

Lessons from the Philosophy of Science on the Perceptions and Practice of Science

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Introduction

- A. Lessons
 - 1. Philosophy *OF* science (cf. objective vs. subjective genitive).
 - 2. Prescriptivist implications.
 - 3. Christian context and application.
- B. The philosophy of science should help explicate our diverse perceptions of science and direct the Christian community to a more plausible and productive approach to science.
- C. Objectives
 - 1. Describe a very prominent view of science: the “**Received View**” of science
 - 2. Explain the rise of a “**New View**” of science.
 - a. The ideas and influence of Thomas Kuhn (1922-1996) and Karl Popper (1902-1994).
 - b. Standard presentations of Kuhn & Popper are misleading and even mistaken.
 - (1) A “weak” and “strong” interpretation of Kuhn.
 - (2) “Early” and “late” views of Popper.
 - (3) A “fusion” of (weak) Kuhn and (late) Popper.
 - c. Top ten reflections on this new view of science.
 - 3. Offer some **lesson applications** for the Christian community and our culture regarding how science should be perceived and practiced.

I. The “Received View” of Science.

- A. Steps toward the Received View
 - 1. Empiricists (e.g. David Hume) > Positivists (e.g. Ernst Mach) > Logical Positivists (e.g. A. J. Ayer).
 - 2. Popularists (i.e., Science is based in certain fact and proceeds from hypothesis to theory to law).
 - 3. New Atheists
 - a. Richard Dawkins, *The God Delusion*, 2006
 - b. Christopher Hitchens, *God is Not Great: How Religion Poisons Everything*, 2007.
 - c. Sam Harris, *The End of Faith: Religion, Terror, and the Future of Reason*, 2005.
 - d. Victor Stenger, *God: The Failed Hypothesis: How Science Shows that God Does Not Exist*, 2007.
- B. Perception of science.
 - 1. A “layer cake” concept.
 - 2. A “Modernist” ship.

Table 1: The “Received View” of Science: Science ...

<ul style="list-style-type: none"> 1. Rests on foundationally-certain facts. 2. Empirical (not metaphysical). 3. Objective. 4. Rational, using rigorous logic and universally-accepted methods and criteria. 5. Exhibits no significant commitment; its hypotheses are held tentatively.

- C. Often used to sharply separate science from religion: The emphasis of “Neo-Positivism.”

Table 2: Neo-Positivism (Modernism) on Science VERSUS Religion

<u>Science</u>	<u>Religion</u>
Objective	Subjective
Empirical	Metaphysical (and meaningless)
Rational	Irrational
Certain, epistemic foundations	Epistemically baseless
Only tentative commitment	Requires unconditional commitment.

II. Thomas Kuhn, Karl Popper, and a “New View” of Science.

A. The “traditional” portrayal of Kuhn and Popper: **Fundamental opposition.**

1. Popper (1902-1994): An epistemological realist who extols the uniqueness, rationality, and objectivity of science.
2. Kuhn (1922-1996): An epistemological non-realist who renders science relativistic.
3. The “debate” arranged in London (July 13, 1965) by Imre Lakatos.
 - a. Kuhn, *The Structure of Scientific Revolutions* (1962, 1970).
 - b. Popper, *The Logic of Scientific Discovery* (trans. into English in 1959 from his 1934 *Logik der Forschung*).

Table 3: The “Traditional” Portrayal of Kuhn vs. Popper: Fundamental Opposition

Popper’s View of Science	Kuhn’s View of Science
P1 The hallmark of science is its <u>critical</u> nature. Science progresses through its attempts at <u>falsifying</u> its hypotheses.	K1 “Normal” science exhibits tenacious <u>commitment</u> to an established paradigm whose methods and assumptions are <u>uncritically</u> accepted.
P2 Science is <u>demarcated</u> from non-science (including metaphysics) because it is empirically <u>falsifiable</u> .	K2 Many “ <u>non-scientific</u> ” assumptions and influences, including metaphysical ones, are embedded in scientific activity.
P3 Science is <u>objective</u> ; objective criteria are used to decide among competing scientific theories.	K3 <u>No objective or cross-paradigm criteria</u> are available in science; selecting among competing theories is like “mob psychology.”
P4 Science is <u>rational</u> in its operation and progress.	K4 Scientific “revolutions” occur <u>non-rationally/irrationally</u> .
P5 Science gets “ <u>closer to truth</u> ” in its historical development.	K5 Science historically “shifts” from one paradigm to another, but it <u>does not get “closer to the truth.”</u>

