The Real Issue

Stephen Hawking, The Big Bang, and God

Meet the Author: ***Dr. Henry "Fritz" Schaefer III***

Dr. "Fritz" Schaefer is the Graham Perdue Professor of Chemistry and the director of the Center for Computational Quantum Chemistry at the University of Georgia. He has been nominated for the Nobel Prize and was recently cited as the third most quoted chemist in the world. "The significance and joy in my science comes in the occasional moments of discovering something new and saying to myself, `So that's how God did it!' My goal is to understand a little corner of God's plan." -U.S. News & World Report, Dec. 23, 1991.

(This article is a transcript of a lecture Dr. Schaefer presented at the University of Colorado in the Spring of 1994, sponsored by Christian Leadership and other campus ministries. Over 500 students and professors were present.)

Stephen Hawking's bestseller *A Brief History of Time* is the most popular book about cosmology ever written. The questions cosmology addresses are scientifically and theologically profound. Hawking's book covers both of these implications.

Cosmology is the study of the universe as a whole--it's structure, origin and development. I won't answer all the questions Hawking raises concerning cosmology, but I will try to make comments on many of them. I caution here that you should not confuse cosmology with cosmetology, the art of beautifying the hair, skin, and nails!

Here are some of the questions cosmology seeks to answer (As elsewhere in this lecture, I borrow heavily from astrophysicist Hugh Ross' excellent books *The Fingerprint of God* and *The Creator and the Cosmos.*):

1. Is the universe finite or infinite in extent and content?
2. Is it eternal or does it have a beginning?
3. Was it created? If not, how did it get here? If so, how was this creation accomplished and what can we learn about the agent and events of creation?
4. Who or what governs the laws and constants of physics? Are such laws the product of chance or have they been designed? How do they relate to the support and development of life?
5. Is there any knowable existence beyond the known dimensions of the universe?
6. Is the universe running down irreversibly or will it bounce back?

Let me begin with five traditional arguments for the existence of God. It may seem an unlikely starting point for this topic, but I think you'll see as time goes on that these arguments keep coming up. I'm not going to comment right away on whether these arguments are valid or not,

but I will state them because throughout astrophysical literature these arguments are often referred to:

1. The cosmological argument: the effect of the universe's existence must have a suitable cause.
2. The teleological argument: the design of the universe implies a purpose or direction behind it.
3. The rational argument: the operation of the universe, according to order and natural law, implies a mind behind it.
4. The ontological argument: man's ideas of God (his God-consciousness) implies a God who imprinted such a consciousness.
5. The moral argument: man's built-in sense of right and wrong can be accounted for only by an innate awareness of a code of law--an awareness implanted by a higher being.

The Big Bang

The idea that the universe had a specific time of origin has been philosophically resisted by some very distinguished scientists. We could begin with Arthur Eddington, who experimentally confirmed Einstein's general theory of relativity in 1919. He stated a dozen years later: "Philosophically, the notion of a beginning to the present order is repugnant to me and I should like to find a genuine loophole." He later said, "We must allow evolution an infinite amount of time to get started."

Albert Einstein's reaction to the consequences of his own general theory of relativity appear to acknowledge the threat of an encounter with God. Through the equations of general relativity, we can trace the origin of the universe backward in time to some sort of a beginning. However, before publishing his cosmological inferences, Einstein introduced a cosmological constant, a "fudge factor," to yield a static model for the universe. Einstein later considered this to be the greatest blunder of his scientific career.
Einstein ultimately gave grudging acceptance to what he called "the necessity for a beginning" and eventually to "the presence of a superior reasoning power." But he never did accept the reality of a personal God.

Why such resistance to the idea of a definite beginning of the universe? It goes right back to that first argument, the cosmological argument: (a) Everything that begins to exist must have a cause; (b) If the universe began to exist, then (c) the universe must have a cause. You can see the direction in which this argument is flowing--a direction of discomfort to some physicists.

