

Paper Title: What is a Theological Explanation?

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Abstract:

Recent work in the philosophy of science suggests that critical realism is controverted in its attempts to reconcile mutually opposed priorities in epistemology. In developing Popper's falsificationism, critical realists have affirmed both the objective logic of inference and the creative, socially contingent, subjective nature of human understanding. But, can this be done without stretching the meaning of critical realism to breaking point? What about theological explanations? Can they be depicted in critical realist terms? Is there a theological equivalent to scientific critical realism?

In this paper, I show, through attention to the contributions of Ernan McMullin (scientific realism), Wentzel van Huyssteen (postfoundationalism) and Bernard Lonergan (theological functional specialties), that theological explanations can be construed analogously to scientific explanations. The key difference in theology lies in terms of the ultimacy of meaning and the value predicated of existence.

In his position of scientific realism, McMullin has developed a theory of scientific explanation that he terms retrodution. This is a realist, probabilistic and historical theory of science. Where retrodution pertains to the science-theology dialogue is by correcting the popular approaches to knowledge in the writings of Thomas Kuhn and Imre Lakatos. Kuhn and Lakatos have been widely interpreted by theologians for their holist rationality, widely regarded as applicable to theological explanation. Sympathetic theological interpretations of Lakatos, for instance, have focused on the dialectic between core doctrines and auxiliary hypotheses. But, these interpretations generally provide for merely a heuristic portrait of theology, which is inadequate. On its own, a heuristic only follows the epistemological structure of questions and answers, it does not attempt to judge the worth of the structure of the explanations given. To go from a heuristic to an explanatory perspective, I argue that elements from McMullin's retrodution theory such as: a) theory assessment criteria, b) insight and c) truth as correspondence can legitimately be used to measure the effectiveness of theological explanations. I cite the anthropic principle as an example to suggest what is and what is not explanatory in science and theology.

I end the paper with a few reflections on how my interpretation of a theological explanation, in borrowing from McMullin, may be similar to that of Wentzel van Huyssteen, who has developed a postfoundationalist theory of theological explanation that claims rationality is 'transversal.' This notion of theological explanation may also be similar to the way that Bernard Lonergan defined systematics in his scientifically inspired theological method of functional specialties. For Lonergan's conception of theology, as

McMullin's reading of science anticipates, the twin priorities of discovery and verification are wedded to human rationality and the object of religious knowledge. Here, as critical realists tried to suggest earlier, the problem of subject/object opposition is mitigated.

Biography

Paul Allen is Assistant Professor in Theology at Concordia University, a public university in Montreal, Quebec, Canada. He received his Ph.D. from l'Université Saint-Paul in the University of Ottawa in Ottawa. His publications include two books in progress, including *Via Media: Ernan McMullin and Critical Realism in the Science-Theology Dialogue* (forthcoming). He is co-author, with Peter M.J. Hess, of the forthcoming volume *Catholicism and the Sciences*, in the Greenwood Religion and Science series. He has chapters / articles in a number of collected works, journals such as *Théologiques* and in the *Encyclopedia of Science and Religion*. He teaches in the area of systematic theology, inter-religious dialogue, science and religion and faith and culture. He lives in Montreal with his spouse and two children.

Paper:

What is a Theological Explanation?

Historically, Christian theology has held that it offers explanations that purport to be universal truth claims about the nature of the world, or at least some identifiable part of it. Pluralism, inter-religious encounters and dialogue certainly challenge this self-understanding, since there is a common sense way in which the Principle of the Excluded Middle is traditionally thought to bear on how God works in the world. Is Jesus God's only son, is Mohammad his true prophet, or is divinity manifest in many avatars? Many scholars and religious leaders who are more closely involved in the encounter between religions have sought higher level explanations about the nature of God and God's relations with the world. Such general accounts are typically designed so that specific traditional doctrines are placed as partly truthful, and therefore possessing limited explanatory value.

Science places similar constraints on theology's ability to communicate explanations. According to scientific materialists, religion represents subjective attitudes, identified as categories of psychological meaning, and these can be described, or 'explained away', but religion does not refer to anything in an explanatory way. Theologians and religious scholars certainly have internalized the view that religion does not require an 'objective' reference in order for religion to be meaningful. Realism then, is widely understood to be a *passé* doctrine in theology and religious studies.

There is additional support for this dismissal of explanation in theology. It comes from a critique of the realist doctrine in science. The scientific challenge to theology in the form of materialism has been turned on its head by the treatment accorded science by philosophers of science, especially Thomas Kuhn. This postmodern or historicist philosophy of science downplays or eliminates altogether the role of scientific explanation. It limits the extent to which science effectively communicates through explanations. As such, it undercuts the positivist and Popperian (falsificationist) philosophies of science that were epistemological allies for many scientific materialists.

In this paper, I want to draw on the debates between realists and anti-realists in the philosophy of science by way of rediscovering how realism and the notion of explanation are tenable aspects of scientific endeavour, and also theology. Thus, I want to suggest why scientific explanation, considered in a realist vein, justifies theological explanations. In short, on a modified realist view, both science and religion purport to explain the existence of unobservable entities. The parallels between science and theology are thus more significant epistemologically than might appear at first. I will reach this conclusion by referring to three areas of philosophical and theological work. After a preface dealing with current science-religion controversy, I will turn, first of all, to the work of philosopher of science Ernan McMullin. From McMullin's work, we have a way of diagnosing and responding to the enormously successful contribution of Thomas Kuhn and the historicist school. Second and more briefly, I will cite the portrait of human rationality that is provided by Wentzel van Huyssteen, a position that he calls 'postfoundationalism.' Instead of the more popular 'non-foundationalist' view, van

Huyssteen's post-foundationalism accounts for the possibility of objective reference in science and the other disciplines. Third, and more briefly still, I will point out the somewhat neglected outline of theological method that is advocated by Bernard Lonergan in his important book *Method in Theology*. In *Method*, Lonergan takes as his model the structure of scientific disciplines and adapts that structure through attention to how the human mind understands, the cognitive processes that are employed in both science and theology. While Lonergan presupposes the validity of religious experience and the objective, historical reality that such experience presumes, this paper cannot explore this question in detail. Instead, I show how Lonergan accounts for theology's intent to explain and its methodical potential for doing so.

