

Theology and the Natural Sciences

The Virtue of Faith in Theology, Natural Science and Philosophy

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There are various ways in which a comparison and contrast between theology, natural science, and philosophy can be made. It is instructive, for example, to raise the question of whether, and if so to what extent, they have a common object. Is there, in other words, any overlap with respect to their subject matter? The possibility of overlap raises the possibility of conflict. To the extent that any of the overlapping disciplines uses probable reasoning, there is a possibility that the conclusion that is most probable to the practitioners of a given discipline on the basis of evidence currently available to them will be inconsistent with the results of another discipline based on probable reasoning from a different evidence base. This is not, however, the only interesting basis for comparison and contrast. The contrast of reason and faith as method, or even as cognitive disposition is a common trope in discussions of science and religion. That contrast figures prominently in atheistic polemics.¹ It is probably related to the tendency to contrast the medieval “Age of Faith” with the early modern “Age of Reason.”² Suggestive of the connection, Louis L. Snyder, for example, explicitly calls “the age of reason” “the age of faith in science” (emphasis added) and says of this “great intellectual revolution”:³

Modern man, rejecting medieval theology as final authority, now sought to interpret the universe, the world, and himself in terms of reason and logical analysis.

These period labels are, however, at best misleading. Anyone who thinks that reason and logical analysis figured more prominently in modern than in medieval intellectual work would do well to compare the discussions of, say, faith in the Voltaire’s *Philosophical Dictionary* with that to be found in St. Thomas’ *Summa Theologiae*. Authors of potted intellectual history to the contrary notwithstanding, the study of logic was a major component of medieval intellectual life. It was a tool that every medieval theologian was required to study, and use. And in the early modern period, the value of faith was recognized by most of the founders of modern science. Robert Boyle, for example, left in his will £50 to establish a lectureship “for proving the Christian religion against notorious infidels.” (The lecture series has been continued to this day.) One can, to be sure, find many thinkers, particularly in the eighteenth century, who lack faith. Hume and Voltaire are obvious examples. What is harder to find are medievals who lack respect for reason. That lack of respect for reason is a feature not of the medieval thinkers, but of their Romantic successors. It is the thesis of this paper that any attempt to make a methodological contrast between science and theology on the basis of the role of reason and faith is misconceived and overstated. My project, however, is not to undertake the essentially historical task of defending the remarks of the previous paragraph. What I will do is rather to make a philosophical investigation. First, I will offer a definition of “faith”.

Then, I will say something about the role of faith in theology, natural science, and philosophy.

1. What is Faith?

The best way to begin a discussion of faith is to get clear about the definition of the term and the best way to begin the project of definition is to search for the genus. William Ladd Sessions begins his study *The Concept of Faith: A Philosophical Investigation*⁴ by distinguishing six “models” of faith — personal relationship, belief, attitude, confidence, devotion, and hope. These models, he says, “highlight distinct, coherent sets of fundamental features prominently exemplified in some group of conceptions of faith.”⁵ The purposes of this essay do not require that we find a concept so broad as to include “faith in democracy” and the like. In what follows, I will sketch what Sessions would call a particular conception of faith. Even within that conception, there is no need to focus on every dimension and implication of having faith. Since the topic of this paper is faith in various academic disciplines, what is needed is merely the epistemic component of faith, independent of how that is related to any other components (and independent of whether the epistemic component is focal or peripheral).

Consequently, I will begin this search for the genus of faith along the lines laid down in some epistemological writings of Aristotle (primarily, Book VI of the *Nicomachean Ethics*) and of St. Thomas Aquinas (primarily, the *Treatise on Faith* found in his *Summa Theologiae*). In the course of the investigation I will, however, develop and modify what they have to say.

Since having faith means believing that certain things are true, faith is, in the first instance, a habit or state of mind by which we have (or can have) truth. I will argue later that it is a good habit or, in other words, an intellectual virtue, a habit that makes human beings good with respect to their minds. But first we must determine what particular habit of mind it is and how it differs from other habits of mind. Aristotle distinguishes two basic “parts” of the human mind:⁶ “one by which we contemplate the kind of things whose originative causes are invariable, and one by which we contemplate variable things.”⁷ The former he calls the epistemic part; the latter the deliberative or calculative part. Aristotle goes on to distinguish three kinds of human activity which display our character as intellectual beings — knowing, making, and doing. Each of these activities is distinctively human; the ability to do each is therefore a human perfection. The resultant virtues he assigns to the two parts of the soul. Art (*techné*) and practical wisdom (*phronesis*) perfect the deliberative-calculative part. The epistemic part is perfected by a set of virtues which I will call, collectively, epistemic virtues. For simplicity, I will focus on two of these epistemic virtues — *nous* and *epistēmē*.⁸ Each of these virtues requires some comment. For each, we must identify a disposition (the virtue itself), an activity, and a product.