In 1946, George Gamow, a Russian-born scientist, proposed that the primeval fireball, the "big bang," was an intense concentration of pure energy. It was the source of all the matter that now exists in the universe. The theory predicts that all the galaxies in the universe should be rushing away from each other at high speeds as a result of that initial big bang. A dictionary definition of the hot big bang theory is "the entire physical universe, all the matter and energy and even the four dimensions of time and space, burst forth from a state of infinite or near infinite density, temperature, and pressure."

The 1965 observation of the microwave background radiation by Arno Penzias and Robert Wilson from the Bell Telephone laboratories convinced most scientists of the validity of the big

bang theory. Further observations reported in 1992 have moved the big bang theory from a consensus view to the nearly unanimous view among cosmologists: there was an origin to the universe approximately 15 billion years ago.

About the 1992 observations, which were from the COBE (the NASA satellite Cosmic Background Explorer), there was a story on the front page of virtually every newspaper in the world. The thing that the *London Times*, *New York Times*, etc. seemed to pick up on was a statement by George Smoot, the team leader from the Lawrence-Berkeley Laboratory. He said, "It's like looking at God." Obviously, this captured the public's attention.

A somewhat more sober assessment of the findings was given by Frederick Burnham, a science-historian. He said, "These findings, now available, make the idea that God created the universe a more respectable hypothesis today than at any time in the last 100 years."

Not everyone was ecstatic about these observations that revealed the so-called "big bang ripples." Certainly, those who had argued so strongly and passionately for a steady-state model of the universe didn't like the interpretation of these results at all--primarily two persons, Fred Hoyle, the British astronomer, and Jeffrey Burbidge, a very distinguished astrophysicist at the University of California at San Diego.

We can begin to get into the philosophical implications of these observations when we assess Burbidge's statement (made during a radio discussion with Hugh Ross) on these things. Burbidge discounts the new experiment. He is a strong advocate still today, in the face of overwhelming evidence, of the steady-state theory. He says these new experiments come from "the first church of Christ of the big bang." I can tell you that my former colleague George Smoot, at the Lawrence-Berkeley Laboratory, took strong exception to this statement. He absolutely insisted his observations were in no way colored by any religious presuppositions.

Burbidge does say something that is true, however. He favors the steady-state hypothesis and claims his view supports Hinduism and not Christianity. That is correct, because a steady-state theory of the universe, were it to be true, would provide some support for the endless cycles taught by Hinduism. The big bang theory is significant evidence against Hinduism.

Hugh Ross, an astrophysicist, has written very persuasively on this topic. He again brings us into the philosophical implications. Ross says that, by definition,

> Time is that dimension in which cause and effect phenomena take place. . . . If time's beginning is concurrent with the beginning of the universe, as the space-time theorem says, then the cause of the universe must be some entity operating in a time dimension completely independent of and pre-existent to the time dimension of the cosmos. This conclusion is powerfully important to our understanding of who God is and who or what God isn't. It tells us that the creator is transcendent, operating beyond the dimensional limits of the universe. It tells us that God is not the universe itself, nor is God contained within the universe.

These are two very popular views, which brings us to something very significant metaphysically or philosophically. If the big bang theory is true, then we can conclude God is not the same as

the universe (a popular view) and God is not con-tained within the universe (another popular view).

Stephen Hawking has said, in his writings, "the actual point of creation lies outside the scope of presently known laws of physics," and a less well-known but very distinguished cosmologist, Professor Alan Guth from MIT, says the "instant of creation remains unexplained."

I want to quote from a book that I don't recommend. It is by a brilliant physicist, Leon Lederman, a Nobel Prize winner. It is called *The God Particle* and although the title sounds very appealing, the good information is all in the first paragraph. The rest of it is just a case for the building of the SSC, the Super Conducting-Super Collider, which we now know is not going to be built. Therefore the book is a bit of a Rip Van-Winkle sort of experience! But the first paragraph is wonderful; it's a great summary of what I have said so far:

> In the very beginning, there was a void, a curious form of vacuum, a nothingness containing no space, no time, no matter, no light, no sound. Yet the laws of nature were in place and this curious vacuum held potential. A story logically begins at the beginning, but this story is about the universe and unfortunately there are no data for the very beginnings--none, zero. We don't know anything about the universe until it reaches the mature age of a billion of a trillionth of a second. That is, some very short time after creation in the big bang. When you read or hear anything about the birth of the universe, someone is making it up--we are in the realm of philosophy. Only God knows what happened at the very beginning.

