

1 Science, Religion, and Evolution

1.1 An Asymmetric Tension

Religion and science are in a peculiar tension because they have an asymmetric dependence relationship. Some fundamental metaphysical presuppositions of science are religious in origin. At the same time, science questions these religious assumptions. To see this tension at work, consider miracles and their relationship to laws of nature. The Christian doctrine of creation holds that an intelligent creator designed the world according to intelligible and orderly laws. This conception of the world as governed by laws that are discoverable by human minds inspired natural philosophers in the early seventeenth century, such as René Descartes, Robert Boyle, and Isaac Newton, to formulate their mechanistic conceptions of the world. Some natural philosophers, such as Bernard Nieuwentyt and John Ray, believed that experimental science provides clear evidence for divine design: it shows how ingenious and intelligently designed the laws of nature are. An unintended consequence of this line of thinking, however, was that miracles – a central element of Christian doctrine, for instance, in the resurrection of Jesus of Nazareth – had become all but impossible. Miracles constituted, by definition, a violation of the laws of nature, although there were minority views such as Samuel Clarke's that saw miracles as merely surprising or unusual. The laws of nature admitted no exceptions. This gave rise to an unstable conception of miracles as events that violated immutable laws of nature (Harrison, 1995). As a result, miracles became improbable and testimony to such events highly suspect, as exemplified in David Hume's (1748) argument against miracles.

The Fall narrative provides another example of how science undermines the religious foundations it was built on. The Fall is a religious doctrine based on chapter 3 of the biblical book of Genesis, where the first man and woman disobey God by eating the fruit of the Tree of Knowledge. Through this act of rebellion, humans marred the image of God in them, and death entered the world. Early modern natural philosophers believed that our mental faculties and senses – which were allegedly superior before the Fall – degenerated as a result of this original sin. This idea of human depravity contributed to the rise of empirical science in the early modern period: if we cannot trust our reason or senses, we need to do experiments to find out more about the world, supplementing our limited sensory capacities with instruments such as telescopes and microscopes (Harrison, 2007). We need to study nature to find out what it looks like rather than start from a priori assumptions, which are unreliable due to our defective cognition. Empirical research, however, has cast serious doubt on the historicity of the Fall (see Section 3). The discovery of fossils of prehistoric

animals indicated that death existed before humans did. Early geologists such as Nicolas Steno (1638–1686) pointed out that fossils could not be explained away as somehow formed within rocks: they genuinely were the remains of living organisms, many of which are now extinct (Murray, 2008: 79). In the nineteenth century, the evolution of humans from hominin ancestors and their continuity with other great apes challenged the idea of an original state of superior senses and intellect. Therefore, while the idea of the Fall may have encouraged empirical research, that research indicates there never was a historical Fall.

Scientific concepts and attitudes may have religious origins, but religious beliefs do not seem to play a direct, productive role in science today, and this difference in epistemic standing is reflected in the contemporary science and religion literature. A number of contemporary theologians engage earnestly with scientific theories (e.g., van Huyssteen, 2006). Scientists, however, rarely explicitly draw on religious concepts for their ideas. There are some exceptions; for example, the evolutionary biologist Theodosius Dobzhansky (1973: 127) drew on his Eastern Orthodox faith to make evolution intelligible to himself. Evolution through natural selection, he argued, made more sense as a method of creation than creating species through intelligent design only to let the vast majority of them die out: “The organic diversity becomes, however, reasonable and understandable if the Creator has created the living world not by caprice but by evolution propelled by natural selection.”

