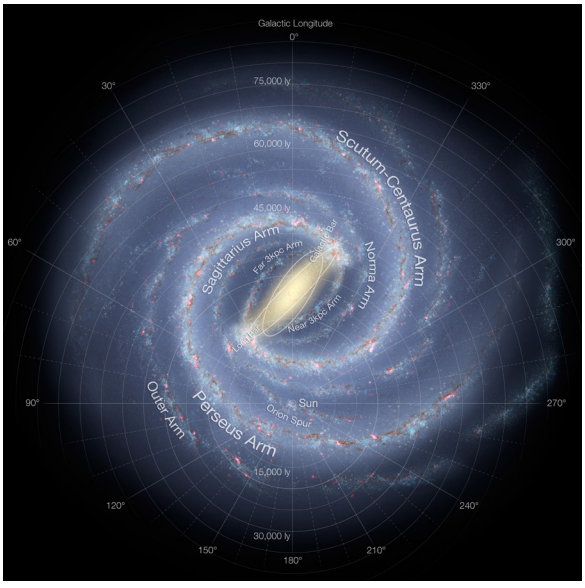
Leader Discussion Guide for *Cosmos: A SpaceTime Odyssey*

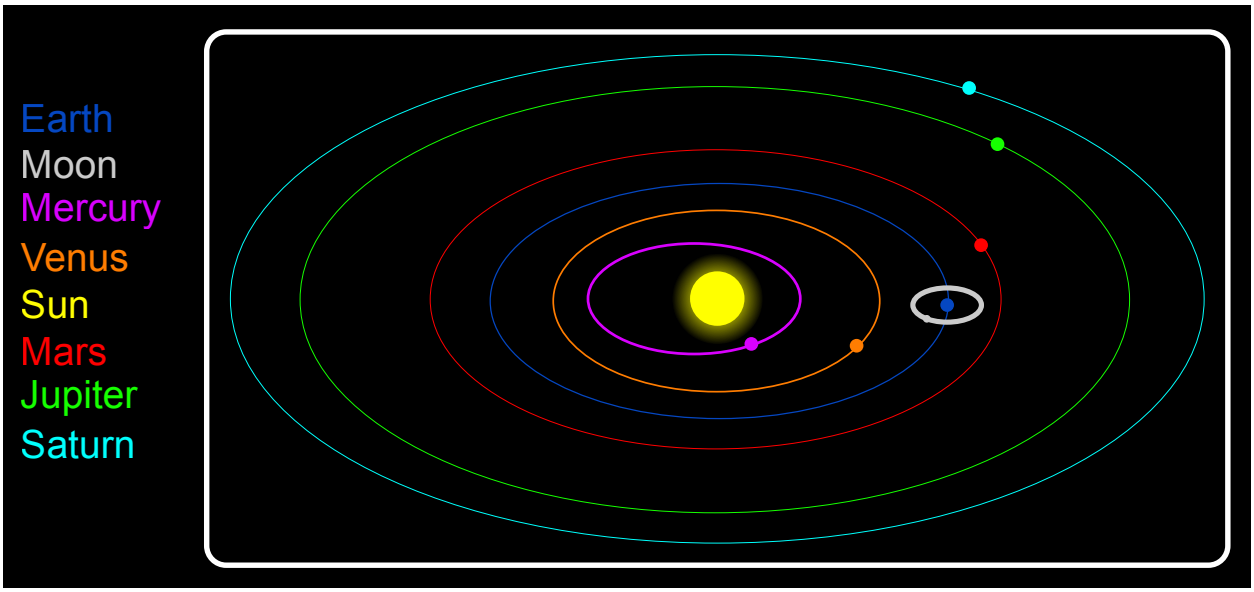
Episode 1: "Standing Up in the Milky Way"

The creators of *Cosmos: A SpaceTime Odyssey* state that their aim is to promote scientific literacy. We know that many who watch the program may find the blurring of observational, experimental science with historical, origins science confusing In this study guide for episode one, we emphasize the need for a historical record to correctly interpret times and events that cannot be directly observed using the scientific method.

