernatural creator" is at first sight meaningful by analogy to human design and creation. But even when applied to the merely overnatural, it is no longer clear what "intelligence," "design," and "creation" actually mean. Indeed, as Sarkar (2011) has shown, intelligent design "theorists" are unable to offer coherent and positive specifications of these concepts. This does not preclude that some overnatural concepts could be made more precise, but it shows that the road to evidence for the supernatural and the supposed benefits of its explanatory power are much rockier than the accommodationists believe.

56.5.3 Metaphysical Versus Methodological Naturalism

While it has become common knowledge that science goes together with naturalism, it is by no means commonly agreed upon what the exact nature of this relationship is. Compatibilist authors, for example, claim that science's naturalism is only a methodological naturalism, not a metaphysical one. Particularly in the philosophical context of the evolutionism/creationism controversy as well as in science education, which is concerned with *nature of science* issues, it has become common practice to distinguish methodological naturalism from metaphysical (or ontological or philosophical) naturalism and to claim that the former, not the latter, is the correct philosophical assumption of science. For the sake of convenience, let's abbreviate methodological naturalism by MN and metaphysical or ontological naturalism by ON.

Despite the popularity of MN, the characterizations of MN that we encounter in this debate are less than clear, so much so that we must guess what exactly MN is and how it differs from ON. Before substantiating this charge by taking a look at some of the most common definitions, it is important to point out first that, in this context, "MN" is used in a nonstandard way.

In philosophy, the standard meaning of "MN" is that philosophy ought to embrace the results of science and use some of its methods (weak MN) or that there is no unique philosophical method at all because only the methods of the natural sciences produce genuine knowledge (strong MN or strong scientism). In other words, weak MN states that science and philosophy are essentially continuous in that they pursue similar tasks with similar means, whereas strong MN leaves not much to do for philosophy.[38] By contrast,

> [i]n some philosophy of religion circles, 'methodological naturalism' is understood differently, as a thesis about natural scientific method itself, not about philosophical method. In this sense, 'methodological naturalism' asserts that religious commitments have no relevance within science: natural science itself requires no specific attitude to religion, and can be practised just as well by adherents of religious faiths as by atheists or agnostics. (Papineau 2007)

It is only this second meaning of "MN" that is relevant here, and it is this conception that in my view is ill-understood. The main problem is that it is unclear whether this MN actually is about scientific method rather than the metaphysics of science, in other words, whether it is a methodological (and hence an epistemological) view proper or whether it is just a covert metaphysical position, that is, a disguised form of ON. To illustrate this problem, let us take a look at some common definitions.

Pennock (2001) characterizes ON thus: "The Ontological Naturalist makes a commitment to substantive claims about what exists in nature, and then adds a closure clause stating 'and that is all there is'" (p. 84). By contrast

> [t]he Methodological Naturalist does not make a commitment directly to a picture of what exists in the world, but rather to a set of methods as a reliable way to find out about the world – typically the methods of the natural sciences, and perhaps extensions that are continuous with them – and indirectly to what these methods discover. (Pennock 2001, p. 84)

A commitment to method indicates that MN is epistemological. This is seconded by Forrest (2000), who tells us that MN is "an epistemology as well as a procedural protocol." Michael Ruse, by contrast, includes also ontological assumptions (lawfulness):

> On the one hand, one has what one might call 'metaphysical naturalism': this indeed is a materialistic, atheistic view, for it argues that the world is as we see it and that there is nothing more. On the other hand, one has a notion or a practice that can properly be called 'methodological naturalism': although this is the working philosophy of the scientist, it is in no way atheistic as such. The methodological naturalist is the person who assumes that the world runs according to unbroken law; that humans can understand the world in terms of this law; and that science involves just such understanding without any reference to extra or supernatural forces like God. Whether there are such forces or beings is another matter entirely and simply not addressed by methodological naturalism. Hence … in no sense is

[38] For further varieties of naturalism, see, e.g., De Caro and Macarthur (2008) and McMullin (2011).

