



PAUL FEYERABEND

Science and Myth

Science is much closer to myth than a scientific philosophy is prepared to admit. It is one of the many forms of thought that have been developed by man, and not necessarily the best. It is conspicuous, noisy, and impudent, but it is inherently superior only for those who have already decided in favor of a certain ideology, or who have accepted it without ever having examined its advantages and its limits. And as the accepting and rejecting of ideologies should be left to the individual it follows that the separation of state and *church* must be complemented by the separation of state and *science*, that most recent, most aggressive, and most dogmatic religious institution. Such a separation may be our only chance to achieve a humanity we are capable of, but have never fully realized. . . .

The rise of modern science coincides with the suppression of non-Western tribes by Western invaders. The tribes are not only physically suppressed, they also lose their intellectual independence and are forced to adopt the bloodthirsty religion of brotherly love—Christianity. The most intelligent members get an extra bonus: they are introduced into the mysteries of Western Rationalism and its peak—Western Science. Occasionally this leads to an almost unbearable tension with tradition (Haiti). In most cases the tradition disappears without the trace of an argument; one simply becomes a slave both in body and in mind. Today this development is gradually reversed—with great reluctance, to be sure, but it is reversed. Freedom is regained, old traditions are rediscovered, both among the minorities in Western

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countries and among large populations in non-Western continents. *But science still reigns supreme.* It reigns supreme because its practitioners are *unable to understand*, and *unwilling to condone*, different ideologies, because they have the *power* to enforce their wishes, and because they *use* this power just as their ancestors used *their* power to force Christianity on the peoples they encountered during their conquests. Thus, while an American can now choose the religion he likes, he is still not permitted to demand that his children learn magic rather than science at school. There is a separation between state and church; there is no separation between state and science.

And yet science has no greater authority than any other form of life. Its aims are certainly not more important than are the aims that guide the lives in a religious community or in a tribe that is united by a myth. At any rate, [scientists] have no business restricting the lives, the thoughts, the education of the members of a free society where everyone should have a chance to make up his own mind and to live in accordance with the social beliefs he finds most acceptable. The separation between state and church must therefore be complemented by the separation between state and science.

We need not fear that such a separation will lead to a breakdown of technology. There will always be people who prefer being scientists to being the masters of their fate and who gladly submit to the meanest kind of (intellectual and institutional) slavery provided they are paid well and provided also there are some people around who examine their work and sing their praise. Greece developed and progressed because it could rely on the services of unwilling slaves. We shall develop and progress with the help of

the numerous *willing* slaves in universities and laboratories who provide us with pills, gas, electricity, atom bombs, frozen dinners and, occasionally, with a few interesting fairy-tales. We shall treat these slaves well, we shall even listen to them, for they have occasionally some interesting stories to tell, but we shall *not* permit them to impose their ideology on our children in the guise of 'progressive' theories of education. We shall not permit them to teach the fancies of science as if they were the only factual statements in existence. This separation of science and state may be our only chance to overcome the hectic barbarism of our scientific-technical age and to achieve a humanity we are capable of, but have never fully realized.¹ Let us, therefore, . . . review the arguments that can be adduced for such a procedure.

The image of 20th-century science in the minds of scientists and laymen is determined by technological miracles such as color television, the moon shots, the infra-red oven, as well as by a somewhat vague but still quite influential rumor, or fairy-tale, concerning the manner in which these miracles are produced.

According to the fairy-tale the success of science is the result of a subtle, but carefully balanced combination of inventiveness and control. Scientists have *ideas*. And they have special *methods* for improving ideas. The theories of science have passed the test of method. They give a better account of the world than ideas which have not passed the test.

The fairy-tale explains why modern society treats science in a special way and why it grants it privileges not enjoyed by other institutions.

Ideally, the modern state is ideologically neutral. Religion, myth, prejudices *do* have an influence, but only in a roundabout way, through the medium of politically influential *parties*. Ideological principles *may* enter the governmental structure, but only via a majority vote, and after a lengthy discussion of possible consequences. In our schools the main religions are taught as *historical phenomena*. They are taught as parts of the truth only if the parents insist on a more direct mode of instruction. It is up to them to decide about the religious education of their children. The financial support of ideologies does not exceed the financial support granted to parties and to private groups. State and ideology, state and church, state and myth, are carefully separated.