4. I contend that this traditional characterization of Kuhn vs. Popper is **misleading** and even **mistaken**.
 - a. Early Popper vs. Late Popper.
 - b. Strong vs. Weaker interpretation of Kuhn.
 - c. (Late Popper + Weaker Kuhn) $\Rightarrow \Rightarrow \Rightarrow$ “New View” of science.

B. Karl Popper

1. **Popper’s initial project:** To demarcate science from non-science (*Logik der Forschung*, 1934; *The Logic of Scientific Discovery*, 1959).
 - a. Falsifiability (rather than verifiability) as the criterion to demarcate science from non-science.
 - b. Non-foundationalist (vs. the Received View)
 - c. Fallibilist (vs. the Received View).

The “great problem”: “How can we admit that our knowledge is a human—all too human—affair, without at the same time implying that it is all individual whim and arbitrariness?” (*Conjectures and Refutations*, p. 16).

2. The **eventual “conversion”** of Popper.
 - a. Effects from Kuhn.
 - b. Challenges from Imre Lakatos: The “hard core” of scientific research programs is “tenaciously protected from refutation by a vast ‘protective belt’ of auxiliary hypotheses” (Lakatos, “Falsification and the Methodology of Scientific Research Programmes,” in *Criticism and the Growth of Knowledge*, edited by Imre Lakatos and Alan Musgrave [London: Cambridge University Press, 1970], 133).
 - c. The Duhem-Quine problem:
 - (1) $(T \wedge B) \rightarrow P \wedge \neg P$ [i.e., a **T**heory AND its **B**ackground assumptions imply a **P**rediction that turns out false]. But what, specifically, has been falsified?
 - (2) A hypothesis cannot be falsified in isolation from its background assumptions, some of which may be metaphysical in nature.
 - d. Popper’s “**conversion**”:

“Admittedly, Duhem is right when he says that we can test only huge and complex theoretical systems rather than isolated hypotheses” (*The Poverty of Historicism* [New York, NY: Beacon Press, 1957], 132).

“I no longer think, as I once did, that there is a difference between science and metaphysics regarding this most important point (i.e., regarding claim to truth). I look upon a metaphysical theory as similar to a scientific one ... *as long as a metaphysical theory can be rationally criticized*, I should be inclined to take seriously its implicit claim to be considered, tentatively, as true” (*Quantum Theory and the Schism in Physics* [Totowa, NY: Rowman and Littlefield, 1982], 199).

“I do not think it possible to eliminate *all* ‘metaphysical elements’ from science: they are too closely interwoven with the rest” (*Realism and the Aim of Science* [Totowa, NY: Rowman and Littlefield, 1983], 179).

- e. Popper *abandons* falsifiability as a demarcation criterion (in favor of “rational criticizability”).
 - f. He retains non-foundationalism and fallibilism.
3. Popper’s appeal to “**empirical boldness.**”
- a. Scientific theories have varying degrees of empirical content.
 - b. Empirically “bolder” theories *exclude* more than less bold ones.
 - c. *Ceteris Parabus* (all other things being equal), bolder theories should be rationally preferred.

C. Thomas Kuhn (*The Structure of Scientific Revolutions*, 1962; 1970; 1996)

1. “**Normal Science**” and its paradigm.
- a. Normal science is governed by a “paradigm” that consists of a variety of assumptions, including metaphysical ones.
 - b. Normal science does “puzzle-solving” (“mop up” work); it does not critically assess the assumptions of its paradigm.
 - c. Normal science exhibits significant commitment by scientists.

Paradigm: “strong network of commitments—conceptual, theoretical, instrumental, and methodological that guide scientists within that paradigm merely to do “puzzle-solving” or “mop up” work” (SSR, 41-42,16).