That is about all that Lederman has to say about God--in the first paragraph--and that's the end of it. The thing that has made Hawking's book so popular is that he is talking about God from beginning to end.

Stephen Hawking

Hawking is probably the most famous living scientist. His book, *A Brief History of Time*, is available in paperback and I strongly recommend it. It has sold in excess of 10 million copies, and I think he sold about five million before the paperback version. For a book to sell so many copies is almost unheard of in the history of science writing.

There has been a film made about the book. The film is also good. There has even been a book made about the film. Hawking has a wonderful sense of humor. He writes in the introduction of the second book, "This is the book of the film of the book. I don't know if they are planning a film of the book of the film of the book."

I want to begin by saying something about Stephen Hawking's scientific research. Hawking has made his reputation by investigating, in great detail, one particular set of problems: the singularity and horizons around black holes and at the beginning of time. Now, everyone is sure if you encountered a black hole, it would be the last thing you ever encountered--and that is correct! A black hole is a massive system so centrally condensed that the force of gravity prevents everything within it, even light, from escaping.

Hawking's first major work was published with Roger Penrose, a physicist very famous in his own right, and George Ellis, during the period 1968-1970. They demonstrated that every solution to the equations of general relativity guarantees the existence of a singular boundary for space and time in the past. This is now known as the "singularity theorem," and is a tremendously important finding.

Later, working by himself, in 1974, he began to formulate ideas about the quantum evaporation of exploding black holes, the now famous "Hawking radiation." These are all tremendously important scientific works.

The work most referred to in *A Brief History of Time* is also the most speculative: the 1984 work with James Hartle, a professor at the University of California at Santa Barbara. Using an elegant vacuum fluctuation model, they were able to provide a mathematical rationalization for the entire universe popping into existence at the beginning of time. This is also called the "universe as a wave function." I need to emphasize that they were using very simple models. Now, while such mathematical exercises are highly speculative, they may eventually lead us to a deeper understanding of this creation event.

Hawking is certainly the most famous physicist in history who has not won the Nobel Prize. This has puzzled people. They automatically assume he has won the Nobel Prize. He has not yet. This is because the Swedish Royal Academy demands that an award-winning discovery must be supported by verifiable experimental or observational evidence. Hawking's work, to date, remains unproved. The mathematics of his theory, however, are certainly beautiful and elegant. Science is just beginning to verify the existence of black holes, let alone verify "Hawking radiation" or any of his more radical theoretical proposals.

My opinion is that within the next year or two we will have firm evidence for the existence of black holes. Unfortunately, I think the person who will get the Nobel Prize will be the observationalist who comes up with its data. So I think Hawking may not get the Nobel Prize soon, even though he's the world's most famous scientist.

Even if some aspects of Hawking's research turn out to be wrong, he will have had a profound impact on the history of scientific thought. Einstein was wrong about all matter of things, especially quantum mechanics, and we still recognize him as one of the three great geniuses of physics.

And God

A Brief History of Time says a lot about God. God is mentioned in this book from beginning to end. So let us try to put Hawking's opinions about God in some sort of a context. The context is that Stephen Hawking made up his mind about God long before he became a cosmologist.

The principle influence in his early life was his mother, Isabel. Isabel Hawking was a member of the Communist Party in England in the 1930's, and her son has carried a good bit of that intellectual baggage right through his life.