This limited engagement between science and religion in the form of dialogue¹ and especially integration may in part be a historical accident. Scientists since the nineteenth century have increasingly adhered to methodological naturalism, as exemplified in initiatives such as the X Club. The X Club was founded in 1864 by Thomas Huxley and friends. Its aim was to promote science untrammelled by religious dogmas and also to professionalize science, making it less a hobby project for amateur clergymen and more a profession with full-time salaried scientists (Garwood, 2008). There might be a more fundamental tension at work, however, that is not merely a historical accident. Some authors (e.g., Dawes, 2016) hold that religious dogmatism inevitably conflicts with scientific fallibilism – a conflict that surpasses individual scientists and religious thinkers. As we will see in the following sections, conflict positions such as Dawes’, which stress the epistemic inflexibility of religion, do not take sufficiently into account how far religious positions can shift to accommodate results of the sciences. Sophisticated models of divine action (Section 2) and of human evolution (Section 3) are sensitive to empirical

¹ We here follow Barbour’s (2000) distinction between dialogue, integration, conflict, and independence as potential ways in which science and religion can relate.

evidence. When we consider evolutionary theory, it seems difficult to maintain a position of independence, which tries to restrict science to the domain of facts and religion to the domain of values (*pace* Gould, 2001).

Religion frequently does venture on the domain of facts, as illustrated by high-profile court cases on the teaching of creationism, notably the Scopes “Monkey” trial (1925) and the Kitzmiller versus Dover trial (2005). Creationism in the broad sense is the position that the world’s structure can be adequately explained only by positing at least one creator god (Sedley, 2007). This position is not necessarily in contradiction to evolution, as some authors (e.g., Dobzhansky, 1973; Lamoureux, 2008) have argued that God creates by using the process of evolution. But some forms of “creationism” are in tension with evolution, and the term creationism is often used to denote creationist positions that deny that God uses evolution as a method of creation (Alexander, 2008).² In particular, the term usually refers to Old Earth creationism, which rejects macroevolution but accepts an old Earth (geology, cosmology), and to Young Earth creationism, which in addition to macroevolution also rejects findings of geology and cosmology by positing a literal six-day creation. Intelligent design creationism replaces the term “God” with a nonspecified intelligent designer but does not endorse macroevolution as a mode of creation either. Debates on whether teaching such forms of creationism in US public schools is constitutional will continue for the foreseeable future. Scientists, for their part, explore the domain of values. For example, the biochemist Jacques Monod (1970) argued that coming to terms with evolution meant grappling with a universe that was fundamentally amoral and indifferent to our hopes and fears. This indicates that a neat separation of scientific and religious views into views about facts and values (in the form of nonoverlapping magisteria) cannot be maintained.

1.2 Evolution and Religion: Examples from Judaism and Hinduism

Most of the philosophical and theological literature on evolutionary challenges to religion has focused on Christianity, and for this reason this Element will primarily draw on this tradition. Writers in other religious traditions, however, have also grappled with the challenge of evolution. To give a sense of these discussions, we here briefly look at Judaism and Hinduism.

Judaism has a long tradition of sophisticated engagement between science and religion, which informs debates on evolution to this day. For example, although he wrote centuries before the formulation of evolutionary theory, the

² Unless otherwise specified, the term creationism in this Element refers to the narrower definition of creationist views that exclude evolution as a method of creation.