I Epistemology in Science and Religion

Why is a philosophical issue such as epistemology important? Epistemology is a touchstone. It arises in response to a host of surface debates about the relationship between science and religion. The debate about whether religion and theology are realist in their intent is also a debate about how earlier views of linguistic reference and history are to be interpreted. There is a theological divide between traditional Christians who see theological claims as straightforward realist accounts of objective realities on the one hand and liberal Christians who see more mystery than certainty. Liberals see theological doctrine as inherently relative to the conceptual frameworks, metaphorical language and the contingencies of human history that mediate accounts of God and God's relationship with the world. Needless to say, such cleavages are not found only in Christianity, but in other religions as well. This issue is neither new nor exclusive to Christianity, the latter of which is my concern as a Christian believer and theologian.

Christian theology, and Jewish and Islamic thought have traditionally presumed not just a realism about the world, but also metaphysical realism, which advocates the belief in natural kinds, the non-reducibility of the mental to the physical etc. But, now, there is widespread opposition and agnosticism toward this philosophical heritage from within Christian theology. This situation contrasts with centuries of firm theological allegiance to neo-Platonic and, following the mediaeval scholastics, Aristotelian metaphysics. Current theological opposition to metaphysical realism is inspired by such historical lessons as that of Galileo, where church adherence to Aristotelian metaphysics blinded it to a hermeneutical path consistent with Augustine in which scripture does not need to be interpreted literally. Narrative concerns are also highly influential in contemporary theology, along with various fideist and post-liberal approaches. I will not outline these influences, but instead stick to the philosophy of science and theology that have acted in concert by drawing on the anti-metaphysical thrust of Thomas Kuhn's work.

The recent admission by longtime atheist Anthony Flew that he now believes in an intelligent guide operating in the universe is yet more grounds for thinking that the early twentieth century alliance of science with atheism is breaking down. This breakdown has followed in the wake of the logical positivism's collapse in the philosophy of science, and I think that there is a clear connection between the two trends

that awaits some future historical analysis. What is amazing about the little Flew has said publicly about his change of mind is the kind of scientific grounds he cites for it. He points to the improbability of emerging complex life forms in this universe, the sheer unlikelihood of chance events serving as the sole cause of these organisms. The choice of biology is ironic, since biologists are reputed to be the most prone to atheist or agnostic views in contrast with other scientists. Intelligent Design theory is now the most seriously contested area of dispute in the science-religion field, at least in the U.S. To say that there is a lack of consensus about what biological structures give evidence for irreducible complexity caused by direct, intentional design is an understatement. That Anthony Flew, a lifelong empiricist, should cite this contentious area of research in abandoning atheism in favour of some sort of deism is fascinating. Such conversions make the headlines, but less noticed, yet of paramount importance, are the metaphysical and epistemological bridges that have been constructed over the past thirty years between scientists and theologians who share an interest in God and in research programmes that purport to detect God's action or presence in the world.

The dialogue between science and religion is ideally understood through the epistemological perspectives of religious scientists. Two general options are prevalent. 1) Many scientists see religious belief as essentially consistent with their scientific work by pointing to general parallels of knowledge and belief structures found in both domains. Also prevalent, however, is 2) the view that religious belief has nothing whatsoever to do with science. Those who adopt this view often seem to expound a two-truth theory about the world. This second option is easier to hold, since it usually implies that religion be interpreted in a strictly symbolic or poetic mode. It is even more credible if religion is affiliated with private experience only, what might be termed in some cases mysticism, as opposed to publicly expressible beliefs. Obviously, the second option also allows for the work of theologians who are anti-metaphysical, for reasons already described above.

Is either of these two perspectives preferable? Yes, I believe the first view is best, the view that suggests an overlap, and even in some ways, a structural similarity in knowledge between faith and science. Qualifications are necessary by the dozen, yet without a single, albeit differentiated view of truth, it seems that otherwise one falls into a two-truth theory of the universe.

Perspectives that marry theology and science have a long, checkered history. On the positive side, one can think of natural theology of the sort worked out by Thomas Aquinas where various effects of the natural world such as contingency, movement, value and causality are explained by reference to a necessary source, a prime mover, a Being of eternal goodness, in short, an existing, living God. Even here, though, Aquinas' use of Aristotelian categories exhibit obvious limitations for a contemporary natural theology.

More seriously flawed on the other hand, one can think of the theology of Isaac Newton, whose 'God of the gaps' was introduced into his accounts of gravitational attraction, the behaviour of the planets and other physical events in Absolute Space, for which no universally true physical explanation could then be imagined. The subsequent advances in physical theory, beginning with Laplace's nebular hypothesis for planetary

movement through to relativity theory render this very active God quite useless. Christian theology was greatly affected, with the concepts of God remaining constant but with the functions of God's action eliminated from the picture.

Reintroducing divine action is a perilous exercise. One such incautious leap from science into faith was that of Pope Pius XI, who, in an address to the Pontifical Academy of Sciences on November 22, 1951 stated:

“What, then, is the importance of modern science in the argument for the existence of God drawn from the mutability of the cosmos? [Science] has widened and deepened to a considerable extent the empirical foundation upon which the argument is based and from which we conclude a self-existent Being immutable by nature... it has followed the course and direction of cosmic developments... it has indicated their beginning in time at a period about five billion years ago, confirming with the concreteness of physical proofs the contingency of the universe and the well-founded deduction that about that time the cosmos issued from the hand of the Creator.”ⁱ

Here is an example of direct implication, a view that cites particular findings of science that pertain directly to a theological affirmation, which in this case, is the alleged empirical basis for the doctrine of creation *ex nihilo*, the creation of the world out of nothing. Such statements show the difficulty of leaping directly from scientific findings to theological doctrine, as the later revelation of the universe's fifteen billion years of age has demonstrated. More seriously perhaps are current speculations about oscillating universes. Although extremely difficult to verify, such speculation render papal endorsements hasty. What is needed is a methodical approach, and below in the section on Lonergan's contribution, I will outline such an approach.