By the time he was 13, Hawking's hero was the atheist philosopher and mathematician, Bertrand Russell. At the same age, two of Hawking's friends became Christians as a result of the 1955

Billy Graham London campaign. According to his 1992 biographers, Hawking stood apart from these encounters with "a certain amused detachment." There is nothing in *A Brief History of Time* that deviates in a significant way from the religious views of the 13-year old Stephen Hawking.

The most important event of his life occurred on December 31, 1962. He met his future wife, Jane Wilde, at a New Year's Eve party. One month later, he was diagnosed with a terrible disease, ALS, amyotrophic lateral sclerosis. He was given two years to live at that time. That was 32 years ago. I have had three friends die of this disease. It's a horrible disease. They lasted two, three, and five years, respectively. By anyone's estimation, Stephen Hawking is a medical miracle.

At this point in his life, 1962, Stephen was by all accounts an average-performing graduate student at Cambridge University. Let me quote from his biographers, White and Gribbon, on this point:

> There is little doubt that Jane Wilde's appearance on the scene was a major turning-point in Stephen Hawking's life. The two of them began to see a lot more of one another and a strong relationship developed. It was finding Jane that enabled him to break out of his depression and regenerate some belief in his life and work. For Hawking, his engagement to Jane was probably the most important thing that ever happened to him. It changed his life, gave him something to live for and made him determined to live. Without the help that Jane gave him, he would almost certainly not have been able to carry on or had the will to do so.

They married in July of 1965. Hawking himself has said that "what really made a difference was that I got engaged to a woman named Jane Wilde. This gave me something to live for."

Jane Hawking is an interesting person in her own right. I think she decided early on to get into an academic discipline as far as possible from her husband. She has a doctorate in Medieval Portuguese Literature!

Jane Hawking is a Christian. She made the statement in 1986, "Without my faith in God, I wouldn't have been able to live in this situation;" namely, the deteriorating health of her husband. "I would not have been able to marry Stephen in the first place because I wouldn't have had the optimism to carry me through and I wouldn't have been able to carry on with it."

The reason the book has sold 10 million copies, i.e., the reason for Hawking's success as a popularizer of science, is that he addresses the problems of meaning and purpose that concern all thinking people. The book overlaps with Christian belief and it does so deliberately, but graciously and without rancor. It is an important book that needs to be treated with respect and attention.

There is no reason to agree with everything put forth in *A Brief History of Time* and you will see that I have some areas of disagreement. It has been said that this is the most widely unread book in the history of literature. I first prepared this material for a lecture in December 1992, because I was asked by a friend in Australia to come and speak on it. He told me, "A great many people in Sydney have purchased this book. Some claim to have read it." So I encourage you to be one of those who have actually read *A Brief History of Time*.

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Part II
By Dr. Fritz Schaefer III
Professor of Quantum Chemistry, University of Georgia

Dr. "Fritz" Schaefer is the Graham Perdue Professor of Chemistry and the director of the Center for Computational Quantum Chemistry at the University of Georgia. He has been nominated for the Nobel Prize and was recently cited as the third most quoted chemist in the world. "The significance and joy in my science comes in the occasional moments of discovering something new and saying to myself, 'So that's how God did it!' My goal is to understand a little corner of God's plan." --U.S. News & World Report, Dec. 23, 1991.

This is the second part of a two-part lecture given by Dr. Schaefer. Part 1 of this lecture appeared in The Real Issue, November/December, 1994.

We shall begin with the philosophical aspects of *A Brief History of Time*, which really explains why it has sold so many copies. Stephen Hawking has stated, "It is difficult to discuss the beginning of the universe without mentioning the concept of God. My work on the origin of the universe is on the borderline between science and religion, but I try to stay on the scientific side of the border. It is quite possible that God acts in ways that cannot be described by scientific laws, but in that case, one would just have to go by personal belief."

When asked whether he believed that science and Christianity were competing world views, Hawking replied, "...then Newton would not have discovered the law of gravity." He knew that Newton had strong religious convictions.

