

# Using Galileo to Teach Darwin: A Developmental and Historical Approach

Craig A. Boyd



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In the spring of 2003, I was asked to create and teach an upper division general education course entitled “Science and Christianity,” an interdisciplinary course I team-taught with biologist Eugene Dunkley and psychologist James Zahniser.<sup>1</sup> Since my own area of expertise is in the history of philosophy and the intersection of science and Christianity, I was selected to lead the team through the portion of the course that considered the historic conflicts between faith and science. As we prepared the course, we realized that in teaching Darwinian theories of evolution, we would encounter resistance because it has the potential to cause distress among students, parents, faculty, and administrators at Christian colleges. Theories of evolution, it is assumed, challenge Christian views of creation—and maybe more importantly—the idea that the Bible is the uniquely inspired word of God.

Darwin’s advocacy of evolution, however, was not the first great crisis to confront people who were both scientifically literate and deeply religious. Galileo’s famous encounter with the Church provides a helpful model for faculty members in negotiating the science-religion terrain since there are so many similarities in the two cases. In his incisive study of Galileo’s *Letter to the Grand Duchess Christina*, Ernan McMullin examines the various hermeneutical principles employed by Galileo in his controversy with the Church. These principles can also apply to the Darwinian controversy. Although Galileo’s own attempt to use these principles is ultimately inconsistent, it provides a helpful approach to negotiating science-theology conflicts.<sup>2</sup>

Since the geo-centric model of the cosmos is no longer widely accepted, it presents a fairly safe starting place for professors who

wish to discuss issues concerning the broader science-religion relationship, but also the more specific issue of evolution and the Christian faith. This approach to teaching Darwinian evolution has the following advantages: (1) it considers the problem of Darwinian evolution and Christian faith within a larger historical context; (2) it helps faculty and students attempt to see that both religious texts as well as the natural world require interpretive tools; and (3) it introduces the materials in an appropriate developmental manner.

As one would expect, students had little difficulty negotiating the conflict between Galileo and the Church, but they did not realize that the same hermeneutical principles could be applied, *mutatis mutandis*, to the Darwin controversy. Our interest was not in proving Galileo or Darwin right or wrong. These issues were secondary to the methodological issues involved in giving a fair hearing to a scientist and theory that has often been misunderstood. Our intent in presenting the material in this way was not to convert students to one particular way of thinking about Darwinism, but to help them see the theories of evolution in the most positive light while giving them “the good news” and “the bad news.”

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## Communication

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To get a handle on the students' beliefs about Darwinian thought and its compatibility with Christian faith, we decided that we would collect some data from them. Before considering the materials on evolution, we presented them briefly with four views on evolution and creation: (1) young-earth creationism, (2) old-earth creationism, (3) theistic evolution, and (4) naturalistic evolution. After these brief presentations, we gave a short survey and asked the students to self-identify with one of the theories. These surveys were anonymous. At the close of the unit, we give them the survey again. An interesting result was the move from the extremes (options 1 and 4) to the middle (options 2 and 3). Most surprisingly, we had students move from nontheistic evolution to one of the theistic models even though our primary concern was not evangelism.

### Primary and Secondary Texts

As a general introduction to various theological, historical, and scientific issues, Gary Ferngren's *Science and Religion: A Historical Introduction* and Ian Barbour's *Religion and Science* prove to be helpful texts. Barbour's work is especially valuable in at least two respects.<sup>3</sup> First, it provides a helpful historical background to both Galileo and Darwin and students find this material readily accessible. Second, Barbour provides four helpful models for considering the interaction of science and religion. The conflict model views science and religion in competition and so if one view is true then the other must be false. The contrast between the fundamentalism of creation scientists as well as the atheistic fundamentalism of Richard Dawkins helps students see the conflict model in stark relief. The independence model—one that Galileo seems to adopt at times—can be seen in the work of Stephen Jay Gould's NOMA thesis as well as the work of neo-orthodox theologian Langdon Gilkey.<sup>4</sup> Defenders of the dialogue model see science raising certain "limit questions" that science does not have the resources to answer. McMullin seems to represent this view. And finally, Barbour considers a model of integration where science and religion can be integrated into a coherent whole.<sup>5</sup>

As a background to the issues, we used Thomas Kuhn's *The Copernican Revolution*. Kuhn provides an excellent understanding of Ptolemaic cosmology and Aristotelian philosophy of nature that shaped the medieval synthesis, which was the context for Galileo.<sup>6</sup> These materials are easily converted to lecture materials and are especially helpful for lecturing on Ptolemaic and Copernican cosmologies.