> the methodological naturalist … committed to the denial of God's existence. It is simply that the methodological naturalist insists that, inasmuch as one is doing science, one avoid all theological or other religious references. (Ruse 2001b, p. 365)

Ruse's characterization reveals the main motivation behind MN: to assure the religious believer that science and religion are compatible.[39] Thus, the nonexistence of the supernatural (or rather its positive complement, ON) is not among the metaphysical presuppositions of science; it is just prohibited to refer to it. MN, then, boils down to the methodological rule, "Do not refer to anything supernatural!". The assumption of lawfulness, by contrast, is an ontological postulate. So Ruse's MN combines ontological and methodological aspects.

Even more ontological is another characterization of MN by Pennock:

> MN holds that as a principle of research we should regard the universe as a structured place that is ordered by uniform natural processes, and that scientists may not appeal to miracles or other supernatural interventions that break this presumed order. Science does not hold to MN dogmatically, but because of reasons having to do with the nature of empirical evidence. (Pennock 2009, p. 8)

Now, assumptions about the nature, structure, and workings of the world are metaphysical, not epistemological, even if most of the reasons for them are based on methodology. Moreover, Pennock's emphasis on MN as being nondogmatic indicates that in "MN" the adjective "methodological" could have a different meaning than the standard one, which is in the sense of methodology as normative epistemology, that is, the branch of epistemology concerned with the justification of beliefs and knowledge and the evaluation of methods. The standard adjective "methodological," then, classifies a position as epistemological – in contradistinction to adjectives describing some other philosophical category, such as a logical, semantical, ontological, or ethical. Another usage of "methodological," however, is in the sense of "provisional," "tentative," or "hypothetical." In this sense, "methodological" (sometimes also just "methodical") indicates either that the position in question is not regarded as an a priori truth or that it is not held dogmatically.

Consequently, there are at least two interpretations of MN:

1. MN is a genuine methodological/epistemological view, not an ontological one.
2. MN is an ontological position, namely, ON, but it is held provisionally rather than dogmatically.[40]

In the light of what was said about ON in this paper, only the second interpretation of MN is acceptable, although it would turn the name "MN" into a misnomer. The preference of "MN" over "provisional ON" could be due to the prejudice that

[39] That this is one of the main reasons behind MN has also been shown by Boudry et al. (2012).

[40] MN in the first sense can be held either dogmatically or provisionally. In the latter case, we may provocatively propose the name "methodological methodological naturalism," so as to point out the double meaning of "methodological." Note also that Boudry et al. (2010, 2012) distinguish intrinsic MN (in the sense of a defining feature of science) from provisional MN. The latter would be what I have just called methodological MN. Here I defend provisional ON as an intrinsic feature of science.

everything metaphysical is dogmatic. While traditional, and in particular religious, metaphysics often was dogmatic indeed, this is no longer true of a modern science-oriented metaphysics, which is fallible (Bunge 1977; Ladyman 2012). And even if modern metaphysics still were an a priori discipline, as some authors maintain (e.g., Lowe 2011), its rationalist claims would not be dogmas. For example, nobody would consider the modus ponens or the tertium quid as dogmas. This needs to be emphasized because some authors seem to confuse "a priori" with "dogmatic" (e.g., Fishman 2009, p. 814). The same would of course be true if only *some* claims of metaphysics were fallible, whereas *others* would be a priori.

If MN were indeed an epistemology, a procedural protocol, or a set of purely methodological rules, it would be a rather arbitrary choice of a protocol or of a set of rules, because it would not be backed up by a metaphysics. In a realist philosophy, being is prior to knowing. That is, the furniture and structure of the world must make cognition possible in the first place, and they must allow for the successful application of scientific methods. Hence, for a methodology to make any sense and to work successfully, there must be a metaphysics that helps to explain the functioning of this methodology. The methodology of science is therefore based on ON, just as the methodology of Plantinga's "theistic science" is based on supernaturalism.