A Brief History of Time makes wonderfully ambiguous statements such as, "Even if there is only one possible unified theory [here he's talking about the unification of quantum mechanics with an understanding of gravity], it is just a set of rules and equations. What is it that breathes fire into the equations and makes a universe for them to describe?"(p. 174). I love that statement.

Hawking pokes fun at Albert Einstein for not believing in quantum mechanics. When asked why he didn't believe in quantum mechanics, Einstein would say things like, "Well, God doesn't play dice with human beings"(p. 56). Hawking's response is that God not only plays with dice, He sometimes throws them where they can't be seen.

The first time I read *A Brief History of Time*, for the first 122 pages I thought, "This is a great book; Hawking is building a splendid case for creation by an intelligent being." But then everything changes and this magnificent cosmological epic becomes adulterated by poor philosophy and theology.

For example, he writes, "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" (p. 122). The grounds on which Hawking claims "it appears" are unstated and what happens is

that a straw God is set up that is certainly not the God of Biblical history. What follows is a curious mixture of deism and the ubiquitous God of the gaps.

Now, lest anyone be confused, let me state that Hawking strenuously denies charges that he is an atheist. When he is accused of that he really gets angry and says that such assertions are not true at all. He is an agnostic or deist or something more along those lines. He's certainly not an atheist and not even very sympathetic to atheism.

One of the most famous and quoted statements in the book is, "So long as the universe had a beginning, we could suppose it had a creator [the cosmological argument]. But if the universe is really completely self- contained, having no boundary or edge, it would have neither beginning nor end: it would simply be. What place, then, for a creator?"(pp. 140- 1).

So Hawking is uncertain about his belief in a god of his own creation. I cannot resist the conclusion that Stephen Hawking's god is too small.

At the end of the book he states, "However, if we do discover a complete theory. . . then we would know the mind of God"(p. 175). I'm sympathetic to this statement but I think he's claiming a bit much. I would modify it to say that if we had a unified, complete theory, we would know *a lot more* about the mind of God.

The Anthropic Principle

I must say something here about the anthropic principle: there are a number of scientific parameters or constants, any one of which, if changed just a little bit would make the earth uninhabitable by human beings. A book that I strongly recommend is by Hugh Ross, *The Creator and the Cosmos.* He has a substantial discussion of the anthropic principle and demonstrates why many physicists and astronomers have considered the possibility that the universe not only was divinely caused, but in fact divinely designed.

One such person is the pantheistic astronomer, George Greenstein, who makes this statement: "As we survey all the evidence, the thought insistently arises that some supernatural agency, or rather Agency, must be involved. Is it possible that suddenly, without intending to, we have stumbled upon scientific proof of the existence of a supreme being? Was it God who stepped in and so providentially created the cosmos for our benefit?"

I think Greenstein has gone a little too far in the other direction. I do not think we have proof of the existence of God but I think we do have, in the big bang understanding, some good evidence for the existence of God.

Others have commented on this evidence. A book I recommend is *Dreams of a Final Theory* by Steven Weinberg. He doesn't have God in the title, but God is discussed in the book. He tells the story about a poem by the Venerable Bede, a religious person of the Middle Ages. In the poem, Bede talks about the banqueting hall being our ordinary existence and Weinberg's comment on this is, "It is an almost irresistible temptation to believe with the Venerable Bede that there must be something for us outside the banqueting hall." There must be something beyond materialism.

Of course this view is echoed in the New Testament. For example, Paul the Apostle wrote, "Ever since the creation of the world, God's eternal power and divine nature, invisible though they are,

have been understood and seen through the things He has made"(Romans 1:20). This is exactly what Weinberg is talking about-that almost irresistible temptation.

Atheism

It is very rare that a physical scientist is truly an atheist. Why is this true? Freeman Dyson, a Princeton faculty member, has said, "Nature has been kinder to us than we had any right to expect."

Martin Rees, one of Hawking's colleagues at Cambridge, stated, "The possibility of life as we know it depends on the values of a few basic, physical constants and is in some respects remarkably sensitive to their numerical values. Nature does exhibit remarkable coincidences."

