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Myth and Science: Their Varying Relationships

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Abstract

The relationship between myth and science is a subject as old as that of myth and science themselves. The position on the issue taken by modern theories of myth can be divided chronologically by the centuries. In the nineteenth century, myth and science were commonly taken to be incompatible. One could not consistently accept both. Because moderns were assumed to be scientific, the choice had already been made for them: they had to abandon myth. In the twentieth century, by contrast, myth and science were usually taken to be compatible, so that one could consistently accept both. Moderns were still assumed to be scientific, but myth was now re-characterized to accommodate science. Only recently, with the rise of postmodernism, has the deference to science assumed by both nineteenth- and twentieth-century theorists been challenged. This article concentrates on the varying positions on myth and science taken in both centuries by those for whom myth and science intersect rather than diverge. Whether, as the 'mission' of the twenty-first century, myth can be brought back to the world – the world explained by science – is finally considered with the case of Gaia.

The issue of the compatibility of myth with science goes back to ancient Greece. In modern times this issue pitted nineteenth-century theories of myth against twentieth-century ones. In the nineteenth century, if one can generalize, myth and science were taken to be incompatible. Myth and science, it was assumed, originated and functioned identically: to explain the operation or origin of all events in the physical world. Both myth and science were read literally. The subject matter of myth was the physical world. Myth attributed events to either the decision or the condition of a god. Science attributed events to mechanical processes. In myth, rain falls because a god decides to send rain or because a god urinates. In science, rain falls because of meteorological processes.

In the twentieth century, myth and science were taken to be compatible. They were assumed to diverge rather than intersect. Either the origin and function of myth were other than explanatory, or else myth was to be read symbolically, in which case the subject matter of myth was other than gods or the physical world. For example, myth, so it was claimed, arose and served to justify suffering, to express the human condition, to unify

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society, or to reveal the unconscious. The subject matter of myth was society or human beings.

So I have argued more than once.[1] Yet the nineteenth-century view that myth and science intersect has in fact never died out, even if it has never regained its dominance. At the same time this view has taken a twentieth-century form – the aim now being the reconciliation of myth with science even when they intersect. I will consider the array of positions on the intersection of myth with science from the nineteenth century to the present.

Myth as True Science

The most straightforward modern challenge to myth has been to the scientific credibility of myth. For example, the Bible seems to be incompatible with evolution. The Bible has two myths of creation: Genesis 1.1-2.4a and 2.4b-25. According to the first myth, God created all life within 4 days (days three to six of creation). Species did not evolve separately over tens of thousands of years, with some species dying out and others emerging. Rather, all species that will ever exist were created in 4 days, were created separately from one another, and presumably have never died out, thanks initially to the dependable Noah. There was no randomness to creation. The species that exist are the result of a plan, not of natural selection. Human beings were created last and – here in conformity with evolution – are the most advanced of all animals. But in the Bible humans were created independently of all other living things, will never be succeeded by a yet more advanced species, and from the outset were created in their present form. On all these points, the first creation myth in the Bible is incompatible with evolution and therefore with science.

According to the second creation myth, God created humans before he created most other living things. He put the first humans in a single place, Eden, where snakes as well as plants were also to be found. A big change in human beings did occur, but it occurred within Eden, even if the physical consequences – mortality and pain in childbirth – ensued only upon eviction from Eden. Apart from these punishments, severe as they were, humans outside Eden have been no different from the original pair inside Eden. On all these points the second biblical creation myth, like the first one, is incompatible with evolution and therefore with science.

The challenge to myth by science is not limited to evolution. Was there really a worldwide flood? Is the earth truly but 6,000 or 7,000 years old? Could the 10 plagues on the Egyptians actually have happened? The Bible is full of events that scientifically are either improbable or impossible.

The most unrepentant defense against the challenge of science has been to claim that the biblical account is correct, on the grounds that the Hebrew Bible was revealed to Moses by God. This position, known as 'creationism', assumes varying forms, ranging, for example, from taking the days of creation to mean exactly 6 days to taking them to mean 'ages'.

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Creationism arose in reaction to the geological claim of Charles Lyell that the earth is millions rather than thousands of years old and to the biological claim of Charles Darwin that human beings gradually evolved out of other species rather than were created separately. Surprisingly, creationism has become ever more, not ever less, uncompromisingly literalist in its rendition of the biblical account of creation.[2]

Yet creationists of all stripes tout their views as scientific *as well as* religious. 'Creationism' is shorthand for 'creation science', which appropriates scientific evidence of any kind both to bolster its own claims and to refute those of secular rivals like geology and evolution. For 'creation scientists', the choice is not between religion and science but between biblical science and modern science. For creation scientists, it is evolution that is untenable scientifically. In any clash between the Bible and modern science, modern science must give way to biblical science, not vice versa.

Doubtless creation scientists would object to the term 'myth' to characterize their position, but only because the term has come to connote false belief. If the term is used neutrally for a firmly held belief, the first two chapters of Genesis, which creationists consider a single story, would constitute a biblically scientific myth, and a true one.

As a response to the challenge of science, creationism has found scant acceptance among theorists of myth, all of whom take for granted the truth of modern science and then determine whether myth is compatible with it. For all theorists of myth, the challenge is to myth, not to science. For no theorist does myth trump science.

Myth as Modern Science

Against the challenge of science, a much tamer defense than the rejection of science for myth has been the reconciliation of myth with science. Here science means modern science. There is no mythic or religious science. Elements at odds with modern science are either removed or, more cleverly, reinterpreted as in fact scientific. Myth is credible scientifically because it *is* science, of which there is only one kind. Perhaps no Noah singlehandedly gathered up all living species and kept them alive in a wooden boat sturdy enough to withstand the strongest seas that ever arose, but a worldwide flood did occur.[3] What thus remains in myth is true because scientific.