State and science, however, work closely together. Immense sums are spent on the improvement of scientific ideas. Bastard subjects such as the philosophy of science, which have not a single discovery to their credit, profit from the boom of the sciences. Even human relations are dealt with in a scientific manner, as is shown by education programs, proposals for prison reform, army training, and so on. Almost all scientific subjects are compulsory subjects in our schools. While the parents of a six-year-old child can decide to have him instructed in the rudiments of Protestantism, or in the rudiments of the Jewish faith, or to omit religious instruction altogether, they do not have a similar freedom in the case of the sciences. Physics, astronomy, history *must* be learned. They cannot be replaced by magic, astrology, or by a study of legends. . . .

The reason for this special treatment of science is, of course, our little fairy-tale: if science has found a method that turns ideologically contaminated ideas into true and useful theories, then it is indeed not mere ideology, but an objective measure of all ideologies. It is then not subjected to the demand for a separation between state and ideology.

But the fairy-tale is false, as we have seen. There is no special method that guarantees success or makes it probable. Scientists do not solve problems because they possess a magic wand—methodology, or a theory of rationality—but because they have studied a problem for a long time, because they know the situation fairly well, because they are not too dumb (though that is rather doubtful nowadays when almost anyone can become a scientist), and because the excesses of one scientific school are almost always balanced by the excesses of some other school. (Besides, scientists only rarely solve their problems, they make lots of mistakes, and many of their solutions are quite useless.) Basically there is hardly any difference between the process that leads to the announcement of a new scientific law and the process preceding passage of a new law in society: one informs either all citizens or those immediately concerned, one collects 'facts' and prejudices, one discusses the matter, and one finally votes. But while a democracy makes some effort to *explain* the process so that everyone can understand it, scientists either *conceal* it, or *bend* it, to make it fit their sectarian interests.

No scientist will admit that voting plays a role in his subject. Facts, logic, and methodology alone decide—this is what the fairy-tale tells us. But how do facts decide? What is their function in the advancement of knowledge? We cannot *derive* our theories from them. We cannot give a *negative* criterion by saying, for example, that good theories are theories which can be refuted, but which are not yet contradicted by any fact. A principle of falsification that removes theories because they do not fit the facts would have to remove the whole of science (or it would have to admit that large parts of science are irrefutable). The hint that a good theory *explains more* than its rivals is not very realistic either. True: new theories often predict new things—but almost always at the expense of things already known. Turning to logic we realize that even the simplest demands are *not* satisfied in scientific practice, and *could not be* satisfied, because of the complexity of the material. The ideas which scientists use to present the known and to advance into the unknown are only rarely in agreement with the strict injunctions of logic or pure mathematics, and the attempt to make them conform would rob science of the elasticity without which progress cannot be achieved. We see: facts alone are not strong enough for making us accept, or reject, scientific theories, the range they leave to thought is *too wide*; logic and methodology eliminate too much, they are *too narrow*. In between these two extremes lies the ever-changing domain of human ideas and wishes. And a more detailed analysis of successful moves in the game of science ('successful' from the point of view of the scientists themselves) shows indeed that there is a wide range of freedom that *demand*s a multiplicity of ideas and *permits* the application of democratic procedures (ballot-discussion-vote) but that is actually closed by power politics and propaganda. *This is where the fairy-tale of a special method assumes its decisive function.* It conceals the freedom of decision which creative scientists and the general public have even inside the most rigid and the most advanced parts of science by a recitation of 'objective' criteria, and it thus protects the big-shots (Nobel Prize winners; heads of laboratories, of organizations such as the AMA, of special schools; 'educators'; etc.) from the masses (laymen; experts in non-scientific fields; experts in other fields of science): only those citizens count who were sub-

jected to the pressures of scientific institutions (they have undergone a long process of education), who succumbed to these pressures (they have passed their examinations), and who are now firmly convinced of the truth of the fairy-tale. This is how scientists have deceived themselves and everyone else about their business, but without any real disadvantage: they have more money, more authority, more sex appeal than they deserve, and the most stupid procedures and the most laughable results in their domain are surrounded with an aura of excellence. It is time to cut them down in size, and to give them a more modest position in society. . . .

