

# THE SOURCE Workbook

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## Chapter 1 — THE COSMOS AND THE CREATION

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Note: There are no questions for this section.

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# The Source Workbook - Answers

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## Chapter 1 - THE COSMOS AND THE CREATION

### Page 1 to pp 4 INTRODUCTION - THE NEED FOR ANSWERS

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### Page 5 CHAPTER 1 - THE COSMOS AND THE CREATION

**q-5.1 As a preliminary review, we should understand what the word "solipsism" means.** *Solipsism* (sol' up sizum) – American Heritage - Philosophy 1. The theory that the self is the only thing that can be known and verified. 2. The theory or view that the self is the only reality. 3. Microsoft® Encarta® Reference Library 2005: The belief that the only thing somebody can be sure of is that he or she exists, and that true knowledge of anything else is impossible.

**q-5.2 Why may "absolute proof" be a problem when discussing the subject of existence?**

Solipsists say that we cannot prove we exist because dreams can sometimes be so realistic that we may think that we are actually awake. Therefore, to be honest, we can only know "absolutely" of our own existence because everyone else may be just in our dream. However, any person observing us knows that we are wrong in this solipsistic opinion because they personally know that they are experiencing their existence apart from ours. For that reason, it is not much of a stretch to assume that everybody else exists just as we think we exist. To be practical, even if we believe that everything is a dream, it is absolutely necessary for us to take our lives seriously and act as if things are real. If we don't, we will quickly find ourselves in big trouble.

**q-5.3 With regard to existence, what simple question are we compelled to answer?**

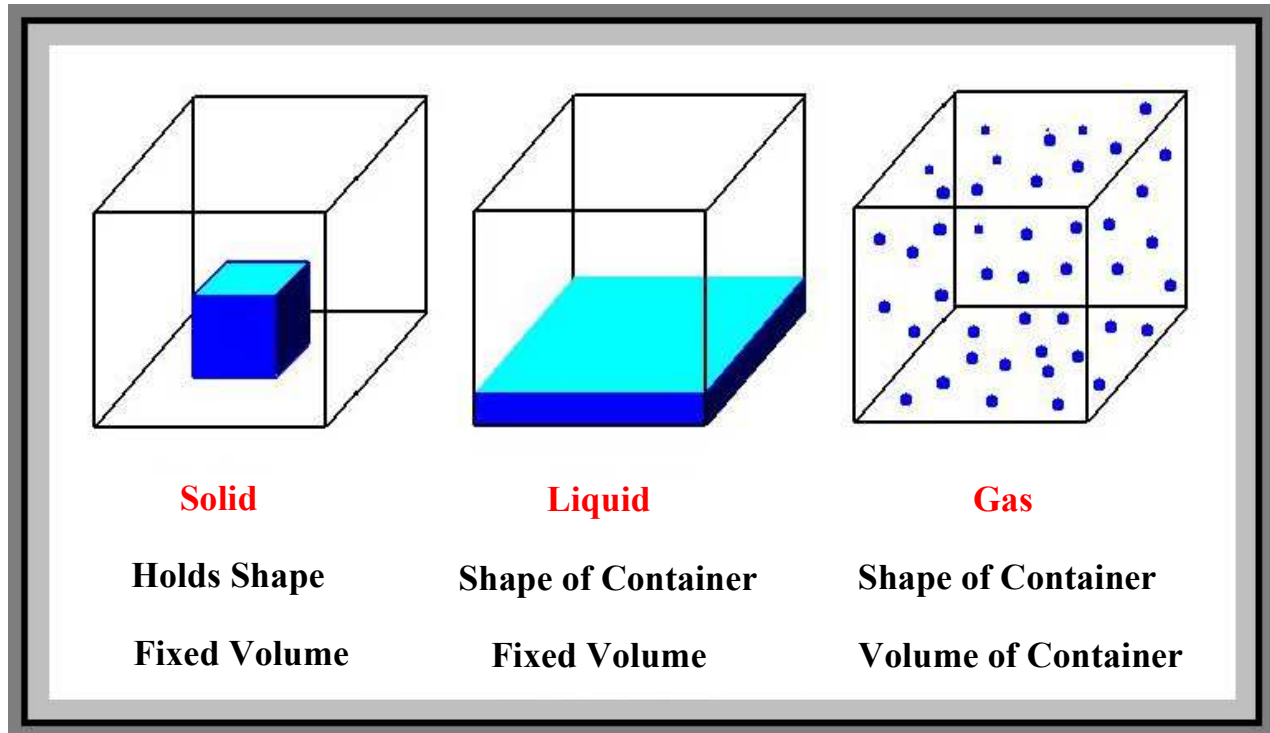
Where did everything we observe come from? Did it have a beginning or did it always exist?