1. **You can probably describe where you live using your street address, your neighborhood, your town, your state or province, your country, and your planet. Describe earth's place in the universe.**



ANSWER: Earth is the third planet in our solar system. Mercury and Venus are the first and second planets. Mars, Jupiter, Saturn, Uranus, and Neptune orbit farther from sun than we do. Our solar system is in the Milky Way galaxy. The next nearest galaxy of any size in



the Local Group of galaxies is Andromeda. The Local Group is part of the Virgo Supercluster. Space is a very big place.

2. **What is the scientific method?**

ANSWER: The scientific method is systematic search for knowledge about the material, observable universe using controlled experiments or observations to test ideas. After making initial observations, a scientist proposes a testable "hypothesis" about how or why something works. Then the scientist tests the hypothesis using controlled, repeatable experiments. If the hypothesis is not proven wrong by experiments and observation, the hypothesis is accepted and used as a basis for testing ideas further. Then additional hypotheses are considered and more experiments are performed to build on and define theories. Scientists continually test scientific theories by using those theories to interpret new data. If a theory cannot explain the data, then the theory is questioned and a new theory is proposed and tested. In science, a theory is not simply a guess, but a well-tested idea that can explain a broad set of observations.

For further study:

http://www.answersingenesis.org/articles/ee/what-is-science

3. **What is the difference between observational, experimental science and historical science? Which one of these is origins science?**

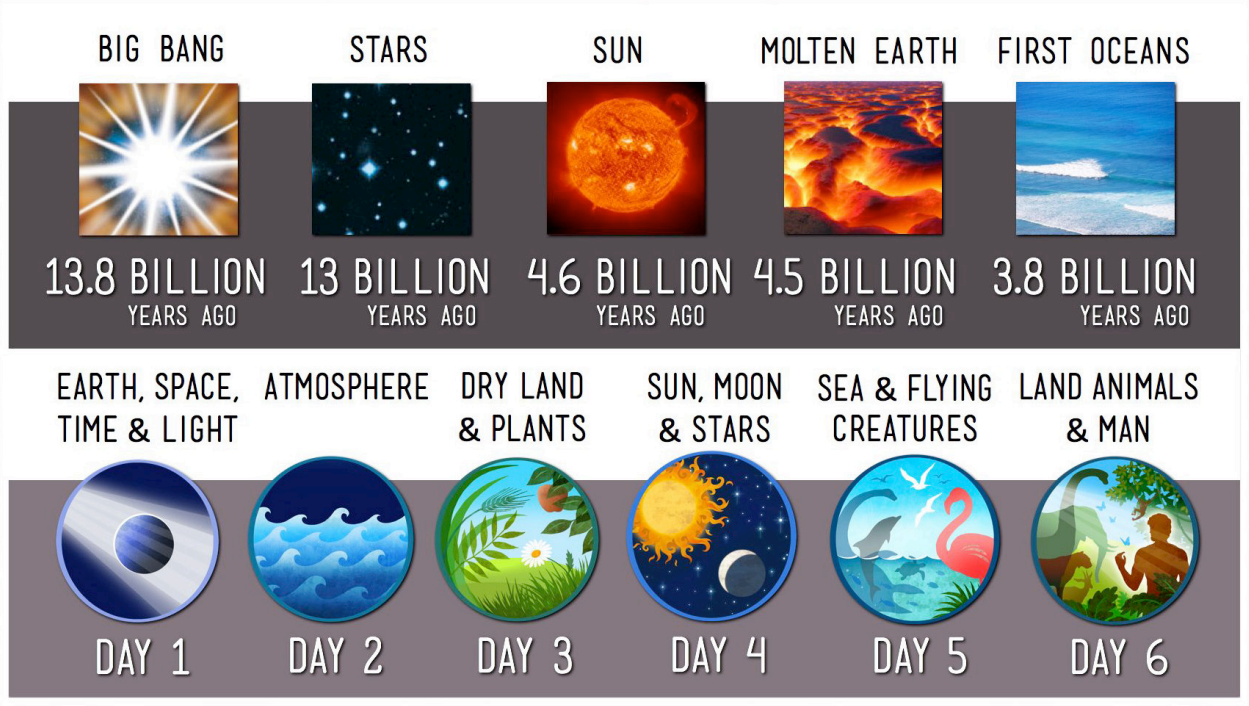
ANSWER: Experimental science relies on observable, testable, repeatable experiments to evaluate ideas about the present physical universe. Origins science is historical science because it attempts to discover the truth about the unobservable

past by interpreting scientific observations in light of what the scientist believes about the past (presuppositions or starting assumptions). These beliefs about the past may include eyewitness testimony of someone who was there—namely, God our Creator—or uniformitarian or materialistic evolutionary beliefs that substitute man's fallible ideas for what God has told us about our origins. Because our origins in the past cannot be directly observed and subjected to experiments, scientists must interpret their observations that give clues about the past. The conclusions of these interpretations are greatly affected by what the scientists believe about the past.

