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The Guy in the Wheelchair

God & Stephen Hawking
by Karl W. Giberson

In my freshman astronomy class, filled with unwilling non-science majors unhappily meeting an unappreciated general education requirement, I show the PBS video series "Stephen Hawking's Universe." The script for the series was well done, the visuals engaging and enlivened by the occasional appearance of Hawking.

The six-part series and its companion text were not actually about Hawking and were just capitalizing on the cosmologist's rock-star stature. But some of his ideas were discussed—and, wherever possible, the director would arrange a shot of Hawking in his wheelchair, going to his office or scooting across a college campus somewhere, en route to a lecture.

To keep the students awake in a darkened room with reclining seats—and salvage some of the money their parents had ponyed up for their education—I made them write reports on the videos. One student, an aspiring filmmaker, reviewed the video series from a technical point of view as well as for the content I wanted them to learn. He expressed puzzlement about why the PBS director chose to have "some guy in a wheelchair repeatedly crossing the screen for no apparent reason."

The student obviously missed the point, but his question, enlarged, is still a good one. Why has "some guy in a wheelchair"—Stephen Hawking—been repeatedly crossing in front of us, most recently floating weightlessly in space *sans* wheelchair, for the past quarter century?

A Brief History of *A Brief History*_Hawking is the best-known physicist since Albert Einstein and one of the scientific community's rare celebrities. His signature work of science popularization, *A Brief History of Time*, has sold one copy for every 750 people on earth—an astonishing record; it has been translated into 40 languages and has turned its author into a

major public figure, capable of filling large lecture halls and even getting multiple guest spots on *The Simpsons*, the ultimate measure of cultural cachet.

Hawking's extraordinary scientific mind resides in a tragically withered body rarely seen away from his ubiquitous high-tech wheelchair. When he appeared on *The Simpsons* his wheelchair was outfitted with a propeller that allowed him to fly away at will and a boxing glove on a spring enabling him to mechanically punch people.

A Brief History of Time gave currency to the idea that our universe had no "beginning." This bizarre-sounding claim actually fits with what we know about the origin of the universe, but we know so little about how our universe began that there are, in fact, many "compatible" speculations. Ignorance is consistent with a great many notions.

The argument in *A Brief History of Time* has an interesting theological spin that accounts for much of the book's enduring fascination. Eliminating the temporal beginning to the universe, says Hawking, rules out any role that God might have played in creating it. Carl Sagan, among others, found this notion delightful, exulting in his introduction to the first edition of the book that *A Brief History of Time* was about "God … or perhaps the absence of God."

God, of course, has a long association with modern cosmology, and many amateur theologians have waxed eloquent about the way creation connects to the well-defined beginning hinted at by the Big Bang theory. But there have also been theoretical models for the Big Bang without this interesting aspect. One such "no-beginning" idea exploded into broad circulation in 1988 when Hawking published *A Brief History of Time*. The book, while brief and without equations, was a challenging read. Nevertheless it appeared with something of a big bang itself and became a blockbuster of cosmic proportions.

The success of Hawking's book is itself an interesting story. How did this happen? How did a challenging book on an esoteric topic sell millions of copies? Colleagues began to wonder if they should

jump on this newly respectable bandwagon of science popularization; publishers looked about eagerly for a piece of the new literary action. Spinoffs appeared, riding on the book's seemingly infinite coattails. *A Reader's Companion* appeared in 1992. Hawking wrote his own account of the book's success, "A Brief History of *A Brief History*," which appeared in *Black Holes and Baby Universes*, a short collection of essays published in 1993. *A Briefer History of Time*, described on the cover as "More Accessible, More Concise, Illustrated, and Updated with the Latest Research," appeared in 2005. Hawking's 2001 *The Universe in a Nutshell*, and a few edited volumes, complete his modest output of science popularization.

Hawking wrote his *Brief History* to meet financial needs generated by his advancing illness, amyotrophic lateral sclerosis (ALS), better known as "Lou Gehrig's disease," which gradually destroys motor neurons, in turn limiting one's ability to initiate and control muscle movement. Although the disease leads to complete physical paralysis, the majority of those afflicted with ALS suffer no mental impairment. Hawking, for example, has continued to work productively even after his physical limitations advanced to the point that all he could do was wiggle one finger.