There are numerous other examples of the implication style of relationship, some that are cruder and others that are more sophisticated. What advocates of the implication relationship reveal, in my judgment, is a lack of philosophical mediation between scientific findings and theological views. This is where epistemological differentiation plays a role in deciphering how science is science and religion is religion yet allowing for some way for these two enterprises to be related.

II Realism and Relativism

In a critical realist approach, the data of one discipline are not taken to base the insights and conclusions of the other discipline, at least not by crude logical inference. A more circuitous approach is necessary. The leading exponent and virtual founder of the science-and-religion dialogue is physicist Ian Barbour. Barbour cites critical realism as an essential doctrine that ties science and religion together in equal though distinct forms of knowledge:

“Against instrumentalism, which sees both scientific theories and religious beliefs as human constructs, useful for specific human purposes, I advocate a critical

realism holding that both communities make cognitive claims about realities beyond the human world.”ⁱⁱ

Why are distinctive disciplines alike in making cognitive claims? For Barbour, the chief similarity has to do with the parallel between science’s use of theories and data and theology’s use of belief and experience. In both disciplines, models and paradigms serve to identify the tentative yet progressive way in which truth is held for each. So far, so good. But as Barbour describes the epistemological relationship, there is no reason given as to how scientific understanding supports the way that theology understands religiously. This is what I want to explore further. This is not to suggest that theology cannot stand on its own. It does. But theology, even in its classical definition, *fides quaerens intellectum* (faith seeking understanding) is the search for understanding. Any theological understanding will involve some aspect of interdisciplinarity. Let me try to identify how critical realism can be more adequately stated than Barbour’s description of science and religion parallels. On the face of it, data and theory are very different from belief and experience. Is there another way to spell out the similarities?

The scientific history of the twentieth century was not been kind to realists. Early on, the dominance of logical positivism rendered realism redundant in the quest for a pure science. Hempel once described the confrontation of a hypothesis with observation reports as of: “A purely logical character; the standards of evaluation here invoked - namely the criteria of confirmation, disconfirmation and neutrality - can be completely formulated in terms of concepts belonging to pure logic.”ⁱⁱⁱ Realism was also challenged through specific physical theories. Special Relativity has presented its own challenges of relativism to a realist portrait of science, and by extension, morality and the human sciences. Quantum theory dealt an especially hard blow against realism when Bohr trumped Einstein on the question of wave-particle complementarity in sub-atomic physics, a riddle that constrains, in ways previously unforeseen, the potential reach of human understanding. The decline of realism has been precipitous, in spite of Bohr’s own realism which he articulated in terms of entities having the capacity to appear in different “phenomenal manifestations, rather than through determinate properties corresponding to those of phenomenal objects...”^{iv}

The distinctive character of micro-world behaviour vis a vis classical macro-world behaviour led Bohr and others to attempt to import quantum world *complementarity* into other disciplines. This has not proven promising. For one thing, Bohr’s thinking presumes the ontological incommensurability of models in disciplines where competing models are actually intended to serve as differing heuristic structures that are epistemologically instrumental, not necessarily ontologically different forms of knowledge.

Realism, for all its apparent limitations concerning the micro-world, has proven far more resilient in the structural disciplines, such as geology, evolutionary biology and astrophysics. In these fields, theoretical constructs have invited experimentation and in case after case, yielded verifications and progressive results that bear out critical realism’s promise of scientific progress. While this assessment is far from a consensus

view, one can take solace in varying degrees of assent to critical realism from diverse philosophical sources. So, for instance, there is Hilary Putnam's 'No Miracle' argument, a common sense affirmation of what most working scientists take realism to mean. Popper's falsificationism serves a similar purpose in a way that tried to get beyond the rigid mindset of logical positivism. Philip Kitcher suggests that realists are fully within their rights to hold to a correspondence theory of truth.^v But I am getting a bit ahead of myself.

There is an antecedent question that bears asking. Why have so many other philosophers of science accepted Thomas Kuhn's argument that theories are displaced through revolutions in broader paradigms of thought rather than being falsified one at a time? Even though Kuhn has to now share the spotlight with Imre Lakatos, since Kuhn's *The Structure of Scientific Revolutions* (SSR) first came out, his influence has not dampened.^{vi} In the humanities, postmodernisms thrive partly on the use, with varying degrees of insight, of Kuhn's idea of paradigms. One citation mentioned that Kuhn's SSR is the most widely read contemporary book in college and university humanities curricula.

One consequence of this sympathetic appropriation of historicist philosophy of science is that theologians have been led to assume that the empiricist and positivist campaigns against religion have been declared null and void on epistemological grounds. Sensing an opportunity, some theologians have adopted relativist or holist epistemological positions. In what is possibly the most widely read book in twentieth century theology, Hans Küng borrows from Thomas Kuhn as follows: "Are there 'scientific revolutions also in philosophy and theology? As a natural scientist, Kuhn did not deal with this question. It is however, scarcely possible to deny it."^{vii} Thus, according to Küng, theological explanations, like scientific explanations, are radically historically conditioned.

So, what is the problem with Kuhn's argument? Ernan McMullin has identified it thus:

"The Kuhnian heritage is thus a curiously divided one. Kuhn wanted to maintain the rational character of theory choice in science while denying the epistemic character of the theory chosen. The consequent tensions are, of course, familiar to every reader of current philosophy of science."^{viii}

Theory choice, as we will see shortly, is an epistemological problem. The question is how confident we are in the verifications of theories we have made through discovery. For the Kuhnian movement, the insight that bubbled up in the historical studies of the 1960's was that social values and social factors lie behind the material scientists investigate and the conclusions they reach. The question that remains therefore is whether or not such social factors in themselves determine the material investigated and the conclusions reached. McMullin and other realists say no, but in saying no, realists should be cautious about what should still be said of values that guide theory choice.

