Summer 2017

How Can We Understand the Universe? (Leader's Guide)

Robbin Eppinga
Dordt College, robbin.eppinga@dordt.edu

Lydia Marcus
Dordt College

A Leader's Guide to

How Can We Understand the Universe?

A Study of *A Brief History of Time*

Dr. Robbin Eppinga, Lydia Marcus
Dordt College, Sioux Center, Iowa
Summer 2017

How to Use This Material?

This study of how we understand the universe using Stephen Hawking's *A Brief History of Time* consists of 4 modules. Each module contains two sections. The first section presents a set of Reading and Reflection questions that are to be completed before each meeting and are meant to help the participant wrestle with the concepts introduced in that week's chapters. The second section consists of two (or more) Discussion questions, which will be written by the participants and the leader as they read. Both sets of questions are meant to foster discussion, but your group should by no means limit itself to the questions contained in these sections.

This study is intended for **informal, small group** discussion, such as that of a Bible study or small group. The themes presented in each submodule may be unpacked on its own, but it is the hope of the authors that the entire study may be useful to the interested reader (leader and participant alike). The study is also aimed toward **high school students, college students, and post-college adults** with an interest in how science and the Christian faith interact.

As you read, it is our hope that you will come across (and come up with) questions which challenge you, both in understanding your personal faith and in understanding science. In these questions, you will have the opportunity to grow through asking and answering these questions: Why has the church historically believed in *this* answer or *that* answer? How might you be challenged to defend your answer?

Planning and Preparing for a Session

The material assumes that each session will last for about 30-45 minutes. It also assumes that each participant will have read the assigned chapter(s) and considered the Reading and Reflection questions ahead of time.

It must also be noted that the provided discussion questions are intended as a guide for your discussion, but you should by no means restrict your discussion to these questions. Try to keep your group's discussion relevant to the general themes addressed in the module, but be flexible.

Equipped for Service

This "Leader's Guide" is meant to **equip leaders** of these small group discussions, and thus the following pages are far more detailed and expansive than the average participant may judge necessary for complex discussion. We offer information from other references and suggested answers to questions posed in the text. This has been done in the hope that you, as the leader, may more easily facilitate and moderate discussion amongst your peers in the small group. Your small group may be made up of the generation that initiates change in how the common Christian comes to understand these questions and answer – in the service of your peers, do not underestimate your own significance as a leader or co-leader.

Who is the author of *A Brief History of Time*?

Stephen Hawking is a theoretical physicist and cosmologist who is most known for his work in the fields of quantum gravity and general relativity. His book *A Brief History of Time* was a *Sunday Times* best-seller for 237 weeks. He has won many awards, including the Presidential Medal of Freedom (2009) and the Royal Society's Copley Medal (2006).

Hawking is also known for his amyotrophic lateral sclerosis (ALS, or Lou Gehrig's disease), which has slowly paralyzed him. He communicates using a speech-generating computer, which allowed him to continue to write even after losing the ability to speak. Hawking is an atheist, and he seems to be an adherent of scientism (at least, he is now—he may have become more so with age).

Table of Contents

Module 1: How We Understand Space, Time, and Space-Time

Reading Material: "Our Picture of the Universe" and "Space and Time"

Reading and Reflection

"Our Picture of the Universe"

1. Do you have answers to the questions Hawking poses in the second paragraph? Do you think that the universe is eternal and unchanging?

2. What do you think Hawking means when he says "God"? How do you think Hawking views religion?

3. How does Hawking define "theory"? What do you think of Hawking's assessment that "the eventual goal of science" is to provide a comprehensive theory of everything (10)?

   Suggested Answer: Hawking says that theories are "just models of the universe" and "a set of rules that relate quantities in the model to observations that we make" (9). Theories are merely models, but they are useful, well-validated models.

4. Do you agree that "humanity's deepest desire for knowledge is justification enough for our continuing quest" (13)?

"Space and Time"

1. In what ways would "absolute position" be related to belief in an absolute God? Does the absoluteness of God require the "absoluteness" of laws of nature?

   Suggested Answer: Newton (and others) believed that the characteristics of God would be reflected in His Creation. Therefore, because God is constant and absolute, time, space, and natural laws should also be constant and absolute. Though this is a fairly reasonable assertion, it can be dangerous to define the ways God would and

wouldn't act too rigidly; it gets tricky to reconcile belief in God with observations about the created world when we've put God in a box.

2. What do you think of the proposed warped nature of space-time? About the idea that time appears to be slower near massive bodies? What implications do the relativity of position and time have for your understanding of the universe?

Discussion Questions

In addition to answering the Reading and Reflection questions above, please write two of your own questions about the assigned reading for today.

1.

2.

Module 2: Models of the Universe

Reading Material: "The Expanding Universe," "The Uncertainty Principle," and "Elementary Particles and the Forces of Nature"

Reading and Reflection

"The Expanding Universe"

1. What purpose does measuring the stars serve? Why does astronomy (or astrophysics) matter?

   Suggested Answer: From a purely utilitarian perspective, astronomy isn't terribly practical. Astronomical advancements have produced useful by-products (e.g. satellites that allowed for the development of GPS technology), but pursuing astronomy because it might yield useful by-products seems rather inefficient. Is there a place for discovery purely for the sake of delight? Can we do science just for the joy of it? What can we learn about God (and ourselves) through the study of space?

2. Do you believe that there was a "big bang"? What do you know of te "big bang," other than what you have read in "The Expanding Universe"?

