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NOTE

FINAL CAUSALITY: A RESPONSE

In his thoughtful and probing article in a recent issue of this journal, Christopher Mooney has written a most provocative essay on the still neuralgic relations between science and theology.[1] As he correctly notes, relations between the two worlds no longer seem to be so beholden to the sorry episodes of the past (typified by the Galileo affair) or to the dogmatism of science's self-appointed apologists (Huxley, Dewey, etc.). This shift of tone, itself often the product of unexpected results in scientific research, opens up new opportunities for dialogue, a situation that Mooney exploits so well in his essay.

His approach is primarily formal: according to his analysis, both science and theology (for reasons unique to each discipline and independent of each other's concerns) have come to a chastened sense of their respective limits. Both by reason of the nature of the human intellect and of the materials which that intellect must seek to understand, neither science nor theology can claim the competence to provide an apodictic and all-encompassing view of the universe which would explain all the remaining enigmas of the existence of the universe or of the knowing beings born within it.

This new-found modesty in both science and theology, besides displaying a becoming virtue that all would do well to imitate, also allows each discipline to look over the fence at its neighbor's lawn and admire the ingenious work going on across the (increasingly permeable) wall. Mooney establishes this thesis by drawing on the insights of various scholars who have looked at the history of science and theology and noticed the remarkable changes that each discipline has undergone. Both the history of science and the history of Christian thought teach us, say these scholars, that each new era seems to call into question the assured results of the past, thereby superseding what went before as it continues to make progress in the present.

From this insight it is but a short step to conclude by recommending the same modesty now. For if both science and theology have abandoned previously held views in the light of later discoveries or developments, who can say that further change shall not be necessary in the future as well? Both disciplines deal, formally speaking, in conceptual models (which like the Church herself must be regarded as *semper*

[1] "Theology and Science: A New Commitment to Dialogue," *TS* 52 (1991) 289–329. All page references in the body of the text refer to this article.

reformanda). Precisely because they are models, they might claim to be realistically *referring* to actual states of affairs, but nonetheless, as models, they can make no claim to *know* those states of affairs: "A critical realism would say that a model comes into existence originally in order to help an individual or community to interpret an event or experience by imagining what cannot be observed" (306).

Mooney notices, however, that such formal resemblances have done nothing so far to promote actual dialogue between practicing scientists and theologians. This puzzling state of affairs can be explained by several factors: theologians are content to leave science alone because they have taken the fact/value distinction for granted for so long (theologians deal with meanings, scientists with data and causal explanation; theologians ask "Why?" and scientists ask "How?") that they rather prefer to let scientists continue on their erstwhile positivistic tracks. And scientists, for their part, are afraid that some "God of the gaps" will be introduced to rupture the seamless web of the cause-effect nexus: "In the eyes of scientists religion constitutes a threat—not to themselves personally so much as to the integrity of their method, which seeks knowledge of universal causality" (313).

To get the conversation going despite these historically reinforced inhibitions, Mooney proposes that the partners in the dialogue distinguish various "levels" of knowledge that correspond both to the different languages of these two disciplines as well as to the structure of reality itself (318). According to Mooney, these linguistic domains reflect the different levels of complexity in the organization of matter in the universe, which in turn give rise to the different methods used in physics, chemistry, biology, and the human sciences.[2]

While I do not disagree with anything specifically asserted in Mooney's essay, I find that he has no sooner alluded to these levels of complexity than he has moved rather too abruptly to the supreme instance of complexity in the universe, the human being. And from that point

[2] "For science is a way of thought, not merely a body of knowledge, and scientists now readily admit that the way they think has its own built-in limitation. Such contemporary modesty in truth claims has also had an unexpected result: many scientists in recent years have begun to listen with more respect to other truth claims about the real world, especially to those proposed by the insights of contemporary theology" (300). "This structure [of the world] in turn reveals levels of organic complexity in nature that chemistry and physics do not deal with, and in the case of humans there occur events of reflective intelligence whose complexity biology does not deal with. . . . When the language of theology makes assertions about humans as persons addressed by God, therefore, this likewise does not exclude scientific statements regarding lower-level phenomena like atoms, neurons, and DNA molecules" (318). There are, then, two key moments in Mooney's argument: the inherent limitations of the human mind, and the admissibility of theological language at the appropriate level of complexity.

on he tries to exploit the paradox of a knowing being inside the universe who simultaneously tries to explain all there is to know in the universe in terms of causal determinism.