Myths about not only floods but also volcanoes and earthquakes have been interpreted as records of actual events. In *Natural Knowledge in Preclassical Antiquity* (1992) Mott Greene correlates the divine war in Hesiod's Theogony with a volcanic eruption. In *When They Severed Earth from Sky* (2004) Elizabeth Barber and Paul Barber match a Native American myth of a cosmic battle between gods with, again, a volcanic eruption. Myths about stars and planets have been taken as records of astronomical observations. In their classic, *Hamlet's Mill* (1969), Giorgio de Santillana and Hertha von Dechend demonstrate that detailed astronomical calculations underlie various

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myths. In *The Myth of Replacement* (1991) Thomas Worthen attributes many Indo-European myths to reactions to the unsettling observations of the precession of the equinoxes.

These twentieth- and even twentieth-first-century works may seem like an unabashed throwback to a nineteenth-century approach to myth, for the subject of myth is again the physical world, and the function of myth is the relaying of indispensable information about it. But there is a difference between these works and nineteenth-century ones. These works aim to show that the information conveyed by myth is accurate scientifically. Nineteenth-century works aimed to show that myth was unscientific. Still, the 'scientizing' of myth by Greene, the Barbers, de Santillana and von Dechend, and Worthen does constitute the continuation into the present of a nineteenth-century concern.

In their comment on the first plague on the Egyptians, the turning of the waters of the Nile into blood (Exodus 7:14–24), the editors of the *Oxford Annotated Bible* exemplify this rationalizing approach: 'The plague of blood apparently reflects a natural phenomenon of Egypt: namely, the reddish color of the Nile at its height in the summer owing to red particles of earth or perhaps minute organisms' (May and Metzger 1977 [1962], 75). Of the second plague, that of frogs (Exodus 8:1–15), the editors declare similarly: 'The mud of the Nile, after the seasonal overflowing, was a natural place for frogs to generate. Egypt has been spared more frequent occurrence of this pestilence by the frog-eating bird, the ibis' (May and Metzger 1977 [1962], 75). How fortuitous that the ibis must have been away on holiday when Aaron stretched out his hand to produce the plague and must have just returned when Moses wanted the plague to cease! Instead of setting myth *against* science, this tactic turns myth *into* science – and not, as in postmodernism, turns science into myth.

Similarly, Samuel Noah Kramer 'naturalizes' Sumerian mythology. For him, Sumerian creation myths evince both observations about the physical world and scientific-like hypotheses accounting for them:

> It cannot be sufficiently stressed that the Sumerian cosmogonic concepts, early as they are, are by no means *primitive*. They reflect the mature thought and reason of the thinking Sumerian as he contemplated the forces of nature and the character of his own existence. When these concepts are analyzed; when the theological cloak and polytheistic trappings are removed, . . . the Sumerian creation concepts indicate a keenly observing mentality as well as an ability to draw and formulate pertinent conclusions from the data observed. (Kramer 1961, p. 73)

Gods become mere personifications of natural phenomena, and their actions become mere metaphors for natural processes.

Myth as Primitive Science

In the nineteenth century the most common response to the challenge of science was to surrender myth to science. Here myth, while still an

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explanation of the world, was taken as an explanation of its own kind, not a scientific explanation in mythic guise. The issue was therefore not the scientific credibility of myth but the compatibility of myth with science. Myth was considered to be 'primitive' science – or, more precisely, the prescientific counterpart to science, which had ancient roots but which as a widespread explanation of events was assumed to be exclusively modern.

Myth was here part of religion. Where religion apart from myth provided the sheer belief in gods, myth filled in the details of how gods caused events. Because myth was part of religion, the rise of science as the reigning modern explanation of physical events consequently spelled the fall of not only religion but also myth. Because moderns by definition accepted science, they could not also have myth, and the phrase 'modern myth' was self-contradictory. Myth was a victim of the process of secularization that constituted modernity.

The relationship between religion and science has actually been anything but uniform, and works with tendentious titles like *History of the Conflict between Religion and Science* (Draper 1875) and *A History of the Warfare of Science with Theology in Christendom* (White 1896) express a one-sided viewpoint.[4] Still, religion and science, and therefore myth and science, were indisputably more regularly opposed in the nineteenth century than in the twentieth century, where they were more regularly reconciled.

E. B. Tylor

The pioneering English anthropologist E. B. Tylor (1832–1917) remains the classic exponent of the view that myth and science are incompatible. Tylor (1958 [1913]) subsumes myth under religion and in turn subsumes both religion and science under philosophy. He divides philosophy into 'primitive' and 'modern'. Primitive philosophy is identical with primitive religion. There is no primitive science. Modern philosophy, by contrast, has two subdivisions: religion and science. Of the two, science is by far the more important and is the modern counterpart to primitive religion.

Modern religion is composed of two elements – metaphysics and ethics – neither of which is present in primitive religion. Metaphysics deals with nonphysical entities, of which 'primitive peoples' have no conception. Ethics is not absent from primitive culture, but it falls outside primitive religion (see Tylor 1958 [1913], II, p. 11). Tylor uses the term 'animism' for religion per se, modern and primitive alike, because he derives the belief in gods from the belief in souls ('anima' in Latin means soul). In primitive religion souls occupy all physical entities, beginning with the bodies of humans. Gods are the souls in all physical entities *except* humans, who themselves are not gods.

Primitive religion is the primitive counterpart to science because both are explanations of the physical world. Tylor thus characterizes primitive religion as 'savage biology' (Tylor 1958 [1913], II, p. 20) and maintains that

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'mechanical astronomy gradually superseded the animistic astronomy of the lower races' and that today 'biological pathology gradually supersedes animistic pathology' (Tylor 1958 [1913], II, p. 229). The religious explanation is one of agency: the decisions of gods explain events. The scientific explanation is one of natural processes: mechanical laws explain events. The sciences as a whole have replaced religion as the explanation of the physical world, so that 'animistic astronomy' and 'animistic pathology' refer to only primitive, not modern, animism.