theologian Maimonides (Rabbi Mōsheh ben-Maymūn, 1138–1204) has had an enduring influence on this topic. He aimed to reconcile Judaism with Aristotelian philosophy. His *Guide of the Perplexed* treats the potential sources of tension between the two and resists a wholesale acceptance of the Sages (religious experts responsible for formulating the Halakhah, or Jewish law) and a literalist interpretation of the Torah. Maimonides maintained that the Sages were experts on religious matters but that this expertise did not automatically extend to other domains. For example, he rejected astrology (which some Sages endorsed), arguing that it was not only scientifically dubious but also difficult to reconcile with human freedom and divine sovereignty. The Sages' acceptance of astrology was a result of their limited knowledge of mathematics: "Do not ask me to show that everything they [the Sages] have said concerning astronomical matters conforms to the way things really are. For at that time mathematics were imperfect" (Maimonides, twelfth century [1963], part III, chapter 15: 459). Maimonides also resisted literalist interpretations of the Torah; for example, he did not see the six days of creation in Genesis, chapter 1, as a chronological sequence of events. Rather than showing how the universe was formed, Genesis provides insights about the structure of the universe (see Slifkin, 2008 for discussion). The mere frequency of Torah passages is no guideline to how they should be interpreted. For example, there are several scriptural references to God's body parts, yet Maimonides, and most other Jewish theologians, insisted that God is disembodied. Rather, interpreting the Torah should be done in line with our total body of knowledge. If science is clear that a literal interpretation will not work, then the literal reading should be rejected and other interpretations must be sought (Maimonides, twelfth century [1963], part II, chapter 25). Likewise, Gersonides (Rabbi Levi ben Gershon, 1288–1344) eschewed a literalist reading of the Torah. He went as far as to reject *creatio ex nihilo*, instead seeing God as co-eternal with matter and constrained by its properties.

As a result of this legacy, Judaism shows a wide range of positions, from rejection of evolutionary theory in favor of creationism to acceptance of evolution. Jewish theologians tend to accept the transmutation of species, that is, that evolution has occurred and has led to the emergence of species, though some reject natural selection as a mechanism because it undermines the idea of divine design and, by extension, divine providence in human history. For example, Abraham Kook (1865–1935) and Mordecai Kaplan (1881–1983) accepted transmutation but combined it with a progressivist, teleological picture of evolution that rejects natural selection (Cherry, 2003). By contrast, Yeshayahu Leibowitz (1903–1994), while being critical of the modern evolutionary synthesis, embraced a dysteleological picture of nature (see Section 2).

The Hindu reception of evolutionary theory was also varied. During British colonial rule Hindus in India came in contact with evolutionary theory and sought to assimilate it with their religious beliefs. Their responses are as wide-ranging as those of Christian and Jewish authors, ranging from creationist challenges to acceptance. Some authors, such as Dayananda Saraswati (1824–1883), rejected evolutionary theory on scriptural grounds. Saraswati argued for a form of Vedic creationism according to which the Vedic scriptures are infallible and prefigure any later scientific and technological innovations. God created humans in their present form – not as a single couple, but a few hundred thousand strong – and they migrated from Tibet to other parts of the world (Brown, 2012, chapter 10).

Other Hindus endorsed evolutionary theory. For example, Mahendralal Sircar (1833–1904) outlined an evolutionary theism. Sircar accepted common descent and organic evolution and proposed that the mind was a result of gradual evolutionary processes. He pitted this idea against what he termed the “crude doctrine of the transmigration of souls” or reincarnation (cited in Brown, 2012: 63). At the same time, Sircar defended a theistic worldview and conceived of evolution in teleological terms: evolution was God’s way to create order out of chaos, with the human mind as its endpoint. Sircar’s efforts to integrate evolutionary theory with more traditional Hindu views were part of a broader nationalistic project: he disagreed with colonialist assumptions that Hindus were incapable of scientific thought and believed a deep and sustained engagement with science was necessary for progress and for a nation-state to fully develop. For this reason, he advocated that Hinduism be integrated with evolutionary theory (Chakraborty, 2001).

Other ambitious attempts to integrate Hinduism and evolutionary theory can be found in avataric evolutionism, which holds that ancient Hindu myths of Viṣṇu’s ten incarnations prefigured evolutionary theory. For example, Sri Aurobindo (1872–1950) held that God incarnates into the world in successive times, reminiscent of organic evolution. Avatars are mostly associated with Viṣṇu, who is the preserver/sustainer in the Hindu Trimūrti. His avatars descend into the world to preserve dharma and to fight evil, especially when the cosmos is in crisis. Although Viṣṇu’s avatars are innumerable, the Garuda Purāṇa lists ten major ones, including a fish, a turtle, a boar, a man (Rama), Kṛṣṇa, and Buddha. Aurobindo proposed a metaphysical picture that saw physical and spiritual evolution as manifestations of God, criticizing Darwinism for focusing too much on self-preservation of organisms at the expense of cooperation: “[B]ecause the struggle for survival, the impulse towards permanence is contradicted by the law of death, the individual life is compelled, and used, to secure permanence rather for its species than for