I do not dispute that this paradox can be usefully adduced when one is trying to refute Laplacean determinism, but I doubt its long-term usefulness in the dialogue between religion and science. Rather than using the paradoxical constitution of man as the knowing animal to refute an already jejune positivism, I think it would be much better to return to the central issue of *method* in science and theology. For too long, in my opinion, there has been a rather facile division of labor between science and theology according to the hoary fact/value distinction. By that I mean that we must reopen for investigation the assumed dichotomy between meaning ("why") and cause ("how") and investigate more closely their potential conflicts and harmonies. It is interesting, and indicative, that Mooney raises this issue only in the last paragraph of the section on "obstacles to dialogue" before moving on to a wholly other topic in the next section. This is unfortunate, because this is the paragraph that is richest in its implications for the future prospects of the dialogue. He says:

> Science is mainly in search of physical causes, theology mainly in search of meanings and values. Tension exists between them at the points of their overlap because we all want our understandings of causes and meanings to cohere. "The warfare between science and theology is often a struggle to clarify to what extent causal explanations are compatible with or antagonistic to meaning explanations." Some "precursors of meaning" may even appear in biological and sociological explanations, but a religious explanation is usually needed to provide a full account of meaning. Nor do such full accounts of meaning compete with causes. Rather, there is a "causal looseness" in matter itself, an unfinished openness and indeterminacy well documented by science. It is here that meanings are to be found, not in some "perforation of the natural by the supernatural order." Indeed . . . warrants exist within the sciences for nonreductive causal explanations that allow for the influence and effectiveness of *purpose*. For the universe that science studies is not a mere sequence but a story, a struggle *upward* through matter, life, thought, history and culture. Only a narrative can really capture what is going on (318–19, my emphasis).[3]

With all of the above I fully agree, only regretting that the analysis terminated here. For there *is* indeed warrant for nonreductive causal explanations, ones that take into account purpose and upward movement. And that schema of explanation is called teleology. Like the dog that never barked in the Sherlock Holmes story, "teleology" is a word

[3] The text Mooney quotes is from Holmes Rolston III, *Science and Religion: A Critical Survey* (New York: Random House, 1987) 25.

that goes unmentioned in this article but whose very silence is fraught with significance: indeed, it could well be the very clue that can resolve the tensions between science and theology.

In my own experience of teaching college courses to science majors on "Religion and Science" I generally adopt the pedagogically jesuitical strategy of taking science on its own implied terms of naturalism. In other words, I assume for the sake of the argument that the cause–effect nexus is indeed seamless and unperforated. But in both biology and cosmology such assumptions soon lead to irresolvable antinomies that can only be assuaged by the introduction of teleological explanations.

For example, nothing would seem to have been more certain as a result of Darwin's theory of natural selection than the utter untenability of Paley's natural theology, based as it was on the notion of design. For Paley, wings could fly because God so designed them, giraffes could reach the vegetation of the highest trees because their necks were so designed for reaching such otherwise inaccessible fare, etc. But Darwin's theory of natural selection has seemingly expelled such naive explanations for good. It is true that the word "selection" normally implies the operation of choice and purpose,[4] but the whole emphasis of Darwin's theory rests on the adjective: the process is entirely *natural,* that is, no purposive designing force is at work, only the environment operating on chance variations accumulating over vast periods of time.

But follow the assumptions of this theory through. Natural selection requires two preconditions: *chance* variations (of a minute nature) and a truly vast period of time for those minute variations to add up to a different species. But consider the eventual contradiction that arises under this purely naturalistic assumption. Supposedly, only those variations will survive the gene pool that prove beneficial, but how can the variation prove beneficial as long as it is a minute variation? In other words, how can the variation survive except in its fully developed form? In her biographical study of the impact of Darwin on the nineteenth century, Gertrude Himmelfarb is particularly astute in pointing out the irresolvable difficulty lurking in the dual concept of minute variation adding up to *eventual* benefit to the species:

> The eye, as one of the most complex organs, has been the symbol and archetype of [Darwin's] dilemma. Since the eye is obviously of no use at all except in its