Modern religion has surrendered the physical world to science and has retreated to the immaterial world, especially to the realm of life after death – that is, of the life of the soul after the death of the body. Where in primitive religion souls are deemed material, in modern religion they are deemed immaterial and are limited to human beings:

> In our own day and country, the notion of souls of beasts is to be seen dying out. Animism, indeed, seems to be drawing in its outposts, and concentrating itself on its first and main position, the doctrine of the human soul. . . . The soul has given up its ethereal substance, and become an immaterial entity, 'the shadow of a shade'. Its theory is becoming separated from the investigations of biology and mental science, which now discuss the phenomena of life and thought, the senses and the intellect, the emotions and the will, on a groundwork of pure experience. There has arisen an intellectual product whose very existence is of the deepest significance, a 'psychology' which has no longer anything to do with 'soul'. The soul's place in modern thought is in the metaphysics of religion, and its especial office there is that of furnishing an intellectual side to the religious doctrine of the future. (Tylor 1958 [1913], II, p. 85)

Similarly, where in primitive religion gods are deemed material, in modern religion they are deemed immaterial. Gods thereby cease to be agents in the physical world – Tylor assuming that physical effects must have physical causes – and religion ceases to be an explanation of the physical world. Gods are relocated from the physical world to the social world. They become models for humans, just as they should be for Plato. One now reads the Bible not for the story of creation but for the Ten Commandments, which for Plato Homer's gods should practice. Jesus is to be emulated as the ideal human, not as a miracle worker.

This irenic position is also like that of the evolutionary biologist Stephen Jay Gould, for whom science, above all evolution, is compatible with religion because the two never intersect. Science explains the physical world; religion prescribes ethics and gives meaning to life: 'Science tries to document the factual character of the natural world, and to develop theories that coordinate and explain these facts. Religion, on the other hand, operates in the equally important, but utterly different, realm of human purposes, meanings, and values' (Gould 2002 [1999], p. 4). But where for Gould religion has *always* served a function different from that of science, for Tylor religion has been forced to retrain upon having been

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made compulsorily redundant by science. And its present function is a demotion. Tylor is closer to biologist Richard Dawkins (2006), though Dawkins, in contrast to Tylor, is unprepared to grant religion even a lesser function in the wake of science. Both Gould and Dawkins are, of course, twentieth-century scientists, yet Dawkins' view is more typical of the nineteenth century, whereas Gould's is typical of the twentieth.

For Tylor, the demise of religion as an explanation of the physical world has meant the demise of myth altogether, which for Tylor is thus confined to primitive religion. Even though myth is an elaboration on the belief in gods, the belief itself can survive the rise of science where somehow myth cannot. Apparently, myths are too closely tied to gods as agents in the world to permit any comparable transformation from physics to metaphysics. Where, then, there is 'modern religion', albeit religion shorn of its key role as explanation, there are no modern myths.

For Tylor, myth and science are not merely redundant but incompatible. Why? Because the explanations they give are. It is not simply that the mythic explanation is teleological and the scientific one mechanical. It is that both explanations are direct. Gods operate not behind or through natural forces but in place of them. According to myth, the rain god, let us say, collects rain in buckets and then chooses to empty the buckets on some spot below. According to science, meteorological processes cause rain. One cannot stack the mythic account atop the scientific one, for the rain god, rather than utilizing meteorological processes, acts in place of them.

Tylor takes for granted not merely that primitive peoples have only myth but, even more, that moderns have only science. Not coincidentally, he refers to the 'myth-making stage' of culture. Rather than an eternal phenomenon, as the theorists Mircea Eliade, C. G. Jung, and Joseph Campbell grandly proclaim, myth for Tylor is merely a passing, if slowly passing, one. Myth has done its job admirably, but its time is past. Moderns who still cling to myth have simply failed either to recognize or to concede the incompatibility of it with science. While Tylor does not date the beginning of the scientific stage, it is identical with the beginning of modernity and is therefore only a few centuries old. Dying in 1917, Tylor never quite envisioned a stage post the modern one.

One reason Tylor pits myth against science is that he subsumes myth under religion. For him, there is no myth outside religion, even though modern religion is without myth. Because primitive religion is the counterpart to science, myth must be as well.

Another reason Tylor pits myth against science is that he reads myth, as part of primitive religion, literally. He opposes those who read myth symbolically, poetically, or metaphorically – for him interchangeable terms. He opposes the 'moral allegorizers', for whom the myth of Helius's daily driving his chariot across the sky is a mode of self-discipline. Equally, he opposes the 'euhemerists', for whom the myth is simply a

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colorful way of describing the exploits of some local or national hero. For Tylor, the myth is an explanation of why the sun rises and sets, and the explanatory function *requires* a literal reading. For both the allegorizers and the euhemerists, myth is not the primitive counterpart to science because, read symbolically, it is about human beings rather than about gods or the world. For the allegorizers, it is also unscientific-like because, read symbolically, it prescribes how humans ought to behave rather than explains how they do behave. As interpretations of myth, moral allegory and euhemerism alike go back to antiquity, but Tylor sees contemporary exponents of both as motivated by a desire to preserve myth in the face of the distinctively modern challenge of science. A twentieth-century exemplar of Tylor's position is the American anthropologist David Bidney (1955, 1967).

Opposite to Tylor stands his fellow Victorian, the German-born Sanskritist Friedrich Max Müller (1823–1900), who spent his career at Oxford. Where for Tylor moderns misread myth by taking it symbolically, for Müller (1867) ancients themselves mistakenly came to take literally their originally symbolic personifications of natural phenomena, for which myths then had to be created. For example, the sea initially described poetically as 'raging' was gradually taken to be the characteristic of the personality responsible for the sea, and a myth was then invented to account for this characteristic. Mythology for Müller stems from the absence in ancient languages of a neuter gender. Speakers therefore had to refer to impersonal entities in the male or female gender, forever after misleading their descendants into taking the referent to be a person rather than a thing.

Where for Tylor, myth really is about the physical world, for Müller myth really is about an immaterial god, the Infinite, symbolized by the sky: the grandeur of, especially, the sun provides the ideal 'condition' for the experience of the Infinite. In nineteenth-century fashion, myth is still thereby rooted in the physical world. Myth is not the projection of something human or social onto the physical world. Myth is not the confusion of something outside the physical world with something in it, as twentieth-century theorists would maintain. Rather, myth really is about a quality of the physical world, even if that quality symbolizes something beyond the physical world (see Müller 1878, lecture I).