Modern science . . . is not at all as difficult and as perfect as scientific propaganda wants us to believe. A subject such as medicine, or physics, or biology appears difficult only because it is taught badly, because the standard instructions are full of redundant material, and because they start too late in life. During the war, when the American Army needed physicians within a very short time, it was suddenly possible to reduce medical instruction to half a year (the corresponding instruction manuals have disappeared long ago, however. Science may be simplified during the war. In peacetime the prestige of science demands greater complication.) And how often does it not happen that the proud and conceited judgment of an expert is put in its proper place by a layman! Numerous inventors built 'impossible' machines. Lawyers show again and again that an expert does not know what he is talking about. Scientists, especially physicians, frequently come to different results so that it is up to the relatives of the sick person (or the inhabitants of a certain area) to decide *by vote* about the procedure to be adopted. How often is science improved, and turned into new directions by non-scientific influences! It is up to us, it is up to the citizens of a free society to either accept the chauvinism of science without contradiction or to overcome it by the counterforce of public action. Public action was used against science by the Communists in China in the fifties, and it was again used, under very different circumstances, by some opponents of evolution in California in the seventies. Let us follow their example and let us free society from the strangling hold of an ideologically petrified science just as our ancestors freed *us* from the strangling hold of the One True Religion!

NOTE

1. For the humanitarian deficiencies of science cf. 'Experts in a Free Society,' *The Critic*, November/December 1971, or the improved German version of this essay and of 'Towards a Humanitarian Science' in Part II of Vol. I of my *Ausgewählte Aufsätze*. Vieweg, 1974.

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RICHARD DAWKINS

Is Science a Religion?

It is fashionable to wax apocalyptic about the threat to humanity posed by the AIDS virus, "mad cow" disease, and many others, but I think a case can be made that *faith* is one of the world's great evils, comparable to the smallpox virus but harder to eradicate.

Faith, being belief that isn't based on evidence, is the principle vice of any religion. And who, looking at Northern Ireland or the Middle East, can be confident that the brain virus of faith is not exceedingly dangerous? One of the stories told to young Muslim suicide bombers is that martyrdom is the quickest way to heaven—and not just heaven but a special part of heaven where they will receive their special reward of 72 virgin brides. It occurs to me that our best hope may be to provide a kind of "spiritual arms control": send in specially trained theologians to deescalate the going rate in virgins.

Given the dangers of faith—and considering the accomplishments of reason and observation in the activity called science—I find it ironic that, whenever I lecture publicly, there always seems to be someone who comes forward and says, "Of course, your science is just a religion like ours. Fundamentally, science just comes down to faith, doesn't it?"

Transcript of a speech delivered to the American Humanist Association accepting the award of 1996 Humanist of the Year.

Well, science is not religion and it doesn't just come down to faith. Although it has many of religion's virtues, it has none of its vices. Science is based upon verifiable evidence. Religious faith not only lacks evidence, its independence from evidence is its pride and joy, shouted from the rooftops. Why else would Christians wax critical of doubting Thomas? The other apostles are held up to us as exemplars of virtue because faith was enough for them. Doubting Thomas, on the other hand, required evidence. Perhaps he should be the patron saint of scientists.

One reason I receive the comment about science being a religion is because I believe in the fact of evolution. I even believe in it with passionate conviction. To some, this may superficially look like faith. But the evidence that makes me believe in evolution is not only overwhelmingly strong; it is freely available to anyone who takes the trouble to read up on it. Anyone can study the same evidence that I have and presumably come to the same conclusion. But if you have a belief that is based solely on faith, I can't examine your reasons. You can retreat behind the private wall of faith where I can't reach you.

Now in practice, of course, individual scientists do sometimes slip back into the vice of faith, and a few may believe so single-mindedly in a favorite theory that they occasionally falsify evidence. However, the fact that this sometimes happens doesn't alter

the principle that, when they do so, they do it with shame and not with pride. The method of science is so designed that it usually finds them out in the end.

Science is actually one of the most moral, one of the most honest disciplines around—because science would completely collapse if it weren't for a scrupulous adherence to honesty in the reporting of evidence. (As James Randi has pointed out, this is one reason why scientists are so often fooled by paranormal tricksters and why the debunking role is better played by professional conjurers; scientists just don't anticipate deliberate dishonesty as well.) There are other professions (no need to mention lawyers specifically) in which falsifying evidence or at least twisting it is precisely what people are paid for and get brownie points for doing.

