

God and Time Machines

A conversation with Templeton Prize-winning physicist Paul Davies

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*Born in England in 1946 and educated at the University of Cambridge and University College London, Paul Davies has enjoyed a distinguished career as a theoretical physicist, but most readers know him as a superbly gifted expositor of science for the layperson: lucid, witty, and provocative. He is the author of more than 20 books, including *The Mind of God: The Scientific Basis for a Rational World*; *About Time: Einstein's Unfinished Revolution*; and *The Fifth Miracle: The Search for the Origin and Meaning of Life*. His latest book, just published by Viking, is *How to Build a Time Machine*. In 1995 he was awarded the Templeton Prize for Progress in Religion.*

*Because Davies has argued that intelligent, purposeful order is at the very heart of things, his work has been cited favorably by many religious believers. But what Davies means by God is quite different from what orthodox Christians mean, as is clear in this conversation with Karl Giberson. Fittingly, the interview took place in Harvard University's Memorial Church, the site of a Templeton Foundation-sponsored conference, *Science and the Spiritual Quest II*, in October 2001.*

When you finished your undergraduate studies in physics and were looking for an area of specialization, what drew you into the particular area you chose?

Early on I had identified astrophysics and cosmology as what I wanted to do. In fact I can even remember at the age of 16 asking the chemistry master about how I could become an astronomer. He said he really didn't know; it wasn't at all clear how you would actually embark on a career as an astronomer. I figured that was the way to go, so by the time I was thinking about my ph.d. thesis work I had already requested a project in cosmology. I worked on something that Fred Hoyle had started; I won't go into the technical details, but it was a project in theoretical cosmology, which was a branch of physics. I completed my ph.d. on that work and Hoyle was the external

examiner. He offered me a job at Cambridge in theoretical astronomy. That was in 1970.

From listening to a lecture by Hoyle, I had formed a deep interest in the nature of time, and whilst I was in Cambridge I wrote my first book, *The Physics of Time Asymmetry*. It's about the arrow of time, the distinction between past and future, and the physical basis for that. That's still a subject that is of deep interest to me. My latest book is about time travel and how to build a time machine. So this is a theme that I have revisited many times.

Do you hold out any hope for human time travel?

What interests me is whether this is physically possible. If it is, then it tells us something about the nature of reality. But, in terms of the practical proposition, it's a tough one. Traveling to the future is straightforward. You simply use the time dilation effect; if you could move close to the speed of light then you would effectively leap into the future. That, of course, is very expensive to do, but we could imagine that it could be done. Going to the past would require something like constructing a wormhole or stargate as a shortcut between two points in space, and then adapting that for time travel. That looks like cosmic engineering of a supercivilization. It's hard to foresee that we could do that, and definitely not in the near future—but, having said that, we may eventually understand enough about the physics of wormholes and strong gravitational fields, and it could be that there is an easier way to do it. In my new book I'm looking at the wormhole scenario specifically, because that's the one that put the subject on the map. But we may find that our understanding of gravitation, particularly at small distances, is incomplete and that in another 20 years we might see a much easier way of doing it.

Still, it is important to note that we don't see any time travelers from the future; this means either that this is never going to be done or, more likely, as is the case with the wormhole, that you can't travel back to an epoch before you made the time machine. So the idea that we'll just wait and be given a time machine from our descendants when they come back and visit us doesn't work. That neatly explains why there aren't any time tourists around at

the moment.

I want to move on to your role as a popularizer of physics. What drew you into writing for a general audience? I imagine that some of your colleagues must have thought that you were abandoning the real work and becoming a journalist.

Indeed, that's exactly right. First, I should say that I never had any facility for writing. I barely scraped through English at school, and any writing ability I have has come as a bit of a surprise. I just blundered into it.

When I went to King's College, London, it happened to be more or less next door to the offices of the journal *Nature*, and they used to get me to help from time to time with their manuscript assessment. Then they asked if I would like to write a little column for them, and I thought that it might be fun to try. My first skirmish with attempting to sit midway between the specialist's world of science and the general public was that column. It grew from there. My first book, which I was already working on [*The Physics of Time Asymmetry*], was one the publisher just asked me to write. That was an academic book, not a work of popularization. There was a knock-on effect, because that book created a stir and publishers requested that I write a book for undergraduates. So I wrote one for Cambridge University Press called *Space and Time in the Modern Universe*, and then another publisher saw that and suggested that I write something for the general public. So, with each stage the level came down, but the sales went up!