### McMullin's Interpretive Principles

The Galileo Affair, as it has come to be known, has been well documented, especially by Stillman Drake and Richard Blackwell.<sup>7</sup> The first trial in 1615 focused primarily on the scientific, philosophical, and theological issues concerning Copernicanism while the second trial was concerned primarily with whether Galileo had violated the terms of the agreement negotiated by Cardinal Bellarmine, who unfortunately died years before the second trial.

Galileo's classic defense of Copernicanism can be found in his *Letter to the Grand Duchess Christina*, a work that was circulated as an apologetic for his own views and as a means to sway those who might be open to a heliocentric cosmology. In our course, we placed Drake's *Discoveries and Opinions of Galileo* on reserve at the library and required the students to read Drake's translation of the *Letter* along with McMullin's essay "Galileo on Science and Scripture" in Peter Machamer's *The Cambridge Companion to Galileo*. McMullin observes in the *Letter* that Galileo appeals to the work of Augustine because it is a shrewd political ploy<sup>8</sup> but also because Augustine seems to offer some helpful hermeneutics to address the problem.

McMullin has compiled five of the hermeneutics that Galileo used in his famous letter and uses them to unravel the affair in order to show where Galileo's arguments are the strongest and where they lead to his undoing. The principle that lies behind Galileo's hermeneutical principles is the *Principle of the Unity of Truth*:

Since an all-truthful God is the author of both the book of nature and the book of revelation; then it is not possible in principle for there to be a contradiction

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between a religious truth and a scientific truth when each is properly understood.<sup>9</sup>

This principle anticipates the phrase “All truth is God’s truth,” which has become a shibboleth at most evangelical Christian institutions of higher learning. The principle itself is not too controversial and students readily accept it otherwise they are forced into the attitude that it “may be true in theology but it’s false in science” which seems to violate the basic realism that underscores both scientific method as well as common sense intuitions.

The five hermeneutical principles that McMullin lists can all be found in the earlier work of St. Augustine since the great father of the church also had to negotiate difficult issues that arose between Christian faith and the “science” of his day.<sup>10</sup>

1. *Principle of the Priority of Prudence:*

- When trying to discern the meaning of a difficult Scripture passage, one should keep in mind that different interpretations of the text may be possible, and that, in consequence one should not rush into premature commitment to one of these, especially since further progress in the search for truth may later undermine this interpretation.<sup>11</sup>

This principle, we might say, requires a prior commitment to noetic humility, since it means that we must keep in mind that there is a distinction between what we *read* in the Scriptures and what it *means*. Another way of stating this for students is that our arguments are not about the Scriptures themselves but about our *interpretations* of the Scriptures. It is, of course, possible that students can remain pedagogically incorrigible about this issue but the principle of accommodation seems to cure them of this attitude.

2. *Principle of Priority of Demonstration:*

- When there is a conflict between a proven truth about nature and a particular reading of Scripture, an alternative reading of Scripture must be sought.<sup>12</sup>

This principle seems at times to shape Galileo’s views more than the others. The assumption Galileo makes here is that demonstration itself can “prove” the truth of his own perspective along the lines of a modified Aristotelian notion of demonstration wherein a major premise, followed by a minor premise produced a conclusion in a deductive manner. For Galileo, “demonstration” included this idea but instead of appealing to Aristotelian essences in the reasoning process, he employed mathematics and sense observation. Today we no longer accept this view of demonstration and therefore Galileo’s commitment to this method would ultimately undermine his arguments since on this view neither truth nor demonstration are possible since “scientific method” proceeds inductively.

3. *Principle of Priority of Scripture:*

- When there is an apparent conflict between a Scripture passage and an assertion about the natural world grounded on sense or reason, the literal reading of Scripture should prevail as long as the latter assertion lacks demonstration.<sup>13</sup>

What Galileo means by “sense” and “reason” is a strict Aristotelian form of demonstration, i.e., a deductive proof of the matter that does not admit of alternative possibilities. What Galileo *does not intend* is a reference to a naive realism where things simply are the way they appear to us. Indeed, the whole Copernican enterprise is based upon an understanding of “sense” that is modified by an appeal to “reason” which employs mathematical explanations.<sup>14</sup> What Galileo means by “literal reading of Scripture” is a consideration of the text in its appropriate context.