Aristotle defines *epistēmē* as “a habit (*hexis*) of demonstration (*apodeixis*);”⁹ demonstration being syllogistic deduction from premises that are true, first, immediate, prior to and better known than, and cause of the conclusion.¹⁰ The product of

demonstration can also be called episth μ h. Episth μ h, then, is not just knowledge in the colloquial sense of a true belief. Nor is it any justified true belief, for the justification has to be of a particular kind. It is rather a knowledge grounded in more basic truths. Anyone who paid attention in school, perhaps, knows (i.e., correctly believes) that the area of the square on the hypotenuse of a right triangle is equal to the combined area of the squares on the two other sides. But only the person who has studied Euclid's Elements (or the equivalent) knows it in Aristotle's sense.

Aristotle recognized that he had to give an account of the epistemic status of the premises of demonstrations. Some, of course, could themselves be the products of demonstration. But if all were, then anyone who knew anything would have to know an infinite number of things, which seemed unlikely. His alternative was that some propositions could be known not by demonstration, but immediately. "Immediately" here meant not "at first hearing" but rather "not on the basis of demonstration."

If this account is to work, Aristotle must give an account of a habit of mind by which, given sufficient experience of the world, we recognize the truth of some propositions. Aristotle believed that we could have such a habit. He called it nou ν , which is sometimes translated "intuition." Its operation he called induction (epagogh); its product, principles (arcai). The Postulates of Euclid, e.g., that [on a Euclidean plane] any line can be extended indefinitely in either direction, or his Common Notions, e.g., that when equals are added to equals the results are equal, would be examples.

Aristotle's account of epistemic virtues, as developed so far, can be summarized as follows:

Habit Operation (Act) nou ν (intuition) epagogh (induction) episth μ h (knowledge)
apodeixi ν (demonstration)

Product arcai (principles) episth μ h (knowledge)

This list of states or habits of mind is not complete. Indeed Aristotle recognizes this, for immediately after giving his list of five intellectual virtues¹¹ he adds, "we do not include judgment and opinion because in these we may be mistaken." St. Thomas, on this, as on so many other topics, presents a fundamentally Aristotelian account. But since, unlike Aristotle, he had to give an account of faith, he provides a slightly more elaborate account here. He distinguishes three states in which there is less evidence than is necessary to compel assent — doubt, suspicion, and opinion. That one might doubt the truth of some proposition one did not know to be false, or that one might hold as one's opinion a proposition that one did not know (in the strict sense) to be true, is easy to understand. But what is suspicion? Unfortunately, the term is somewhat Janus-faced in English. On the one hand, a traditional attribution of a work to a famous author may be called, by the revisionists, "suspect." On the other hand, the police call someone whom they think committed the crime "the suspect." It is the second facing, "suspicion" of truth, that we need here. The first facing is equivalent to doubt. Suspicion of truth, however, falls short of belief; a policeman who suspects the butler might not be ready to

say that, in his opinion, the butler did it. Suspicion, in the sense defined, has an important role to play in science, as can be seen in the following sketch of a line of physiological research pursued by Ernst Heinrich Weber:¹²

Weber determined that the just noticeable difference (...jnd) for weight discrimination — that is, the minimum amount of difference between two weights necessary to tell them apart — was always an amount equal to 1/30th of the heavier of the weights being compared. Weber observed similar regularities for other kinds of sensory discriminations — though the specific fraction for the jnd differed for each sense. In comparing the length of lines ... the jnd was always about 1/100th. ... For musical pitches, the jnd seemed to be about 1/161th of the vibrations per second. Weber suspected, though he did not prove, that a constant factor could be determined for all the other senses as well. [Emphasis added.]

“Suspicion,” then, is the state that a scientist has with respect to working hypotheses. All three of these states are contrasted with scientia and intellectus (St. Thomas’ names for Aristotle’s nouV and episthmh).¹³ Both Aristotle and St. Thomas argue that opinion, by which they mean beliefs that, however much evidence there may be for them, are not the product of intuition or demonstration, is not an intellectual virtue, since it does not preclude the possibility of error.

Aristotle restricts intuition and knowledge to necessary truths and to truths about universals (kinds of things, in contrast to particular individuals). In doing so, however, he leaves at the margins of his taxonomy many important aspects of the intellectual life. Aristotle believed that episthmh was possible in mathematics, metaphysics and the philosophy of nature. Many modern authors, even some generally sympathetic to Aristotle,¹⁴ are less sanguine. It is arguable, but a minority position, that he thought it was possible in ethics.¹⁵ He surely did not think it was possible in history, since all historical truths are contingent. His criteria require us to make the same judgment about most of modern natural science, since the best results of modern science — evolutionary theory, Mendelian genetics, the atomic theory of matter, etc. — are accepted because they are the best explanation of the phenomena so far observed, not because their principles are self-evident.¹⁶

We need, therefore, a richer account of the human intellectual life, one that will be more explicit about the knowledge of particulars as well as about contingent truths. There are, I will suggest, two sets of analogs of nouV and episthmh.