However, if methodology cannot be separated from metaphysics, science is not religiously neutral. If science adopts ON in the sense of a metaphysical null hypothesis, it is not true that science is neutral on the existence of God, as most defenders of MN maintain (e.g., Scott 1998; Ruse 2001b; Pennock 2009). After all, the null hypothesis about some entity x states that x does not exist. Thus, science is committed to the "presumption of nonexistence" also with regard to God's existence.

56.6 Methodological and Other Conflicts

The preceding was one long argument to the metaphysical incompatibility of science and religion. It also mentioned several methodological conflicts arising from their disparate metaphysics. It may be helpful to recall them here and add a few further sources of conflict.

We have seen that the successful application of empirical scientific methods and thus the very concept of empirical evidence presuppose ON as a metaphysical null hypothesis. Whoever maintains that science can test supernatural hypotheses must find a way to resolve the paradox that any empirical test of any factual hypothesis presupposes the null assumption that supernatural entities do not exist. Most likely, an attempt at resolving this paradox will consist in some form of noninterventionism, but such an answer should not just consist in coming up with (untestable) ad hoc explanations as to why supernatural entities might refrain from such interventions: it should be a more principled approach, that is, a full theory. And, if scientific rather than philosophical, such a theory about noninterventionism should be independently testable. Yet any such test would in turn presuppose the very non-interventionist assumption….

Assuming for the sake of the argument that this paradox may be resolved, hypotheses involving supernatural entities would be empirically testable only in a limited way, namely, inasmuch as the supernatural is merely overnatural, that is, inasmuch as it has at least some natural properties. Insofar as religious convictions involve transnatural entities, they are untestable. Nonetheless, it is often claimed that even such convictions are testable. However, this often turns out to be terminological trickery, because in the context of religion, "testability" has nothing to do with empirical testability but with some alleged "experiential" or "existential" testability (Rolston 1987). Such "existential testability" is a wholly subjective notion, which is incompatible with the objective testability of science. Indeed, empirical testability undermines religion: "Because religion is an ostensible social relationship, it tends to be nonempirical, since openly testing a social relationship (…) undermines it. Testing therefore may be explicitly prohibited" (Guthrie 1995, p. 202f).

We have also seen that explanations referring to supernatural entities are either omni-explanatory or pseudo-explanatory. They are appeals to ignorance, and they may fill any explanatory gap by positing some supernatural intervention. Such "explanations," however, are arbitrary because any supernatural entity could do the same explanatory work as any other, and we may have no way to distinguish between competing supernaturalist explanations.

An important methodological incompatibility between science and religion is the latter's reliance on particular "methods" of cognition such as intuition, revelation, or religious experience.[41] Their characteristic is that they are inscrutable procedures, hence purely subjective ones. Thus, if such revelations or experiences are contradictory, there is no possibility to decide which of the alternatives is true – unless they yielded some specific factual statements that would be testable independently of the revelation or experience itself. From a methodological point of view then, they are not methods at all. However, whether such procedures are endorsed or not, religionists can always retreat to their faith when they wish to circumvent further rational and critical analysis. The difference between fundamentalist and more liberal religious views only lies at the point when such a retreat to fideism occurs (Bartley 1984; Kitcher 2004; Martin 1990).

Whereas the religionists' faith, i.e., the disregard and disrespect for evidence, is hailed as a virtue in their belief community, scientists are supposed to recognize that personal conviction or psychological certitude is no substitute for cognitive justification. The latter can only be achieved by objective evidence. Now, it may be objected that the history of science indicates that many scientists also stick to their hypotheses in an irrational manner, that they believe in them, and that they try to protect them against negative evidence. Granted. The difference, however, is that critical thinking and cognitive justification by empirical evidence belong to the ideals of the scientific community. If a particular scientist fails to comply with these ideals, he will be blamed by his peers, not praised. And if a hypothesis is not

[41] For a defense of religious experience as a valid method, see, e.g., Alston (2004). For critical analyses of the concept of religious experience, see Fales (2004, 2010), Kitcher (2004), Martin (1990), and Proudfoot (1985).

accepted by the scientific community, because there is too much negative evidence counting against it and there are perhaps better alternatives available, it will not enter the fund of scientific knowledge. By contrast, retaining one's faith even under the most averse falsifying conditions is a praiseworthy ideal in religion.