Some scientists express surprise at so many accidental occurrences. However, that astonishment quickly disappears when one sees divine purpose instead of arbitrariness in the laws of nature.

Against overwhelming logic, some atheists continue to claim that the universe and human life were created by chance. A reply to this argument has been developed by the philosopher, William Lane Craig. The atheist's argument states that since we're here, we know this must have all happened by material forces. Craig's counter-argument states,

Suppose a dozen sharp-shooters are sent to execute a prisoner by firing squad. They all shoot a number of rounds in that direction, but the prisoner escapes unharmed. The prisoner could conclude, since he is alive, that all the sharp-shooters missed by some extremely unlikely chance. He may wish to attribute his survival to some remarkable piece of good luck. But he would be far more rational to conclude that the guns were loaded with blanks or that the sharp-shooters had deliberately missed. Not only is life itself overwhelmingly improbable, but its appearance, almost immediately, perhaps in as short a period as 10 million years following the solidification and cooling of our once molten planet, defies explanation by conventional physical and chemical laws.

Hawking's No Boundary Proposal

Let us return to Hawking's no boundary proposal-the universe as a wave function, popping into existence 15-20 billion years ago. The use of imaginary time is a powerful mathematical trick that is used on occasion by theoretical chemists and physicists. My best friend at Berkeley, William Miller, in 1969 used imaginary time to understand the dynamics of chemical reactions and it made him a household word. It is a powerful tool.

In Hawking and Hartle's no boundary proposal, the notion that the universe has neither beginning nor end is something that exists in mathematical terms only. In real time, which is what we as human beings are confined to rather than in Hawking's use of imaginary time, there will always be a singularity, that is, a beginning of time.

Among his contradictory statements in *A Brief History of Time*, Hawking actually concedes this. "When one goes back to the real time in which we live, however, there will still appear to be singularities . . . ," he wrote. "In real time, the universe has a beginning and an end at singularities that form a boundary to space-time and at which the laws of science breaks down"(p. 139). Only if we live in imaginary time would we encounter no singularities. So here he has really answered his own question.

Science is primarily concerned with facts, not motive, and thus a complete scientific description of the creation does not rule out a providential account at the same time. William Paley's famous argument suggests that if you're taking a walk in the woods and you find a watch on the path, you don't conclude that the watch just assembled itself, despite the fact that we can take the watch apart, look at every single part and completely understand how it works. We look at the watch on the path and we prudently conclude that it was designed by some higher intelligence.

In *A Brief History of Time*, Hawking states, "If the no boundary proposal is correct, he [God] had no freedom at all to choose initial conditions"(p. 174). This statement is a leap into irrationality. Why does Hawking find, within the functioning of the universe, aspects that appear to him to be limitations of God's power? This stems not from any attitude of an infinite God, but rather from the attributes of finite man. Namely, we as human beings are able to scientifically discern characteristics of the Creator only as they are related to that which is created, that which we can observe. This limitation of ours immediately reduces what might be infinite to the finiteness of our existence.

Of course Biblically there is no problem in accepting divine constraints to divine option, if the Creator chooses to run the universe according to His stated and established laws. Divine tenacity to His own laws is, of course, the very essence of the Biblical God.

Another of Hawking's controversial statements needs to be addressed. Although it is not original with him, it is this: "We are such insignificant creatures on a minor planet of a very average star in the outer suburb of one of a hundred billion galaxies. So it is difficult to believe in a God that would care about us or even notice our existence."

My response to that statement by Hawking, and to others that have said this over the years, is that that's a silly thing to say. There isn't any evidence to date that life exists anywhere else in the universe. Human beings, thus far, appear to be the most advanced species in the universe. Maybe God does care about us! Where Hawking surveys the cosmos and concludes that man's defining characteristic is obscurity, I consider the same data and conclude that humankind is very special.