The first set of analogs focuses on the use of our natural powers in ways that fall short of nouV and episthmh. Some aspects of our intellectual life, including all of modern science, depend upon our having the ability to make observations and to carry out probable reasoning (in particular, generalization and argument to the best explanation). Successful observation and probable reasoning require skill. One has to recognize one’s good observations and set aside one’s bad ones. Similarly, there is a skill in distinguishing better from worse explanations. Given the multiplicity of desiderata in a good theory — accuracy, consistency, coherence, simplicity, elegance, scope, fertility¹⁷

— one must develop an eye for when a theory's elegance or scope is great enough to allow for some inaccuracy. Insofar as having these skills allows us to form well-grounded opinions about matters with respect to which, for the time being or even in principle, episthmh is impossible, they improve our intellect. They are, therefore, virtues.

The second set of analogs is, inchoately, noticed by Aristotle himself, who writes:¹⁸

We ought to attend to the undemonstrated sayings and opinions of experienced and older people or of people of practical wisdom not less than to demonstrations; for, because experience has given them an eye, they see aright.

We cannot know everything we need to know on the basis of our own intellectual work. Sometimes we may lack the intuitional or observational basis which underlies the knowability of certain truths. Are there really planets beyond Saturn? Those who do not have access to large telescopes must take it on faith that there are, at least until they can check it out for themselves. Had John Flamsteed, Tobias Mayer, Pierre Charles Le Mounier and others really seen Uranus unawares in the years before William Herschel's 1781 discovery? This was an important question because, if their observations were accurate, Uranus was not following the course prescribed for it by Newton's Laws. Here, of course, there's no checking it out. Although Alexis Bouvard¹⁹ attempted to dismiss the pre-discovery observations as inaccurate, most astronomers accepted the observations and worried about the discrepancy. Their faith in the earlier observers led to the discovery of Neptune. At other times, we may lack the mathematical skill necessary to work out a conclusion for ourselves. Did Uranus' position in the early nineteenth century really deviate from where Newton's theory plus the pre-discovery observations put it? Surely most historians of science trust the work of the nineteenth century calculators without doing the calculations for themselves. They take it on faith that this is so.

These two limitations force recognition of yet more epistemic virtues. Analogous to nouV and observation there is trust in others, or faith. Analogous to episthmh and probable reasoning, is skill in the interpretation of what others said.

Having faith is a peculiar intellectual virtue in that it has two objects — the personal object,²⁰ in whom the subject has faith, and the propositional object, which the subject believes as a result of that faith.

The virtue of faith bears an interesting similarity to the moral virtues. Aristotle defines the moral virtues in two ways. One definition contrasts them with intellectual virtues — moral virtues are habits which perfect the will. Another contrasts them with moral vices — moral virtues are habits of choosing the mean.²¹ This latter definition does not seem to apply to nouV or episthmh. In their exercise, no choice is involved. St. Thomas, however, recognizes that faith is a matter of will as well as reason.²² The same can be said about the virtue that makes probable reasoning possible — one must decide that the proper standard of evidence is met, and one must decide how rigorous a standard is relevant to the matter at hand.²³ For that reason, Aristotle's second definition applies to faith (and the virtue connected to probable reasoning) — faith is a mean between the extremes of

gullibility and excessive skepticism. It is a virtue when it is a habit of making the right choice with respect to belief.

Aristotle's conception of faith is a natural faith of the kind that one human being might have in another. St. Augustine recognizes a qualitative similarity between natural faith and faith in God in *The City of God*.²⁴

If we attain the knowledge of present objects by the testimony of our own senses, whether internal or external, then, regarding objects remote from our own senses, we need others to bring their testimony, since we cannot know them by our own, and we credit the persons to whom the objects have been or are sensibly present. Accordingly, as in the case of visible objects which we have not seen we trust those who have (and likewise with all sensible objects), so in the case of things which are perceived by the mind and spirit, i.e., which are remote from our interior sense, it behooves us to trust those who have seen them set in that incorporeal light, or abidingly contemplate them.

St. Thomas' discussion of faith, by contrast, is focused almost exclusively on the theological virtue of faith in God, although he does at one point mention "faith commonly so called, which has no reference to the beatitude we hope for."²⁵ We have, nevertheless, reached, by a different path, the definition of St. Paul — "faith is the evidence of things not seen"²⁶ — and that of St. Thomas — "faith is a habit of the mind ... making the intellect assent to what is not apparent."²⁷

Having suggested, in these last paragraphs, that faith is not only a habit of mind, but one that will get us to some truths that would otherwise be inaccessible to us, I have gone some way to showing that faith is a good habit, a virtue. This is a topic to which I will return in the following sections, where I will discuss the importance of faith in theology and in the natural sciences.

2. Faith in Theology

Theology can be defined in either of two ways — as a discipline and as a subject matter. As a subject matter, it is exactly what the etymology of the term suggests — an account of God. That account might be developed solely on the basis of natural reason (hence, natural or philosophical theology), or on the basis of revelation. The existence of revelation and its distinctness from all natural methods of acquiring knowledge makes possible a second definition of theology — the science (i.e., organized body of knowledge) based upon revealed truth.²⁸ St. Anselm put the point slightly differently: theology is *fides quaerens intellectum* — faith seeking understanding. It is this second sense in which the term "theology" will be used in this paper.