4. *Principle of Accommodation:*

- The choice of language in the Scripture is accommodated to the capacities of the intended audience.<sup>15</sup>

When combined with the prior principle, we see the idea that a “literal reading” for Galileo is not what our students understand it to be. Any literal reading presupposes the genre of the scriptures and the particular context. Again, this is not too controversial since centuries later Bernard Ramm would appeal to the principle as well.<sup>16</sup>

5. *Principle of Limitation:*

- Since the primary concern of Scripture is with human salvation, texts of Scripture should not be taken to have a bearing on technical issues of natural science.<sup>17</sup>

This is probably the most controversial of the principles as far as our students were concerned. Why is it, they want to know, that Scripture should not speak to technical issues in science? Their reasoning is as follows. If the Bible is the authoritative word of God anything it addresses must be true. The Bible seems to address issues concerning the natural world. Therefore, the Bible addresses scientific issues. The faulty logic lies in the ambiguity of terms such as “truth” as well as the anachronistic problem of twenty-first century ideas superimposed on ancient texts. Of course, carefully explicating the nature of linguistic accommodation can help defuse this potential problem. Nonetheless, the principle is problematic for other reasons since miracles seem to be held true by faith but seem impossible from a strictly scientific (i.e., naturalistic) perspective.



Galileo Galilei

## Questions on Galileo

After lecturing on McMullin’s hermeneutical principles and after students have read the materials from Galileo’s *Letter*, selections from Barbour’s text, and the selections on



## Communication

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“The Copernican Revolution” and “Galileo Galilei” from Ferngren’s *Science and Religion*,<sup>18</sup> they are required to write a brief paper that answers the question, Which is the most important of the interpretive principles in the Galileo Affair? Stated in this way the question leaves open the possibility for students to consider the issue from historical, scientific, philosophical, or theological perspectives.

A key philosophical issue that stands behind much of the debate concerns the nature of interpretive models and epistemological perspectives. We contrast naive realism and critical realism. Naive realism is the view that the world is exactly the way it appears to us and that there is no interpretation of our perceptions. Certainly the Ptolemaic view comes closer to naive realism than the Copernican model since the sun certainly appears to move and we do not! This is one of Cardinal Bellarmine’s key arguments presented in his brief but pointed letter to Foscarini.<sup>19</sup>

Critical realism, however, is the perspective that interpretive models mediate the world of reality to us. As a realist perspective it assumes that there is a real world, independent of our perceptions, that we encounter and that science, no matter what various postmodernists might say, is a fairly reliable guide to knowing the world.

In order to engage the students in class discussion with regard to the intersection of philosophical, theological, historical, and scientific issues involved in the Galileo Affair, we used the following questions:

1. Which interpretive principle was the most important in the Galileo Affair? This can be considered from Galileo’s perspective, the Church’s perspective, a scientific perspective, a theological perspective.
2. What is the weakest element of his argument in the *Letter*?
3. Where do his arguments break down?
4. Is the *Principle of Limitation* a good principle for negotiating conflict? Why?
5. When must you adopt the *Principle of the Priority of Scripture* and when must you adopt the *Principle of Accommodation*? How do you know when to do this?

These questions require the students not only to master the nature of the hermeneutical principles but also to evaluate their validity as applied to situations of potential conflict between religious and scientific authority.

## Interpreting Darwin

When introducing Darwin’s materials, we used the *Origin of Species* as the basis for our lectures. We supplemented these materials with materials from Ferngren,<sup>20</sup> as well as Ernst Mayr’s *What Evolution Is*<sup>21</sup> and Michael Ruse’s *Can A Darwinian be a Christian?*<sup>22</sup> Of course, Darwin did not feel the same need as Galileo did to make his theories acceptable to Church officials. Therefore we do not find protracted theological defenses of his scientific theories. That is not to say that he did not have his theological defenders such as Asa Gray.<sup>23</sup>