For further study: http://www.answersingenesis.org/get-answers/features/two-kinds-of-science

4. **How old do evolutionists believe the universe is? How old does the Bible indicate the universe is?**

ANSWER: Evolutionary scientists believe the universe is 13.8 billion years old. Scientists who believe God's Word—the Bible—believe that the universe is about 6,000 years old. There is not a particular verse in the Bible containing this information, because the verse would have been outdated soon after it was written. Instead, God included in the Bible a lot of history about how long certain things took (like six days to create all things, Exodus 20:11) and about how old certain people were when other important people were born. By reading the entire Bible



and putting all this information together, we see that God created all things during the six days of Creation Week about 6,000 years ago.

For further study:

http://www.answersingenesis.org/articles/2007/05/30/how-old-is-earth

5. **How was the idea of a "cosmic calendar" used in this episode?**

ANSWER: The "cosmic calendar" is a way to help people grasp the supposed enormous age of the universe—13.8 billion years according to evolutionists—in familiar terms. It superimposes 13.8 billion years on a familiar 12-month calendar. Then various important events that evolutionists believe happened are proportionately assigned to particular days on the cosmic calendar. Using this approach, evolutionists say the big bang happened on January 1 of the cosmic calendar, that our sun was born on August 31 (corresponding to a time 4½ billion years ago), that life evolved in a pool on September 21 (3½ billion years ago), and that humans evolved during the last minute of the cosmic calendar's year.

6. **How do materialistic evolutionists say life began?**

ANSWER: They do not know. They say it is a great mystery. Scientific observations demonstrate that living cells come only from living cells. But because materialistic evolutionists reject that God created all things and told us the truth about His

creation in the Bible, they insist life must have formed itself from non-living elements through random natural processes.

For further study:

http://www.answersingenesis.org/articles/nab2/natural-processes-origin-of-life

http://www.answersingenesis.org/articles/ee/origin-of-life

7. How does the Bible say life began? Who witnessed life's beginning? What was the first kind of life created?

ANSWER: According to Genesis chapter 1 and Exodus 20:11, God created the earth, light, water, the dry land and seas, and all that is in them. During the first three days, God prepared the earth to be inhabited by making the earth itself, light, and dry land. On Day Three of Creation Week, God also spoke plants into existence. On Day Four, He made the sun, moon, and stars. On Day Five, God made the flying and aquatic creatures. On Day Six, God made land animals and Adam and Eve. God made each kind of living thing fully functional and ready for life on earth. God has given us His eyewitness account of Creation Week in the Bible. Job 38:7 indicates that the angels of God also witnessed Creation, but our only record of Creation Week comes from God and is recorded in the Bible. God's Word describing what He did rules out the possibility that He used evolution or stretched out His creation over millions or billions of years.

For further study:

http://www.answersingenesis.org/articles/nab/couldnt-god-have-used-evolution

http://www.answersingenesis.org/articles/arj/v1/n1/microbes-days-of-creation

8. What are some laws of nature? How do we discover laws of nature?

ANSWER: A scientific law—a law of nature—is a pattern of how things always appear to happen in the physical universe. Laws of nature are discovered by making many, many scientific observations and discovering that the pattern, or "law," is never violated.

The law of gravity describes the manner in which all matter is attracted to other matter. Because of the law of gravity, balls dropped fall to the ground and the earth stays in orbit around the sun.

One of the laws of motion describes the fact that objects in motion continue in straight line motion unless acted on by an outside force.

The law of conservation of matter and energy describes the fact that the total amount of matter and energy in a closed system does not change.

Another law of nature is the law of biogenesis: all life comes from other living things. This, like all scientific laws, is deduced from many observations. Life has never been observed evolving from nonliving material through natural processes. Thus, evolutionists claim that the entire universe and all that is in it came into being through ordinary natural processes. But the evolutionary origin of life cannot be explained in this way.