### Page 6 COSMOLOGICAL FACTS

**q-6.1 What is the term used to describe the composition of the universe?**

The term is "Matter." Matter is everything around us. Matter is anything made up of atoms and molecules. Matter is anything that has a mass. Matter is also related to light and electromagnetic radiation. Even though matter can be found all over the universe, it is usually found in just a few forms. As of 1995, scientists have identified five states of matter. They are solids, liquids, gases, plasmas, and the B-E Condensate (Bose-Einstein Condensate). Each state has its own traits and ways of interacting with the world of chemistry. In 1925, Albert Einstein, along with Indian physicist Satyendra Nath Bose, predicted that a strange kind of matter would exist around absolute zero, a frosty -459.69 F below zero. This is the coldest temperature possible that causes all similar atoms to enter the same quantum-mechanical state and begin behaving something like a fluid. In other words, at this temperature, everything that exists becomes something with fluid-like qualities. See Figure 1.1 for details.

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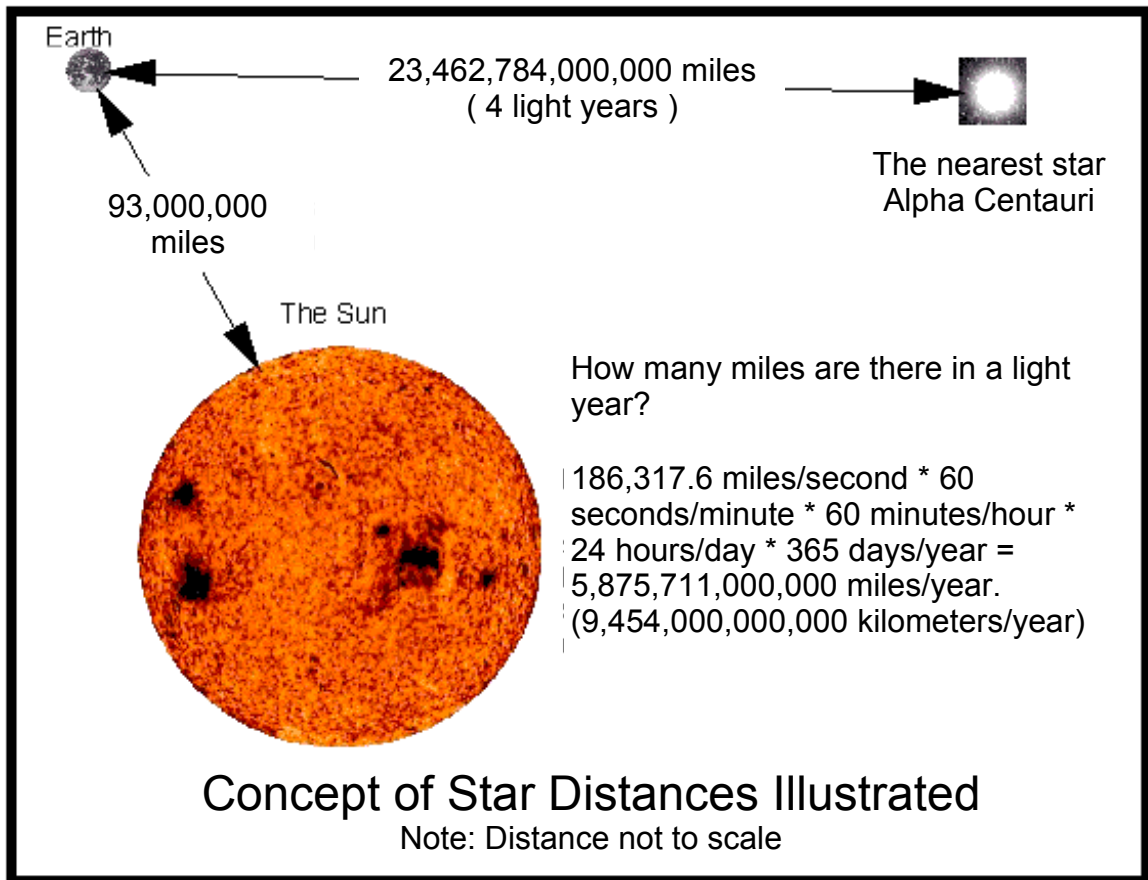
**Figure 1.1:** The three most familiar forms of matter. Unusual plasma states exist in electrical arcs and hot environments like the sun and stars. The Bose-Einstein Condensate forms at absolute zero temperature and can only exist in the laboratory because nature never gets that cold.