Scientist Believers

Does everyone agree with Stephen Hawking's opinion on these matters? The answer is no. Alan Lightman, a MIT professor, said in his book *Origins: The Lives and Worlds of Modern Cosmologists* (Harvard University Press, 1990), "Contrary to popular myths, scientists appear to have the same range of attitudes about religious matters as does the general public."

This fact can be established either from anecdote or from statistical data. Sigma Xi, the scientific honorary society, ran a large poll a few years ago which showed that, on any given Sunday, around 46 percent of all Ph.D. scientists are in church; for the general population the figure is 47 percent. So, whatever influences people in their beliefs about God, it doesn't appear to have much to do with having a Ph.D. in science.

There are many prominent counter-examples to Stephen Hawking. One is a colleague of mine at Berkeley for 18 years, Charlie Townes. Townes won the Nobel Prize for discovering the maser. One statement he made differs greatly from Hawking's view; he said, "In my view, the question of origin seems to be left unanswered if we explore from a scientific view alone. Thus, I believe

there is a need for some religious or metaphysical explanation. I believe in the concept of God and in His existence."

Arthur Schawlow is another Nobel Prize winner, a professor at Stanford who identifies himself as a Christian. He states, "We are fortunate to have the Bible and especially the New Testament which tells us so much about God in widely accessible human terms."

The other Cambridge professor of theoretical physics for much of Hawking's career was John Polkinghorn, a nuclear physicist. He left his chair of theoretical physics at Cambridge in 1979 and went to seminary to become a minister. Upon completing that, he had a parish church for awhile and now has recently come back to be the President of Queen's College at Cambridge. He states, "I take God very seriously indeed. I am a Christian believer and I believe that God exists and has made Himself known in human terms in Jesus Christ."

Probably the world's greatest observational cosmologist is Allan Sandage. Sandage works in Pasadena, California at the Carnegie Observatories. In 1991, he received a prize given by the Swedish academy that is given every six years in physics for cosmology and is worth the same amount of money as the Nobel prize (there is not a Nobel Prize given for cosmology). Sandage has even been called "the grand old man of cosmology" by the New York Times.

At the age of 50, Sandage became a Christian. He states in Lightman's book, *Origins: The Lives and Worlds of Modern Cosmologists*, "The nature of God is not to be found within any part of the findings of science. For that, one must turn to the Scriptures." When asked the famous question regarding whether it's possible to be a scientist and a Christian, Sandage replies, "Yes. The world is too complicated in all its parts and interconnections to be due to chance alone. I am convinced that the existence of life with all its order in each of its organisms is simply too well put together."

One of the persons closest to Stephen Hawking, whom you know if you've seen the movie about *A Brief History of Time*, is Donald Page. Page has had an excellent physics career in his own right, but he started to become famous as a post-doctoral fellow with Stephen Hawking. The Hawkings were not financially well-off in the years prior to his book and needed some help to keep going. So the post-doctoral fellows would come to live with the Hawkings. Donald Page did this for three years.

Page described these years in the book (the book about the film about the book!). He said, "I would usually get up around 7:15 or 7:30, take a shower, read in my Bible and pray. Then I would go down and get Stephen up. After breakfast, I would often tell him what I'd been reading in the Bible, hoping that this would eventually have some influence. I remember telling Stephen one story about how Jesus had seen the deranged man and how this man had these demons and the demons had been sent into a herd of swine. The swine then plunged over the edge of the cliff and into the sea. Stephen piped up and said, 'Well, the Society for the Prevention of Cruelty to Animals would not like that story, would they?'"

Page stated, "I am a conservative Christian in the sense of pretty much taking the Bible seriously for what it says. Of course I know that certain parts are not intended to be read literally, so I am not precisely a literalist but I try to believe in the meaning, I think, it is intended to have."

The Limits of Science

A statement that I think gives some balance to all of this is by one of my scientific heroes, Erwin Schrodinger, after whom the most famous equation in science is named: the Schrodinger equation. I have spent a good bit of my professional life trying to solve this equation for atoms and molecules.