I know that you have been thinking about design ever since you were a little kid, but when did you start reflecting on it in the philosophical way that you began with *God and the New Physics* and continued in *The Mind of God*? That idea seems to have captured you in a lot of ways.

I suppose that what really fascinated me at the time of my thesis work, which I was doing at the age of 22, was the link between the large and the small, the idea that the physics in a local region might depend in some way on the largescale structure of the

Universe, the connectedness of things. That still fascinates me as a philosophy, as a way of looking at the world. That was a very deep part of my thinking in those early days.

What do you think is the most compelling evidence of design in the universe?

There is nothing that is totally compelling. Steven Weinberg or Martin Rees can look at exactly the same set of facts and say, "No, that isn't evidence of design." At best this is circumstantial evidence. I have thought long and hard, though, about the nature of the laws of physics and the fine-tuning of those laws and the way it all fits together so well. It's not just the fine-tuning; it's both aspects. So, for me it is in those laws.

Now, I am well aware that we should not commit the fallacy that William Paley committed and look at the natural world and say: "The contrivances of nature look so clever that they must have been made by a Creator." I accept the fact that all the physical systems that we see, from the biological realm right through to the galaxies, are the products of natural physical processes, and I wouldn't use the word design in connection with those. It is only in metaphysics, when we look at the laws that underlie all this—at the total package, in other words, not the specifics—that I would say that there is evidence for design. You can look at it all and not draw that conclusion. Everybody will have a threshold, and this is an interesting point: what would it take to convince Richard Dawkins that there is design in nature?

I'll give you an example: Suppose we digitized a sequence of human dna and put it in some sort of array, and then found that it spelled out a message in English: "Hello humans, I am God." Carl Sagan had this rather neat idea that maybe very deep in the digits of pi, there is a message of some sort. I guess that would convince people that the universe has been put together by an intelligent designer. So, obviously at some point we would have to say we have design, because we make the inference of design all the time in daily life when we see things that are the product of human or animal activity.

In my book *The Fifth Miracle* I contrast the ripples in the sand

that you find when you are walking on the beach, which are the product of waves and water sloshing around, with the little holes made by the crabs. Somehow we know when we look at the little holes that they are designed, so to speak, and are the product of purposeful activity, while the ridges are not. Trying to pin down what it is about one and not the other that allows us to see design is not an easy thing. But we do recognize it, and everybody has that point at which they say, "Aha, something is going on here." That would surely be the case if it came to God and the design of the universe. There must be some point at which the most hardened skeptic would be convinced that things have been designed.

But, you see, there is nothing that is so compelling; and I really do believe that the case for design stands or falls upon whether we can find another explanation in terms of multiple universes. I keep trying to get this onto the agenda for the science-religion dialogue. It seems to me that this is the most urgent and important and fascinating challenge: can we mimic the design in the fundamental laws by invoking an ensemble of universes with a whole range of different laws? And what is the status of those theories? I really think that this is the most important area for inquiry at the moment.

Are you impressed with William Dembski's attempts to give a philosophical and mathematical framework for the detection of design?

Yes, I think that Dembski has done a good job in providing a way of mathematizing design. That is really what we need because otherwise, if we are just talking about subjective impressions, we can argue till the cows come home. It has got to be possible, or it should be, to quantify the degree of "surprise" that one would bring to bear if something turned out to be the result of pure chance. I think that that is a very useful step. Of course I don't exactly endorse Dembski's interpretation or his application of those design arguments to biology. We all recognize that biological organisms have the appearance of design. Where I would part company from him is in the matter of irreducible complexity at the level of cells. That's another issue, but I think that he has made a useful contribution by trying to mathematize

the design idea.

The design argument is interesting, of course, because it points toward a designer. When you talk about God, or god, what kind of god do you envision? I'm not asking you what kind of god you have defended in your books, but rather, as you try to flesh this out for yourself, how do you, as Paul Davies, envision this god?