Related to faith is the role of authority in religion. While authority in religion is a methodological category, it is not so in science. Smith (2012) has recently examined the role of authority in science and religion from a mostly cognitive science viewpoint, pointing out that there are parallels between science and religion in how information is passed down from the original authority to colleagues, thence to science or religious teachers, respectively, and finally to students. Even though in science we do learn from authorities, such as colleagues, teachers, textbooks, and papers, because we cannot check every fact ourselves, and even though as individuals we do accept scientific knowledge on the basis of such authority, this is merely a matter of psychology and sociology. The real arbiter in science is evidence cum the current theoretical state of the art. This constitutes the ultimate justification. In religion, by contrast, religious doctrines are justified not by evidence, but because some authority, such as God himself or some spiritual guru, *pronounces* them as true. Justification by fiat and justification by evidence are incompatible methodologies.[42]

It may be objected that in religion "faith" does not mean "acceptance of doctrines on the basis of authority instead of evidence," but rather "trust" or "commitment." In this sense, faith is an aspect of a social relation such as trust in some other person around us. Yet such faith in persons is based on evidence: we trust our family and friends because we have some prior experience that they are trustworthy or worthy of commitment. By contrast, we have no such evidence in regard to supernatural persons, as we do not even have evidence of their very existence. So trust ($faith_2$) in such entities presupposes that we have already accepted the claim of their existence on ($faith_1$) (belief without evidence). So even if there are two different concepts of faith, $faith_2$ is based on $faith_1$, so that the notion of $faith_1$ cannot be escaped. And $faith_1$ remains incompatible with science.

A different area of conflict concerns incompatible views about matters of fact. The most well-known case is the evolution/creation controversy. Liberal religionists tend to downplay such conspicuous conflicts because they are restricted to fundamentalist religions or denominations, respectively. However, fundamentalism is widespread in the USA, as well as in the Islamic world. While fundamentalism may have not much intellectual merit, it certainly is a powerful and dangerous social force. The doctrinal incompatibilities between fundamentalist religion and science are well known, so we may focus on the question of whether or not there are remaining conflicts even with respect to more liberal religion.

Apparently, there are no doctrinal conflicts left between science and liberal religion. Many scientific theories such as those in quantum physics, electromagnetism, plate tectonics, or immunology do not pose any problems for liberal religionists.

[42] Curiously, Smith (2012, p. 13) appears to realize this difference but he downplays it by saying that "in practice, however, the distinction is less stark." Yet practice is irrelevant: demarcation is first of all a matter of methodology. The cognitive and sociological similarities of learning on the basis of authority in both science and religion cannot attenuate the methodological conflict.

However, a clash between scientific theories and religious beliefs is bound to occur concerning the general cosmological views about man's (and woman's) place and status in the world, such as the evolution of *Homo sapiens*, the nature of mind, the existence of an afterlife, and the origins and social functions of religion. However liberal, religionists cannot admit that evolution has been a purely natural process (Rachels 1991; Plantinga 2011). If consistent, they must adopt at least a minimal teleological viewpoint, that is, they must posit that the evolutionary process has been guided from above and that it has a definite purpose, particularly, to establish a relationship between humans and some supernatural entity, e.g., a deity. Even if this view reduces to the claim that evolution is God's way of creation, it is at odds with evolutionary theory, because the latter makes no reference to supernatural entities and neither does any other scientific theory.