Science, then, is free of the main vice of religion, which is faith. But, as I pointed out, science does have some of religion's virtues. Religion may aspire to provide its followers with various benefits—among them explanation, consolation, and uplift. Science, too, has something to offer in these areas.

Humans have a great hunger for explanation. It may be one of the main reasons why humanity so universally has religion, since religions do aspire to provide explanations. We come to our individual consciousness in a mysterious universe and long to understand it. Most religions offer a cosmology and a biology, a theory of life, a theory of origins, and reasons for existence. In doing so, they demonstrate that religion is, in a sense, science; it's just bad science. Don't fall for the argument that religion and science operate on separate dimensions and are concerned with quite separate sorts of questions. Religions have historically always attempted to answer the questions that properly belong to science. Thus religions should not be allowed now to retreat from the ground upon which they have traditionally attempted to fight. They do offer both a cosmology and a biology; however, in both cases it is false.

Consolation is harder for science to provide. Unlike Religion, science cannot offer the bereaved a glorious reunion with their loved ones in the hereafter. Those wronged on this earth cannot, on a scientific view, anticipate a sweet comeuppance for their tormentors in a life to come. It could be argued that, if the idea of an afterlife is an illusion (as I believe it is), the consolation it offers is hollow. But that's not nec-

essarily so; a false belief can be just as comforting as a true one, provided the believer never discovers its falsity. But if consolation comes that cheap, science can weigh in with other cheap palliatives, such as pain-killing drugs, whose comfort may or may not be illusory, but they do work.

Uplift, however, is where science really comes into its own. All the great religions have a place for awe, for ecstatic transport at the wonder and beauty of creation. And it's exactly this feeling of spine-shivering, breath-catching awe—almost worship—this flooding of the chest with ecstatic wonder, that modern science can provide. And it does so beyond the wildest dreams of saints and mystics. The fact that the supernatural has no place in our explanations, in our understanding of so much about the universe and life, doesn't diminish the awe. Quite the contrary. The merest glance through a microscope at the brain of an ant or through a telescope at a long-ago galaxy of a billion worlds is enough to render poky and parochial the very psalms of praise.

Now, as I say, when it is put to me that science or some particular part of science, like evolutionary theory, is just a religion like any other, I usually deny it with indignation. But I've begun to wonder whether perhaps that's the wrong tactic. Perhaps the right tactic is to accept the charge gratefully and demand equal time for science in religious education classes. And the more I think about it, the more I realize that an excellent case could be made for this. So I want to talk a little bit about religious education and the place that science might play in it.

I do feel very strongly about the way children are brought up. I'm not entirely familiar with the way things are in the United States, and what I say may have more relevance to the United Kingdom, where there is state-obliged, legally enforced religious instruction for all children. That's unconstitutional in the United States, but I presume that children are nevertheless given religious instruction in whatever particular religion their parents deem suitable.

Which brings me to my point about mental child abuse. In a 1995 issue of the *Independent*, one of London's leading newspapers, there was a photograph of a rather sweet and touching scene. It was Christmas time, and the picture showed three children dressed up as the three wise men for a nativity

play. The accompanying story described one child as a Muslim, one as a Hindu, and one as a Christian. The supposedly sweet and touching point of the story was that they were all taking part in this nativity play.

What is not sweet and touching is that these children were all four years old. How can you possibly describe a child of four as a Muslim or a Christian or a Hindu or a Jew? Would you talk about a four-year-old economic monetarist? Would you talk about a four-year-old neo-isolationist or a four-year-old liberal Republican? There are opinions about the cosmos and the world that children, once grown, will presumably be in a position to evaluate for themselves. Religion is the one field in our culture about which it is absolutely accepted, without question—without even noticing how bizarre it is—that parents have a total and absolute say in what their children are going to be, how their children are going to be raised, what opinions their children are going to have about the cosmos, about life, about existence. Do you see what I mean about mental child abuse?

Looking now at the various things that religious education might be expected to accomplish, one of its aims could be to encourage children to reflect upon the deep questions of existence, to invite them to rise above the humdrum preoccupations of ordinary life and think *sub specie aeternitatis*.