“Without commitment to a paradigm there could be no normal science” (Ibid., 100).

This “interpretive enterprise ... can only articulate a paradigm, not correct it”; the commitments “specify not only what sort of entities the universe does contain, but also, by implication, those that it does not” (Ibid., 7).

“The most striking feature” of paradigm-based research is “how little [it aims] to produce major novelties, conceptual, or phenomenal” (Ibid., 35).

“No part of the aim of normal science is to call forth new sorts of phenomena; indeed, those that will not fit the box are often not seen at all” (Ibid., 27).

2. Anomalies, Crises, and “**Revolutionary Science**”

- a. Accumulated anomalies in normal science generate a paradigm “crisis.”
- b. New paradigms are introduced.
- c. Rival paradigms are “incommensurable”—no “point-by-point” comparison is possible.
- d. Scientists in different paradigms “talk through one another” (SSR, 148).
- e. When choosing between competing theories, scientists “behave like philosophers” (Kuhn, “Logic of Discovery or Psychology of Research?” in *Criticism and the Growth of Knowledge*, ed. Imre Lakatos and Alan Musgrave [New York: Cambridge University Press, 1970], 7).
- f. Kuhn: The move to another paradigm is “like a gestalt switch”; a “conversion experience”; “only made on faith”; “cannot be justified by proof” (SSR, 150-152, 158).

“Confronted with anomaly or with crisis, scientists take a different attitude toward existing paradigms, and the nature of their research changes accordingly. . . . Scientific revolutions are inaugurated by a growing sense . . . that an existing paradigm has ceased to function adequately in the exploration of an aspect of nature to which that paradigm itself had previously led the way” (SSR, 90-92).

“The transition between competing paradigms cannot be made a step at a time, forced by logic and neutral experience. Like a gestalt switch, it must occur all at once (though not necessarily in an instant) or not at all” (Ibid., 150).

“In a debate over choice of theory, neither party has access to an argument which resembles a proof in logic or formal mathematics” (“Reflections on My Critics,” in *Criticism and the Growth of Knowledge*, edited by Imre Lakatos and Alan Musgrave, [1970], 260).

3. **Two contrasting interpretations of Kuhn:**

- a. **Strong** (Relativist) interpretation: Kuhn is subjectivist, relativist, and non-realist.
 - (1) **Imre Lakatos:** Kuhn makes science “irrational, a matter for mob psychology” (“Falsification and the Methodology of Scientific Research Programmes,” in Lakatos and Musgrave, ed., *Criticism and the Growth of Knowledge* [1970], 178).
 - (2) **Del Ratzsch,** *The Battle of Beginnings* (1996).

For Kuhn, “Truth plays no essential role in science;” it has “no relevance to science at all”; and it implies “that there was no complete and independent world ‘out there’ for science to investigate” (118,120).

“By the late 1960s and early 1970s, philosophy of science was clearly steering away from any sort of straight Kuhnianism” (118-119).

- (3) **Moreland and Craig,** *Philosophical Foundations for a Christian Worldview* (2003).

Kuhn is “the best-known advocate of nonrational nonrealism” which “rejects both the truthfulness and referential aspects of science, as well as the notion that science is objectively rational” (340, 345).

b. **Weak(er)** interpretation: While rejecting strict proof, Kuhn repudiates relativism and accepts rational criteria in theory selection.

(1) **Kuhn himself** claims that the relativistic interpretations of him “manifest a total misunderstanding” of his views (*The Essential Tension*, 321).

(a) Kuhn: Rejects “postmodern excesses.”

“[T]he world is not invented nor constructed. The creatures to whom this responsibility is imputed, in fact, find the world already in place,... That world, furthermore, has been experimentally given, in part to the new inhabitants directly, and in part indirectly, by inheritance, embodying the experience of their forebears. As such, it is entirely solid: not in the least respectful of an observer’s wishes and desires; quite capable of providing decisive evidence against invented hypotheses which fail to match its behaviour” (*The Road Since Structure* [1992], 101).

(b) Kuhn: Incommensurability does not mean incomparability. (Contrast Moreland’s claim below with Kuhn’s response.)