**q-6.2 Why are there such great distances between stars? See Figure 1.2**

The great intervening distances prevent stars and galaxies from being drawn together into one massive lump by gravity. However, despite such great distances, galaxies and stars do occasionally collide. **Note:** There is an adjustment needed in the book on page 6 in the sentence that reads, “*Ultimately all matter would be reduced to one enormous blob of virtually infinite MASS.*” Technically speaking, the word “mass” should be replaced by the word “density.” The density of the universe is its entire mass divided by the volume it occupies. During a universal collapse due to gravity, as its volume approaches zero, its density approaches infinity. As the universe finally “disappears” into another “reality,” its density measured in our universe would be considered mathematically “infinite.” However, when we get an infinite answer as a mathematical solution, it usually means that we have either made a mistake in calculation or that a significant unaccountable change has occurred to the boundary conditions of the problem.

**q-7.1 What unit of measurement is generally used by astronomers to measure distance in space outside our solar system, and how many miles long is it?**

The “light year” is the unit of measurement generally used to measure distances in space outside the solar system. With light traveling about 186,317.6 miles per second, a light year is approximately 5,875,711,000,000 (5 trillion, 876 billion miles). It is hard to conceptualize the speed of light. For comparison, imagine something traveling around the earth about 7.5 times in one second. (186,000 miles/second divided by 25,000 miles equals about 7.45 seconds)



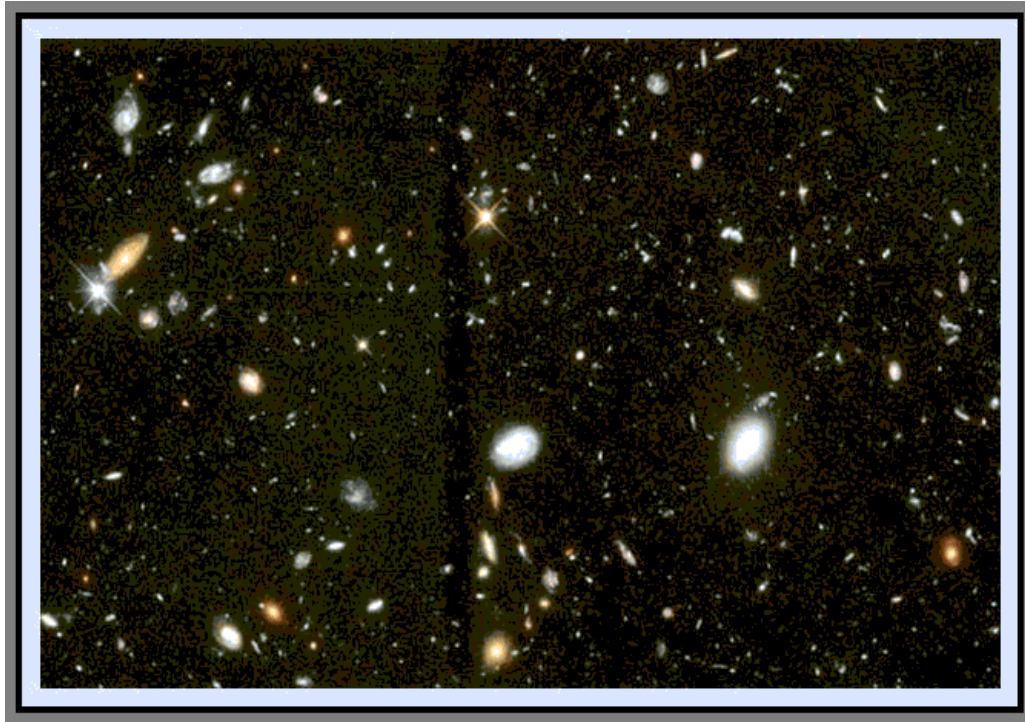
**Figure 1.2:** The size of the universe simply cannot be conceptualized in the human mind. We are used to dealing with distances on earth measured in inches, feet, and miles. We do not have the capacity to understand exactly how much distance is really involved when we talk about light years! Because of these great distances, our solar system is far less likely to be captured by another star system's gravitational field. As shown above, the closest known star is about 4 light-years away from us.

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### q-8.1 Is our galaxy the only one in the universe?

No, it isn't. The actual estimate is continually being revised as new and better equipment is brought into service. Many observable galaxies were too faint to be detected with older telescopes. However, in 1999 the Hubble Space Telescope was able to estimate that there were 125 billion galaxies in the universe. In 2004, with a new camera, they have observed 10,000 visible galaxies in the Hubble Deep Field (See Figure 1.3), which is twice as many as they observed before with the old camera. The emphasis is being placed on "visible" galaxies because observations with radio telescopes, infrared cameras, x-ray cameras, etc. would detect other galaxies that are not able to be detected by Hubble. As observations continue with astronomers exploring more and more of our universe, the number of galaxies detected will no doubt increase. For more about the Hubble Space Telescope, check out this web site:

<http://hubblesite.org/newscenter/archive/releases/2004/07/>



**Figure 1.3: *The Hubble Deep Field*** , showing a deep space photograph of some of the many galaxies in the universe. Depending on just what level of statistical error can be tolerated, catalogs of galaxies in this picture of the Hubble Deep Field list about 10,000. This field covers an area of sky of only about 0.04 degrees on a side, meaning that we would need 27,000,000 such patches to cover the whole sky. Source : <http://www.stsci.edu/ftp/science/hdf/hdf.html> © 1997 The Association of Universities for Research in Astronomy, Inc.