Curiously, Plantinga (2011) claims that evolutionary theory is compatible with theism, because God could have guided the process of evolution and even have caused particular mutations (see also Dennett and Plantinga 2011). Nothing in evolutionary theory would prohibit that. The supernatural is excluded only if evolutionary theory is paired off to naturalism – a union that Plantinga believes to be gratuitous. But this connection is not at all gratuitous because science is not free of metaphysics.[43]

The preceding considerations indicate that, if a religious methodology were applied in science and the scientific methodology in religion, the result would be mutual destruction. Science and religion are not only methodologically different but incompatible. The same holds for the metaphysics and the ethos of science and religion. Finally, insofar as religion makes factual statements about the world, there will also remain some doctrinal incompatibilities between religion and science. Thus, it is plainly false that, at least at a deep level, science and religion are not in conflict (O'Hear 1993). Actually, it is just at the deeper levels where the most conspicuous conflicts arise.

[43] Even more curiously, Plantinga (2011) argues that evolutionary theory is incompatible with metaphysical naturalism (see also Dennett and Plantinga 2011). A premise of this counterintuitive claim is that naturalists adopt an instrumentalist view of evolution, according to which natural selection favors at most cognitive faculties adequate for survival, not cognitive faculties furnishing truth, whether absolute or approximate. A purely natural evolution, then, entails that our cognitive faculties are not reliable in the sense of truth tracking. Plantinga is aware of the objection that a frog which manages to catch a fly must have correctly represented some property of its environment. But he claims that, even in the case of humans, the naturalist can talk only of appropriate behavior, not of true beliefs. He supports his case by resorting to antimaterialist arguments from the philosophy of mind, maintaining that any materialist conception of the brain and its functions, whether reductive or emergent, allows at best for appropriate behaviors, never beliefs, let alone true beliefs. True beliefs, so Plantinga's presupposition, can be had only in a nonmaterialist conception of the mind and a nonnaturalist conception of evolution. And the naturalist, who believes in the truth of naturalism, is inconsistent because naturalist evolution does not allow for the very existence of true beliefs. The real conflict, then, is between evolution and naturalism, not theism and evolution or science in general. Yet as evolutionary epistemology shows (Vollmer 2005), which is ignored by Plantinga, the evolution of cognition does lead to approximately true representations of the world (see also Dennett's reply in Dennett and Plantinga 2011). Also, naturalism requires a reconceptualization of concepts such as "knowledge" and "belief," which renders the antimaterialist argument moot (Bunge 1983).

56.7 The Conflict Between Science Education and Religious Education

> Even in his ability to be trained, man surpasses all animals. Mohammedans are trained to pray five times a day with their faces turned to Mecca and never fail to do so. Christians are trained to cross themselves, to bow, and to do other things on certain occasions. Indeed, speaking generally, religion is the chef d'œuvre of training, namely the ability to think; and so, as we know, a beginning in it cannot be made too early. There is no absurdity, however palpable, which cannot be firmly implanted in the minds of all, if only one begins to inculcate it before the early age of six by constantly repeating it to them with an air of great solemnity. For the training of man, like that of animals, is completely successful only at an early age. (Schopenhauer 1974, p. 603)

If science education is expected to inform students not only about facts but also about the philosophical background of science, it will have to address the methodological and metaphysical suppositions of science and maybe even all the world view components of science.[44] Inasmuch as religious education is also concerned with world view aspects, and we may claim that conveying a world view is even its major task, there is bound to be a conflict with the naturalist world view of science. After all, a religious education will have to state that the philosophical view of science is narrow or restricted, whereas the metaphysical and methodological outlook of religion offers so "much more" to discover. Indeed, defenders of religion argue that science and religion can be made compatible by choosing a broader metaphysics than naturalism (Barbour 2000), which entails of course that what science education teaches with respect to its philosophical foundations is inadequate.