The Making of a Legend_"*I suspect that Hawking—who may be less a truth seeker than an artist, an illusionist, a cosmic joker—knew all along that finding and empirically validating a unified theory would be extremely difficult, even impossible. His declaration that physics was on the verge of finding The Answer may well have been an ironic statement, less an assertion than a provocation.*"

—John Horgan in *The End of Science. Facing the Limits of Knowledge in the Twilight of the Scientific Age* (1997)

Hawking's ALS showed up in the early 1970s when he was barely thirty and turned simple tasks like getting into bed into major challenges. Initially he had one of his students live with him and his wife Jane to help him manage personal tasks. Fortunately for Hawking, his great fame guaranteed that there were always students eager to do this—even cosmology has its groupies. By the early 1980s, his disease had so slurred his speech that only people very familiar with Hawking could understand him; many of his public appearances at this time included one of his

students, who would interpret his inscrutable monotone mumbling. There was the looming financial pressure of his children's education. And expensive nurses were now required to supplement the care provided by his students and the long-suffering Jane.

Hawking was encouraged to spin some money out of his growing fame by writing a popular book on cosmology, an idea he rejected at first; scientists writing "popular" books were typically regarded by their peers with disdain. He eventually gave in, however, and met with an editor from Cambridge University Press, explaining that he needed to write a book that would make money. The editor responded that Hawking's proposed "popular" science manuscript, with equations on every page, might not turn out to be all that popular. A publishing dictum suggests that each equation cuts a book's sales in half. Applied to Hawking's manuscript, this formula predicted sales in the single digits.

In early 1983, a farsighted editor at Bantam Books in New York lured Hawking away from Cambridge University Press. Convinced that the combination of Hawking's heroic scientific stature and pitiful physical condition was the stuff of legend, he offered Hawking a quarter-million-dollar advance and a favorable deal on royalties. Hawking signed.

The book appeared in 1988, and within a decade had sold almost ten million copies. Meanwhile, Stephen and Jane Hawking's personal life became tabloid fare, even as their marriage began to disintegrate, a development they hid from the press for as long as possible. The ensuing publicity marginalized the heroic Jane (an evangelical Christian, as it happens), whose loving support for Stephen had been instrumental both in saving his life and in enabling his career. In her deeply spiritual memoir *Travelling to Infinity: My Life with Stephen*, which appeared in an updated edition this spring, Jane laments that she became "an appendage, a peep show—relevant to Stephen's survival and success only because in the distant past I had married him, made a home for him, and produced his three children." They separated in 1991 and divorced four years later.

Knowing the Mind of God_The science "popularized" in A Brief

History of Time derives from Hawking's speculative work on the large-scale structure of the cosmos, particularly as it relates to the "beginning." The conventional picture of the cosmos articulated in introductory astronomy books comes from the Big Bang theory and has the universe appearing from some unknown prior configuration about 14 billion years ago. The ubiquitous timelines that lay out this cosmic history in such books generally have a comic-book "explosion" at the beginning (time = 0, or "t = 0" as scientists shorthand it).

The t = 0 "appearance" of the universe has occasioned much cosmological head-scratching. In the early days of the Big Bang theory, when the evidence was less than compelling, many cosmologists rejected the idea of a beginning. The Belgian cleric/physicist Georges Lemaître, who first proposed it, was accused of smuggling a suspiciously biblical "creation" into science. The enthusiastic agnostic Fred Hoyle developed an alternative "steady state" model, hopefully doing away with what Sir Arthur Eddington had called an "unaesthetically abrupt" beginning to the universe.

The discovery of the predicted background radiation in 1965 dramatically confirmed the Big Bang. Modern cosmology was born. Since then extrapolations have tried to deal with the beginning of the universe, sometimes "explaining" it, other times "explaining it away." Maybe our universe is the daughter of a previous universe or a bubble in a meta-universe or a sibling of many contemporary universes. Or, suggests Hawking, maybe there simply is no beginning.

The most exasperating feature of the Big Bang theory is its increasing vagueness as one approaches the point t = 0 on the cosmic timeline. As a description of today's universe the theory works well; there is ample evidence that the universe is expanding in the way the theory says it should; the radiation left over from the initial "explosion" is spread uniformly throughout space, as we would expect. And, when we look billions of light years "out" into space and see things as they were long ago, they are different in ways that fit with the Big Bang. All of this is comforting, for those who take comfort from such things.