itself; but this it cannot do without the co-operation of others; and the principle of co-operation and mutual help” (Aurobindo, 1914–1918 [2005]: 212). These examples from Judaism and Hinduism demonstrate that the challenge of evolution to religion is not unique to Christianity. Indeed, as we will show in the following sections, the challenge of evolution to religion can be better construed as a challenge of particular aspects of evolutionary theory to specific religious claims, such as those about teleology in nature, human origins, and the origin of religion.

1.3 Why Does Evolution Challenge Religion?

While evolution is not the only scientific theory against which there is religiously motivated resistance, it is the most prominent one. Before evolution through common descent was widely accepted in biology, cosmology was the main battlefield for science and religion, as medieval geocentrism clashed with heliocentrism and later cosmological models. What makes a scientific explanation susceptible to religiously motivated conflict?

One might be tempted to think that any scientific explanation could clash with any religious claim, but in many domains of everyday life people appeal to both natural and supernatural explanations, often integrating both types of explanation. For example, Banerjee and Bloom (2014) found that both theists and atheists have a tendency to ascribe purpose to significant life events such as meeting one’s partner, job loss, or illness. So, for example, Carla could say that meeting her future partner Sophie (fortuitously seated next to her on a plane) was “meant to be.” At the same time she is aware of the natural causes that put them together: as Carla and Sophie are both religious studies scholars, it is unsurprising they were both flying to the American Academy of Religion’s annual meeting from a major international airport. Carla is aware of these naturalistic causes but might still insist that God, or fate, or the universe brought her and Sophie together. Such combinations of supernatural and naturalistic explanations have already been observed by early anthropologists such as E. E. Evans-Pritchard (1937 [1965]), who famously found that the Azande (a tribe in north central Africa) were well aware that termites can cause buildings to collapse. Yet, at the same time, they invoked supernatural agency (witchcraft) to explain why *this* granary collapsed on *that* person. More recently, Cristine Legare and colleagues (2012) found that South Africans attribute AIDS both to natural biological causes (HIV virus) and to supernatural causes (witches) who put one in the way of the HIV virus. It would seem from everyday explanations that natural and supernatural causes are not inherently in competition.

As Legare et al. (2012) observe, there are three domains that consistently generate both natural and supernatural explanations: illness, death, and (human) origins. These three domains have emotional relevance, speaking to events that affect us personally and that are relevant for beliefs about our destiny, both in personal terms (death) and as a species (evolution). For each of these domains, there are well-developed narratives that appeal to supernatural agents and properties, for example, the existence of a soul that lives beyond the death of a physical body. Such narratives predate evolutionary theory and are usually well embedded within cultural contexts. While evolutionary theory makes a wide range of factual claims that seem, *prima facie*, incompatible with scriptural claims about the age of the Earth, the origin of species, and the position of humanity in the world, a number of authors have argued that religious belief does not require a literalist interpretation of religious origin stories. For example, the theologian Denis Lamoureux (2008) argues that biblical origin stories such as Genesis, chapters 1–3, should not be taken literally. Taken at face value, the Bible has many inaccuracies that even creationists do not accept, such as that there is water in the heavens above the firmament. Instead, the Bible reflects ancient science and accommodates people who read the Bible books at the time of their writing (Lamoureux, 2008: 272). With this approach, it is possible to simultaneously endorse evolutionary theory and be a religious believer. Coming to grips with evolutionary theory, however, might hold some uncomfortable conclusions about our place in the world as just another species (see Section 3). Poling and Evans (2004), for example, show that children and laypeople find it difficult to accept that extinction is inevitable for all species, including humans, while evolutionary biologists endorse the inevitability of extinction of all species, including humans. As evolutionary theory also examines the origins and fate of humanity, it is likely to challenge religious frameworks.