The same holds for methodology. Religious education is likely to go against science education by allowing for exceptions concerning the acceptance of beliefs: religious beliefs need not be based on evidence, but may or even must be accepted on faith$_1$. Similarly, while it is a goal of science education to teach that it is appropriate to change one's views in the light of new evidence, religious education is prone to bringing forward a dogmatic mind-set because it teaches that unwavering faith is a good thing (Martin 1997).

Many evolutionary and developmental psychologists maintain that magical and religious thinking comes more natural because it is based on intuition rather than reflection, whereas critical or scientific thinking is something that has to be learned by keeping in check and overcoming our natural inclination towards superstitious thinking.[45]

Reinforcing our natural tendency for magical thinking by religious education thus appears to be antagonistic to the goals of science education. For example, while young children learn to master natural causality, they are at the same time exposed to religious concepts such as prayer, which teaches them that sheer wishing could

[44] See Davson-Galle (2004), Irzik and Nola (2009), Matthews (1992, 2009), and Smith and Siegel (2004).

[45] See, e.g., Guthrie (1995), Boyer and Walker (2000), Boyer (2001), Dennett (2007), McCauley (2011), and Shermer (2011). For a different view, see Subbotsky (2000) and Woolley (2000), who consider children's minds as neutral and thus to be filled with either rational or irrational cultural input.

have a physical effect. It seems that children somehow manage to put natural and imaginary causation in different "mental compartments" so as to avoid confusion (Woolley 2000). Even so, we may suspect that this compartmentalization is only partial and thus remains a steady source for ontological confusions, leading to a greater temptation to believe in various supernatural or paranormal claims and theories. Indeed, there is growing evidence that religious believers are more prone to also believing in the paranormal.[46]

If we want to raise responsible citizens who ground both their private and political decisions on scientific rather than illusory information, it is counterproductive to expose them to illusory world views. Worse, they not only learn that it is alright to accept such views as true but also to act according to those illusory beliefs. It comes as no surprise therefore that analytical thinking reduces religious belief (Gervais and Norenzayan 2012), which invites the conclusion that the converse is true too.

It may be objected here that, as the case of religious scientists shows, religion neither impedes scientific understanding nor prevents believers from choosing a career in science (see, e.g., Cobern et al. 2012). However, the empirical situation is not as straightforward.[47] Unsurprisingly, the effects of religious education very much depend on the degree of one's religiosity: the more seriously people take their religion, the worse the effects. For example, Christian fundamentalist students suffer from a lower complexity of thought and thus achieve lower educational attainment (Hunsberger et al. 1996; Sherkat 2007). In general, according to Evans (2011), religious believers take up a scientific career just as often as others. However, both scientific understanding and career choice are reduced when it comes to those scientific fields that interfere with religious belief, such as evolutionary biology and other areas that study human origins. Also, believers tend to deny scientific results if they have the impression that scientists pursue a moral agenda, for example, if scientists make recommendations for political action, as it may occur in the case of climate change. So it appears that orthodox religiosity does not lead to a general hostility towards science, unless the latter competes with central tenets of the given belief system – which shows, however, that there is a conflict with regard to a consistently scientific or else religious world view.

[46] See, e.g., Humphrey (1999), Goode (2000), Orenstein (2002), Hergovich et al. (2005), Lindeman and Aarnio (2007), and Eder et al. (2010). Note that the relation between religious belief and belief in the paranormal is not straightforward but depends on many variables such as level of education, gender, church attendance, and even the nature of the paranormal claims. For example, whereas astrology is mostly ruled out by Christians, creationism is not; and regular church attendance seems to prevent belief in the paranormal, presumably because the more frequent contact with official dogma protects from belief in competing paranormal or supernatural claims, respectively.

[47] For example, if science is strongly associated with technology, as in the questionnaire of Cobern et al. (2012), it may not be surprising that even orthodox believers see not much conflict between science and religion, except for ideologically contentious issues such as creationism or embryonic stem cell research. After all, even fundamentalists are glad to reap the benefits of modern technology. More importantly, personal views about the relation of science and religion, or even career choice, do not answer the de jure conflict problem concerning a consistent world view.