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### q-9.1 How might an atheist explain why the universe exists?

The Humanist Manifesto I, a statement written by atheists, suggests that the universe has always existed. However, this hypothesis has little support among astronomers in general. See link for discussion of the Humanist Manifesto. [http://en.wikipedia.org/wiki/Humanist\\_Manifesto](http://en.wikipedia.org/wiki/Humanist_Manifesto)

### q-9.2 How does the Bible explain why the universe exists?

The Bible gives a very straightforward answer from its first verse, which says, “In the beginning.” This simple statement implies that the universe was caused by something.

### q-9.3 Why can we conclude the Bible implies that God also created “time” when he created the universe?

The Bible does not say directly that God created time. However, a specific phrase used in the New Testament that can be translated as “before the beginning of time,” is used to refer to existence before Genesis 1:1. In the King James Version, these same words are rendered, “before the world began,” which is another way of saying before the beginning of time. Examples of this phrase are found at 2 Timothy 1:9 and Titus 1:2. These facts also allow us to justifiably conclude that if there is a beginning of time, then there can be an end of time. Additionally, since God does not appear to be limited by time restrictions, we can infer that he must have created it.

He apparently knows the future just as well as we know the past, and he can alter time’s

duration in mysterious ways. Isaiah 44:6-8 (GNB)-- The LORD, who rules and protects Israel, the LORD Almighty, has this to say: "I am the first, the last, the only God; there is no other god but me. (7) Could anyone else have done what I did? Who could have predicted all that would happen from the very beginning to the end of time? (8) Do not be afraid, my people! You know that from ancient times until now I have predicted all that would happen, and you are my witnesses. Is there any other god? Is there some powerful god I never heard of?" Psalm 90:4 (GNB) -- A thousand years to you [GOD] are like one day; they are like yesterday, already gone, like a short hour in the night.

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### q-10.1 What dynamic relationship between our galaxy and the galaxies around us have we discovered?

We have learned that most of the galaxies we can detect are traveling away from us. At first, this may give the appearance that we are located at the center of the universe. However, this is a mistaken view. Because of the geometry of the universal expansion, if we were in any other galaxy, it would also appear to the observer as if that galaxy were the center of the expansion even though it is not. Can you visualize why this is true?

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### q-11.1 How can you describe what scientists call a “singularity?”

Singularities are regions where the density of matter, or the curvature of space-time, becomes infinite. In such locales, the standard concepts of space and time cease to have any meaning. A singularity is not a real location. It is a theoretical location defined as a “point” within which all the matter of the universe is supposed to have been compressed. What really is a singularity and where did it come from? Well, to be honest, we don't know for sure. Singularities are zones which defy our current understanding of physics. They are thought to exist at the core of "black holes." Black holes are areas of intense gravitational pressure. The pressure is imagined as being so intense that finite matter is actually squished into infinite density (a mathematical concept which truly boggles the mind and can't be thought of as being real). These zones of *putative* infinite density are called singularities. Our universe is thought to have begun as an infinitesimally small, infinitely hot, infinitely dense something - a singularity. Where did it come from? We don't know. Why did it appear? Again, we don't know. From a Biblical point of view, we can speculate that a singularity represents the point of entry from God's domain (wherever that is) through which our universe was apparently squeezed into existence. It occurred “In the beginning.” (Genesis 1:1)