9. How did the laws of nature come to exist?

ANSWER: God created all things in just six days, about 6,000 years ago. He created "nature" at that time as well as the scientific "laws," which describe the ways the physical universe works. Because God created the laws of nature, we can use the scientific method to discover them and to make accurate predictions about how matter and energy behave. If God does not exist, there is no reason to expect that the universe should operate in an orderly manner. The uniformity of nature is a reflection of the unchanging character of God.

For further study:

http://www.answersingenesis.org/articles/am/v1/n2/god-natural-law

10. Dr. Tyson said that there is "strong observational support" for the big bang. Do evolutionists believe that anyone witnessed the big bang? If no one observed the big bang, what does Dr. Tyson mean by observational evidence for the big bang?

ANSWER: Evolutionists believe that they are seeing backward in time when they look at distant objects in space, but they do not believe that anyone witnessed the big bang. Tyson mentioned the "cosmic horizon" beyond which evolutionists believe lie parts of the universe too far away for its light to have reached us. The "observational evidence" to which Tyson refers does not actually include observations of the big bang. Instead, this "evidence" consists of interpretations of scientific data that interpret scientific observations within a big bang model of origins. The big bang model is unable to explain many scientific observations, but this is not mentioned in the *Cosmos* program. Astronomer Dr. Danny Faulkner points out that this is not "observational evidence" about our origins but rather "an interpretation of the data, data that could be interpreted a number of different ways apart from the big bang."

For further study:

http://www.answersingenesis.org/articles/am/v8/n4/big-bang-evolution-of-theory

http://www.answersingenesis.org/articles/ud/problems-with-big-bang

http://www.answersingenesis.org/articles/oect/big-bang-god

11. Do Bible-believing Christians reject science?

ANSWER: No, Bible-believing Christians not only use science but also understand that the scientific method works because God created an orderly world governed by the laws of nature. While the Bible is not a modern scientific textbook, whenever it addresses a scientific point, it is a completely reliable yardstick to guide our discoveries and interpretations of scientific questions. Bible-believing scientists understand that the reliable and predictable laws of nature on which science depends come from our all-powerful Creator. Bible-believing scientists enjoy discovering how things work that God created and learning how to use science to benefit mankind.

Reaching Beyond

Suppose you do two experiments. For each experiment you need two identical candles (small birthday candles will work well) and a ruler. Measure the candles before you begin and record your measurements. (Kids, don't do this unless an adult assists you!) Write down all measurements and conclusions, as all good scientists do. After reading these two experiments, answer the questions that follow.

EXPERIMENT ONE

Let a candle burn for a while and then blow it out. Don't light the other candle; this is the "control." Then, show both candles and the ruler to several people who did not see it burning. Ask them to measure the two candles. Then ask them how long the candle burned.

EXPERIMENT TWO

Let a candle burn for a while, but this time write down the time that you lit the candle and the time you blew it out. Don't light the other candle; this is the "control." Then, show both candles, the ruler, and your recording of the times to several people who did not see it burning. Ask them to measure the two candles. Then ask them how long the candle burned.

FOLLOW-UP QUESTIONS

***From the point of view of the people who did not see the candles burning*, do these experiments illustrate experimental science or origins science?**

In which of the experiments will the people who see the candles know how long the candle burned?

In which of the experiments do the people who see the candles have a reliable written account of the candle's burning history?

In which of the experiments will the people who see the candles be able to accurately predict how long it would take to burn another inch from the candle?

ANSWERS: From the point of view of those who were not there when the candles burned, these experiments illustrate ***origins* science**. They can only know what happened and how long it took if they are supplied with a record of what happened provided by an eyewitness, namely you. Only in the second experiment will the people know how long the candle burned, have a reliable historical account, and be able to make good predictions about how long it would take to make the candle shorter.

Kids resources on the web:

http://www.answersingenesis.org/articles/kw/what-really-happened

http://www.answersingenesis.org/articles/kw/museum-guide-what-is-science

http://www.answersingenesis.org/articles/kw/length-of-days

Please see http://www.answersingenesis.org/articles/2014/03/11/review-cosmos-milky-way for more information about the program and for a list of resources offering more information about all these topics.