That a high level of religiosity may have negative effects is perhaps better seen at the social level. Comparing societal health data of the strongly religious USA with the more secular democracies of Western Europe and Japan, Paul concludes:

> In general, higher rates of belief in and worship of a creator correlate with higher rates of homicide, juvenile and early adult mortality, STD infection rates, teen pregnancy, and abortion in the prosperous democracies (…). The most theistic prosperous democracy, the U.S., […] is almost always the most dysfunctional of the developed democracies, sometimes spectacularly so, and almost always scores poorly. (Paul 2005, p. 7)

Critics have pointed out that, concerning the USA, these correlations are in most cases better explained by its higher level of social inequality rather than its high rate of religious belief (Delamontagne 2010, 2012). Using the Human Development Index (HDI), Delamontagne confirms the finding that high religiosity is accompanied by higher levels of societal dysfunction. However, he does not find a significant difference in HDI scores between moderately religious believers and nonbelievers, where the "moderately religious" are those for whom religion is "somewhat important" and the Bible is not true word by word, and who attend religious services but occasionally. Overall, higher levels of societal dysfunction in the USA are correlated with lower educational attainment, lower income, and race (Delamontagne 2012). While this may be correct sociologically, it is interesting to note from an ethical point of view that the high level of religiosity in the USA does not seem to contribute to decreasing the high level of social inequality – which casts doubt on the self-image of religion as a moral enterprise benefitting society.

It should not go unmentioned that psychological and sociological studies also report some positive effects associated with religiosity. For example, religious students tend to be more sociable, show less substance abuse problems, and tend to be more disciplined with respect to their coursework (Donahue and Nielsen 2005; Sherkat 2007). As the members of many denominations tend to form closer-knit communities, these examples may be seen as beneficial aspects of social embeddedness rather than direct effects of religious education as such. But should we not expect anyway that religious education contributes to a better morality?

Indeed, probably the major argument for religious education is that it is indispensable for moral education, in particular as science is concerned with matters of fact, not values and ethics. However, the alleged connection between religion and morality does not withstand scrutiny. First, empirical studies have shown that, overall, religious people fail to behave more morally than nonreligious people (Spilka et al. 1985; Tan 2006). For example, they neither cheat less in tests nor are they less selfish. Overall, then, religious education has no distinctly positive effect on moral behavior, which we would have to expect if the main function of religion and religious education were an ethical one.

Second, the goals of a modern moral education include acquiring the attitude and the capability of modifying one's moral principles in the light of new experience, knowledge, and insight (Martin 1991). This aim is certainly antagonistic to the religious attitude towards moral norms. If moral norms are God-given, be it by direct command or by a created natural law, they cannot be questioned or modified: they

can only be obeyed or disobeyed. Finally, philosophy has amply demonstrated from Plato on that religion cannot be the basis of morality anyway.[48]

A final point, just for the fun of it, so to speak: it appears that religiosity is negatively associated to sense of humor; the more so, the more dogmatic or authoritarian believers are (Saroglou 2002). A possible objection, analogous to the argument from religious scientists, is obvious: we all know religious people with a great sense of humor. But "it is possible that religious people have a good sense of humor *despite* their religiosity; and not necessarily *because* of it" (Saroglou 2002, p. 206).

The quick upshot is this: empirical research on religiosity shows that both people and societies are the better off the less seriously they take the contents of their religious belief systems. The more literal and dogmatic the religious beliefs, the worse; the more abstract and liberal – more bluntly: the fuzzier and emptier – the better. The reason for this is, as we have seen again and again, that science and religion or, if preferred, a scientific and a religious world view are metaphysically, methodologically, and attitudinally incompatible.

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[48] See, e.g., Nowell-Smith (1967), Mackie (1982), Martin (1990, 2002), and Rachels (1995).

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