Recall that critical realism forges a route roughly in between positivism and relativism. Declaring a via media and describing the analogy between disciplines is not the same as saying why realism and the explanatory ideal applies in both disciplines. But, one theory that goes a long way to supporting a scientific realist position with interdisciplinary repercussions is that of retroduction or ‘abduction.’ First coined by Charles Sanders Peirce and elaborated by McMullin, retroduction attempts to explain, with reference to history, what general inference is employed by scientists in generating and verifying hypotheses. This is where theory choice enters in.

Retroduction refers to a twofold process of scientific inference. First, the scientist hypothesizes about certain phenomena through inference to unobservable entities in structural explanations. Disciplines like geology and astronomy are the best candidates for laying out structurally interconnected explanations where hypotheses can be verified. Such explanations are causal: they purport to explain the underlying processes, structures and entities that yield inductively explained regularities. The second aspect of retroduction is the process of verification made through appeals to the virtues of a theory, yielding greater likelihood of its confirmation, indeed its truth as a realist would say.

For Peirce and McMullin, as with many others, deduction and induction alone are insufficient to account for the range and complexity of scientific inference. Retroduction goes beyond the logical shape of these simpler inferences. Yet, it can be stated logically thus: “The surprising fact C is observed. But if A were true, C would be a matter of course; Hence there is reason to suspect that A is true.”^{ix} Note, in contrast to logical positivism’s interpretation of verification, there exists a lack of certitude in the conclusion in this inference. But, note also that causal explanation of events is sought and achieved. This goes against the relativist position, where theories are useful collections of hypotheses geared only for making predictions.

Scientific history is replete with examples of retroduction, but most of these are difficult to condense as single examples, since retroduction is a thesis about the past record of successful theories, explicitly highlighting the ongoing verifications and revisions to theory that occur over time, sometimes a long period of time. One condense example may suffice:

“In 1879 Louis Pasteur noticed a ‘surprising fact.’ He injected some chickens with bacillus that had been around for several months. Instead of dying as expected, the chickens became only slightly ill and then recovered. Pasteur concluded that the old cultures had spoiled. So he obtained a new culture of virulent bacilli from chickens afflicted with a current outbreak of cholera. Then he again injected the chickens along with some new ones. In due time, all the first-time injected chickens died. Those previously injected with the old ‘spoiled’ stuff lived. When Pasteur was told what had happened he, according to an eyewitness, ‘remained silent for a minute, then exclaimed as if he had seen a vision: ‘Don’t you see these animals have been vaccinated!’ Nearly a hundred years earlier, Edward Jenner had seen the connection between cowpox and smallpox. Even the term ‘vaccination’ derives from the Latin word for cow ‘vacca’. The germ theory

of disease was more recent. Pasteur was the first to connect the two and give birth to modern immunology.”^x

The retrodution here is that the hypothesis “These animals have been vaccinated” followed on the surprising fact that the chickens did not die. This hypothesis was subsequently verified through numerous empirical studies, comprising the second phase of the retrodution. The generation of the hypothesis is a prior, singular, creative act of insight, not foreseen by any logical rule deriving from a strict, planned observation of data. This is the first part of the retrodution, the discovery of a natural process or entity previously unknown.

Verification is the second stage. For McMullin, verification is not understood in the logical positivist sense. It is a process guided by criteria known as complementary or cognitive virtues, especially fertility, simplicity, coherence, consistency, consilience and last but not least, empirical adequacy. These virtues are associated by some with the Quine-Duhem Underdetermination thesis, and indeed, Stathis Psillos calls them the ‘Quinean virtues.’ But this should not deter us from seeing the employment of these virtues as consonant with realism. This is the thrust of retrodution’s power as a philosophical explanation for scientific explanation: the successful deployment of non-logical criteria of theory verification yields a qualified definition of scientific realism, which McMullin provides in one of the most oft-quoted statements in the science-religion dialogue. It is as follows: “the long-term success of a scientific theory gives reason to believe that something like the entities and structure postulated by the theory actually exists.”^{xi}

These virtues, as applied to the act of verifying theories in the philosophy of science, refer to the performance of theories over time, their ability to handle anomalies and in opening up new arenas for investigation. They do not necessarily refer to the theory’s future potential, only to a theory’s past as understood in the light of successful verification. This is the truly historical nature of retrodution. Retrodution is ampliative. It alights on the resources of a theory, both in terms of the implications stemming directly from formal rules applied to a theory and indirectly on the conceptual juxtaposition of elements in a theory “capable (as McMullin says) of suggesting to the creative mind a whole range of possible developments of the theory itself.”^{xii}

Metaphors and models, as they figure in Barbour’s definition of critical realism that I alluded to earlier, play a role here. But, models and metaphors are not ultimately determining the explanations that emerge from the verified hypotheses. Indeed, models and metaphors repose happily in a Kuhnian paradigm portrait of science. The *fertility* of a theory, on the other hand, with its tendency to force analogies from several domains of investigation when probing the veracity of a theory, are more relevant here, and hence a more powerful basis on which to define one’s realism. What is ultimately interesting in the discovery of vaccination is that the theory proved so fertile in cognate disciplines and areas of investigation. The various metaphors Pasteur employed in developing his insight are interesting, but less relevant to the issue of whether one is dealing with true, explanatory knowledge when one is dealing with vaccination.