Moreland: “Kuhn holds that rival paradigms are incommensurable. They cannot even be compared with each other for rational assessment” (*Christianity and the Nature of Science* [1989], 199).

Kuhn: “Most readers of my text have supposed that when I spoke of theories as incommensurable, I meant that they could not be compared.... In applying the term “incommensurability” to theories, I had intended only to insist that there was no common language within which both could be fully expressed and which could therefore be used in a point-by-point comparison between them” (“Theory Change as Structure Change: Comments on the Sneed Formalism,” in *Historical and Philosophical Dimensions of Logic, Methodology, and Philosophy of Science*, ed. Robert Butts and Jaakko Hintikka [Dordrecht: D. Reidel, 1977], 300-301).

(c) Kuhn: Rational persuasion is possible in theory choice.

“To say that . . . paradigm change cannot be justified by proof, is not to say that no arguments are relevant or that scientists cannot be persuaded to change their minds” (*SSR*, 152).

“To name persuasion as the scientist’s recourse is not to suggest that there are not many good reasons for choosing one theory rather than another” (“Reflections on My Critics,” in *Criticism and the Growth of Knowledge*, 261).

(2) **Ratzsch’s** updated and “improved” description of Kuhn.

“Kuhn believed that scientific ‘truth’ was in part sociologically determined by factors within the scientific community.... On Kuhn’s view, while human factors played a significant, unavoidable and indeed constitutive role in science, an external reality (the ‘environment’) and the picture that science built was not merely a human fabrication” (*Science and Its Limits*, 2nd ed. [Downers Grove, IL: InterVarsity, 2000], 52-53.) (Contrast this to Ratzsch’s earlier quotation above from *The Battle of Beginnings*, 1996, 118-120; emphasis added.)

(3) **Alister McGrath’s** more cautious (and more accurate) description of Kuhn.

“The critical point to note is that the factors which precipitate this revolution are not necessarily rational in character. Kuhn argues that a complex network of issues lie behind the decision to abandon one paradigm and accept another, and that these cannot be explained solely on the basis of scientific considerations” (*Science and Religion: A New Introduction*, 2nd ed. [Malden, MA: Wiley-Blackwell, 2010], 132; emphasis added).

D. Top 10 reflections on the “New View” of science. (Cf. The position of Imre Lakatos)

[Read from bottom to top]

1. Determining what constitutes genuine “science” is much more complex than using a single criterion or set of criteria. (Cf. Popper’s rejection of simple falsifiability as a demarcating criterion.)
2. Some scientific theories, especially about large conceptual systems, theoretical entities, or during stages of “revolutionary science” (*a la* Kuhn), are surprisingly similar in nature and function to some religious tradition’s truth-claims (i.e., those traditions that include significant empirical content).
3. Rejecting the “received view” of science (and its associated foundationalist epistemology) need not result in epistemological relativism. (Cf. Both Popper’s and Kuhn’s positions.)
4. The dogmatism of science, especially when wielded as a weapon against religion, should be deflated due to the fallibilistic nature of science (*a la* Popper).
5. Entire systems, not just isolated lower-level hypotheses, must be comparatively evaluated. (Cf. Kuhn’s paradigms and Lakatos’s “research programmes”)
6. Rational comparison among competing scientific paradigms is difficult but possible.

- a. Cf. Kuhn: Incommensurability does not entail incomparability.
- b. Cf. Popper: Theories with greater empirical “boldness” that survive empirical test and rational criticism should be preferred over those with less “boldness.”
7. Science exhibits a complex dynamic between the impact of evidence and the influence of guiding assumptions. Scientists invariably make “decisions.” (Cf. Kuhn’s paradigm switches. Cf. Popper: “It is decisions that settle the fate of theories”).
8. In spite of its professed critical and self-correcting nature, science includes a host of methodological and even metaphysical assumptions and commitments—especially so at the level of large-scale interpretative frameworks. (Cf. Kuhn’s paradigms and Popper’s acknowledgement that science is an “all too human affair”).
9. Science is neither monolithic in its methods nor in its mindsets. (Cf. Kuhn’s revolutionary science and competing paradigms).
10. The “received view” of science (with all of its pretensions about objectivity, certainty, neutrality, unique rationality, and pure empiricity) has been decisively devastated, in spite of its lingering and prominent presence.