The fact that theology, unavoidably and by its very nature, begins with revelation — truths accepted by faith — makes it different from all other sciences.

Revelation, according to St. Thomas, is useful for two reasons:²⁹ First, there are some truths necessary to our salvation which are beyond the reach of unaided human reason.

Second, even those truths necessary to salvation which are not in principle beyond the reach of human reason are often difficult to attain — “knowable only to a few, and that after long study.” Making salvation available to all requires that these truths be revealed.

The fact that theology is grounded in revelation does not, of course, mean that there is nothing for theologians to do other than to repeat those truths. Since not all revelation is propositional in character, they must use their interpretive skills to draw propositions from the stories, poems, and myths of Scripture as needed in the light of new controversies. Revealed propositions provide the foundation for a variety of kinds of work. Theologians can seek proofs for those revealed truths that are also knowable by reason. They can seek probable arguments for any revealed truth. They can answer objections to revealed truths. They can draw conclusions from the revealed principles, either alone or in combination with propositions known by reason alone. And they can attempt, in various ways, to draw the various propositions known by revelation into a systematic structure.³⁰ John Henry Cardinal Newman made this point as follows:³¹

Reason ... is subservient to faith, as handling, examining, explaining, recording, cataloguing, defending the truths which faith, not reason, has gained for us, as providing an intellectual expression of supernatural facts, eliciting what is implicit, comparing, measuring, connecting each with each, and forming one and all into a theological system.

Revealed truth, according to St. Thomas provides the highest possible degree of certainty.³²

A man of little science is more certain about what he hears on the authority of an expert in science, than about what is apparent to him according to his own reason. And much more is a man certain about what he hears from God, Who cannot be deceived, than about what he sees with his own reason, which can be mistaken.

Such certainty does not, however, extend to all aspects of theological work.

3. Faith in Natural Science

Natural science, like philosophy, mathematics, history and all other disciplines except theology, does not begin with revealed truths. Does faith play any role in the doing of natural science?

Some fundamentalists, particularly in the heat of their battle with scientists over evolution, have insisted that it does. Richard B. Bliss, for example, once wrote: “For the past 100 years, Darwin’s ideas have become a not-to-be-challenged by word of science.”³³ This theme has been picked up by others. In his introduction to a modern edition of Darwin’s *Origin of Species*, L. Harrison Matthews states:³⁴

The fact of evolution is the backbone of biology, and biology is thus in the peculiar position of being a science founded on an unproved theory — is it then a science or a faith? Belief in the theory of evolution is thus exactly parallel to belief in creation — both

are concepts which believers know to be true but neither, up to the present time, has been capable of proof.

Both of these comments are, however, mistaken. Although Darwin's thesis that species originated by descent with modification from one or a few first kinds of organisms quickly won wide acceptance among scientists, his thesis that modification was a result of natural selection was not accepted until the development of the "new synthesis" (of Darwinism and Mendelism) in the 1930s.

The two "beliefs" are by no means parallel. Biologists accept Darwin's theory of evolution for the same reason they accept any other explanation — because it is the best explanation of a wide array of observed facts. Is that proof? That depends, of course, on what one means by "proof". It is not the kind of proof one finds in mathematics, viz., deduction from principles. Evolutionary biology, then, like most of the rest of modern science, does not meet the high standards set by Aristotle. But in the more modest sense of "proof" (sc., testing), it is provable — it withstands the test of new discoveries.

Evolutionary theory is accepted by biologists on the basis of ordinary evidence, not on the basis of faith. Would those who are looking for faith in scientific work have done better had they looked elsewhere?

The kind of thing that authors like Matthews seem to be looking for — propositions that are accepted without evidence — can be found in science. One place where such propositional acceptance may be found is in the commitment some scientists show to the metaphysical principles that underlie certain research programs. William James once wrote, but not with particular reference to scientific research:³⁵

Not a victory is gained, not a deed of faithfulness or courage is done, except upon a maybe; not a service, not a sally of generosity, not a scientific exploration or experiment or textbook, that may not be a mistake. ... And often enough our faith beforehand in an uncertified result is the only thing that makes the result come true. ... [In an enormous class of cases], the part of wisdom as well as of courage is to believe what is in the line of your needs, for only by such belief is the need fulfilled.

May a scientist do that? Emil Du Bois-Reymond, one of the founders of the mechanistic research program in physiology, wrote in a letter:³⁶

Brücke and I pledged a solemn oath to put in power this truth: No other forces than the common physical-chemical ones are active within the organism. In those cases which cannot at the time be explained by these forces one has either to find the specific way or form of their action by means of the physical mathematical method, or to assume new forces equal in dignity to the chemical physical forces inherent in matter, reducible to the force of attraction and repulsion.