McMullin has not proposed his theory of retrodution unopposed. Far from it. Perhaps his chief interlocutor on the question of inference and retrodution is Bas van Fraassen, who emphasizes the criterion of ‘empirical adequacy’ and denies other criteria any worth in scientific explanation, which fits with his basically empiricist outlook. History, however, is not kind to such a view. McMullin cites the Copernican episode, for example, on just how crucial a role other criteria play: “Unlike the mathematical astronomers before him, Copernicus claimed that his model was not just an economic saving of the appearances but that it was true, so that the earth really was in motion. To appeal only to the appearances (to the criterion of empirical adequacy) would not suffice. His own system would have to be presented as a better explanation.”^{xiii}

Explanations concern both observable and unobservable entities. Unobservable entities trouble van Fraassen. (It should be noted that in recent years, van Fraassen’s position has altered somewhat, but it is unclear to me whether his change in position affects how he thinks about cognitive virtues other than empirical adequacy or the existence of unobservable entities.) There is probably no need to rehearse the well known debates between realists and anti-realists concerning electrons and similar entities. McMullin provides familiar argumentation on this issue, with an emphasis on the success of science that depends for its practice on there being real entities called electrons, as spelled out by particle physics. What is new, and possibly critical, is not just the unobservability of entities like electrons, but the fact that the human imagination, developing insights and employing the mental criteria of cognitive virtues are able collectively to achieve explanatory knowledge about the structures of nature. Truth as correspondence between the knower and known, as Belgian philosopher Jean Ladriere has claimed, is a position that is difficult to avoid. Knowing involves unobservability all the way through, from imaginative wondering, to insight to the judgment of the existence of the unobservable entity itself. This persistence of unobservability is striking.

Unobservability is critical to an account of science that can resist strong reductionist tendencies. It is also critical to the way theology accounts for God, an unobservable feature of reality.^{xiv} I have been emphasizing epistemological elements of science in the theory of retrodution that uphold both a realist account of scientific knowing without falling into empiricism. The cognitive virtues in theory verification are neither logic-bound aspects to scientific knowing, nor reducible to a social constructionist evaluation of the place of values in the biased context of a scientist. With cognitive virtues, human interpretation is involved, but it is not destined to be biased. After all, one scientist’s interpretation can be evaluated by other scientists, and the mutual corrective process unfolds historically, dialectically toward greater truth and away from false belief.

Another aspect of unobservability bears mentioning, since the most poignant arguments of reductionism are made through neuroscience and evolutionary psychology. In this context, the human imagination is a vital element of retrodution theory. In his fascinating study of the scientific imagination, Gerald Holton describes an incident in 1934 in connection with physicist Enrico Fermi. One morning in October, 1934, in an old physics lab at the University of Rome, Fermi recounts the following tale:

“We were working very hard on the neutron-induced radioactivity, and the results we were obtaining made no sense. One day, as I came to the laboratory, it occurred to me that I should examine the effect of placing a piece of lead before the incident neutrons. And instead of my usual custom, I took great pains to have the piece of lead precisely machined. I was clearly dissatisfied with something: I tried every “excuse” to postpone putting the piece of lead in its place. When finally, with some reluctance, I was going to put it in its place, I said to myself: “No, I do not want this piece of lead here; what I want is a piece of paraffin.” It was just like that: with no advanced warning, no conscious, prior, reasoning. I immediately took some odd piece of paraffin ... and placed it where the piece of lead was to have been.” The result was what was termed “the miraculous effects of the filtration by paraffin...”, “a vastly enhanced radioactivity in the silver cylinder which served as a target for the slowed neutron beam.”^{xv}

This imaginative leap helped demonstrate that neutron bombardment transformed most elements, and was critical for the later discovery of nuclear fission and the discovery of many more elements in the periodic table. Ironically, Fermi understood himself to be a strictly empirical inductivist, in the methodological spirit of positivism. The point here, to be necessarily brief, is that the imagination is a crucial cognitive element that apprehends images for acquiring insight into data. Imagining takes place, neither as a neurobiologically determined event, nor as a socially constructed free play, but in a world-shaped mind that demands to understand the world. Imagining takes place, not in spite of the rules of logic and induction, but in order to allow them to be applied at all by science.

It is Augustine who first coined the Latin term ‘*imaginatio*’ deriving conceptually as it does from the Greek term ‘*phantasia*’. But for Augustine, there was a very precise way that imagination manifests itself – for him, the imagination is “not a faculty but a product of a faculty called *spiritus*, intermediate between sense and intellect.”^{xvi} It is to the ‘faculty’ of the human spirit, that essentially non-empirical, constructive activity of combining multiple earlier perceptions, that we owe much of the success of science. Reason cannot function without it. No structural explanation is possible without the imagination. That is, no inference that involves hypothesis formation and verification as well as inductive insights from observation, is possible without imagination.

On the strength of its heuristic role in grounding insights and explanations, the imagination goes beyond Kuhnian epistemological holism. Holism sees the human inquirer as effectively sealed off from objective knowledge. The imagination is not reducible to physical constituents exclusively, although clearly, the brain processes involved in imaginative operations require a physical basis for their functioning. Likewise, the non-physical, non-logical cognitive values employed by the scientist in theory verification are guides for understanding natural processes.

The way forward indicated in these aspects of scientific inquiry for a theological perspective on reality is through the scientist herself, through the kinds of operations that she conducts, whether imaginatively in the discovery of something or with the help of

cognitive values in the verification process. For a scientist, so long as there is no prior materialist metaphysic preventing self-understanding from occurring, there is spirit in imagination, and this is absolutely crucial to a dialogue with theology. For a scientist, there is a relationship between the values guiding the act of judging the truth of an insight, and so, the values in knowing are values in the universe that is known.

One last point on retrodution's broad scope should be registered, since the ultimate issue being addressed here is theological. Retrodution is not a stance of necessity in knowledge as scientific deduction was often understood. Deduction was the mode of inference stressed by logical positivists, for its rule-oriented logic. On the contrary, with the contingent picture of knowledge afforded by retrodution, "(t)here could well be a universe in which observable regularities would *not* be explainable in terms of hidden structures, that is, a world in which retrodution would not work."^{xvii}

It is indeed possible to conceive of an evolutionary process in which there would not be truth as correspondence between mind and matter. That is, it is possible to conceive of a universe where natural processes are prevented from developing to the point where mind was capable of the degree of complex functioning that we know ourselves to be capable of carrying out. In this context, the work of Simon Conway Morris is significant for accounting for overall patterns of convergence in natural life where complexity appears bound to evolve under certain pre-determined biological constraints.^{xviii} Morris, a Christian paleoanthropologist, disagrees with Gould and other evolutionary biologists who emphasize chance and contingency at the expense of an overarching framework where the evolution of life is fundamentally oriented by physical constraints.