Toward the end of Schrodinger's career he made this statement, "I am very astonished that the scientific picture of the real world around me is very deficient. It gives us a lot of factual information, puts all of our experience in a magnificently consistent order but it is ghastly silent about all and sundry that is really near to our heart, that really matters to us."

Schrodinger believed that science has limits; it knows nothing of beautiful and ugly, good or bad, God and eternity. Science sometimes pretends to answer questions in these domains but the answers are very often so silly that we are not inclined to take them seriously.

Jane Hawking has commented on this aspect of her husband's work. "Stephen has the feelings that because everything is reduced to a rational, mathematical formula, that must be the truth," Jane explained. "He is delving into realms that really do matter to thinking people and, in a way, that can have a very disturbing effect on people-and he's not competent."

The irony of the story is that Hawking's professional life currently is devoted to telling a story about the cosmos in which all the elements which make his own life so fascinating-love, faith, courage and even creative imagination-disappear from view. Aspiring to know the mind of God, he can imagine nothing more interesting than a set of equations governing the motion of particles. I love these equations too, but they are not the be-all and end-all of life!

A unified field-theory would be an amazing, magnificent scientific accomplishment, of course. But to Hawking it is just a step toward a distant but attainable goal of what he calls "a complete *understanding* of the events around us, and of our own existence."(p. 169)

The way to this goal does not seem to require reading the Bible or Shakespeare, living in a variety of cultures, experiencing art, climbing mountains, or falling in love and having children. All it involves is the intellectually challenging task of developing better approximation methods.

Richard Feynman states in his last technical book, *The Character of Physical Law*, "Everything in physical science is a lot of protons, neutrons and electrons, while in daily life, we talk about men and history or beauty and hope. Which is nearer to God-beauty and hope or the fundamental laws? To stand at either end and to walk off that end of the pier only, hoping that out in that direction is a complete understanding, is a mistake." I would have to say that what Stephen Hawking has done is to walk off one end of that pier.

Some Conclusions

After evaluating all the cosmological evidence, Hugh Ross has come to a number of conclusions (*The Fingerprint of God*, pp. 181-2). With only minor modifications, I wholeheartedly concur:

1. A Creator must exist. The big bang ripples are clearly pointing to an *ex nihilo* creation consistent with the first few verses of the book of Genesis.

2. The Creator must have awesome power and wisdom. The quantity of material and the power resources within our universe are truly immense. The information, or intricacy, manifest in any part of the universe, and especially in a living organism, is beyond our ability to comprehend. And what we do see is only what God has shown us within our dimensions of space and time!

3. The Creator is loving. The simplicity, balance, order, elegance, and beauty seen throughout the creation demonstrate that God is loving rather than capricious. Further, the capacity and desire to nurture and to protect, seen in so many creatures, makes sense if their Creator possesses these same attributes. It is apparent that God cares for His creatures, for He has provided for their needs.

4. The Creator is just and requires justice. Inward reflection and outward investigation affirm that human beings have a conscience. The conscience reflects the reality of right and wrong and the necessity of obedience.

5. Each of us falls hopelessly short of the Creator's standard. We incur His displeasure when we violate any part of God's moral law in our actions, our words, and our thoughts. Who can keep his or her thoughts and attitudes pure for even an hour? If each person falls short of his or her own standards, how much more so of God's standards?

6. Because the Creator is loving, wise and powerful, He made a way to rescue us. When we come to a point of concern about our personal failings, we can begin to understand from the creation around us that God's love, wisdom, and power are sufficient to deliver us from our otherwise hopeless situation.

7. If we trust our lives totally to the Rescuer, Jesus Christ, we will be saved. The one and only path is to give up all human attempts to satisfy God's requirements and put our trust solely in Jesus Christ and in His means of redemption, namely, His death on the cross.

(Editor's note: This article is a transcript of a lecture Dr. Schaefer presented at the University of Colorado in the spring of 1994, sponsored by Christian Leadership and other campus ministries. Over 500 students and professors were present.)

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http://www.leaderu.com/real/ri9501/bigbang2.html