Commenting on this oath, psychologist and historian Raymond Fancher says, "Mechanism became an article of faith among [Du Bois-Reymond and his colleagues]."³⁷

The taking of this oath does not seem to have interfered with the doing of good science. Du Bois-Reymond did excellent work on animal electricity. The approach led Hermann Helmholtz to such important results as the conservation of energy and a measurement of the speed of nerve impulses. The metaphysical principles codified in the above-mentioned oath are by no means necessary to the discoveries Helmholtz and other mechanists made. No one who accepts their conclusions need accept their metaphysical opinions, since these opinions did not function as premises in their arguments. But as a psychological matter, those opinions may have encouraged them to undertake lines of research which their methodologically mechanist but metaphysically vitalist teacher Johannes Müller had set aside.

In other scientific work, unsecured opinions do serve as premises. Consider the argument for the claim that the universe is expanding. That argument begins with an empirical law based on observational work done by V. M. Slipher, Edwin Hubble and Milton Humason in 1912–1929:

1) Hubble's Law:³⁸ Galaxies outside the local group recede from the earth at a speed proportional to their distance.

Obviously

2) If the universe is homogeneous and isotropic [i.e., is everywhere and in every direction the same], then every observer in the universe finds other galaxies moving away from them at a speed proportionate to their distance from the observer.

It can be shown that

3) If every observer in the universe finds other galaxies moving away from them at a speed proportionate to their distance from the observer, then the universe is expanding.

These premises will yield the now-accepted cosmological conclusion — that the universe is, in fact, expanding — only if one adds as a premise the antecedent of P2:

4) The Cosmological Principle: The universe is homogeneous and isotropic.

But what evidence can be offered for that premise? Surely not observational evidence, for no observers we know have ever been anyplace outside the solar system. University of Massachusetts physicist Edward R. Harrison says, “we must postulate the cosmological principle as an article of faith. ...”³⁹

Those who accept evolutionary cosmology as good science have two options at this point. They can either marshal some kind of argument for the cosmological principle or offer an account of why some sciences may legitimately proceed on the basis of unsecured premises. It does not matter for our purposes which of these options they choose.

What is important for our purposes is rather the recognition that the concept of faith of those who see this as a matter of faith is an impoverished one. What the argument for the expansion of the universe includes (and what the arguments for Darwinism are said to include) are premises which are believed to be true even though there seems to be no evidence for them. Accepting premises for which no evidence can be given, whether legitimate or not, is not faith. There is no personal object. When St. Paul commends the faith of Biblical heroes from Abel to the prophets in Hebrews 11, he is not commending them for believing something arbitrarily. The faith he commends is their faith in God. Faith is not belief for no reason whatever; it is belief on the basis of authority. Medieval authors sometimes characterized this distinction as believing on the basis of what one sees (science) and believing on the basis of what one hears (faith).

We can set aside then as irrelevant to the subject under discussion the kind of confidence that some scientists show in their hunches, working hypotheses, or research programs. The myth that scientists are Cliffordian rigorists, carefully apportioning their confidence in the truth of a proposition to their evidence for it was exploded by the work of Thomas Kuhn, Imre Lakatos and others. As the title of one of his early articles (“The Function of Dogma in Scientific Research”⁴⁰) suggests, Kuhn thinks that such confidence is not a mark against the scientific enterprise. None of these are cases in which a scientist’s confidence is (at least not per se) grounded in any confidence in someone else’s judgment. They are not, therefore, matters of faith.

Faith does, nevertheless, play a role in scientific work. It is obvious that an introductory student must take much on faith. Consider the electron micrographs which illustrate chapters on cell biology in all the standard textbooks. That these granules are starch molecules, or that those microfibrils are bundles of cellulose strands, the student must take on faith.

This is true of the specialist as well. First, a scientist exhibits trust in his reliance on the instruments he uses. How well does the typical biologist understand the physical principles of electron microscopy?

Second, scientists trust their fellow scientists to do good work and honest reporting. This trust is not, of course, unlimited. Scientists live by Ronald Reagan’s favorite Russian proverb — “Trust, but verify.” They attempt to replicate the work of others. But not every scientist undertakes the replication. Some do; the rest trust the replicators. Sometimes replication is too costly to be practical.

Worse, sometimes replication is impossible in principle. That is the case in some parts of observational, but non-experimental, sciences, such as astronomy. Here is Sir Edmund Halley’s case for the periodic nature of cometary appearances:⁴¹

There are many things which make me believe that the Comet which Apian observ’d in the Year 1531, was the same with that which Kepler and Longomontanus more accurately describ’d in the Year 1607; and which I myself have seen return, and observ’d in the Year 1682. All of the Elements [of the orbit] agree, and nothing seems to contradict

this my opinion, besides the Inequality of the Periodic revolutions. Which Inequality is not so great neither, as that it may not be owing to Physical Causes. ... And I am the more confirmed in my opinion of its being the same; for that in the Year 1456, in the Summer time, a Comet was seen passing Retrograde between the Earth and the Sun, much after the same manner: Which tho' nobody made observations upon it, yet from its Period and the manner of its Transit, I cannot think different from those I have just now mention'd. And since looking over the Histories of Comets I find, at an equal interval of Time, a Comet to have been seen about Easter in the Year 1305, which is another double Period of 151 Years before the former.