But the picture grows murky as we approach the beginning. On the observational side, we simply cannot look out far enough to see light from 14 billion years ago. We can't even get close, so we are very much in the dark, so to speak, when it comes to observation of this critical point in the history of the universe.

There is, however, a glimmer of light on the theoretical side. Mathematical models of the early universe predict, in a rather straightforward way, astonishingly great densities of matter and very high temperatures. Microcosmic versions of such extreme environments can be created in the laboratory and tested against theoretical models. And the match is excellent for those early stages of the universe that come *after* the moment of origination.

But what about the actual point t = 0? This cannot be reproduced in the laboratory. Nor does there exist a compelling, generally accepted theory of exactly what this stage would look like.

Absent both observational data and compelling theoretical models, we have an explanatory vacuum—and cosmologists, like nature, abhor vacuums. This particular vacuum is filled with ingenious speculations, including those of Hawking.

The technical version of Hawking's speculation was published in collaboration with James Hartle in the *Physical Review*, the world's leading physics journal. After a densely mathematical, conceptually opaque presentation of the problem of the temporal and spatial "boundaries" of the universe, they conclude, so cryptically that readers can be forgiven for thinking they understand: "This means that the Universe does not have any boundaries in space or time … . There is thus no problem of boundary conditions."

Hawking repeated the final words of the paper until they became rather famous: "If this were the case, one would have solved the problem of the initial boundary conditions of the Universe: the boundary conditions are that it has no boundary." Note the all-important-but-easily-overlooked conditional, "If this were the case."

Hawking and Hartle's result is remarkable, but it must be placed in context. Interesting ideas in mathematical physics always

contain assumptions and simplifications. As remarkable as the fit between the natural world and mathematics might be, the fit can rarely be made without simplifying assumptions; even the simple calculation of the rate at which a body falls to earth must assume that the earth and the body have all of their mass located at their centers of gravity, and that all other gravitational centers are infinitely far away. Such assumptions are necessary to make the "real world" match the "theoretical world," which it often does astonishingly well.

With theories—*hypotheses* would be a better word—such as Hawking's the-universe-has-no-boundary, however, there are no empirical tests that can be made—not now, probably not for decades, and maybe never.

Nevertheless, we must not dismiss the no-boundary idea simply because it is presently untestable. The mathematical model that eventually gave rise to the Big Bang theory, for example, was itself once untestable and was ridiculed by critics as "supernatural." Many ideas in science originate in this way, but, prior to validation through observation, they coexist with other possibilities on a more-or-less equal footing. (For readers who can recall solving the quadratic equation in high school, there is a helpful analogy. The quadratic equation always has two solutions—two different values for "x," both of which are "correct" in that they solve the equation. In the simple quadratic equation, x2 = 4, the two solutions are x = 2 and x = -2. If the quadratic equation applies to the real world, however, usually one of the two solutions will not work and must be discarded as "non-physical." In this case the quadratic equation could be an expression for the area of a square with sides of length "2." The solution x = -2, implying negative lengths for the sides of the square, makes no sense.) Mathematics usually provides more possibilities than those that correspond to physical reality; we should thus withhold our applause for any particular mathematical result until such time as it turns out to match the real world.

In the glossary to his *Brief History*, Hawking says that the no-boundary condition is "The idea that the universe is finite but has no boundary (in imaginary time)." Hawking's proposal works "in

imaginary time," something that sounds more indigenous to Narnia than physics. To explain how t = 0 is not a boundary in time, Hawking compares it to the North Pole of the earth, where the latitude equals 0. Every point on the earth *except* the North Pole has points "north" of it. But treating the earth as a uniform sphere, the North Pole is a point like any other. Hence the "uniqueness" of the North Pole is just an artifact of the way we label latitude. Nothing "begins" at the North Pole, except our coordinate system.

In Hawking's model, asking what happened *before* the Big Bang is vaguely like asking what is *north* of the North Pole. The inquiry is meaningless: there is no mystery at the North Pole; we can walk across it without noticing anything odd whatsoever.

This analogy breaks down, however, when we note that Hawking's proposal works only in "imaginary time," which may or may not be a meaningful concept. If we can convince ourselves that it is OK for time to become imaginary as we approach the moment of the Big Bang, Hawking's proposal does indeed do away with the "beginning." But, absent some fancy new imaginary clocks keeping track of imaginary time, skeptics—including Hawking's colleague Sir Roger Penrose—may be forgiven for preferring to take their time straight.