[4] "Given the operation of a differential selection process, it is possible to show that any system resulting from this process has all the relevant logical features of purposiveness and teleology" (William C. Wimsatt, "Teleology and the Logical Structure of Function Statements," *Studies in the History and Philosophy of Science* 3 [1972] 16).

final, complete form, how could natural selection have functioned in those initial stages of its evolution when the variations had no possible survival value? No single variation, indeed no single part, being of any use without every other, and natural selection presuming no knowledge of the ultimate end or purpose of the organ, the criterion of utility, or survival, would seem to be irrelevant. . . . Nor could an extra inch in the forerunner of the giraffe have been of much use to him in reaching those top boughs of the trees which presumably [would eventually give] him his superiority over his neighbors. The case of the giraffe, the classical exemplar of evolution, is made even more problematical by the fact that the extra inch of neck would have been particularly useless to the young offspring of the new variety.[5]

Naturalists in Darwin's time were not slow in pointing out this difficulty, and he himself admitted to a certain knee-knocking at the thought of the human eye in particular: Of what survival benefit is a half-formed eye? Or the neck of a giraffe that in its intermediate stage only reaches half-way up the palm tree (and yet has progressed so far that it cannot bend down to reach ground vegetation)? How can such tiny variations survive over the long haul without their final end in view—an end which must both select and preserve such temporarily *un*beneficial variations?

Darwin, of course, knew of this difficulty, and felt he had answered it to his satisfaction. But besides the theoretical difficulty raised by reviewers of his time (and these were Darwin's fellow naturalists, not theologians, as Himmelfarb has pointed out),[6] there soon cropped up the difficulty of the fossil record. If Darwin were right, there ought to be an infinite spectrum of variation displayed among the fossils: fins on the way to becoming wings, scales showing incipient signs of becoming feathers, etc. But fossils display the same reality as animal life does today: by and large, what needs to be accounted for is the *stability* of species, not how their nearly infinite (and infinitely teeming) variations are channeled by the environment to an (at best) temporary stability.[7]

These difficulties gave rise to the "punctuated equilibria" theory made famous by Stephen Jay Gould. This theory has the great benefit that it at least keeps in mind what was the alleged intent behind Darwin: to explain the *origin* of species, which as the Latin root implies means *discrete* species. To explain this discretion in animal forms (and not the subtle spectrum of variations demanded by the Darwinian

[5] Gertrude Himmelfarb, *Darwin and the Darwinian Revolution* (New York: Norton, 1968) 337–38.

[6] Ibid. 268–309.

[7] This point is made with particular force by Philip Johnson in his article "Evolution as Dogma: The Establishment of Naturalism," *First Things* 6 (October 1990) 15–22.

hypothesis), Gould posits moments of sudden variation, leaps, which in just a few generations lead to an entirely different species followed by long stretches of time when stability of form reigns.

The cogency of this theory as it is fully worked out by Gould and his partisans cannot be the subject of this essay. My purpose is merely to show that Gould is quite desperate, in his correction of Darwin, to preserve his naturalistic and nonteleological assumptions. But to do so, while asserting vast leaps and gaps in the record of evolution itself, requires no small leap of the imagination and a gap in the argument which more than one reviewer of his many books has noticed. His latest book, *Wonderful Life: The Burgess Shale and the Nature of History,*[8] prompted an especially penetrating review from Robert Wright, who notes this implication of Gould:

> Gould's central goal in this book is to demolish once and for all the comfortable notion that the human species is Darwinianly ordained—that we, the only self-conscious animals, sit at the pinnacle of evolution, and that, indeed, the whole point of evolution may in some sense have been to reach this pinnacle. There is no ladder of evolution, Gould insists, no necessary path of rising biological complexity and sentience; the coming of self-conscious intelligence was not inexorable or even very likely. Rather, our species exists by virtue of a long series of lucky evolutionary breaks. If you rewound the tape of organic history and edited out any one of those breaks, all subsequent evolution would be radically altered. "Replay the tape a million times," he writes, "and I doubt that anything like *Homo sapiens* would ever evolve again."[9]

But like Darwin with the fossil record, this thesis only denies the very evidence it is the purpose of his theory to explain. For the pattern of evolution does not portray anything like the chaotic zigging and zagging his theory would demand:

> In short, what Gould seems to consider central to his argument is more or less irrelevant to it. He can talk all he wants (and he does) about the role of "contingency" in natural history, about how some quirky ecological circumstance can send the branches of evolution zigging in odd directions, or even snip them off. But if the overall direction of the bush's branches, after all the zigzagging and dying out are done, is toward complexity and intelligence, then how much bearing does this "contingency" have on the thesis that the evolution of highly intelligent life was highly unlikely?[10]

I cite this case of Gould not to focus on him, or on biology in general, but to show how the pesky issue of teleology keeps cropping up when-

[8] (New York: Norton, 1989).
[9] Robert Wright, "The Intelligence Test," *The New Republic* (29 January 1990) 30.
[10] Ibid. 33.

ever consistently nonteleological explanations are pursued to their furthest limit.

This same snag crops up in cosmology too. Mooney mentions Einstein's uneasiness with the notion of a Big Bang (for aesthetic and religious reasons); one can only imagine what his opinion would be of the cosmological anthropic principle, which is by far the most resolutely teleological theory of the origins of the universe since Aristotle. In Stephen Hawking's formulation, certain specifications in the value of what seem to be variables point to the inevitability of raising the teleological question:

> The laws of science, as we know them at present, contain many fundamental numbers, like the size of the electric charge of the electron and the ratio of the masses of the proton and the electron. We cannot, at the moment at least, predict the values of these numbers from theory—we have to find them by observation. It may be that one day we shall discover a complete unified theory that predicts them all, but it is also possible that some or all of them vary from universe to universe or within a single universe. The remarkable fact is that the values of these numbers seem to have been *very finely adjusted* to make possible the development of life. For example, if the electric charge of the electron had been only slightly different, stars either would have been unable to burn hydrogen and helium, or else they would not have exploded. Of course, there might be other forms of intelligent life, not dreamed of even by writers of science fiction, that did not require the light of a star like the sun or the heavier chemical elements that are made in stars and are flung back into space when the stars explode. Nevertheless, it seems clear that there are relatively few ranges of values for the numbers that would allow the development of any form of intelligent life. Most sets of values would give rise to universes that, although they might be very beautiful, would contain no one able to wonder at that beauty. One can take this either as evidence of a divine purpose in Creation and the choice of the law of science or as support for the strong anthropic principle.[11]

Therefore, I maintain that because of this consistently encountered antinomy of natural reason, teleology should be regarded as the central focus for discussions between scientists and theologians. Indeed,

[11] Stephen Hawking, *A Brief History of Time* (New York: Bantam, 1988) 125 (my emphasis). Roughly speaking, the strong anthropic principle is a theory (startlingly reminiscent of the ontology of Bishop Berkeley and his principle *esse est percipi*) that asserts that the universe is observer-dependent. Or more strictly, "the Universe must be such as to admit the creation of observers within it at some stage" (Brandon Carter, "Large Number Coincidences and the Anthropic Principle," *Confrontations of Cosmological Theories with Observation* [Dordrecht: D. Reidel, 1974] 107; see also the same author's "The Anthropic Principle and its Implications for Biological Evolution," *Philosophical Transactions of the Royal Society* A130 [1983] 347–63).

this fits in very well with Mooney's essay, which advocates a project in which we investigate "to what extent causal explanations are compatible with or antagonistic to meaning explanations" (319), where we seek out "precursors of meaning." But this is precisely what an analysis of final causes provides: the end in view *is* the precursor of meaning, indeed is its very presence.

It was the great virtue of Michael Polanyi's book *Personal Knowledge* to have seen this connection between meaning and final causality. We have seen that both in the case of organic forms and in the case of cosmology, teleology inevitably pokes its nose under the tent because of the increasing unlikelihood of things turning out the way they did purely by chance. In other words, chance is the counterconcept to directed outcomes. We are driven to posit teleology because of the inadequacies of asserting that a certain outcome occurs by chance. Why?