These observations, crucial as they were to the argument, obviously could not be checked by Halley or his contemporaries. His claim gained more support, to be sure, when the comet reappeared in 1758–9, as Halley had predicted. But the periodicity of comets was accepted before that confirmation. The reports might be dismissed if they were inconsistent with other available data.⁴² Halley does not worry about the absence of a report from about 1381. Whether this is a problem or not depends on the thoroughness of fourteenth century astronomical reports.

Although scientists must have faith in their colleagues if science is to advance, this faith need not be unlimited. It extends more readily to acceptance of raw scientific data than to acceptance of the conclusions a scientist draws from those data. D. C. Miller spent much of the 1920s, when he was president of the American Physical Society, attempting to measure the aether wind caused by motion of the earth through the aether.⁴³ (It was the failure of Michelson and Morley to measure this effect that provided strong logical, if not historical, support for Einstein's Special Theory of Relativity.) Almost no one accepted Miller's claims to have measured the aether wind, though most did recognize their responsibility to explain why he was getting the results he got. No one thought he was making them up. Incompetence and fraud⁴⁴ do, nevertheless, occur in science and dismissing the evidence of others is not ruled out in principle.

There are, to be sure, differences between the faith scientists have in one another's work and the theologian's faith in God. First, the faith of the scientist in other researchers is provisional and limited by plausibility constraints. Scientists were skeptical of the claims about cold fusion. And, in the late nineteenth century, they were skeptical of reports of sea-serpent sightings, even from experienced sea captains and scientists. The faith of the theologian in God, by contrast, is unlimited.

Second, although any given scientist must rely, for much of what he believes, on faith in other scientists, the scientific community, as a whole, does not have to have faith in any non-human or supernatural beings. Science is, that is to say, a purely human enterprise.

But while both of these differences are real, neither is relevant to the question of what habits of mind count as intellectual virtues for scientist or theologian. Faith must always be proportioned to the one in whom the faith is placed. Experienced observers should be trusted further than amateurs. Was a golden eagle really observed in a Minnesota state park? Golden eagles are relatively uncommon in Minnesota and immature bald eagles are

easy to mistake for golden eagles. We will accept the report of an expert bird watcher much more readily than that of picnicker with a copy of Peterson's on the shelf at home. Christian theologians believe that there is someone (namely, God) who is omniscient and honest and therefore trustworthy even in the matter of otherwise incredible things. They believe that we will rise from the dead on the last day, not because there is any direct evidence for it, but because there is evidence that God exists and that he promised us that we would do so. The difference between one who believes in the general resurrection and one who does not need not be a difference in any habit of mind (e.g., presence or lack of faith). It is rather a difference in factual beliefs — whether God exists and whether he made any such promise.

One does not need merely provisional faith in all persons (including God) to do science. Nor does one need to believe that a completely human enterprise is the only intellectual enterprise worth pursuing. There is no basis for any claims that the habits of mind required for doing theology (or being a faithful Christian) are in tension with those required for doing science. The contrast between the man of faith and the man of science is a false contrast.

4. Faith in Philosophy

Philosophy, like theology, can be defined in different ways. In accordance with its etymology, it might be defined as a "love of wisdom." Aristotle defined wisdom as "nouV combined with episthmh of the highest objects."⁴⁵ Consequently, when St. Justin Martyr's long search for wisdom culminated in his conversion to Christianity, he did not think that his discovery that the access to the highest truths depended on revelation (i.e., could not be had by natural means alone) made him any less a philosopher.

In contrast with Justin's etymological definition stands the definition of St. Thomas Aquinas. He opens the *Summa Theologiae* by asking "whether, besides philosophy, any further doctrine is required?"⁴⁶ By philosophy he means all (and only) that knowledge which is built up by human reason. The importance of St. Thomas to subsequent Catholic thought has led to the widespread acceptance of this definition by many Christian, as well as secular, philosophers, though the term has subsequently been narrowed to exclude the natural and social sciences.

Relying on the Thomistic definition, appropriately contracted, then, philosophy is like natural science and unlike theology. There are two causes (neither having anything to do with a residual Justinism) of the popular failure to recognize this fact.

The first is the existence of natural theology — the attempt to prove the existence of God by reason alone (i.e., philosophically). It is a doctrine of the Catholic faith (taught by the First Vatican Council) that God "can be known with certainty, by the natural light of reason, from created things."⁴⁷ Many people, both Catholic and non-Catholic, have been interested in whether and how this might be done.

The second cause is recent trends in modern theology, in particular the loss of faith and the decline in standards of logical rigor. There are certain topics, e.g., transubstantiation or the Incarnation, which only arise among those who have faith and can only be discussed in detail by those who have had a good philosophical formation. The decline in discussion of these questions among theologians has led to an increase in discussion of them by Christian philosophers. Students with an interest in and aptitude for discussion of these questions are drawn to the philosophy departments where they are being discussed, reinforcing the tendency of these questions to be discussed in philosophical circles.⁴⁸ This work may be poaching, but it should be judged on its merits. It should also, however, be clearly distinguished from Thomistically-defined philosophy.