Tylor would find an appreciative audience among creationists – not because he would consider Genesis 1 or 2 correct but because he would consider it an account of creation, and a distinctively religious one. He would offer a corrective to those twentieth-century theologians who, intent on making the Bible palatable to moderns, maintain that Genesis 1 or 2 is anything but an account of creation.[5] Tylor would have opposed the 'demythologization' of the New Testament by the German theologian Rudolf Bultmann (1953), for whom the New Testament is really the expression of at-homeness in a world overseen by God rather than an explanation of the world.

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J. G. Frazer

Closest to Tylor on the relationship between myth and science stands J. G. Frazer (1854–1941), the Scottish classicist and fellow pioneering anthropologist. For Frazer (1922), as for Tylor, myth is part of primitive religion; primitive religion is part of philosophy, itself universal; primitive religion is the counterpart to natural science, itself entirely modern; primitive religion and science exclude, not merely duplicate, each other; and primitive religion is false and science true. But where for Tylor primitive religion, including myth, functions as the counterpart to scientific *theory*, for Frazer it functions even more as the counterpart to *applied* science, or technology. Where for Tylor primitive religion, including myth, serves to *explain* the physical world, for Frazer it serves even more to *effect* the world, above all by spurring the crops to grow. Where Tylor treats myth as an autonomous text, Frazer ties myth to ritual, which enacts it.

The biggest difficulty for Tylor's and Frazer's view of myth as the primitive counterpart to science is its inability to account for the continued presence of myth. If myth does no more than science, why is it still around? If myth is incompatible with science, how is it still around? Tylor and Frazer would surely reply that whatever remains is not myth, and exactly because it is not serving a scientific-like function.

By contrast, the contemporary German philosopher Hans Blumenberg (1920–96) maintains that the survival of myth alongside science proves that myth has *never* served the same function as science. For Blumenberg (1985), myth serves to alleviate anxiety about the world rather than to explain the world – an argument that rests partly on his narrow definition of explanation as ultimate origin. Yet neither Blumenberg nor Tylor and Frazer explain the invocation of myth, or of religion as a whole, *alongside* science to explain physical events.

For example, whenever a handful of passengers survive a plane crash, the crash itself gets explained scientifically, but the survival often gets credited to intervention by God and not to, say, the location of the seats. Tylor and Frazer would doubtless reply that the survivors have simply not faced up to the incompatibility of their religious explanation with a scientific one, but the force of consistency seems outweighed by whatever need a religious account fulfills.

Lucien Lévy-Bruhl

Reacting against the views of Tylor and Frazer and other members of what he imprecisely calls 'the English school of anthropology', the French philosopher and armchair anthropologist Lucien Lévy-Bruhl (1857–1939) insisted on a much wider divide between myth and science. Where for Tylor and Frazer primitive peoples think like moderns, just less rigorously,

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for Lévy-Bruhl (1966) primitive peoples think differently from moderns. Where for Tylor and Frazer primitive thinking is logical, just erroneous, for Lévy-Bruhl, primitive thinking is plainly nonlogical – or in his preferred term, 'prelogical'.

According to Lévy-Bruhl, primitive peoples believe not, as for Tylor, that all natural phenomena harbor individual, human-like souls, or gods, but that all phenomena, including humans and their artifacts, are part of an impersonal sacred, or 'mystic', realm pervading the natural one. Primitive peoples believe, further, that the 'participation' of all things in this mystic reality enables phenomena not only to affect one another magically but also to become one another, while remaining what they are: 'objects, beings, phenomena can be, though in a way incomprehensible to us [moderns], both themselves and something other than themselves' (Lévy-Bruhl 1966, p. 61). The Bororo of Brazil declare themselves red araras, or parakeets, yet still consider themselves human beings. Lévy-Bruhl calls this belief 'prelogical' because it violates the law of noncontradiction: the notion that something can simultaneously be both itself and something else.

Where for Tylor and Frazer myth involves the same processes of observation, inference, and generalization as science, or at least of science as they think of it, for Lévy-Bruhl, mythic thinking is the opposite of scientific thinking. Where for Tylor and Frazer primitive peoples *perceive* the same world as moderns but simply *conceive* of it differently, for Lévy-Bruhl primitive peoples see and in turn conceptualize the world differently from moderns – namely, as identical with themselves.

For Lévy-Bruhl, as for Tylor and Frazer, myth is part of religion, religion is primitive, and moderns have science rather than religion. But where Tylor and Frazer subsume both religion and science under philosophy, Lévy-Bruhl associates philosophy with thinking freed from mystical identification with the world. Primitive thinking is nonphilosophical because it is not detached from the world. Primitive peoples have a whole mentality of their own, one evinced in their myths.

Even the use to which myth is put is for Lévy-Bruhl one of involvement rather than, as for Tylor and Frazer, one of detachment. Primitive peoples use myth not to explain or to control the world but instead to commune with it – more precisely, to restore the 'mystic' communion that has gradually begun to fade:

> Where the participation of the individual in the social group is still directly felt, where the participation of the group with surrounding groups is actually lived – that is, as long as the period of mystic symbiosis lasts – myths are meagre in number and of poor quality. . . . Can myths then likewise be the products of primitive mentality which appear when this mentality is endeavouring to realize a participation no longer felt – when it has recourse to intermediaries, and vehicles designed to secure a communion which has ceased to be a living reality? (Lévy-Bruhl 1966, p. 330)

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Bronislaw Malinowski

One reaction to Lévy-Bruhl was to reassert the philosophical nature of myth. The key theorists here were Paul Radin (1957), who goes beyond even Tylor to assert that myth is not merely explanatory but outright metaphysical, and Ernst Cassirer (1955), who maintains that myth, far from irrational, has a logic of its own and constitutes one form of knowledge.[6]

Another reaction to Lévy-Bruhl was to accept his separation of myth from philosophy but not his characterization of myth as pre-philosophical or prescientific. The key figure here was the Polish-born anthropologist Bronislaw Malinowski (1884–1942), who early on moved to England. Where Lévy-Bruhl asserts that primitive peoples seek to commune with nature rather than to explain it, Malinowski (1954 [1948]) asserts that primitive peoples seek to control nature rather than to explain it. Both Lévy-Bruhl and Malinowski associate a philosophical approach with an explanatory, or intellectualist, one, and both associate that view with the British – for Malinowski, with Tylor but not also Frazer. Both attribute this contrived notion of myth and, in general, of religion to a contrived notion of primitive peoples.