The issue of the inevitability or uniqueness of human beings is dramatized by the 'anthropic principle', especially in its strong form. As stated by Hawking and Collins, it is formulated thus: "The fact that we have observed the universe to be isotropic is therefore only a consequence of our own existence."^{xix} But, the problem with postulating this necessary condition for all explanation is its own lack of explanatory appeal. McMullin comments that the anthropic principle derives:

"from the claim (1) that the most basic structures of the universe might have been different from what they are; and (2) that the development of rational life in the universe depends on their being more or less exactly what they, in fact, are."^{xx}

Extrapolating for a minute then, the success of science on this cosmic scale is either a) a massive coincidence, b) an unexplainable necessary condition for there being a universe like ours alongside, as it were, other hypothetical universes, or c) it is a planned out reality foreseen by an intelligent force or being operating in relationship with the universe. As an explanation, the anthropic principle contains very little value, at least if we remain in the scientific domain. It is essential to point out that this logic continues with the retroductive method. It does not diverting to the strategy of implication in theology too soon, that one arrives at option c. The scientist would opt for the simpler, more fertile explanation that does not rest on coincidence or on circular logic. In choosing option c), one is doing two things simultaneously. First, one can see how

simplicity, coherence, not to mention the fertility of the anthropic principle theory in this divine creation explanation aligns with what many in the human sciences and religious civilizations affirm. So, on the face of it, these criteria of theory verification deserve to be applied, albeit in a looser fashion, as part of the way in which the anthropic principle could be appraised as a scientific theory. Second, one has gone beyond science even while one remains within the cognitive grasp of the theory of retroduction, and so new questions need to be faced. Imagination and value-based theory choice are still involved in the inquiry, but the inquiry itself is now much more existential than it is scientific.

III Science and Religion in van Huyssteen's Postfoundationalism

So far, I have sketched a way of seeing the explanatory intent in science as effectively supported by the theory of retroduction, especially in relation to specific cognitive aspects of scientific thinking, namely the imagination and value-based theory choice. As these elements are operations of human cognition, it is only natural to see a connection to theology and the fact of religious reflection. What such relationships signify is a relationship between science and religion that is not dedicated necessarily to the search for some particular contents of scientific data that possess some divine imprint. This is possible, and indeed the work being done through the divine action project of the Vatican Observatory with the CTNS is an exemplary approach in this regard.

The more limited yet, in my view, more interesting task before us is to explore what may be the divine imprint in human rationality. This rationality is obviously capable of scientific knowing and religious reflection. If we are to avoid the holist claims whereby the two domains are hermetically sealed compartments of knowledge, we need to better articulate how science and religion are similarly structured in human rationality, as differentiated expressions of spirit or the divine imprint within us.

Taking up the challenges of holism and relativism in postmodern and Kuhnian inspired approaches in the philosophy of science, Wentzel van Huyssteen works from within the narrative and experience-centered approaches of non-foundationalist thought to suggest how theology can avoid relativism and epistemic irrelevance. In arguing for a return to interdisciplinarity, van Huyssteen's proposal (contained in his 1999 book *The Shaping of Rationality*)^{xxi} cites the importance and the fact of rational judgment in epistemology. He terms his position 'postfoundationalism' to distinguish it from both foundationalism and non-foundationalism. The latter two positions are the opposed strategies of modernist and postmodernist thinkers who claim or doubt indubitable contents in knowledge.

In brief, for van Huyssteen, one of the main errors of foundationalist thinking is its emphasis on consensus, forgoing the complexities of debates in the philosophy of science that transpired in the wake of logical positivism's demise. In science, the possibility of shared assumptions in discourse around the worth of particular theories is a much more plausible basis for scientific practice than the artificial criterion of consensus. For non-foundationalists, the problem is the opposite claim that no theoretical agreement is a conceivable basis for knowledge, and hence explanation. Theologically, this position

has been claimed by Stanley Hauerwas and Nancey Murphy among others to suggest that only the believing community establishes the possibility for doing theology. As van Huyssteen correctly points out, this can be seen as a form of foundationalism for those who simply do not identify with the webs of belief constructed by believing communities.^{xxii}

The emphasis on rational judgment, for van Huyssteen, is not made on an appeal to some form of pure epistemology, but rather to an appeal to praxis. Postfoundationalism is therefore not interested in making claims of universal validity, but in claims that are transversal, a term borrowed from postmodern philosopher Calvin Schrag. Transversal rationality establishes that while epistemological routes may be different according to different traditions and disciplines, that nevertheless, “transcontextual, even transhistorical judgments and assessments can be made.”^{xxiii}

What is the significance of van Huyssteen’s via media between foundationalism and non-foundationalism? I believe it is nothing less than the salvaging of the reality of explanatory knowledge, across disciplines. While I would go farther than van Huyssteen in seeing epistemological parallels that transcend differentiated practices (given the role of imagination and values as sketched above), van Huyssteen has articulated a way through the conflict between radically different philosophical traditions in order to align science and religion as differentiated realities of the single human rational subject. Much more can and should be said in response to van Huyssteen’s proposals as they concern the interpretation of epistemology, and I would certainly wish to add an emphasis on cognitional operations that are found in science and religion. In this way, I would want to fuse what Barbour has written on the epistemological parallels between the disciplines with van Huyssteen’s more nuanced account of rationality. But, this will have to be left to another venue. I will move now to sum up why the salvaging of theological explanation from the example of scientific explanation is meaningful for contemporary theology.