If supernatural faith does not play any role in securing the premises of philosophical arguments, does natural faith nevertheless play at least some role in philosophy, as it does in natural science?

On the whole, it does not. There are, to be sure, certain areas of philosophy where one philosopher must depend on the work of others. The salient example is in the history of philosophy.

What exactly did Descartes mean in some of the less clear passages of his work? On April 16, 1648, Franz Burman, a 20-year-old student in Leyden, had a chance to dine with Descartes and to put to him a whole series of questions about those difficult passages. A few days later, Burman wrote down Descartes' answers to his questions. Since its rediscovery at the end of the nineteenth century, *The Conversation with Burman* has been considered invaluable by Descartes scholars. But without faith in Burman's honesty, the document is of no value.

Similarly, in an on-going research project on the thought of Bertrand Russell, Ned Garvin is interested in Russell's anticipation (in the 1930s) of a theory that is now called naturalized epistemology. This view was later abandoned by Russell and lay dormant until the appearance of W. V. O. Quine's 1969 article "Epistemology Naturalized."⁴⁹ Did Quine, who was at Harvard when Russell visited there during Russell's interest in this approach, get these ideas from Russell? Quine, in recent correspondence with Garvin, does not recall that he did, but diaries of Carnap, written at the time, state that Quine and Russell engaged in extensive discussions on epistemology. Quine may well not remember discussions that he had thirty years before. Garvin's attempt to establish a link between Russell's thought in the 1930s and more recent work depends on trusting (or having faith in) Carnap. There is nothing extraordinary in his doing so.

This faith in one's sources is by no means uncritical. Both Plato and Xenophon were personal friends of Socrates. But even setting aside some dialogues as not aimed at presenting the historical Socrates, the differences between the portraits drawn by the two authors are sufficient to require caution in relying too heavily on either author. Plato is perhaps too original a thinker to be a reliable biographer; Xenophon, perhaps, too literal-minded to appreciate Socrates' originality. Limited faith is appropriate for authors with limitations (which means for all human authors). Nevertheless, this role for faith in

philosophical work is fairly strictly circumscribed. In non-historical philosophical work reliance on the work of others is rather less readily accepted. One is, in general, expected to lay out one's own arguments. Citations there are, to be sure, but their proper role is to give credit, not to establish truth. Two reasons might be suggested as to why this is true. The first is that philosophy is a discipline in which such consensus as there is is diachronic, not synchronic. Questions are seldom closed; most propositions need to be argued for. The second is that philosophy differs from natural science in that the latter is based on special experience; the former on experience that is common to us all.⁵⁰

Darwin's theory of evolution depends on extensive and specialized experience with a wide variety of organisms. Some of the experiences were his own — he bred pigeons to get a deeper understanding of artificial selection; he traveled around the world in the *Beagle* and made careful observations every place he could. But a general theory needs as wide an evidential base as possible. For much of his evidence he had to rely on the investigations of others.

Purely philosophical projects do not, in general, rely on such special experience. Philosophical investigations into, say, the relation between language and the world build on the general phenomena of human language. To the extent that it begins to be relevant, say, how the Hopi say things, one is no longer doing philosophy of language, one is doing linguistics. To the extent that philosophy relies on evidence that is available to us all, there is no need to rely on the authority of others.

5. Conclusion

The often-heard claim that the scientific and the theological approach to knowledge are sharply different creates serious misunderstanding. While it is true that theology is grounded in revelation and science is not, as a practical matter the practitioners of each discipline require the intellectual virtue of faith. The difference in their reliance on and confidence in faith does not show any difference in the habits of mind appropriate to each discipline. It is a result merely of the fact that the source which provides help to the theologian — God — is more reliable than any extrinsic aid available to the scientist.

Notes:

1. See, for example, Tad S. Clements, *Science vs. Religion* (Prometheus, 1990).
2. This term is, to be sure, variously applied. Sometimes it means the period 1650–1750 (Louis L. Snyder, *The Age of Reason* (Van Nostrand, 1955)); sometimes the Enlightenment (Frank E. Manuel, *The Age of Reason* (Cornell, 1951)); and other times, the early modern period up to the Enlightenment (Stuart Hampshire, ed., *The Age of Reason* (Mentor, 1956)).
3. *Op. cit.*, p. 7.
4. Cornell, 1994.

5. Op. cit., p. 10.

6. Although this is not an Aristotelian term, using the word “mind” as a name for the rational parts of the soul makes Aristotle’s points sound more natural to non-Aristotelian ears.

7. VI.1 1139a8.

8. Both of these terms defy easy translation. This is perhaps not so much because ordinary Greek had concepts we lack as because Aristotle used these words in a technical sense which no English term would naturally suggest. *nouV* is usually translated “intuition,” but is sometimes rendered by “intelligence” or “intellect.” *Episthmh* is sometimes translated “[scientific] knowledge” or “science.” Again, all of these English words have connotations that create the risk of serious misunderstanding.