III. Lesson Applications from the New View of Science.

A. It should compel us to emphasize the **diversity of science**.

1. Hard (e.g. physics, chemistry, biology) vs. soft (e.g. sociology, psychology)
 - a. The new philosophy of science rejects a sharp distinction, particularly at the level of large-scale interpretive frameworks.
 - b. Even “hard” sciences have their own “frontiers” (see below).
2. Repeatable science vs. origin science.
3. Directly empirical entities vs. “transempirical entities” (e.g. quarks, strings, dark matter, Higg’s boson).
4. Normal vs. Revolutionary Science.
 - a. Times of “revolutionary” science would exhibit and should allow an environment of multiple and legitimate, rival “scientific” paradigms that are not, at least for the time being, subject to definitive resolution.
 - b. Should truth-claims of Christian theology that have empirical import (e.g. God’s creation, God’s acts in history, the resurrection of Jesus, human capacities) be epistemologically compared to scientific truth-claims of “normal” science, “revolutionary” science, or NO science?

B. It should generate a better and more theologically appropriate understanding of the relationship between science and religion (Christianity in particular).

1. The diversity of religion and the diversity of science
2. Overlapping and necessary conflict
3. NOMA (Non-Overlapping Magisteria)
4. Overlapping but mutually contributory

C. It should provide a pioneering precedent for avoiding the dogmatic pretensions of Modernism and the relativistic prospects of Postmodernism.

1. Modernism (⇒ Neo-positivism) vs. Postmodernism (⇒ Contextualism).
2. Foundationalism vs. Fideism
3. Both Modernism and Postmodernism are philosophically and theologically problematic.
 - a. Rejecting foundationalism for fallibility, yet without relativism.
 - b. Attempts to avoid Modernism and Postmodernism that utilize contemporary philosophy of science.
 - (1) **Nancey Murphy** (Fuller Theological Seminary).

“... I conclude that a non-foundationalist approach to theology guided by current philosophy of science is indeed possible. Its subject matter will be God and God’s relations to the worlds of science and history and human interiority....

“... However, ... the theological methodology proposed here, while providing a counter to total relativism, offers no absolutist view of rationality, even within our (loosely) empiricist worldview. There is no instant rationality in science or theology” (*Theology in the Age of Scientific Reasoning*, 206-207; emphasis added).

- (2) **Wentzel Van Huyssteen** (Princeton Theological Seminary).

“With postmodernism I have rejected all forms of foundationalism, but I have also argued against extreme forms of deconstructive postmodernism and the adoption of relativist forms of nonfoundationalism or contextualism ... as reactions against universalist notions of rationality.... I have tried to plot a course between, on the one hand, modernist, metanarrativist overstatements of universality and objectivity and, on the other hand, the extremes of postmodernist overemphases on contextuality and personal judgment.”

“This post-foundationalist view [referring to his own view as shaped by what is called here the ‘new science’] is certainly meant to remind those who ‘dance on the grave of the Enlightenment that funeral arrangements for reason are premature” (*Alone in the World? Human Uniqueness in Science and Theology. The Gifford Lectures*, 10, 12; emphasis added).

(3) **John Polkinghorne** (theoretical physicist, theologian, and Anglican priest).

“Neither science nor religion has access to absolute truth, indubitable beyond the possibility of a challenge.... [Yet] If an uncritical fideism is what religious belief requires, then I would have the greatest difficulty in being a religious person” (John Polkinghorne, *Theology in the Context of Science* (New Haven, CN: Yale University Press, 2009), xvii, 124).

“In his *Personal Knowledge*, Polanyi tells us that he wrote the book in order to explain how, as a scientist, he could commit himself to what he believed to be true, while knowing that it might be false. I believe this to be the status of all human knowledge” (Ibid., 35-36; emphasis added).

(4) **Tom Wright**: “critical realism.”

