

STUDY GUIDE : THE WORKINGS OF SCIENCE

By Dr. Joshua M. Moritz

VIDEO SUMMARY: Can science answer all possible questions? What exactly is science and does it have any limits? While some popular portrayals hold that science has no bounds and can answer all questions, philosophers of science disagree. According to philosophers of science, science is fundamentally limited by that which it studies—the observable physical universe and its regularities. What science does, it does well, because it limits itself to certain kinds of measurable properties of objects and states of affairs. The powers of science are limited, though, in that there are places that cosmology, physics, and biology cannot go. Science is not all-sufficient because even the best human knowledge is fallible. Beyond this, the practice of science relies crucially on ethical commitments and philosophical assumptions that lie outside of science. Thus questions of transcendence and human meaning--the “before” and “after”--are fundamental queries that science cannot answer.

CONTRIBUTORS

Dr. Melinda Baldwin is a historian of science based out of Washington, DC, where she is the books editor at *Physics Today*. She is author of *Making ‘Nature’: The History of a Scientific Journal* (University of Chicago Press, 2015).

Dr. Sylvester James Gates Jr. is the John S. Toll professor of physics and director of the Center for String and Particle Theory at the University of Maryland at College Park.

Dr. Michael Ruse is the Lucyle T. Werkmeister professor of philosophy and director of the Program in the History and Philosophy of Science at Florida State University. He is a Fellow of both the Royal Society of Canada and the American Association for the Advancement of Science, and is the author of *Can a Darwinian be a Christian? The Relationship between Science and Religion* (Cambridge University Press, 2001) and *Science and Spirituality: Making Room for Faith in the Age of Science* (Cambridge University Press, 2010).

DISCUSSION QUESTIONS:

In this film, Dr. S. James Gates says, “I do not understand how science can discover truth...As I have experienced science, what it discovers is accuracy, and maybe for most people truth and accuracy is the same thing but they're not to me.”

1. Do you think the *pragmatic value* of a scientific theory (i.e. that it works and is useful) is a good measure of whether or not it is *true* (i.e. corresponds to reality)? Why or why not?
2. Do you think it is possible to have any knowledge that is purely objective? Why or why not?

Gates says, “Science, ultimately, is about what we humans can measure, and stating the relationships of those measured quantities. , He says, “If you have a concept that you have no way of measuring and I have no way of measuring, I cannot ascribe the doing of science to ... refute that concept. I have no framework for doing that.”

3. Do you think there are truths that cannot be measured? If so, give some examples.

Dr. Melinda Baldwin speaks about how people trust the authority of scientists, and Gates talks about how the role of faith within the practice of science limits the types of questions that science can answer. Gates, for example, says, “Not only does one have to have faith in one's self, one also has to have a kind of faith that the universe is understandable.”

4. Think of something that you hold as true (*a knowledge claim*) beyond what is immediately evident to your senses at this moment, and consider *why* you hold it as true (e.g. that the Earth is round). What is your *evidence* for the knowledge claim? How “far back” can you take the chain of evidence? At what point or points does trust in the authority of someone else or faith (e.g. in your senses, in the accuracy of your measuring instruments, in your mathematical systems, etc.) enter into the chain of evidence?

5. Can you think of examples where *religious* faith has played an important role in the development of science? Can you think of examples where *religious* faith plays a role in science today?

Dr. Michael Ruse says the very nature of science gives it limits because the essence of science is metaphor.

6. Do you think the scientific dependence on metaphors limits scientific attainment of truth? Why or why not?
7. Do you think there is such a thing as a "perfect metaphor"--that is, a construct or model which is actually a literal interpretation or understanding of reality as it really is? If so, give some examples. If not, why not?
8. How are religion and science similar in their use of metaphors? Do you think that some metaphors employed by religion and science are actually talking about the same underlying reality (e.g. the Big Bang as God's Creation of the Cosmos)? Why or why not?

Baldwin suggests that science raises questions that science itself can't answer.

9. What are some questions that science can't currently answer? Do you think there are any questions that science will never be able to answer? If so, give some examples.
10. Consider the statement: "One day science will be able to answer all questions." Would you consider this a strictly *scientific* statement? Why or why not?