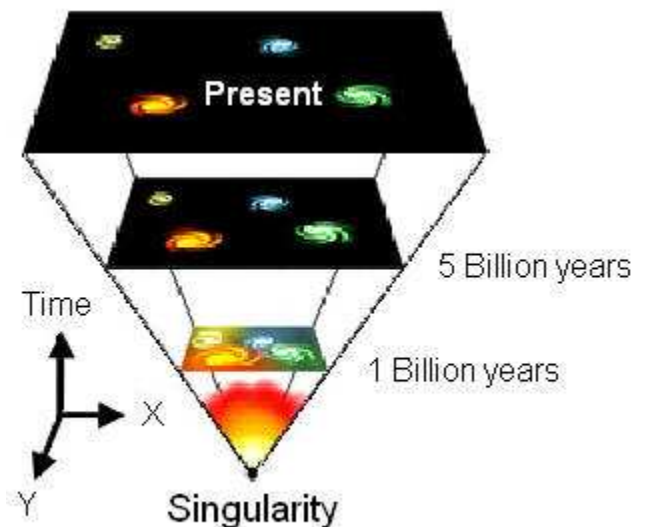


Figure 1.4: Time slices as the universe expands

### q-11.2 What is a secular term used to describe the “beginning of the universe?”

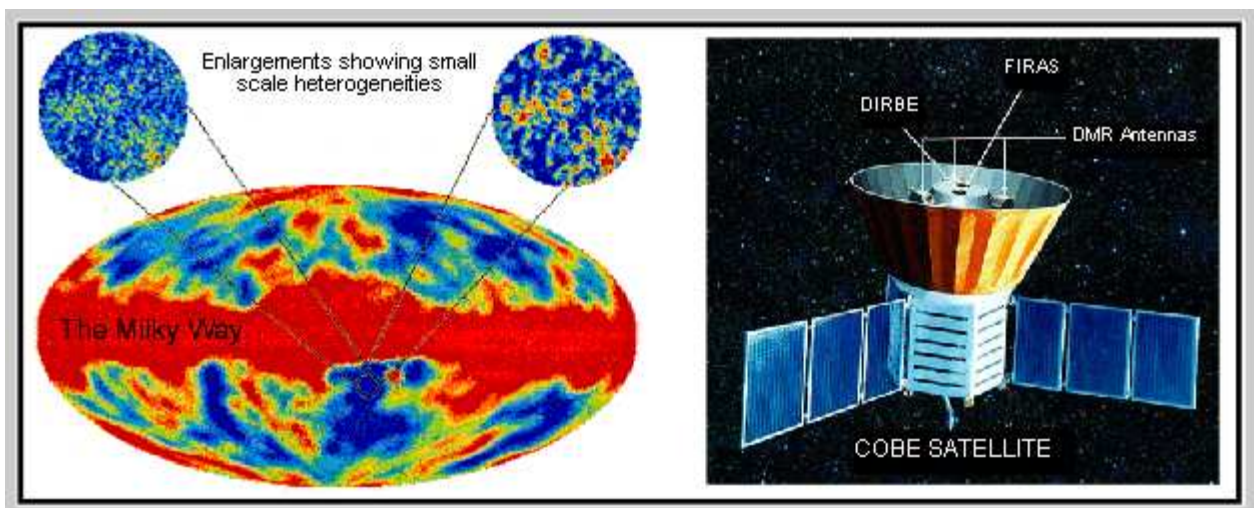
One secular term used to describe the beginning of the universe is “The Big Bang.”

**q-11.3 What are some interesting facts about the term “Big Bang?”**

The term was coined in jest by Fred Hoyle in a 1950 BBC radio series. In physical cosmology, the Big Bang is the scientific theory that the universe emerged from a tremendously dense and hot state about 13.7 billion years ago (2006 estimate subject to revision).

**Page 12****q-12.1 What was discovered through the COBE project (Cosmic Background Explorer Satellite)?**

It was found that the latest temperature variations measured in random locations in free space are exactly what one would expect to find if a Big Bang actually occurred as theorized. This work has helped in cementing the theory. According to the Nobel Prize committee, "the COBE-project can also be regarded as the starting point for cosmology as a precision science." Two of COBE's principal investigators, George Smoot and John Mather, received the Nobel Prize in Physics in 2006 for their part in bringing about this important development.



**Figure 1.5:** The data obtained with the COBE satellite created a cosmic image showing temperature "heterogeneities" indicating that the seeds for the stars and galaxies were already formed at the very beginning. Without these "seeds," the galaxies would not have formed as we see them.

One of the predictions of the Big Bang model for the origin of the universe is that the initial conditions were extremely hot and that remnants of the accompanying fireball might still be detected at the edges of the universe. In the 1960's, Arno Penzias and Robert Wilson of the Bell Telephone Laboratories discovered what came to be known as the Cosmic Microwave Background (CMB). Discovery of the CMB agreed with the work of some physicists who theorized that if the Universe began with a hot Big Bang, then the Universe should be filled with electromagnetic radiation of the early fireball cooled to a temperature of around 10 degrees above absolute zero ( $\sim 10^{\circ}\text{K}$ ). Figure 1.5 shows by color differences the small temperature variations of the Big Bang that are still detectable.