IV Lonergan, Theological Explanations and Method

In his book *Method in Theology*, Catholic theologian (d. 1984) Bernard Lonergan develops a methodical portrait of theology that seeks to do at least two vital things for the discipline as a whole. First, Lonergan works with a two-vector approach to theological questions, in fact, a way of discovery and a way of verification, roughly speaking. Second, Lonergan attempts to dissolve the familiar conflict of differing theologies by advertent to a single methodical tool that would allow theologians to speak with one another in the way that scientists speak with one another in spite of disagreements because of their shared commitment to scientific method.^{xxiv}

The two vectors of theological work operate according to eight different functional specialties, four for each vector. Each of the four functional specialty operates not on different theological contents necessarily, but according to a different cognitive task that is implicated in particular questions. Just as there are questions that arise in the scientists’s mind that pertain to the need for imaginative scheming as with Fermi, and for

verification as with those who verified Pasteur's discovery of vaccination, so there is also a eightfold differentiation of kinds of questions in Lonergan's methodological schema. Functional specialties as such do not dictate the kinds of contents that theologians may attend to. What Lonergan stresses is that those contents, whatever they are, inevitably pertain to particular kinds of cognitive operations that the theologian carries out in the practice of theology. These levels of cognition are the distinct operations that characterize all of human thinking: experiencing, understanding, judging and deciding (see chart in endnote xxiv). The accent on praxis is highly resonant with van Huyssteen's approach. But, even more explicitly, Lonergan suggests that the functional specialties of (doing) history and formulating doctrines are explanatory in nature. That is, these specialties of theology are directed to the formulation of rational judgments. In the formulations that are carried out in these two particular specialties, there are two questions for judgment at stake: first, which view of history and historical interpretations are valid and second, what language best accounts for the nature and action of God.

The implications for theology on Lonergan's view of explanatory knowledge are compelling, as exemplified in his account of (critical) history, the third functional specialty: "critical history is not a matter of believing credible testimonies but of discovering what hitherto had been experienced but not properly known."^{xxv} Similarly, in the case of theological doctrines, Lonergan's sixth functional specialty, explanations are formulated, and as such, are not intended to formulate truths as these are known only from the relative context of some particular group of believers. They are judgments of facts and value made in the face of a dialectical sorting through competing options as to what is or is not so. They are explanatory, true in themselves. But, doctrines are not final statements of dogmatic certitude. In traditional accounts, theological doctrine is the terminus quid, a final stage of reflection on the nature of God or some aspect of God's action. For Lonergan, there needs to be a continual engagement between doctrines and other bodies of knowledge. So, explanations are revisable. Doctrinal explanations or judgments are revised through the questions raised and organized according to a different functional specialty, that of systematics, the seventh functional specialty. At the level of systematic theology, explanations can be verified and clarified, not so differently from those explanations that are verified as the theory of retroduction states. It is fairly easy to think, for example how criteria such as simplicity, fertility, coherence and so forth would guide the way doctrines are re-thought in light of fresh knowledge. And here we have, at least in some form, a way to think about the relevance of a realist account of scientific explanation and its theological equivalent. Cognitionally, there are explanatory parallels between theology and science. As with van Huyssteen's contribution, one can take Lonergan's work in a hundred further directions in order to flesh out why and when theological systematics interacts with scientific theory. It will have to be sufficient at this point to merely demarcate the explanatory thrust of theology as a mirror to the thrust of scientific explanation. More elaboration with test examples would require a lengthier treatment.^{xxvi}

Conclusion

Let me summarize. *The theological issue is whether or not we can affirm that theology, like science, offers explanations. From a particular realist account of science in response to the work of Thomas Kuhn, we can see how cognitional factors are critical for affirming the existence of the entities that scientific theory aims to understand. Similarly, as Wentzel van Huyssteen and Bernard Lonergan acknowledge, theological explanation is possible once careful methodological steps have been taken to refute both the holist (relativist) and positivist (dogmatic) approaches to theology.* Lonergan's approach builds the ongoing reality of verification straight into his method of theological functional specialties. Yet, it assumes that theological knowledge is explanatory knowledge. It is not reducible to subjective states of mind.

It needs to be said that theology is tightly bound to the question of language, far moreso than for the scientist. This linguistic locus of theology needs to stand as a critical qualifier to the parallel realisms being claimed here. Language stands as a stark reminder that key differences between theology and scientific disciplines remain. In the history of theology, the use of analogy, for instance, has informed the use of metaphor and vice versa much more than it has for science.

What I have been trying to do here, therefore, is to draw out of the scientific realist a way of arguing that might open up the epistemological horizon of the theologian. Deductions no longer work for theology, and arguably set it back when they did. The point is that simple deductions and inductions are no longer credible ways to characterize scientific inference either. In pointing to retroduction as the realist epistemology of choice, we have in science a parallel to theological inference: realist in aim, not wedded to certitude in statements or formulations, but not given to undue relativist pessimism either.

Apart from language issues, what changes in theology is both the degree of unobservability in the object known for theology (hence the resort to analogy) and second, the specified, practical contexts of human experience on which theology is immersed. Whereas the scientist has her laboratory to which she might retreat from a philosophical examination of science, the theologian has his church, the life of which is equally tangible. The metaphor-laden texts of scripture, the self-involving stance known through worship etc - these are the experiential grounds of theology that exist apart but not oblivious to the need for their theoretical explanation.

Endnotes

ⁱ*Discourses of the Popes from Pius XI to John Paul II to the Pontifical Academy of Sciences 1936-1986* (Pontifical Academy of Sciences, 1986), p. 83.

ⁱⁱBarbour, *Religion and Science*, (HarperCollins, 1990), p.89.

ⁱⁱⁱCarl G. Hempel, "Studies in the Logic of Confirmation" in *Aspects of Scientific Explanation* (New York, 1965), p. 22. Cited in Ernan McMullin, "The Fertility of Theory and the Unit for Appraisal in Science", p. 396.

^{iv}See Henry Folse, *The Philosophy of Niels Bohr: The Framework of Complementarity* (New York: North Holland, 1985), p. 259.

^v See Philip Kitcher, “On the Explanatory Role of Correspondence Truth” in *Philosophy and Phenomenological Research* (March, 2002), pp 346 - 364.