Invoking Frazer, for whom myth and religion are the primitive counterpart to applied science, Malinowski argues that primitive peoples are too busy scurrying to survive in the world to have the luxury of reflecting on it. Where for Frazer primitive peoples use myth *in place of* science, which, again, is for him exclusively modern, for Malinowski primitive peoples use myth as a *fallback* to science. Primitive peoples possess not just the counterpart to science but science itself:

> If by science be understood a body of rules and conceptions, based on experience and derived from it by logical inference, embodied in material achievements and in a fixed form of tradition and carried on by some sort of social organization – then there is no doubt that even the lowest savage communities have the beginnings of science, however rudimentary. (Malinowski 1954 [1948], p. 34)

Primitive peoples use science to control the physical world. Where science stops, they turn to magic.

Where magic stops, primitive peoples turn to myth – not to secure further control over the world, as Frazer would assume, but to reconcile themselves to aspects of the world that cannot be controlled, such as natural catastrophes, illness, ageing, and death. Myths, which are not limited to religion, root these woes in the irreversible, primordial actions of either gods or humans. According to a typical myth, humans age because two forebears did something foolish that introduced old age irretreviably into the world: 'The longed-for power of eternal youth and the faculty of rejuvenation which gives immunity from decay and age, have been lost by a small accident which it would have been in the power of a child and a woman to prevent' (Malinowski 1954 [1948], p. 137). Myth explains

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how, say, flooding arose – a god or a human brought it about – but primitive science and magic try to do something about it. By contrast, myth says that nothing can be done about it.

Claude Lévi-Strauss

Reacting both against Malinowski's view of primitive peoples as practical rather than intellectual and against Lévy-Bruhl's view of primitive peoples as emotional rather than intellectual, the French anthropologist Claude Lévi-Strauss (b. 1908) has boldly sought to revive an intellectualist view of primitive peoples and of myth. At first glance Lévi-Strauss (1966, 1978) seems a throwback to Tylor. In declaring that primitive peoples, 'moved by a need or a desire to understand the world around them, . . . proceed by intellectual means, exactly as a philosopher, or even to some extent a scientist, can and would do' (Lévi-Strauss 1978, p. 16), Lévi-Strauss seems indistinguishable from Tylor.

Yet in fact Lévi-Strauss is severely critical of Tylor, for whom primitive peoples concoct myth rather than science because they think less critically than moderns. For Lévi-Strauss, primitive peoples create myth because they think differently from moderns – but, contrary to Lévy-Bruhl, still think and still think rigorously. For Lévi-Strauss, as for Tylor, myth is the epitome of primitive thinking.

Where for Tylor primitive thinking assumes agency and modern thinking mechanisms, for Lévi-Strauss primitive thinking is concrete and modern thinking abstract. Primitive thinking deals with phenomena qualitatively rather than, like modern thinking, quantitatively. It focuses on the observable, sensible aspects of phenomena rather than, like modern thinking, on the unobservable, insensible ones:

> For these men [i.e., primitive peoples] . . . the world is made up of minerals, plants, animals, noises, colors, textures, flavors, odors. . . . What separates the savage thought from [modern] scientific thought is perfectly clear – and it is not a greater or lesser thirst for logic. Myths manipulate those qualities of perception that modern thought, at the birth of modern science, exorcised from science. (Akoun and others 1972, p. 39)

Yet antithetically to Tylor, Lévi-Strauss considers myth no less scientific than modern science. Myth is simply part of the 'science of the concrete' rather than of the science of the abstract:

> [T]here are two distinct modes of scientific thought. These are certainly not a function of different stages of the human mind but rather of two strategic levels at which nature is accessible to scientific enquiry: one roughly adapted to that of perception and the imagination: the other at a remove from it. (Lévi-Strauss 1966, p. 15)

Where for Tylor myth is the primitive counterpart to science per se, for Lévi-Strauss myth is the primitive counterpart to *modern* science.

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Myth *is* primitive science, but not thereby inferior science. Where other twentieth-century writers on myth, such as Greene, the Barbers, de Santillana and von Dechend, and Worthen, turn primitive myth into modern science, Lévi-Strauss turns primitive myth into primitive science, but unlike Tylor and Frazer, one that is compatible with modern science.

If myth is an instance of primitive thinking because it deals with concrete, tangible phenomena, it is an instance of thinking itself because it classifies phenomena. Lévi-Strauss maintains that all humans think in the form of classifications, specifically pairs of oppositions, and project them onto the world. Myth resolves or, more accurately, tempers the oppositions it expresses. Where for Tylor myth is scientific-like precisely because it goes beyond observation to explanation, for Lévi-Strauss myth is outright scientific simply because it records and categorizes observations, even while going beyond taxonomy to the resolution of observed contradictions. Those contradictions are to be found not in the plot but in what Lévi-Strauss famously calls the 'structure'.

Karl Popper

Karl Popper (1902–94), the Viennese-born philosopher of science who eventually settled in England, broke radically with Tylor. First, Tylor never explains how science ever emerged, since religion, including myth, provides a comprehensive and seemingly nonfalsifiable explanation of all events in the physical world. Second, science for Tylor does not build on myth but simply replaces it. For Popper (1974, 1998), science emerges *out of* myth – not, however, out of the *acceptance* of myth but out of the *criticism* of it: 'Thus, science must begin with myths, and with the criticism of myths' (Popper 1974, 50). By 'criticism' Popper means not rejection but assessment, which becomes scientific when it takes the form of attempts to falsify the truth claims made.

Going even further, Popper maintains that there are scientific as well as religious myths – this antithetical to Tylor's view. The difference between scientific and religious myths is not in their content but in the attitude toward them. Where religious myths are accepted dogmatically, scientific myths are questioned:

> My thesis is that what we call 'science' is differentiated from the older myths not by being something distinct from a myth, but by being accompanied by a second-order tradition – that of critically discussing the myth. Before, there was only the first-order tradition. A definite story was handed on. Now there was still, of course, a story to be handed on, but with it went something like a silent accompanying text of a second-order character: 'I hand it on to you, but tell me what you think of it. Think it over. Perhaps you can give us a different story'. . . . We shall understand that, in a certain sense, science is myth-making just as religion is. (Popper 1974, p. 127)

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Popper even maintains that scientific theories *remain* myth-like, for theories, like myths, can never be proved, only disproved, and therefore 'remain essentially uncertain or hypothetical' (Popper 1998, p. 116).