FURTHER RESOURCES & SUGGESTED READINGS:

On the Scientific Method, Scientific Explanation, and Religion:

- Video: Denis Alexander, "Truth Telling in the Practice of Science"
<http://downloads.sms.cam.ac.uk/1266574/1266578.m4v>
- Video: Philip Clayton, "Explanation in Science and Religion"
<http://downloads.sms.cam.ac.uk/1293359/1293363.m4v>
- Video: Allan Chapman, "The Historical Roots of Scientific Reductionism"
<http://downloads.sms.cam.ac.uk/1290909/1290913.m4v>
- Video: Philip Clayton, "How Can Emergence Explain Reality?"
<https://www.youtube.com/watch?v=nzWclhC7WmE>
- Video: Roger Trigg, "The Rationality of Science"
<http://media.st-edmunds.cam.ac.uk/WebMedia/Roger%20Trigg%20Rationality.mov>
- Video: Roger Trigg, "Rationality in Science and Faith"
<http://downloads.sms.cam.ac.uk/1691788/1691793.m4v>
- Philip Clayton, *Explanation from Physics to Theology: An Essay in Rationality and Religion* (Yale University Press, 1989).
- Robert P. Crease, ed., *Hermeneutics and the Natural Sciences* (Kluwer Academic Publishers, 1997).
- Lorraine Daston and Peter Galison, *Objectivity* (MIT Press, 2007).
- David Glass and Mark McCartney, "Explaining and Explaining Away in Science and Religion," *Theology and Science* 14:3 (2016).
- Rodney Holder, "Explaining and Explaining Away in Cosmology and Theology" *Theology and Science* 14:3 (2016).
- Gregory Peterson, "Demarcation and the Scientistic Fallacy," *Zygon* 38:4 (Dec 2003).
- Delvin Ratzsch, "The Nature of Science" in *Science and Religion in Dialogue*, Melville Y. Stewart, ed. (Wiley-Blackwell, 2010).
- Robert John Russell, William R. Stoeger, and George V. Coyne, eds., *Physics, Philosophy and Theology: A Common Quest for Understanding* (University of Notre Dame Press, 1988).
- Simon Shaffer and Steven Shapin, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton University Press, 1985).

On the Metaphysical Presuppositions of Science and Limits of Science:

- Audio: Ian Hutchinson, "Monopolising Knowledge: A Refutation of Scientism"

<http://media.st-edmunds.cam.ac.uk/WebMedia/FAR411%20Hutchinson.mp3>

- Video: Ian Hutchinson, "Physics and Faith"
<http://downloads.sms.cam.ac.uk/1162167/1162181.m4v>
- Video: Ian Hutchinson, "Scientism: how much faith should we put in science?"
<http://downloads.sms.cam.ac.uk/1329651/1329656.m4v>
- Video: Timothy O'Connor, "Discerning Purpose at the Limits of Science"
<http://downloads.sms.cam.ac.uk/1160736/1160746.m4v>
- Mariano Artigas, *The Mind of the Universe: Understanding Science and Religion* (Templeton Press, 1999).
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- Philip Clayton, "Philosophy of Science: What One Needs to Know," *Zygon* 32 (1997): 99-108.
- Edward B. Davis, "Christianity and Early Modern Science: The Foster Thesis Reconsidered," in *Evangelicals and Science in Historical Perspective*, David Livingstone, D. Hart, and Mark Noll, eds. (Oxford University Press, 1999).
- John Dupre, *Human Nature and the Limits of Science* (Oxford University Press, 2001).
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- Joshua Moritz, *Science and Religion: Beyond Warfare and Toward Understanding* (Anselm Academic, 2016).
- Nancey Murphy, "The Role of Philosophy in the Science/Religion Dialogue" in *A Science and Religion Primer*, Heidi Campbell and Heather Looy, eds. (Baker Academic, 2009).
- Richard Olson, *Science Deified and Science Defied: The Historical Significance of Science in Western Culture* (University of California Press, 1982).
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- Jitse M. van der Meer, ed., *Facets of Faith and Science, Volume 3: The Role of Beliefs in the Natural Sciences* (University Press of America, 1996).
- René van Woudenberg, "Limits of Science and the Christian Faith," *Science and Christian Belief* 24:2 (October 2012).

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