“... I propose a form of critical realism. This is a way of describing the process of "knowing" that acknowledges the reality of the thing known, as something other than the knower (hence “realism”), while fully acknowledging that the only access we have to this reality lies along the spiraling path of appropriate dialogue or conversation between the knower and the thing known (hence “critical”)” (N.T. Wright, *The New Testament and the People of God*, SPCK, 1992, 35).

D. It should facilitate needed and constructive contributions to the legal, educational, and cultural divisions over Darwinism and Intelligent Design.

I. Prominent court cases.

Judge William Overton (Arkansas creationism trial, 1981):

“More precisely, the essential characteristics of science are: 1) It is guided by natural law; 2) It has to be explanatory by reference to natural law; 3) It is testable against the empirical world; 4) Its conclusions are tentative, i.e., are not necessarily the final word; and 5) It is falsifiable” (“McLean v. Arkansas Board of Education,” IV(C). [<http://www.talkorigins.org/faqs/mclean-v-arkansas.html>])

Judge John Jones (Dover, PA Intelligent Design trial, 2005):

“... Science has been limited to the search for natural causes to explain natural phenomena.... While supernatural explanations may be important and have merit, they are not part of science.... This self-imposed convention of science, which limits inquiry to testable, natural explanations about the natural world, is referred to by philosophers as “methodological naturalism” and is sometimes known as the scientific method.... Methodological naturalism is a “ground rule” of science today which requires scientists to seek explanations in the world around us based upon what we can observe, test, replicate, and verify” (Judge Jones, “Memorandum Opinion,” *Kitzmiller vs. Dover Area School Board*, 2005, p. 65; emphasis added).

2. The dynamics between **Darwinism and Intelligent Design (ID)**.

a. Is Darwinism the “normal science” in biology that resists (expels?) rival paradigms? (Cf. Kuhn)

“[W]hatever its [Kuhn’s model] limitations as a description of science generally, it provides an illuminating picture of the methodology of Darwinism” (Phillip Johnson, *Darwin on Trial*, 2nd ed., p. 120).

b. Possible examples of Darwinian “normal science” at work.

- (1) Note Ben Stein’s “Expelled” movie, but see the strong rebuttal by the National Center for Science Education at <http://www.expelledexposed.com/>.)
- (2) The cancellation of the film “Darwin’s Dilemma: The Mystery of the Cambrian Explosion” by the California Science Center (CSC) in October 2009. CSC paid \$110,000 to settle a First Amendment suit by the American Freedom Alliance.
- (3) By contrast, note the NCSE film “No Dinosaurs in Heaven” (screened at Cal. St. Fullerton on Oct. 27, 2011): “No Dinosaurs in Heaven is a film essay that examines the hijacking of science education by religious fundamentalists, threatening the separation of church and state and dangerously undermining scientific literacy” (<http://www.nodinos.com>).
- (4) The 2002 resolution on Intelligent Design by the AAAS (American Association for the Advancement of Science):

“... Over the past several years proponents of so-called ‘intelligent design theory,’ also known as ID, have challenged the accepted scientific theory of biological evolution.... Recognizing that the ‘intelligent design theory’ represents a challenge to the quality of science education, the Board of Directors of the AAAS

unanimously adopts the following resolution: Whereas, ID proponents claim that contemporary evolutionary theory is incapable of explaining the origin of the diversity of living organisms;

Whereas, to date, the ID movement has failed to offer credible scientific evidence to support their claim that ID undermines the current scientifically accepted theory of evolution;

Whereas, the ID movement has not proposed a scientific means of testing its claims;

Therefore Be It Resolved, that the lack of scientific warrant for so-called "intelligent design theory" makes it improper to include as a part of science education;....” (emphasis added)

[<http://www.aaas.org/news/releases/2002/1106id2.shtml>]

c. Intelligent Design (ID)

(1) Is ID a legitimate “science”?

(2) Has ID raised genuine “anomalies” for (neo)-Darwinism?

(3) Is ID a “**budding research program**”?