According to Polanyi, it is because we have recognized in the outcome a pattern or a meaning, and pattern recognition inherently excludes the notion of pure chance. He uses the example of the diligence of a British Railways employee arranging a large number of pebbles on the hillside of his station to say: "Welcome to Wales by British Railways." The chances of that arrangement of pebbles turning out that way by chance are, of course, so infinitesimal as to be negligible. But supposing, asks Polanyi, the employee retires and the station is closed down permanently. Gradually the pebbles will rearrange themselves in some random order:

> Might we not get into serious difficulty if we were now asked once more: what is the chance of the pebbles having arranged themselves in this particular manner by mere accident? [Specifying precisely this arrangement] would again yield a fantastically small value for the probability of this particular arrangement. Yet obviously we are *not* prepared to say that this arrangement has not come about by chance. Now why this sudden change? . . . Actually, there is no change: we have merely stumbled on a tacit assumption of our argument which we ought to make explicit now. We have assumed from the start that the arrangement of the pebbles which formed an intelligible set of words appropriate to the occasion represented a distinctive pattern. It was only in view of this orderliness that the question could be asked at all whether the orderliness was accidental or not. When the pebbles are scattered irregularly over the whole available area, they possess no pattern and therefore the question whether the orderly pattern is accidental or not cannot arise.[12]

Is there, however, an antinomy on the opposite side of the coin? Does the *assertion* of teleology (or at least the entertainment of it as an

[12] Michael Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy* (Chicago: Univ. of Chicago, 1962) 34.

hypothesis) entail its own contradictions?[13] Or does the assertion of teleology entail not so much contradiction in the Kantian sense as a movement away from the scientific enterprise altogether and into that realm where meaning can be asserted: theology?

This certainly seems to be the fear among scientists, a fear effectively depicted by Mooney in his lucid article. But if his analysis is correct, this fear would seem to have more to do with sociological reasons than the nature of scientific argument.[14] In any case, I think here would be a proper issue for discussion between theologians and scientists.[15] I don't think there is much mileage to be had in sharing our mutual lessons in humility which the history of each discipline has delivered to its respective practitioners. Nor do I think it very fruitful to wax on about the complexity of the three pounds of brain tissue we all carry around, for if the question of teleology is banished, such paeans will only seem like sentimentalism.[16]

With teleology, however, I have found over and over again that it

[13] For a view that says the role of teleology is to provoke the human mind to form novel hypotheses later shown to be valuable in a non-Aristotelian system, see L. S. Feuer, "Teleological Principles in Science," *Inquiry* 21 (1978) 378–80, 397–99.

[14] I refer the reader to the remarks by the Princeton sociologist of knowledge Robert Wuthnow in the citation provided by Mooney (314). According to Wuthnow: "Irreligiosity helps to maintain the plausibility of the scientific province by differentiating scientists (in their own minds) from the larger public who represent everyday reality and generally maintain stronger religious identifications. By helping to maintain the plausibility of the scientific role for the scientist, irreligiosity contributes to his or her role performance as a scientist" ("Science and the Sacred," in *The Sacred in a Secular Age*, ed. Phillip E. Hammond [Berkeley: Univ. of California, 1985] 196–97).

[15] And there is more recognition of the role of teleology among scientists and philosophers of science than one might at first expect: "The insight that no theory can really be closed (or stand alone) will help to open the way once again for the use of teleological terminology and final causes in philosophy and scientific explanation" (Peter Machamer, "Teleology and Selective Processes," in *Logic, Laws, & Life: Some Philosophical Complications* [Pittsburgh: Univ. of Pittsburgh, 1977] 141). This is true even of biologists, who tend to be rather allergic to Aristotelian categories in their science. Richard Dawkins flatly denies this in his *Blind Watchmaker: Why the Evidence of Evolution Reveals a Universe Without Design* (New York: Norton, 1987), but the fundamentals of his thesis have been refuted by biochemist Robert Shapiro in *Origins: A Skeptic's Guide to the Creation of Life on Earth* (New York: Summit, 1986).

[16] For one thing, I *definitely* recommend not hitching our star to the monism of the brain scientists. It is true that Gilbert Ryle exposed deep contradictions in the "ghost in the machine" dualism of Descartes and others. But dualism is by no means out of the ring, as was brilliantly established by one of A. O. Lovejoy's most effective, though underappreciated, books, *The Revolt Against Dualism* (La Salle, Ill.: Open Court, 1960). See also Oliver Sacks, "Neurology and the Soul," *New York Review of Books* (22 November 1990) 44–50; and John Searle, "Is the Brain's Mind a Computer Program?" *Scientific American* 262 (January 1990) 26–41.

manages to raise the most unsettling questions, especially for science majors: these questions invariably arise within the discipline itself, and only when previously accepted methods of inquiry are strictly followed do they eventually prove their inadequacy. But when finally forced to face this aporia (impasse), the scientist-in-training is also forced to face questions of design, pattern and meaning. Inevitably, this leads to a real Socratic moment of perplexity, forcing once assured positivists and empiricists to explore issues in ways they never expected to have to address in their entire professional lives.