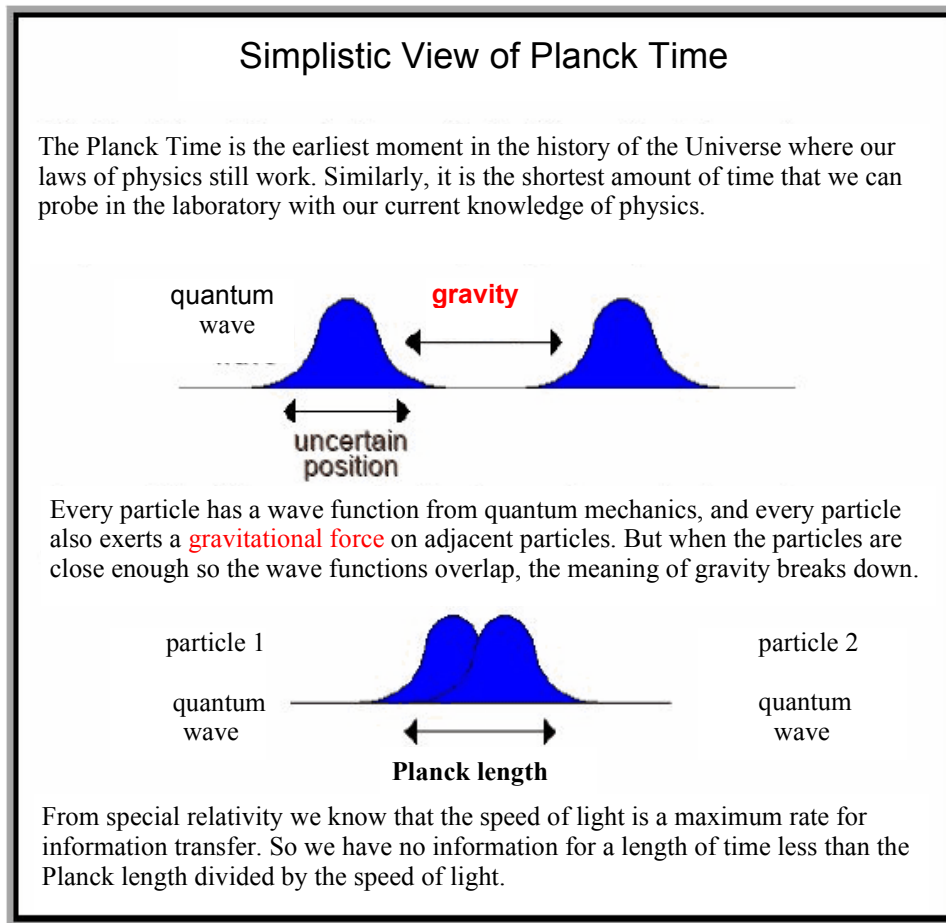
(<http://www.pbs.org/wgbh/as0/databank/entries/dp65co.html>).

**q-12.2 What two questions does the Big Bang not answer?**

a) Does the Big Bang support or deny the existence of a Creator? b) What seemed to have exploded into existence and where did it come from?

**q-12.3 What does “Planck Time” mark?**

Planck Time marks the transition between reality and the unknown. At the Big Bang, events before Planck Time are not definable in realistic terms. This is because Planck time is the time it takes for light to literally travel across a Planck length.



**Figure 1.6:** Planck Time is the shortest interval of meaningful time possible because that is how long it takes light to travel across a Planck Length. To measure any relationship between two particles closer to each other than a Planck Length would require the measuring signal to travel faster than the speed of light which, according to Einstein’s theory, is impossible.

It has been determined by experiment that absolutely nothing can be measured with certainty within the boundaries of a Planck length. Therefore, what existed between the Big Bang and the end of the first unit of Planck Time cannot be determined by any currently known methods in any current theory of quantum gravity that combines general relativity with quantum mechanics. The traditional notions of space and time will break down at distances shorter than the Planck length or times shorter than the Planck time. Planck time is  $1.0 \times 10^{-43}$  seconds and Planck length is  $1.6 \times 10^{-35}$  meters. Note:  $10^{-35}$  is equal to  $10^{-35}$  or 0.000 ... (29 more zeros making a total of 34) ... 001.

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**q-13.1 What chemical process produces the sun's energy?**

It is the same principle as the hydrogen bomb. 661 million tons of hydrogen fuse into 657 million tons of helium and release the equivalent to 4 million tons of energy-mass every second. (energy-mass = <hydrogen-fusion> mass times the speed of light squared) In one second, our sun produces enough energy for almost 500,000 years of the current needs of our so-called civilization. If only we could collect it all and use it!

**q-13.2 What known fact about hydrogen proves the universe had a beginning?**

The "fact" that hydrogen still exists indicates a beginning. Since there is no new hydrogen being created that we know of, if the universe had always existed, the hydrogen would be all gone.