"The Uncertainty Principle"

1. What do you think of the idea of a deterministic universe? Does determinism "infringe on God's freedom to intervene in the world" (53)? What are the implications for faith (and evangelism) in a deterministic universe when it is applied to human activity?

2. What do you think of the statement "We could still imagine that there is a set of laws that determines events completely for some supernatural being, who could observe the present state of the universe without disturbing it" (55)? Is this a deistic understanding of God/gods?

"Elementary Particles and the Forces of Nature"

1. Hawking clarifies that categories of force-carrying particles are man-made and may not "correspond to anything deeper" (69). What do you think of this statement? Particularly, what do you think of the idea that scientific classifications are (or may be) human inventions?

Discussion Questions

In addition to answering the Reading and Reflection questions above, please write two of your own questions about the assigned reading for today.

1.

2.

Module 3: Black Holes, Beginnings, and Ends

Reading Material: "Black Holes," "Black Holes Ain't So Black," and "The Origin and Fate of the Universe"

Reading and Reflection

"Black Holes"

1. Why is the censorship hypothesis important for naked singularities (89)? What do you think of wormholes and time travel?

Suggested Answer: Close to naked singularities, time travel may be possible. Discussion of time travel probably seems outlandish, but it is interesting to consider such possibilities in the context of science rather than science fiction. What implications would time travel have for our lives (besides the "your parents might be killed before you were born" scenario Hawking supplies)? This is a fanciful question—have fun with it!

"Black Holes Ain't So Black"

1. Why do you think that black holes exist? Do they serve some important function in the universe? Are they simply spectacles?

Suggested Answer: These questions may lead to a discussion of the purpose of Creation. Black holes are important consequences of the lifecycle of stars. They are also magnificent and mysterious. What is the purpose of the far reaches of space we are not even aware of yet? Some participants may respond "the glory of God." Encourage them to unpack that statement. How does space bring glory to God? Does it only bring glory to God when humans know of it and explore it?

"The Origin and Fate of the Universe"

1. What do you think of the Pope's caution that scientists "should not inquire into the big bang itself because that was the moment of Creation and therefore the work of God" (116)? What assumptions does the Pope make?

Suggested Answer: The way Hawking phrases this caution makes it sound as though the Pope believes that the evolution of the universe was not "the work of God." This

is serious, and not apparently in line with an understanding of a Creator God who is active in His Creation. Is science in danger of repeating the folly of those who constructed the tower of Babel? Should we stay away from certain aspects of scientific inquiry in order to avoid the hubris of presuming to know how God made the world?

2. What do you think of the evolution of macromolecules? Can the evolution of macromolecules fit with your understanding of the creation of the world?

3. What do you think of the sentence, "These laws may have originally been decreed by God, but it appears that He has since left the universe to evolve according to them and does not now intervene in it" (122)? How do you think Hawking would define natural laws? How do you define natural laws?

Suggested Answer: This assumes that God is not required to uphold and sustain the natural order of things. Hawking would say natural laws are principles that the created world must abide by; they follow these laws without help. We can also define natural law as a human-made description of the way God acts. Natural laws are simply the way God works in the world, and God is constantly involved in the world because He is required to keep the universe going.

Discussion Questions

In addition to answering the Reading and Reflection questions above, please write two of your own questions about the assigned reading for today.

1.

2.

Module 4: Time, Concordance, and Conclusion

Reading Material: "The Arrow of Time," "The Unification of Physics," and "Conclusion"

Reading and Reflection

"The Arrow of Time"

1. What do you think of Hawking's assertion that admitting "in print that you are wrong" is better than avoiding admitting your mistake? What is the role of admitting you're wrong play in science?

   Suggested Answer: Being wrong is part of doing science—it isn't good science if it isn't falsifiable! What do you think of Hawking as an individual? He has inserted bits of personal narrative throughout this book. How does your impression of Hawking as a person influence the way you view his science?

"The Unification of Physics"

1. What do you think of string theory? Have you heard of it before? Does Hawking's description make sense to you?

2. Can God make a stone so heavy that He can't lift it (166)? Do you believe that God exists within time?

   Suggested Answer: These aren't "salvation issue questions" (i.e. you can be a faithful Christian and answer either yes or no to these questions), but they are interesting to consider. Does Scripture tell us anything about these questions?

"Conclusion"

1. What should we do with stories like that of "the sun stopping for Joshua" (172)? Is science wrong? Is Scripture wrong? Have we misunderstood one or the other?

2. Hawkins says that Laplace and his contemporaries confined God to "the areas that nineteenth-century science did not understand" (172). What are the consequences of

relegating God to the parts of Creation we haven't yet described using science (sometimes called "God of the Gaps")?

Suggested Answer: The more we learn, the less room there is for God to act. When we put God in a box, it gets harder and harder to maintain belief in God after being exposed to situations that conflict with the box we've put God into.

3. How would you answer the question "How much choice did God have in constructing the universe"? How does your answer fit with what you've learned about the universe, time, and space in the previous chapters? What do you think of Hawking's answer to the question?

Suggested Answer: Hawking seems to put God into a bit of a box. God's omnipotence is forfeited, and he seems to think that natural laws are somewhat distinct from divine action (i.e. he doesn't interpret natural laws as descriptions of the way God chooses to act).

4. Is it good to seek to know the mind of God? In what ways do we seek to know the mind of God today?

Discussion Questions

In addition to answering the Reading and Reflection questions above, please write two of your own questions about the assigned reading for today.

1.

2.

Bibliography

Hawking, S. W. (1988). *A Brief History of Time.* Toronto: Bantam Books. Print.