This does not mean that teleological issues will take on the same configuration in cosmology and biology. On the contrary, the issues that provoke the teleological impasse are different in each case. In biology, oddly enough, the inevitability of teleology tends to lift organic life above the level of the merely physical and inorganic because of the *functional* nature of the organs in an organism and because organisms are goal-driven in their behavior.[17] In cosmology, however, it would be odd to inquire about the "function" of the universe, or the heterogeneity of its parts harmoniously working together to make the whole function properly.

The teleological issue arises about the existence of the universe only because scientists, at least at the moment, cannot predict *from theory* the numerical values for certain fundamental ratios of forces that bind the universe of matter together. The value of such forces as gravity, electromagnetic force, etc. can only be discovered by observation. This means that they could well be inherently variable, that they could vary from one (supposed) universe to another. Once that is granted, it is then the small room for maneuver within these variables that raises the teleological question.[18] If gravity were only slightly stronger or weaker, life would not have formed ("The remarkable fact is that the

[17] The remarks of the renowned philosopher of biology Michael Ruse in this context are quite fascinating: "Is [there] something necessarily distinctive about biology, or will it vanish with the successful advance of the physical sciences? My surmise is that there is something distinctive about teleological understanding, and that therefore it will not fade away. Or at least let me say that if it were to fade away, something would be lost. . . . Let me add that I doubt, in fact, that there is much danger of this loss happening. As the physical sciences have moved into biology, it is they who have had to do the accommodating! There has been no question of eliminating teleology" ("Teleology and the Biological Sciences," in *Current Issues in Teleology*, ed. Nicholas Rescher [Lanham, Md: University Press of America, 1986] 60–61).

[18] The sometimes complex relations between the anthropic principle and teleological arguments is discussed in Joseph M. Zycinski, "The Anthropic Principle and Teleological Interpretations of Nature," *Review of Metaphysics* 41 (1987) 317–33.

values of these numbers seem to have been very finely adjusted to make possible the development of life"[19]).

None of this, of course, is of immediate use to natural theology. The nagging question of final causality hovers over the explanatory reach of science more in the manner of Poe's raven than Minerva's owl. The contrivances by which the baby kangaroo avoids being strangled in its mother's pouch does not in itself provide "irrefragable evidence of creative thought," as so many nineteenth-century naturalists thought.[20]

In espousing the invocation of teleology as the most useful avenue for scientists and theologians to engage in a mutually fruitful dialogue with each other, I must stress that I am not advocating any *proof* for the existence of God based on teleology.[21] From Hume we have learned that an excessive and too deductive reliance on the concept of design for reaching God only raises the question of what kind of designer it would be who would inflict Lisbon with earthquakes, or parents with leukemic children, or the human mind with convincing arguments for atheism. Teleology is really a limit concept, the inevitable result of a consistently applied naturalism. It represents the snag that will inevitably unravel a rigorous insistence that everything is a result of chance and the patterns we see are those we impose on the data. Any such argument, when fully pursued in all its implications, will soon come face to face with the bothersome indications of design and the sheer unlikelihood of chance generating the universe we know. But what lies behind that indicator only a trust in revelation can reveal. As Cardinal Newman once said, "I believe in design, because I believe in God; not in a God because I see design."[22]

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[19] Hawking, *Brief History* 125.

[20] Richard Owen, "On the Generation of the Marsupial Animals," *Philosophical Transactions of the Royal Society* (1834) 333–64.

[21] On this point, see Willem B. Drees, *Beyond the Big Bang: Quantum Cosmologies and God* (La Salle, Ill.: Open Court, 1990). I am not claiming that teleology can be facilely invoked as a direct bridge between science and theology, only that the aporia that it represents is a better catalyst for discussion between scientists and theologians than the mere admission of the limitation of the human mind would be.

[22] Letter to R. W. Brownlow (13 April 1870), in *The Letters and Diaries of John Henry Newman*, ed. C. S. Dessain and T. Gornall (Oxford: Clarendon, 1973) 25.97.