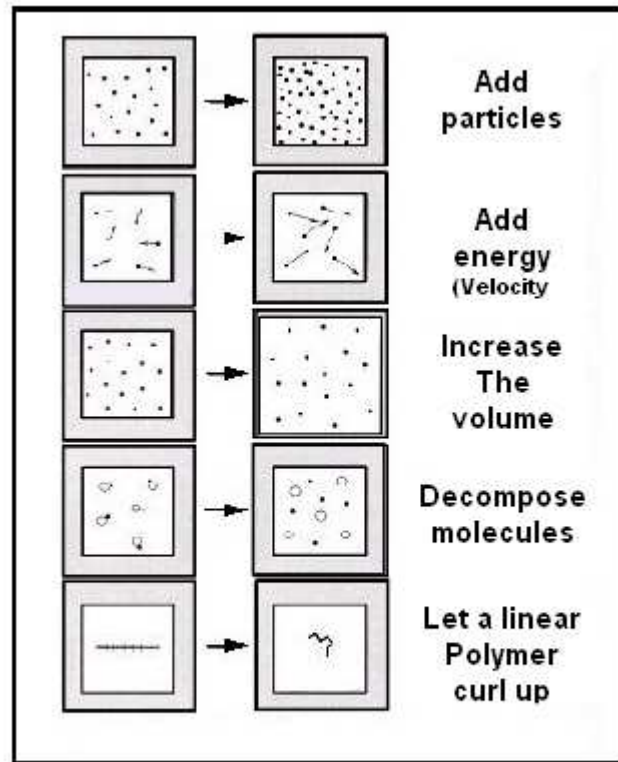
## Page 14

**q-14.1 What does the Second Law of Thermodynamics (SLT) state about matter?**

The SLT states that, on average, the universe is becoming more disordered every second. This means that at some time far into the future, when all the possible reactions will have taken place, all that will be left is heat (i.e. electromagnetic radiation) and fundamental particles. No reactions will be possible, because the universe will have reached its maximum entropy. The only reactions that can take place will result in a decrease of entropy, which is not possible. In effect, the universe will have died. This is called "heat death." Each factor shown in Figure 1.7 illustrates how various processes increase disorder or entropy.

**q-14.2 What did Carl Sagan say about the universe and how can it be described?**

A) Carl Sagan said the "cosmos is everything that was, or is ..." which describes a "closed system." B) A closed system is defined as being comprised of "everything there is" with nothing new ever being added or subtracted from any outside source.



**Figure 1.7:** Factors that tend to increase a system's entropy

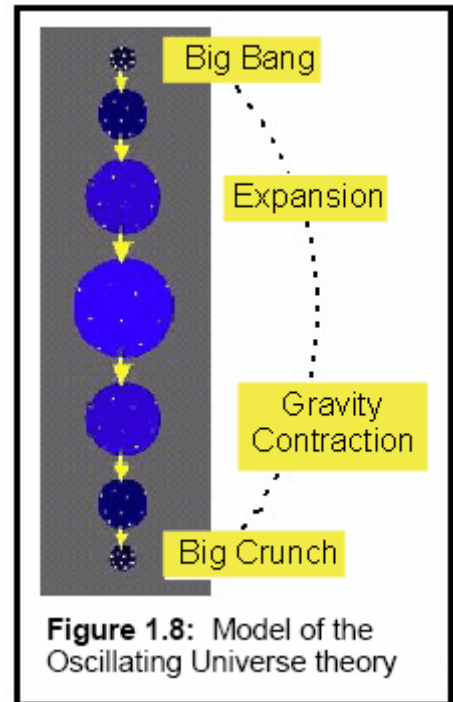
## Page 15

**q-15.1 How can an “Oscillating Universe” be described?**

The proposed Oscillating Universe theory has been suggested by atheists to explain the existence of everything. The theory says that eventually gravity will cause the universe to stop expanding and start contracting back in on itself until it comes together in one concluding “Big Crunch.” The crunch should, however, result in another singularity that will explode back into another new expanding universe. It is stated that this process will “oscillate” back and forth indefinitely, similar to the swing of a pendulum on an old grandfather clock.

**q-15.2 Why can we say that the universe won’t oscillate?**

A new discovery made in 1998 clearly indicates that the universe is not slowing down due to the negative influence of gravity. In fact, the universe is expanding faster and faster. According to these findings, the universe is destined to “expand forever.”



## Page 16

**q-16.1 Why is the “missing mass” question irrelevant with regard to the future of the universe?**

It doesn’t matter if there is missing mass because universal expansion is “accelerating.” Even if missing mass is found, it apparently cannot stop the currently observed acceleration.