First, I try to avoid using the word "God" whenever possible, because everybody's view of God is different. Nevertheless, to some extent except it is indispensable if you are going to write books in this field. The phrase, the ground of being, has been much used among theologians, and views of God among professional theologians range all the way from an invisible, omnipotent personal God to something as nebulous as being itself. I'm midway on that spectrum. What I have in mind is the rational ground on which the order of the universe is rooted, but the crucial quality here is that this rational ground is timeless. Time is part of the physical order of the world, and what I'm talking about is something beyond space and time, so this is not a god within time, not a god to whom you can pray and have something change.

But I would go beyond saying it is just the rational ground; I would bring in the word purpose, the purposeful ground in which the laws of physics are rooted. I think that the Universe is more than just a system; I think that it is about something. Of course, we're using human terms—even design is a human term—and we have to recognize the inadequacy of our concepts; nevertheless, I think that the notion of meaning, purpose, or goal can be applied to the universe as a whole in a limited way. I would say that this god I am talking about is the purposeful rational ground in which the laws of physics are rooted.

Let me ask you a question now, not so much about your own personal view but about how you see your colleagues who are talking about models for God and his action in the world. One of the things that is very striking in a lot of their writings is a clear aversion to the idea of a God who "meddles" or "tinkers," as they put it. Everyone likes to

quote Laplace on this point ("I had no need of that hypothesis"). Is it possible that this aversion—which seems to be an exceptionally visceral distaste with a strong aesthetic component—is primarily a reaction against the metaphor of God as the Supreme Engineer of the Universe? If you're talking about a clockmaker, you are not very impressed if he has to return every week and tune your clock before it gets so out of whack that it's no good anymore. But what if the metaphor is God as parent? When you are conceptualizing how this God might behave, you envision a universe where all the parts necessary for the children to flourish are present and so on, yet in this metaphorical scheme God is not defective if he participates.

That is an interesting point. Yes, you could use holistic language that would not conflict with the details of the lower levels, I could well imagine. This is more or less my point of view. If you look at specific phenomena, they get by perfectly well without God. But if you look at the whole picture—what is the universe doing in the great scheme of things—then God-type language perhaps starts to become more appropriate. But this is not to say that at any given point on the causal chain God zooms in and rearranges a few atoms. I find that idea really repugnant, not only as a scientist, but also theologically—the idea that God is happy to let things tick along, but then sometimes acts like a force of nature. My view of God is something a bit more abstract, its true, but somehow grander than this meddler.

It is the job of the scientist to explain the world in terms of natural processes, and therefore it is not surprising that we don't want something that can be explained only by invoking supernatural intervention. After all, that's like giving up, isn't it? You are faced with a phenomenon that you're finding hard to explain, like the origin of life, for example, which I am particularly interested in. We don't know how it happened, and we might never know. Still, it seems to me that if you then say, well, God did it, that is pretty poor. You might miss out on a lot of really interesting science.

Where do you think the science- religion dialogue is

going?

My own impression, from talking to theo-logians, is that there is hardly any gulf between science and theology. Where there is a huge gulf is between professional theologians and what comes across from the pulpit on a Sunday. The vast mass of the public still supposes that church doctrine is Adam and Eve and special creation, and yet these things were rejected a century ago or more. It is now time for the clergy to come clean with their flock and say this stuff is a load of old-fashioned fairy tales.

It may have its own charm as a literary genre or as a parable, but you have to take seriously the Big Bang origin of the universe and Darwin's theory of evolution. Clergy need to say that they accept all this stuff; we have got to embrace it and move on. That is what I would like to see on the theological side—a mass public education campaign, because I think that religion is getting a really bad name.

And, after the terrorist attacks on September 11, it is not going to get any better. I don't suppose that helped with conversions to Islam! An article appeared in the Guardian newspaper in London under the title of "Damn Them All," simply saying that all the world's religions, once they gain power over people, behave in this despicable way. It is only the religions that are weak and don't have any power that are relatively benign. The Quakers wouldn't exist if it weren't for the liberal democracies that protect them. There are some people who feel that religion, at least in its institutionalized form, is an evil that should be swept away. I think it is high time, if people are to take religion seriously intellectually—and not just as a political creed—it was cleaned up. That is a strong statement, but I do feel that.