Where's the Beef?_"I'd like to emphasize," Hawking has written, "that this idea that time and space should be finite 'without boundary' is just a *proposal*: it cannot be deduced from some other principle. Like any other scientific theory, it may initially be put forward for aesthetic or metaphysical reasons, but the real test is whether it makes predictions that agree with observation. This, however, is difficult."

And yet for all the becoming modesty of this disclaimer, Hawking has repeatedly made extraordinary claims for his proposal, the knowledge of which—as he has famously suggested—allows one to enter the "mind of God." He speaks of a time when everyone might understand such a wondrous theory, allowing us to all "take part in the discussion of the question of why it is that we and the universe exist. If we find the answer to that, it would be the ultimate triumph of human reason—for then we would know

the mind of God."

Hawking's invocation of God is curious, and one cannot but wonder if it is simply a gratuitous insertion to make his books *provocative*, which is to say *marketable*. Putting "God" in your books is the opposite of putting equations in; it enhances sales. Putting "God" on the cover of a science book is akin to putting swimwear models on the cover of *Sports Illustrated*: the juxtaposition is deliberately provocative. The past few years have seen a number of science books capitalizing on the market value of God: Paul Davies' *God and the New Physics* and *The Mind of God*; Leon Lederman's tongue-in-cheek *The God Particle*, and far too many more to list here. Hawking's own most recent work is an edited volume titled *And God Made the Integers*. I must confess to convincing Oxford University Press to put "God" in the subtitle of my recent book, *The Oracles of Science: Celebrity Scientists versus God and Religion*. And I tried, unsuccessfully, to convince HarperOne to title my forthcoming book "God Loves Darwin, Too."

It would be one thing if Hawking, like Lederman, were just having fun or, as John Horgan suggested, acting the provocateur. But the tone of *A Brief History of Time*, with its anecdotes about discussions at the Vatican, suggests that Hawking really *believes* that his no-boundary idea has profound implications for the role of God in the creation of the universe, and many serious readers have taken his claims at face value; indeed, Hawking features in contemporary cultural discourse much as Heisenberg and his Uncertainty Principle did a generation ago.

Hawking's theological naïveté is almost funny. He appears not to know that the heart of the Judeo-Christian doctrine of creation is that the world derives its *being* from God, not that God "started" the world, like some kid building a model airplane. Everyone from Augustine and Aquinas to Barth and Pannenberg has addressed this important distinction. The suggestion that a physical theory ruling out a well-defined "beginning" to the universe removes God from creation is the sort of simplistic misunderstanding that might be tolerated in philosophy students' first term papers, but certainly not their second.

And what of Hawking's claim that knowledge of the profoundly

misnamed "Theory of Everything" would be like entering into the mind of God? Really? Is this what God thinks about? What God is this? Is there actually a church somewhere that puts equations on a big screen and invites worshippers to view them as a prelude to worship? Is this the same God whose existence Hawking disproved a few pages earlier?

All this would indeed be humorous if it were not in a book that has sold ten million copies. Hawking has done a great disservice to those purchasers of his book who have actually read it. He has misled them about the religious implications of science and the apparent motivations of scientists; he has made bogus claims about theology; he has juxtaposed science and theology as if they compete to explain the same things. Hawking's enthusiasm about doing away with God does not reflect the views of the scientific community, where there is widespread belief in God, and widespread disinterest in using science against religion.

Hawking is a major public intellectual, a leading scientist with a flair for popular exposition and a platform from which to explain science to an educated populace. He and his scientific allies—Richard Dawkins, Edward O. Wilson, Peter Atkins, the late Stephen Jay Gould, Steven Weinberg, Stephen Pinker and so on—shape public perceptions of science through their popular presentations, in books, articles, and public appearances. Their collective message—drilled home in many different ways—is that science is hostile to religion, scientists don't believe in God, and science competes with religion to explain natural phenomena.

None of these statements is true.

Hawking's iconic wheelchair has been crisscrossing the world's stage for some time now. And his stature as an ambassador for science has grown steadily, even as his physical frame has withered. He is, to be sure, a hero. But we must avoid the temptation to gloss his philosophical ideas with the mythological heroism of his personal life. He is, when all is said and done, a great scientist who knows nothing about theology, but loves to talk about God.

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Scientists Versus God and Religion. *(Oxford Univ. Press), from which this essay was adapted. He is professor of physics at Eastern Nazarene College.*

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