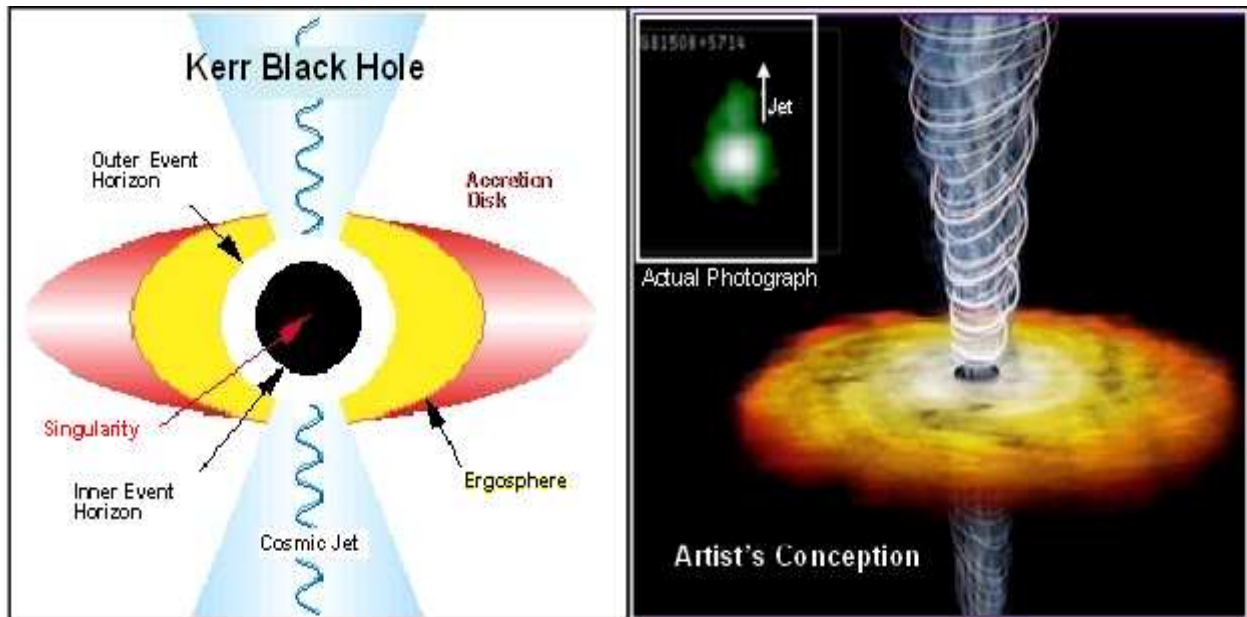
**q-16.2 What do we know about “black holes” that would make an oscillating universe impossible?**

A collapsing universe would form a giant black hole from which nothing can immediately escape due to the immense forces of gravity. However, a black hole can “evaporate” over time and eventually explode. Nevertheless, this is nothing like what the oscillating universe hypothesis requires. Basically, without going into detail, a rapidly expanding singularity like the origin of the universe is mathematically just the opposite of a black hole. That is why some have labeled the initial conditions of the universe a “white hole.” A black hole is a region from which nothing can immediately escape, and a white hole is a region in which nothing can stay or enter.

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**q-17.1 Are black holes real or just theoretical?**

In 1998, the Hubble telescope revealed evidence of a massive black hole feeding on a smaller, adjacent galaxy. Therefore, black holes are real. See Figure 1.9 for an actual photograph of a black hole.



**Figure 1.9:** Are Black Holes real? The small "Actual Photograph" of an x-ray image shown inset in the upper left of the picture is characteristic of an emission from a cosmic jet of high-energy particles. The jet is approximately 100,000 light-years in length and emerges from quasar GB1508+5714. This quasar is estimated to be 12 billion (12,000,000,000) light-years away making it the most distant energetic jet in the known universe as of November 28, 2003. Here, as depicted in the mathematically conceptualized illustration, the bright "accretion disk" shown at the bottom of the x-ray jet is thought to surround a super massive black hole which is accelerating particles to near the speed of light in two opposite jets at right angles to the disk itself. In the case of this quasar, we can see only one jet at the top because the disk of the black hole is tilted towards us with the back jet being mostly hidden from our view.

**q-17.2 If black holes could immediately explode, what other problem would the oscillation theory have to overcome?**

Theoretically, the oscillating universe cannot be reconciled with the Second Law of Thermodynamics. Entropy would build up from oscillation to oscillation and cause heat death. Remember, the second law states that entropy or "disorder" always increases with time. These energy losses would be in the form of radiation. All in all, these loss arguments for the most part have caused cosmologists to abandon the oscillating universe model. There still are some diehards who are presently thinking out loud about a white hole within a black hole that would support some form of Big Bang oscillation. So far, nothing much has come of such thinking.

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**q-18.1 If the facts show that universal development can't oscillate, what does that prove?**

It proves that there was only one universe and it had a "beginning," just as the Bible says.

**q-18.2 If the universe had a beginning, what is the next question we need to consider?**

The next question is, "Was the beginning caused or not caused?"

**End of Chapter 1**