Like Popper, the English classical philosopher F. M. Cornford (1874–1943) argued that Greek science grew out of myth and religion, but he limits himself to the content and considers not at all the attitude. Cornford (1912) contends that Greek science only subsequently severed its ties to religion and became empirical science. In fact, science perpetuates, albeit in secular form, religious and mythical beliefs. Cornford later (1952, chapters 1–11) argued that Greek science never severed its ties to religion and never became empirical science.

Bringing Myth Back to the World

Where theorists of the nineteenth century assumed that myth could not be dislodged from the world and therefore could not be saved from science, theorists of the twentieth century saved myth from science either by removing myth altogether from the world or by removing it as an explanation of the world. The question for the twenty-first century, if I may suggest, is whether myth can be returned to the world – but in a way still compatible with science. The postmodern dismissal of the authority of science, evinced in the labeling of science as itself mythic, cheapens both myth and science. Twentieth-century theorizing commendably sought to accommodate myth *to* science rather than to spurn science in the name of myth.

Elsewhere I have considered two possible ways of restoring myth to the myth: through Jung's concept of synchronicity and through the application to celebrities of D. W. Winnicott's notion of play.[7] Here I consider a more obvious way: the worship of earth, or Gaia.

Gaia is the Greek name for one of the first four gods in Hesiod's Theogony, the Greek counterpart to the Genesis creation myths (1.1-2.4a and 2.4b-3.24). In the Theogony, in contrast to Genesis, gods come into existence rather than, as in Genesis, are presupposed. Hence the title of the work: the 'genesis of gods'. Where in Genesis God is separate from the world he creates – he creates *by* himself but not *out of* himself – in the Theogony gods are identical with the forces of nature after which their very names come. The creation of gods is thus simultaneously the creation of the world. More precisely, the initial four gods – Chaos, Gaia, Tartarus, and Eros – are identical with the forces after which they are named. Where these gods come from, we are never told. Creation myths often begin *in medias res*.

Soon after their creation, however, these four animated forces of nature become fully-fledged personalities. Where Gaia at first bears a child, Ouranos, parthenogenetically, she then mates with her son to bear the 12 Titans. And she then conspires with her youngest, the Titan Kronos, to

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castrate his father, Ouranos, when Ouranos next comes to have sex with his mother. Gaia is now a thinking, deliberative figure, whether or not physically separate from the earth. One can, then, characterize her as a god.

Subsequent generations of gods are separate from the forces they control. Still later generations of gods, together with depictions of them by later Greek authors, make them so human that they are distinctively divine only in degree and, more, have responsibilities far beyond those of natural forces. For example, Zeus is the god of justice, kings, strangers, and suppliants as well as of the sky and the weather. And he presides over his fellow Olympians as their king. Homeric religion, which is commonly taken to be the epitome of paganism, is more than the worship of nature.

For the earth to be a living entity, it need not be a personality. But for the earth to be a goddess, it must be. For the earth to be the subject of worship, it must be a goddess.

The view of the earth or indeed of the cosmos as a living entity is ancient. It is found not just in popular Greek religion but also in Greek philosophy, including Plato, for whom the world 'might be in the fullest measure a living being whole and complete, of complete parts; next, . . . might be single, nothing being left over, out of which another might come into being; and moreover . . . might be free from age and sickness' (Timaeus 32D-33A [Cornford 1937, p. 52]).

Modern science has 'killed' the notion of a living earth. As the common, popular explanation of events in the physical world, modern science has displaced religion and thereby myth, traditionally part of religion. Both religion and myth have had to undergo retraining to survive, and retraining for both has meant surrendering the job of explaining the physical world and doing something else or meaning something else. Thus Dionysus ceased to be taken as a god and has long become a symbol – of something in the world, and not just of wine, or of something in humans. Myth has frequently been decoupled from religion and thereby survived in secular form.

On the one hand the presence of god in the world or in control of the world by no means guarantees design in the world. Many creation myths, including Hesiod's, begin with instinctual procreation as the cause of creation, and even creation spurred by intention need hardly spell a master plan. The planning evinced in the biblical creation myths is atypical. And in the second myth, that of Adam and Eve, much of creation, not least that of woman, is *ad hoc*.

On the other hand the absence of god in the world or in control of the world need not remove design from the world. For Aristotle, all physical entities, such as trees, have design but not a designer. Design means purpose, or teleology.

Aristotle's view, however, is contrary to that of modern science, which has eliminated design from the physical world. The world is explained by mechanical processes and is therefore purposeless. Purposeless does not mean

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chaotic or cruel. It means without a goal. Foreclosed is the conventional question, Why? Science has eliminated not only design but also a designer. If Aristotle's view of the world as designed has been supplanted, even more has the religious view of the world as designed by a designer.

The debate over design in the world long antedates Darwin's *The Origin of Species* (1856). Epicurus maintained that the world arose not from design but from the random swerving of atoms – a view presented in classic form in Lucretius' *De Rerum Natura*. David Hume's *Dialogues Concerning Natural Religion*, published posthumously in 1779, revived this view, or at least put it in the mouth of Philo, one of his interlocutors. Philo argues that humans cannot know the cause of the design of the world because the world is on a different scale from that of, say, a watch. In *Natural Theology* (1802) William Paley, writing *after* Hume but in ignorance of him, used the analogy of a watch to argue *for* a cosmic designer (see Paley 2006 [1802], chapters 1–2). Hume's Philo argues not only against a designer as the cause of the design of the world but also against the world as designed. Philo does not deny that the world is orderly. He denies that that order must have come from design. He maintains that it could have arisen randomly, as for Epicurus. But unlike Epicurus, he does not profess to know the source of order. He is a skeptic.