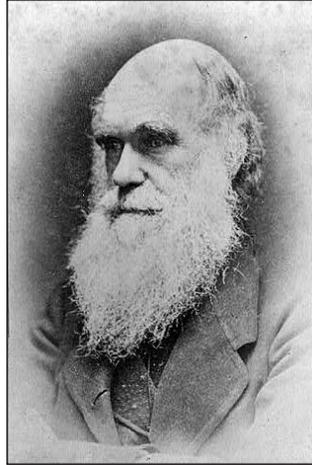
The first question we ask is the converse of Ruse’s question: Can a Christian be a Darwinian? Or rather, can a Christian embrace some form of evolution? This is really a question that probes Galileo’s underlying principle. Does the principle of the unity of truth extend to evolution? The prior question of course is: Is some form of evolution true? And if it is, does this challenge the principle? Pedagogically, we do our best to present both micro- and macro-evolution in the strongest light possible so that students avoid “straw man” fallacies.

Our second line of questioning concerns the *Principle of the Priority of Scripture* as well as the *Principle of Prudence*. We ask whether the Bible speaks unequivocally about six day, 24-hour creation? Or is it possible to remain thoroughly orthodox in belief and view the Genesis creation passages in more than one light? This question touches on the *Principle of the Priority of Prudence*. Should we categorically exclude all other interpretations outright simply because we are committed *a priori* to a theology that forces us to beg the question of our interpretation?

In this way we can simultaneously ask two questions. First, should Christians leave open the possibility for alternative interpretations of the Genesis narratives? And if not, what is the compelling reason to foreclose other avenues of interpretation? Second, how do we know what the literal meaning (in Augustine and Galileo’s sense of the

term) is? That is, do the narratives interpret themselves for us or are we forced to admit that there may be rules that govern how we should interpret them?

The *Principle of the Priority of Demonstration* triggers the most intense response from the more theologically conservative students as they have a tendency to dismiss evolution as “just a theory.” But a quick consideration of philosophy of science can demonstrate that all scientific theories can be considered “just theories.” Moreover, the incredibly high standard of demonstration demanded by Aristotelian natural philosophers simply is not possible. Here, Ruse’s distinction between evolution as fact and evolution as path or cause becomes particularly helpful.<sup>24</sup> If all science is mere theory then knowledge is unattainable.



Charles Darwin

Conversely, if we agree that knowledge is possible, then we must credit some of this to genuine work that theories do. Here again it is important to point out the value of a critical realist approach in scientific reasoning.

When we get to the question of what is the status of the theory (or theories) of evolution, we are quick to point out that there is more than one theory. Ruse’s explication is particularly helpful here since he raises the issue of competing theories of evolution. When engaging evolutionary theorists, do we use Richard Dawkins’ radical neo-Darwinian theory or Stephen Jay Gould’s theory of punctuated equilibrium? These two theorists are also particularly helpful as they represent two of Barbour’s approaches to the science-religion relationship: that of conflict and independence respectively. Here it is important to draw out the distinction between what Darwin himself had to say on the theory of natural selection and how his twenty-first century interpreters use the theory for their own purposes.

As we engage students in class discussion on Darwin and the subsequent modifications of his theories, we begin by reminding them of the hermeneutical principles from the Galileo Affair. We then engage them in discussing the following questions:

1. If the *Principle of the Unity of Truth* holds, how do we resolve the issue between Darwinian (or more contemporary versions of) evolution and Christian faith?
2. To what extent should we adopt the *Principle of the Priority of Prudence* with regard to the creation narratives?

3. To what extent can any evolutionary theory lay claim to be “demonstrative?” That is, to what extent is evolution “just a theory” — as students hostile to the theory are inclined to say — and to what extent is it “more than a theory” — as the late Pope John Paul II said?
4. The *Principle of Limitation* seems to work for Copernicanism but does it work for Darwinian evolutionary theory? Why?

With regard to exam questions, we expect students to be able to articulate the strengths and weaknesses of evolutionary theory but we also believe that in requiring students to represent arguments they disagree with is a healthy exercise; one that enables them to see the issue from another perspective. For their exams we ask them to respond to the following:

Construct two arguments (make sure to employ theological, philosophical, and scientific evidence):

1. Argue that evolution is consistent with Christian faith.
2. Argue that evolution is inconsistent with Christian faith.