Science can offer a vision of life and the universe which, as I've already remarked, for humbling poetic inspiration far outclasses any of the mutually contradictory faiths and disappointingly recent traditions of the world's religions.

For example, how could any child in a religious education class fail to be inspired if we could get across to them some inkling of the age of the universe? Suppose that, at the moment of Christ's death, the news of it had started traveling at the maximum possible speed around the universe outwards from the earth? How far would the terrible tidings have traveled by now? Following the theory of special relativity, the answer is that the news could not, under any circumstances whatever, have reached more than one-fiftieth of the way across one galaxy—not one-thousandth of the way to our nearest neighboring galaxy in the 100-million-galaxy-strong universe. The universe at large couldn't possibly be anything other than indifferent to

Christ, his birth, his passion, and his death. Even such momentous news as the origin of life on Earth could have traveled only across our little local cluster of galaxies. Yet so ancient was that event on our earthly time-scale that, if you span its age with your open arms, the whole of human history, the whole of human culture, would fall in the dust from your fingertip at a single stroke of a nail file.

The argument from design, an important part of the history of religion, wouldn't be ignored in my religious education classes, needless to say. The children would look at the spellbinding wonders of the living kingdoms and would consider Darwinism alongside the creationist alternatives and make up their own minds. I think the children would have no difficulty in making up their minds the right way if presented with the evidence. What worries me is not the question of equal time but that, as far as I can see, children in the United Kingdom and the United States are essentially given *no* time with evolution yet are taught creationism (whether at school, in church, or at home).

It would also be interesting to teach more than one theory of creation. The dominant one in this culture happens to be the Jewish creation myth, which is taken over from the Babylonian creation myth. There are, of course, lots and lots of others, and perhaps they should all be given equal time (except that wouldn't leave much time for studying anything else). I understand that there are Hindus who believe that the world was created in a cosmic butter churn and Nigerian peoples who believe that the world was created by God from the excrement of ants. Surely these stories have as much right to equal time as the Judeo-Christian myth of Adam and Eve.

So much for Genesis; now let's move on to the prophets. Halley's Comet will return without fail in the year 2062. Biblical or Delphic prophecies don't begin to aspire to such accuracy; astrologers and Nostradamians dare not commit themselves to factual prognostications but, rather, disguise their charlatany in a smokescreen of vagueness. When comets have appeared in the past, they've often been taken as portents of disaster. Astrology has played an important part in various religious traditions, including Hinduism. The three wise men I mentioned earlier were said to have been led to the cradle of Jesus by a star. We might ask the children by what physical

route do they imagine the alleged stellar influence on human affairs could travel.

Incidentally, there was a shocking program on the BBC radio around Christmas 1995 featuring an astronomer, a bishop, and a journalist who were sent off on an assignment to retrace the steps of the three wise men. Well, you could understand the participation of the bishop and the journalist (who happened to be a religious writer), but the astronomer was a supposedly respectable astronomy writer, and yet she went along with this! All along the route, she talked about the portents of when Saturn and Jupiter were in the ascendant up Uranus or whatever it was. She doesn't actually believe in astrology, but one of the problems is that our culture has been taught to become tolerant of it, even vaguely amused by it—so much so that even scientific people who don't believe in astrology sort of think it's a bit of harmless fun. I take astrology very seriously indeed: I think it's deeply pernicious because it undermines rationality, and I should like to see campaigns against it.

When the religious education class turns to ethics, I don't think science actually has a lot to say, and I would replace it with rational moral philosophy. Do the children think there are absolute standards of right and wrong? And if so, where do they come from? Can you make up good working principles of right and wrong, like "do as you would be done by" and "the greatest good for the greatest number" (whatever that is supposed to mean)? It's a rewarding question, whatever your personal morality, to ask as an evolutionist where morals come from; by what route has the human brain gained its tendency to have ethics and morals, a feeling of right and wrong?

Should we value human life above all other life? Is there a rigid wall to be built around the species *Homo sapiens*, or should we talk about whether there are other species which are entitled to our humanistic sympathies? Should we, for example, follow the right-to-life lobby, which is wholly preoccupied with *human* life, and value the life of a human fetus with the faculties of a worm over the life of a thinking and feeling chimpanzee? What is the basis of this fence we erect around *Homo sapiens*—even around a small piece of fetal tissue? (Not a very sound evolutionary idea when you think about it.) When, in our evolutionary descent from our common ancestor with chimpanzees, did the fence suddenly rear itself up?