Darwin supplies an explanation of order. The concept of evolution, which evinces the orderliness of the world, antedates Darwin. What Darwin provides is an explanation of evolution: natural selection. Natural selection does not mean evolution by chaos. On the contrary, it means evolution by a law of nature. But natural selection is not design. For natural selection involves no purpose. The world may be getting ever better, but not as the fulfillment of some plan. Natural selection means the response by organisms to the environment as they find it. But that environment – climate, fertility, competing organisms – has not been planned. And the world will presumably continue to evolve, unplanned. Without design, no designer. Darwin eliminates god – a designer – from the world. For Darwin, the key but not the sole process by which the living world operates is natural selection.

In myth the physical world is explained the same way the human world is: as the result of decisions by a personality – though sometimes, as for Frazer, by the condition rather than the decision of a god. It is not that myth always explains the human world – for neither Tylor nor Frazer does myth do so – but that gods act in the physical world in the same deliberative way that humans act in their world.

The rise of science has introduced a disjunction between the way the physical world is explained and the way the human world is explained. Natural science explains physical events nonteleologically. The humanities explain human behavior teleologically. In the social sciences there is variation. Some social scientists, notably behaviorists, explain human behavior nonteleologically. Other social scientists explain human behavior teleologically.

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Within the social sciences one distinction often made is that between explanatory and interpretive social science – with the term 'explanation' thereby restricted to nonteleological explanations. For 'interpretation', the term 'hermeneutics' is frequently used. But the term 'explanation' can, alternatively, be used to encompass both approaches. Even the term 'cause' is used variously. Like explanation, cause is sometimes set against reason, but other times reason is subsumed under cause as one variety of cause.[8] Aristotle himself distinguished four kinds of causes, of which purpose or function is one kind. And for Aristotle the design, or final cause, of every entity requires no designer and therefore no reason. Only the explanation of human action involves reason.

Despite the touted elimination of purpose, or teleology, from modern science, biology seemingly cannot dispense with it. As philosopher Michael Ruse writes of biologists,

> They talk about 'ends' or 'functions' or 'purposes' – as in 'the sail on the back of dimetrodon exists *in order* to regulate body temperature' or in 'heartbeats serve no useful *function*.' Admittedly, every now and then biologists lecture themselves sternly on their practices. They assure themselves – and us – that their usage is just shorthand . . . . But the language does persist. In the nineteenth century, that ardent Christian David Brewster (1854) assured us all that the moon exists in order to light the way of nocturnal travellers. No one today would ask about the function of the moon. But biologists do ask about the function of the kidneys or the purpose of the liver. (Ruse 1988, pp. 43–44)

Darwin was much influenced by Paley, whom he cites, and the *Origins of Species* is often taken as a nonreligious version of *Natural Theology*. Where for Paley the source of the orderliness of the world is the work of a divine designer, for Darwin the orderliness of the world is the work of natural selection: in the competition for limited resources, those living things best adapted to the environment survive. Yet adaptation is akin to design, as Ruse observes:

> [T]he natural theologians [like Paley] spotted something about the living world that today's biologists would acknowledge and exploit, through natural selection. And, of course, they did. They saw that the living world is *as if* it were designed. . . . The heart is like a pump. The eye is like a telescope. The Darwinian knows that the effects come about through natural selection. There is no need to appeal, as once, to an omniscient god. But this does not deny the fact that living beings are like artefacts, objects of thought and planning. And because teleology is appropriate for artefacts – they are made with ends in sight – teleology is appropriate for organisms. (Ruse 1988, 46–47)

So goes the pro-teleological argument for biology. Objections to teleology are multiple.[9] Teleology, it is said, is unprovable: intent can only be inferred, not observed. Teleology, it is said, involves backward causation: the cause of behavior is the goal, which comes after the behavior rather than before. Teleology, it is said, assumes that behavior is always functional

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and precludes purposeless behavior. If these and other scientific objections to teleology cannot be met, then teleology is unscientific, and any effort at bringing back to the world an idea that ties myth to teleology fails to do what any theory of myth must do: keep myth and science compatible.

The figures who created the concept of Gaia, the nineteenth-century Scottish geologist James Hutton and, much more, the present-day English scientist James Lovelock (1979, 1988, 2006), assume that the concept is outright scientific and not just compatible with science. But is Gaia either? To begin with, is the claim being made that the earth *is* a living entity or is merely *like* a living entity? Is the claim being made that the earth has design? If so, who designed it? Is the claim being made that the earth is a god? Unless the claim made goes this far, Gaia does not bring myth back to the world. For while myths per se need not be about gods, myths of the physical world must be about gods, who control the physical world. Finally, even if Gaia is considered a god, is there a myth about Gaia?[10]

Noting the contrast between the absence of life on Mars and the presence of life on earth, Lovelock came to maintain that 'the only feasible explanation of the Earth's highly improbable atmosphere was that it was being manipulated on a day-to-day basis from the surface, and that the manipulator was life itself' (Lovelock 1979, p. 6). Gaia, or the 'Gaia hypothesis', is the view of earth 'as a complex entity involving the Earth's biosphere, atmosphere, oceans, and soil; the totality constituting a feedback or cybernetic system which seeks an optimal physical and chemical environment for life on this planet' (Lovelock 1979, p. 10). In other words, the earth is a self-regulating mechanism.

In *Gaia* (1979), his first book on the subject, Lovelock writes of the earth in teleological terms. For example:

> [T]he Gaian control system will include a means of sensing whether too much or too little ultra-violet radiation is getting through the ozone layer, and of regulating nitrous oxide production accordingly. (Lovelock 1979, p. 71)
>
> We are in fact back at the sink looking for a salt-removal process which must be in some way linked with the biology of the sea if our belief in the intervention of Gaia is well-founded. (Lovelock 1979, p. 85)
>
> What are we to make of volcanic activity and continental drift? Both are consequences of the inner motions of our planet, but could Gaia also be at work? (Lovelock 1979, p. 91)
>
> If Gaia has modified the sea floor, it has been done by exploiting a natural tendency and turning it to her own advantage. (Lovelock 1979, p. 92)

In his introduction, Lovelock puts the teleological approach heartfeltly. The Gaia hypothesis, he tells us, is 'an alternative to that equally depressing picture of our planet as a demented spaceship, forever travelling, driverless and purposeless, around an inner circle of the sun' (Lovelock 1979, p. 11). Lovelock himself does not worship the earth. He reveres it but does not deify it. But when, in subsequent books, he denies that the earth is even alive the way humans are alive, what is he claiming?