^{vi} More improbable for many is the growing theological employment of the historicist position of Imre Lakatos, whose efforts to elevate the status of the ‘research programme’ to something competing with theory have been widely praised as effecting a via media between Popper and Kuhn. Lakatos is said to more accurately portray the uneasy co-existence of realist and relativist components of the philosophy of science by highlighting theoretical progress with specific reference to the role that novel facts have to play in structuring the interplay between a hard core and a belt of auxiliary hypotheses comprising the research programme. The problem with transposing this model of scientific rationality into theology is its lack of explanatory value. Understanding the general structure of scientific progress may provide a more adequate understanding of the heuristic involved, but it does not necessarily or intentionally say anything about the entities to be understood.

^{vii}Hans Küng, *Does God Exist? An Answer for Today* translated by Edward Quinn (New York: Vintage Books, 1981), p. 111.

^{viii} McMullin, “Rationality and paradigm change in science” in Horwich, P., ed. *World Changes: Thomas Kuhn and the Nature of Science* (Cambridge, MA.: MIT Press, 1993), pp. 75-76.

^{ix}See Charles Sanders Peirce, *Collected Papers of Charles Sanders Peirce* Harvard Lecture VII, “On Pragmatism and Abduction” vol. 5 (1903), p. 189. Cited in Terry G. Pence, “Charles S. Peirce, Scientific method and God” in *PSCF* 49 (Sept., 1997), pp. 155-61.

^x From Terry Pence, “Charles S. Peirce, Scientific method and God” in *PSCF* 49 (Sept., 1997), p. 3 of 9 [internet version].

^{xi} McMullin, “A Case for Scientific Realism” in Leplin, J., ed. *Scientific Realism* (Berkeley: University of California Press), pp. 8-40, p. 26.

^{xii} McMullin, “The Fertility of Theory and the Unit for Appraisal in Science” in Cohen, R.S., ed. *Boston Studies* (Lakatos Memorial volume) 39, pp. 395-432, p. 401.

^{xiii} McMullin, “Enlarging the Known World”, in Hilgevoord, J., ed. *Physics and Our View of the World* (Cambridge: Cambridge University Press), pp. 79-113, p. 104.

^{xiv} This dimension of theological epistemology is challenged from a Barthian theological perspective, and the most incisive account according to this line of thinking can be found in Andrew Moore’s *Realism and Christian Faith: God, Grammar and Meaning* (Cambridge University Press, 2003).

^{xv} See Gerald Holton, *The Scientific Imagination* (Cambridge, MA.: Harvard University Press, Rev. Ed. 1998), p. 156. This discovery had momentous implications in physics, as the Nobel Organization notes in its biographical account: “ In 1934, he evolved the β -decay theory, coalescing previous work on radiation theory with Pauli's idea of the neutrino. Following the discovery by Curie and Joliot of artificial radioactivity (1934), he demonstrated that nuclear transformation occurs in almost every element subjected to neutron bombardment. This work resulted in the discovery of slow neutrons that same year, leading to the discovery of nuclear fission and the production of elements lying

beyond what was until then the Periodic Table.” See <http://nobelprize.org/physics/laureates/1938/fermi-bio.html> .

^{xvi} McMullin, “Enlarging Imagination” in *Tijdschrift voor filosofie* 58, n.2 (June, 1996), p.231.

^{xvii} McMullin, “Determination and Underdetermination in the Natural Sciences” in Sdravko Radman, ed., *Horizons of Humanity: Essays in Honour of Ivan Supek* (Frankfurt am Main: Peter Lang, 1997), p. 29.

^{xviii} Simon Conway Morris, *Life’s Solution: Inevitable Humans in a Lonely Universe* (Cambridge University Press, 2003).

^{xix} McMullin, “Indifference principle and anthropic principle in cosmology” in *Studies in the History and Philosophy of Science* 24, p. 371. Cf. C.B. Collins and S. W. Hawking, “Why is the Universe Isotropic?” in *Astrophysical Journal* 180 (1973), pp. 317-334, p. 319.

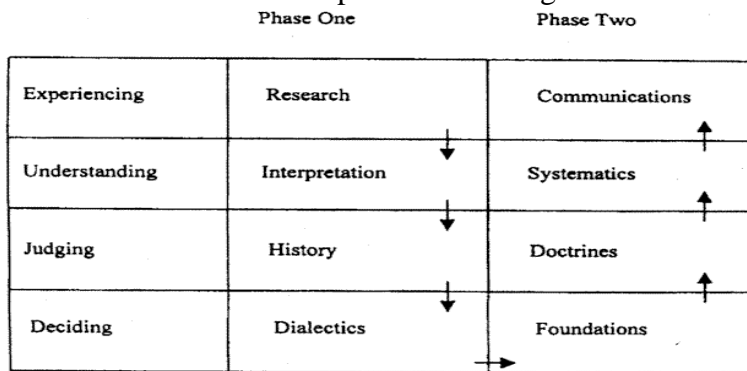
^{xx} McMullin, “Is Philosophy Relevant to Cosmology?” in *American Philosophical Quarterly* 18, pp. 177-89; reprinted in Leslie, John, ed. *Physical Cosmology and Philosophy* (New York: Macmillan, 1990), p. 186.

^{xxi} Van Huyssteen, J. Wentzel. *The Shaping of Rationality: Toward Interdisciplinarity in Theology and Science* (Eerdmans, 1999).

^{xxii} *Ibid*, p. 107.

^{xxiii} *Ibid*, p. 139.

^{xxiv} The following chart (from www.lonergan.org/Online_Books/cronin/epilogue.htm) shows how the functional specialties are organized and interrelated:



^{xxv} Lonergan, Bernard, *Method in Theology* (Seabury Press, 1973) p. 195.

^{xxvi} One example is that of the Chalcedonian formulation of Jesus as ‘one person, two natures.’ Attention to the debates that led up to this formulation would be able to identify how dialectically speaking, Gnostic ideas of Jesus’ identity were ruled out during the process of verification, and that particular *hypotheses* such as Athanasius’ ‘soteriological principle (what is not assumed is not saved)’ were critical epistemological steps along the way to this formulation/explanation.