This Element focuses on three challenges of evolution to specific religious claims. The first is metaphysical. Religious worldviews tend to presuppose a teleological understanding of the origins of living things, including human beings, but contemporary evolutionary theory (at least, in a standard sense, as we will qualify later on) understands evolution as nonteleological. The second challenge focuses on human origins: religious and scientific accounts of human origins are not aligned, at least not in a straightforward sense. The third challenge concerns the evolutionary origins of religion itself. Evolutionary explanations of religion, including religious practices and beliefs, may cast doubt on their justification. We demonstrate how these tensions arise and offer potential responses on behalf of some religious traditions. We conclude that it is possible for religions to meet these challenges if some religious metaphysical assumptions are modified.

2 Teleology, Divine Purpose, and Divine Design

2.1 Chance and Evolution

Ancient Greek and Roman philosophers such as Socrates and Cicero often saw the world in creationist, teleological terms (Sedley, 2007). Prior to Charles Darwin, teleological thinking was ubiquitous. For example, the Hindu philosopher Adi Śaṅkara, writing in the first half of the eighth century, thought the world's apparent congeniality to human life provided evidence that it was intelligently designed by a divine creator – the world is suited to human habitation, which is inexplicable through mechanistic processes (Brown, 2008).

This focus on design and determinism in many religious explanations is in tension with stochasticity, a central element of evolutionary theory. A chance or random event seems to occur without any (discernible) cause either because the outcome is genuinely underdetermined or because we lack enough information to make an accurate prediction. Before the rise of probability theory and statistics in the late seventeenth century, stochasticity (chance) was seen as inherently unpredictable. Advances in mathematics and statistics, however, together with collections of data such as census records have made it possible to perceive regularities in phenomena such as games of chance, birth and death statistics, and economic risks. Chance plays a role in evolutionary theory in at least three ways. First, variation, a result of random, unpredictable mutations, provides the raw material with which natural and sexual selection work. Second, genetic drift is the chance disappearance of genes within populations; it can cause major evolutionary changes. Even in the absence of selection, genes can be lost as a result of sampling errors. Third, mass extinctions caused by random events such as asteroids hitting the Earth (which caused the Cretaceous–Paleocene extinction event some 66 million years ago) have played a major role in evolutionary history.

Nevertheless, as we will see in more detail, evolutionary theory did not end progressivist, teleological thinking, as it continues in both scientific and religious writings. For example, the naturalist Ernst Haeckel (1886) saw evolution as progressive and increasing in complexity, with humans at its apex. Jewish authors, such as rabbis Abraham Isaac Kook and Mordecai M. Kaplan, and Christian thinkers, such as botanist Asa Gray (1810–1888) and theologian Frederick Tennant (1866–1957), attempted to integrate evolution within a broader teleological framework (see also Section 3). As we will see, theistic scientists and theologians who seek to incorporate chance and contingency within a broader framework of divine providence are still reasoning teleologically, but their teleology differs from that before the introduction of evolutionary theory.

This section examines whether evolutionary theory challenges teleology, in particular, whether this theory should lead us to think that there is no overall (divine) higher purpose. We first show that teleological thinking is a result of early-developed biases and explore the relationship between this type of thinking and theism. We then review how evolutionary theory challenges teleology, particularly at the macro level. Next, we consider responses from Jewish and Christian authors to this challenge. These responses either reinterpret evolution as teleological or accept stochasticity and argue that it is not incompatible with theism. While the latter type of response is less problematic than the former, it still comes at a cost.