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If Lovelock is using his teleological talk metaphorically, the way many biologists insist that they are doing, then there is no Gaia hypothesis. But if, to have a Gaia hypothesis, he means his teleological talk literally, then he faces the objection that the earth, while containing living things, some of which themselves act intentionally, is not itself a living thing, let alone one that behaves intentionally. The most straightforward objection to the earth as a living thing is that it does not reproduce. The objection to the earth as a living thing that behaves teleologically is that the seeming purposiveness of the earth is explicable otherwise.

The staunch Darwinian Richard Dawkins put the objections with characteristic bluntness. There is cooperation among genes, but only within a species. There is no 'universal cooperation', which is what a unified earth would require. On the one hand

> It is not the genes of any given individual that cooperate particularly well together. They have never been together before in that combination, for every genome in a sexually reproducing species is unique (with the usual exception of identical twins). It is the genes of species at large that cooperate, because they have met before, often, and in the intimately shared environment of the cell, though always in different combinations. What they cooperate at is the business of making individuals of the same general type as the present one. (Dawkins 1998, pp. 213–14)

On the other hand, genes are mixed only within species, so that there is no cooperation between genes of different species: 'Cheetah genes cooperate with cheetah genes but not with camel genes, and vice versa' (Dawkins 1998, p. 218).

Furthermore, cheetah genes do not cooperate with one another because of some commitment to the preservation of the species:

> They are not working to save the cheetah from extinction like some molecular World Wildlife Fund. They are simply surviving in their environment, and their environment largely consists of other genes from the cheetah gene pool. Therefore, abilities to cooperate with other cheetah genes (but not with camel genes or codfish genes) are among the main qualities favoured in the struggle between rival cheetah genes. Just as, in arctic climates, genes for withstanding the cold come to predominate, so, in cheetah gene pools, do genes that are equipped to flourish in the climate of other cheetah genes. As far as each gene is concerned, the other genes in its gene pool are just another aspect of the weather. (Dawkins 1998, pp. 218–19)

The forest, to use Dawkins' example, may seem to work like 'a single harmonious whole, with each unit pulling for the benefit of all, every tree and every soil mite, even every predator and every parasite, playing its part in one big, happy family' (Dawkins 1998, p. 221). But in actuality, the forest is 'an anarchistic federation of selfish genes, each selected as being good at surviving within its own gene pool against the background of the environment provided by all the others' (Dawkins 1998, pp. 221–22).

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Even if the behavior of one species abets that of others, the consequence is unintended:

> Soil bacteria do break down the dead leaves, dead animals and manure into compost which is useful for the continued prosperity of the whole forest. But they aren't doing so for the sake of making compost. They are using the dead leaves and dead animals as food for themselves, for the good of the genes that programme their compost-making activities. (Dawkins 1998, p. 222)

Because living things do not intend to help the planet, 'we are left with the conclusion that individuals work for Gaia only when it suits them to do so – so why bother to bring Gaia into the discussion?' (Dawkins 1998, p. 224).

Perhaps the Gaia hypothesis can be treated as the equivalent of adult play, or make-believe, for Winnicott. But make-believe for Winnicott means more than mere metaphor. It would mean really treating the earth as if it were an intentional being, not just talking about it that way. It would mean treating the earth as an intentional being while simultaneously acknowledging that doing so involves the suspension of disbelief. Perhaps only this way, as with the treatment of celebrities, can myth be brought back to the physical world.

Short Biography

Robert Segal's field is theories – of myth and of religion. His PhD from Princeton University was in religions of the Greco-Roman world, and his focus was on Gnostic myths. His first book, a revision of his doctoral thesis, was on the first tractate of the Corpus Hermeticum, the Poimandres: *The Poimandres as Myth* (Mouton de Gruyter 1986). Among the other books he has written or edited are *In Quest of the Hero* (Princeton 1989), *Joseph Campbell* (revised ed. Penguin 1990), *The Allure of Gnosticism* (Open Court 1995), The *Gnostic Jung* (Princeton and Routledge 1992), *Jung on Mythology* (Princeton and Routledge 1998), *The Myth and Ritual Theory* (Blackwell 1998), *Theorizing about Myth* (Massachusetts 1999), *Hero Myths* (Blackwell 2000), *Myth: A Very Short Introduction* (Oxford 2004), *The Blackwell Companion to the Study of Religion* (Blackwell 2006), and *Myth: Critical Concepts in Literary and Cultural Studies* (4 vols., Routledge 2007). He is Sixth Century Chair in Religious Studies, University of Aberdeen.

Notes

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[1] See Segal 1999 and 2004.

[2] On the history of creationism, see McCalla 2006; Numbers 2006.

[3] On the historicity of the biblical flood myth, see Ryan and Pitman 1999.

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[4] For a balanced corrective to Draper and White, see Brooke 1991.
[5] For a contemporary example of the view that Tylor opposes, see Gilkey 1985 [1959], esp. 25–29, 148–55.
[6] Cassirer's would-be corrective of Lévy-Bruhl is in fact a mere restatement of Lévy-Bruhl's own position.
[7] On the use of synchronicity, see Segal 2008, 101–03. On the use of Winnicott, see Segal 2003, 152–57; 2004, 137–42.
[8] On the varying differentiations of these terms, see Segal 1992.
[9] See the opposing positions in the section on 'Teleology: Help or Hindrance?' in Ruse 1989, 181–95.
[10] The philosopher Mary Midgley calls a 'myth' the version of the Gaia hypothesis which trusts that the earth will enlist evolution to save itself. By myth, she means blind faith and therefore the opposite of science. She herself embraces Lovelock's version of the hypothesis, according to which humans must help save the earth. See Midgley 2002 [1985], 72–75; 2006 [2001], 237–59; 2005, 209–10.

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