Well, moving on, then, from morals to last things, to eschatology, we know from the second law of thermodynamics that all complexity, all life, all laughter, all sorrow, is hell-bent on leveling itself out into cold nothingness in the end. They—and we—can never be more than temporary, local buckings of the great universal slide into the abyss of uniformity.

We know that the universe is expanding and will probably expand forever, although it's possible it may contract again. We know that, whatever happens to the universe, the sun will engulf the earth in about 60 million centuries from now.

Time itself began at a certain moment, and time may end at a certain moment—or it may not. Time may come locally to an end in miniature crunches called black holes. The laws of the universe seem to be true all over the universe. Why is this? Might the laws change in these crunches? To be really speculative, time could begin again with new laws of physics, new physical constants. And it has even been suggested that there could be many universes, each one isolated so completely that, for it, the others don't exist. Then again, there might be a Darwinian selection among universes.

So science could give a good account of itself in religious education. But it wouldn't be enough. I believe that some familiarity with the King James versions of the Bible is important for anyone wanting to understand the allusions that appear in English literature. Together with Book of Common Prayer, the Bible gets 58 pages in the *Oxford Dictionary of Quotations*. Only Shakespeare has more. I do think that not having any kind of biblical education is unfortunate if children want to read English literature and understand the provenance of phrases like "through a glass darkly," "all flesh is as grass," "the race is not to the swift," "crying in the wilderness," "reaping the whirlwind," "amid the alien corn," "Eyeless in Gaza," "Job's comforters," and "the widow's mite."

I want to return now to the charge that science is just a faith. The more extreme version of this charge—and one that I often encounter as both a scientist and a rationalist—is an accusation of zealotry and bigotry in scientists themselves as great as that found in religious people. Sometimes there may be a little bit of justice in this accusation; but as zealous bigots, we scientists are mere amateurs at the

game. We're content to *argue* with those who disagree with us. We don't kill them.

But I would want to deny even the lesser charge of purely verbal zealotry. There is a very, very important difference between feeling strongly, even passionately, about something because we have thought about and examined the evidence for it on the one hand, and feeling strongly about something because it

has been internally revealed to us, or internally revealed to somebody else in history and subsequently hallowed by tradition. There's all the difference in the world between a belief that one is prepared to defend by quoting evidence and logic and a belief that is supported by nothing more than tradition, authority, or revelation.



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ALVIN PLANTINGA

When Faith and Reason Clash: Evolution and the Bible

My question is simple: how shall we Christians deal with apparent conflicts, between faith and reason, between what we know as Christians and what we know in other ways, between teaching of the Bible and the teachings of science? As a special case, how shall we deal with apparent conflicts between what the Bible initially seems to tell us about the origin and development of life, and what contemporary science seems to tell us about it? Taken at face value, the Bible seems to teach that God created the world relatively recently, that he created life by way of several separate acts of creation, that in another separate act of creation, he created an original human pair, Adam and Eve, and that these our original parents disobeyed God, thereby bringing ruinous calamity on themselves, their posterity and the rest of creation.

According to contemporary science, on the other hand, the universe is exceedingly old—some 15 or 16

billion years or so, give or take a billion or two. The earth is much younger, maybe 4½ billion years old, but still hardly a spring chicken. Primitive life arose on earth perhaps 3½ billion years ago, by virtue of processes that are completely natural if so far not well understood; and subsequent forms of life developed from these aboriginal forms by way of natural processes, the most popular candidates being perhaps random genetic mutation and natural selection.

Now we Reformed Christians are wholly in earnest about the Bible. We are people of the Word; *Sola Scriptura* is our cry; we take Scripture to be a special revelation from God Himself, demanding our absolute trust and allegiance. But we are equally enthusiastic about *reason*, a God-given power by virtue of which we have knowledge of ourselves, our world, our past, logic and mathematics, right and wrong, and God himself; reason is one of the chief features of the image of God in us. And if we are enthusiastic about reason, we must also be enthusiastic about contemporary natural science, which is a powerful and vastly impressive manifestation of reason. So

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