2.2 Intuitive Teleology

A large body of empirical literature suggests that teleological thinking is not merely a product of culture but that it reflects a way human minds make sense of the world. Most of these studies have been conducted with Western children; they show that teleological thinking arises spontaneously. In a typical experiment (e.g., Kelemen, 1999), primary school-aged children are presented with a series of pictures with nonbiological natural kinds such as clouds and rocks, and biological organisms such as tigers. They are asked to choose between explanations for why these things are the way they are, which include teleological explanations, for example, “rocks are pointy so that animals wouldn’t sit on them and smash them,” as well as causal nonteleological explanations, for example, “rocks are pointy because little bits of stuff piled over a long time.” Deborah Kelemen (2004) found that children between about five and ten years of age prefer teleological explanations for all kinds of objects, whereas adults use them only for biological phenomena (e.g., adults endorse that a giraffe has a long neck so that it can reach leaves in high trees).

Subsequent experiments have demonstrated that teleological thinking is a cognitive default to which people resort if they have no alternative explanations. For example, when put under time pressure (commonly referred to as “speeded condition”) adults tend to endorse teleological incorrect explanations, for example, “the sun radiates heat because warmth nurtures life,” but they still reject false mechanistic explanations, for example, “hills form because flood-water freezes” (Kelemen & Rosset, 2009). Education mitigates teleological thinking. Holding a PhD in the sciences or humanities decreases acceptance of false teleological explanations, although acceptance still increases under speeded conditions (Kelemen et al., 2013). Romani people living in Romania value their traditions, which are transmitted informally at home. As a result only one-third of Romani primary school-aged children regularly go to school.

Casler and Kelemen (2008) found that Romani adults with little formal schooling were more likely to endorse teleological explanations for nonbiological natural kinds, for example, sand is grainy “so that it wouldn’t get blown away and scattered by the wind.”

Taken together, this research indicates that teleological thinking is a cognitive default stance that arises early in development and that can be mitigated by mechanistic explanations. While it is uncontroversial that teleological thinking is intuitive and overactive (but see Greif et al., 2006), the psychological link between teleological thinking and theism remains unclear. Kelemen (2004) has argued that children are intuitive theists, as young children not only over-attribute teleology but also hold that God is the designer of living and nonliving natural entities. As we have argued earlier, however (De Cruz & De Smedt, 2015), teleology does not automatically entail divine design. Something can be purposive by accident; for example, a tree stump can be suitable as a chair and used as such without having been designed for that purpose.

Current evidence does not show an automatic link between teleological thinking and theism. Lombrozo et al. (2007), for example, found that although Alzheimer’s patients were more likely than healthy older controls to endorse teleological explanations for features of their environment (e.g., they were more likely to think that rain exists so that plants and animals have water for drinking and growing), they were not more prone to endorse God as the creator of these features. Recent research also shows that people who are not theists but believe that the Earth is alive, has agency, responds to the needs of animals, and helps them survive (which are termed “Gaia beliefs”³) are more likely to endorse teleological explanations. For example, Kelemen et al. (2013) found that although endorsement of teleological explanations among natural scientists was low (e.g., few scientists accept that “germs mutate in order to become drug resistant”), scientists who have stronger Gaia beliefs are more prone to teleology than scientists who hold explicit traditional theistic beliefs or no supernatural beliefs. Cross-cultural research confirms that the link between teleology and theism is tenuous. Järnefelt et al. (2015) showed participants from the United States and Finland images of natural objects such as a giraffe, a maple tree, a mountain, and the paw of a tiger, and then asked them to judge whether this object was purposefully made by any being – the nature of this being was deliberately unspecified. They found that both God-beliefs and Gaia-beliefs were positively correlated with participants’ propensity to judge that natural objects were purposively created. In a study with Chinese participants

³ This does not mean that these people entirely endorse the Gaia hypothesis (e.g., Lovelock & Margulis, 1974), but rather, it measures the extent to which they attribute agency and care to Nature or Earth or see her (Mother Nature) as an agent.