9. VI.3; 1139b32.

10. Posterior Analytics 1; 71b–72a.

11. VI.3; 1139b18; I have omitted from his list the virtue of philosophical wisdom (*sophia*).

12. Raymond E. Fancher, *Pioneers of Psychology*, 2d ed. (Norton, 1990), p. 136.

13. 1a2æ, 57.2; 2a2æ, 4.1.

14. See, for example, Mortimer Adler, *The Four Dimensions of Philosophy* (Macmillan, 1993), pp. 235–237.

15. See Michael Winter, “Can There Be an Aristotelian Science of Aristotle’s Ethics?” Ph.D. Dissertation, University of Minnesota, 1996.

16. For the hope that it will someday be otherwise, see Charles Misner, et al., *Gravitation* (Freeman, 1973), p. 1208: “Some principle uniquely right and uniquely simple must, when one knows it, be also so compelling that it is clear the universe in built, and must be built, in such and such a way, and that it could not possibly be otherwise.”

17. See Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago, 1962).

18. VI.11; 1143b11–14.

19. *Tables astronomique* (Bachelier & Hazard, 1821).

20. The term “personal” is strictly speaking, too narrow. One might also have faith in an institution, e.g., the Church.

21. II.5–6. For example, the virtue of courage is a mean between the extremes of rashness and cowardice.

22. 2a2æ, 2.1 ad 3: “The intellect of the believer is determined to one object, not by the reason, but by the will.” See also 2.2 and 4.2.

23. Note that that standard varies with what is at issue. In American courts, for example, a criminal conviction requires proof beyond a reasonable doubt; a decision in a civil case requires only a preponderance of evidence.

24. 11.3.

25. 2a2æ, 4.1.

26. Hebrews 11:1.

27. 2a2æ, 4.1. The omitted phrase “whereby eternal life is begun in us” applies only to the theological virtue of faith, which is St Thomas’ nearly exclusive interest. In addition, this focuses on the virtue insofar as it relates to the will, not the intellect.

28. 1a 1.1–8.

29. 1a 1.1.

30. Examples of these five types of work would include: (1) Proofs for the existence of God; (2) Defenses of the general resurrection; (3) Answers to the problem of evil or to objections against the coherence of the Incarnation; (4) Arguments for the existence of the Limbo of the Children or for middle knowledge; and (5) Thomism or Scotism.

31. Essay on the Development of Christian Doctrine 2.7.3. 32. 2a2æ, 4.8. See also 1a 1.8 ad 2.

33. “A Two-Model Approach to Origins: A Curriculum Imperative,” p. 195. In J. Peter Zetterberg, ed., *Evolution vs. Creation: The Public Education Controversy* (Oryx, 1983). The italics are in the original.

34. “Introduction,” to *The Origin of Species* (Dent, 1971), p. xi.

35. “Is Life Worth Living?”

36. Letter to Eduard Hallman, dated May 1842. Published in Estelle Du Bois-Reymond, ed. *Jugendbriefe von Emil Du Bois-Reymond an Eduard Hallman* (Reimer, 1918), p. 108.

37. P. 112.

38. The velocity-distance relationship implicit in Slypher’s and Hubble’s data was first

noticed (and published, but in a physics journal) by theoretician Howard Robertson.

39. *Cosmology: The Science of the Universe* (Cambridge, 1981), p. 91. To be precise, he does offer an alternative — the cosmological principle can be derived from the observed isotropy of the universe relative to the earth together with what he calls “The Location Principle” — “It is unlikely that we [sc. the earth] have a special place in the universe” (p 70). Since there is no more evidence for the Location Principle than there is for the Cosmological Principle, this alternative (whatever other advantages it may have) does not solve the problem at hand.

40. A. C. Crombie, ed., *Scientific Change* (Basic Books, 1963), pp. 347–369.

41. From his “A Synopsis of the Astronomy of Comets” (1705), reprinted in Harlow Shapley, *Source Book in Astronomy* (McGraw-Hill, 1929), pp. 94–96.

42. In fact, they were reinforced since the comets were conspicuous enough to have been reported by multiple observers. They received additional confirmation (for European scientists) when access was gained to Oriental observational reports.

43. See Jonathan Powers, *Philosophy & the New Physics* (Methuen, 1982), pp. 83–85.

44. For a brief account, see Alexander Kohn, *False Prophets* (Blackwell, 1986). For a detailed account of accusations of fraud against a prominent scientist, see Judy Sarasohn, *Science on Trial: The Whistleblower, the Accused, and the Nobel Laureate* (St Martin’s, 1993).

45. VI.7 1141a19–20.

46. 1a, 1.1.

47. Dz 1806.

48. For evidence of this trend, see the journal *Faith & Philosophy* or presentation topics at meetings of the Society of Christian Philosophers. For particular examples, see the work of philosophers Frederick Suppe and Thomas Sullivan on transubstantiation or Thomas Morris on the Incarnation.

49. In *Ontological Relativity & Other Essays* (Columbia, 1969).

50. See Mortimer Adler, *The Conditions of Philosophy* (Athenæum, 1965) and *The Four Dimensions of Philosophy*, chapter 2. That citation, of course, gives credit only. An abbreviation of his argument for the second point follows.