“[W]e must not discard a budding research programme simply because it has so far failed to overtake a powerful rival” (Imre Lakatos, “Falsification and the Methodology of Scientific Research Programmes,” in *Criticism and the Growth of Knowledge*, ed. Lakatos and Musgrave, 157). [Published 1970]

“One must treat budding programmes leniently: programmes may take decades before they get off the ground and become empirically progressive” (Lakatos, “Introduction: Science and Pseudoscience,” p. 6). [Originally broadcast in 1973]

E. **It should remind us to ask critical questions, especially during times of “revolutionary science” or “paradigm change.”**

1. Growing evangelical impetus toward **theistic macro-evolution**.

a. Francis Collins, *The Language of God* (Free Press, 2006).

b. Martinez Hewlett and Ted Peters, *Can You Believe in God and Evolution?: A Guide for the Perplexed*. Nashville, TN: Abingdon Press, 2006, 2008.

c. Denis Lamoureux, *Evolutionary Creation* (Wipf & Stock, 2008) and *I Love Jesus and I Accept Evolution* (Wipf & Stock, 2009).

d. Conor Cunningham, *Darwin’s Pious Idea: Why the Ultra-Darwinists and Creationists Both Get It Wrong* (Eerdmans, 2010).

e. Francis Collins and Karl Giberson, *The Language of Science and Faith* (InterVarsity, 2011).

2. **Key questions** for theistic or “teleological evolution”:

a. Is the paradigm necessitated by the available evidence? (Cf. The switch to the Copernican paradigm in the late 16th century.)

b. To what extent are e.g. sociological, psychological, and professional factors involved?

c. What “empirical difference” is there between *theistic* macro-evolution and *non-theistic evolution*? (Cf. Popper’s “boldness” criterion.)

“[I]t is difficult to see what empirical content ... teleological evolution has or how it differs in substance from standard neo-Darwinism with its denial of any evidence of actual, as opposed to merely apparent design.... One must ask: does the ‘teleological’ in the phrase ‘teleological evolution’ make any scientific difference?... But if God’s activity remains forever superfluous or undetectable (except through the eyes of faith), then it also becomes scientifically irrelevant” (Stephen Meyer, “Teleological Evolution: The Difference It Doesn’t Make,” in *Darwinism Defeated? The Johnson-Lamoureux Debate on Biological Origins*, 102).

3. **Specific dilemma** for evangelical theistic evolutionists [ETE]:

a. If the biological evolutionary directives WERE “built in” at God’s initial creation, then it seems difficult for the ETE to reconcile their view of chemical and biological continuity required by Darwinism with the theological and historical sense of discontinuity that seems demanded by e.g. the incarnation, biblical miracles, the resurrection of Jesus, and the relevance of intercessory prayer.

b. If the biological evolutionary directives were NOT “built in”—if God continues to act in ways that transcend “natural” evolutionary capacity—then the ETE seem to admit that a naturalistic mechanism is not sufficient to account for the origin and diversity of life, and this propels the ETE very close to ID.

F. **It should impel us to expose the influential role of worldviews in the perceptions and practice of science.**

1. Kuhn’s scientific “paradigms” extended to the most comprehensive explanatory systems (i.e., worldviews).

2. Presuppositions necessary for science but not justifiable by science.

3. Science OR philosophy? (Becoming good “hat detectors”).

4. Metaphysical Naturalism (a position on the nature of REALITY).

a. E.g. Cosmology?

- b. E.g. Biology?
5. **Methodological Naturalism** (a stipulation on the nature of SCIENCE).
- It does not entail Metaphysical Naturalism, but it seems empirically identical to it.
 - It not only attempts to define science, it entails a theological position that precludes the action of an intelligence that could be detectable by “scientific” inference.
 - If so, it allows *method* to trump the potential discovery of *truth*.
 - It constitutes another problematic “**demarcation attempt**” between science and non-science.
 - E.g. Copernicus theory banned in 1616.
 - E.g. Mendelian genetics rejected in 1949 by the Central Committee on the Soviet Communist Party.

“The problem of demarcation between science and pseudoscience has grave implications also for the institutionalization of criticism.... All these judgments were inevitably based on some sort of demarcation criterion. And this is why the problem of demarcation between science and pseudoscience is not a pseudo-problem of armchair philosophers: it has grave ethical and political implications” (Lakatos, “Science and Pseudo-Science,” pp. 6-7).

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