## Conclusion

It may be that teaching evolution and Darwinism will never be an entirely painless process. However, in presenting materials in historical sequence, students seem to more readily engage the materials and give evolutionary thought a fairer hearing. Moreover, when certain hermeneutical principles are established in the Galileo Affair, students can apply them in an analogous fashion to the Darwinian controversy as well. The upshot should be that they develop a noetic humility in which they have a greater desire to understand the historical, philosophical, theological, and philosophical issues that shape our understanding of both situations. ★

## Notes

<sup>1</sup>We taught this course at Greenville College (IL), which is a small liberal arts college affiliated with the Free Methodist Church of North America. The college is also a member of the Christian Council for Colleges and Universities.

<sup>2</sup>For example, if science and theology belong to entirely separate and discreet domains — as Galileo claims — then no defense of scientific reasoning is necessary; yet Galileo insists on defending it.

<sup>3</sup>Ian Barbour, *Religion and Science: Historical and Contemporary Issues* (San Francisco: Harper Torchbooks, 1997); Gary B. Ferngren, ed., *Science and Religion: A Historical Introduction* (Baltimore: The Johns Hopkins University Press, 2002). Another text we used as supplemental material was Alister McGrath, *Science and Religion: An Introduction* (Boston: Blackwell Publishing, 1998), which has a number of helpful diagrams and charts.

<sup>4</sup>Stephen Jay Gould, *Religion and Science in the Fullness of Life* (New York: Ballantine Books, 1998). NOMA stands for “Non-Overlapping Magisteria,” the idea that the authorities of religion and science in no way share the same content for their “disciplines”; Langdon Gilkey, *Nature, Reality, and the Sacred: The Nexus of Science and Religion* (Philadelphia: Augsburg/Fortress, 1993).

# Communication

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<sup>5</sup>Barbour further subdivides this model into three others: (1) natural theology, (2) theology of nature, and (3) systematic synthesis.

<sup>6</sup>Thomas Kuhn, *The Copernican Revolution* (Cambridge, MA: Harvard University Press, 1959).

<sup>7</sup>Richard J. Blackwell, *Galileo, Bellarmine, and the Bible* (Notre Dame, IN: University of Notre Dame Press, 1991); also see Richard J. Blackwell, *Behind the Scenes at Galileo's Trial* (Notre Dame: University of Notre Dame Press, 2006).

<sup>8</sup>Dating back three centuries before Galileo, Thomas Aquinas realized that anyone writing on theological matters needed the authority of Augustine buttressing his own work. Furthermore, since the authority of tradition was, and still is, very important in Roman Catholic theology, it was wise to cite Augustine since he represents the most significant authority of that tradition.

<sup>9</sup>Ernan McMullin, "Galileo on Science and Scripture," *The Cambridge Companion to Galileo*, ed. Peter Machamer (New York: Cambridge University Press, 1998), 271–347.

<sup>10</sup>Augustine, *The Literal Meaning of Genesis*, 2 vols., trans. John Hammond Taylor, SJ (Mahwah, NJ: Paulist Press, 1982).

<sup>11</sup>McMullin, "Galileo on Science and Scripture," 292.

<sup>12</sup>*Ibid.*, 294.

<sup>13</sup>*Ibid.*, 295.

<sup>14</sup>William Wallace, "Aristotle and Galileo: The Uses of *Suppositio* in Scientific Reasoning," *Studies in Aristotle*, ed. Dominic O'Meara (Washington, DC: Catholic University of America Press, 1981): 44–77.

<sup>15</sup>*Ibid.*, 296.

<sup>16</sup>Bernard Ramm, *The Christian View of Science and Scripture* (Grand Rapids, MI: Eerdmans, 1954).

<sup>17</sup>*Ibid.*, 298.

<sup>18</sup>Ferngren, *Science and Religion*.

<sup>19</sup>An English translation of Bellarmine's letter to Foscarini can be found in Blackwell, *Galileo, Bellarmine, and the Bible*, 265–7.

<sup>20</sup>James Moore, "Darwin"; Peter J. Bowler, "Evolution"; Ronald Numbers, "Creationism Since 1859"; and Edward J. Larson, "The Scopes Trial" in Ferngren, *Science and Religion*.

<sup>21</sup>Ernst Mayr, *What Evolution Is* (New York: Basic Books, 2001).

<sup>22</sup>Michael Ruse, *Can a Darwinian be a Christian? The Relationship between Science and Religion* (New York: Cambridge University Press, 2001).

<sup>23</sup>Asa Gray, *Darwiniana* (New York: 1877).

<sup>24</sup>Ruse, *Can a Darwinian be a Christian?* 12–24.

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