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Physicist Charles Townes in his office at Birge Hall. The department will celebrate Townes's 90th birthday with a symposium in the fall. *(BAP photos)*

'Explore as much as we can': Nobel Prize winner Charles Townes on evolution, intelligent design, and the meaning of life

By Bonnie Azab Powell, NewsCenter | 17 June 2005

BERKELEY – Religion and science, faith and empirical experiment: these terms would seem to have as little in common as a Baptist preacher and a Berkeley physicist. And yet, according to Charles Hard Townes, winner of a Nobel Prize in Physics and a UC Berkeley professor in the Graduate School, they are united by similar goals: science seeks to discern the laws and order of our universe; religion, to understand the universe's purpose and meaning, and how humankind fits into both.

Where these areas intersect is territory that Townes has been exploring for many of his 89 years, and in March his insights were honored with the 2005 Templeton Prize for Progress Toward Research or Discoveries about Spiritual Realities. Worth about $1.5 million, the Templeton Prize recognizes those who, throughout their lives, have sought to advance ideas and/or institutions that will deepen the world's understanding of God and of spiritual realities.

Townes first wrote about the parallels between religion and science in IBM's *Think* magazine in 1966, two years after he shared the Nobel Prize in Physics for his groundbreaking work in quantum electronics: in 1953, thanks in part to what Townes calls a "revelation" experienced on a park bench, he invented the maser (his acronym for Microwave Amplification by Stimulated Emission), which amplifies microwaves to produce an intense beam. By building on this work, he achieved similar amplification using visible light, resulting in the laser (whose name he also coined).

Even as his research interests have segued from microwave physics to astrophysics, Townes has continued to explore topics such as "Science, values, and beyond," in *Synthesis of Science and Religion* (1987), "On Science, and what it may suggest about us," in *Theological Education* (1988), and "Why are we here; where are we going?" in *The International Community of Physics, Essays on Physics* (1997).

Townes sat down one morning recently to discuss how these and other weighty questions have shaped his own life, and their role in current controversies over public education.

Q. If science and religion share a common purpose, why have their proponents tended to be at loggerheads throughout history?

Science and religion have had a long interaction: some of it has been good and some of it hasn't. As Western science grew, Newtonian mechanics had scientists thinking that everything is predictable, meaning there's no room for God — so-called determinism. Religious people didn't want to agree with that. Then Darwin came along, and they *really* didn't want to agree with what he was saying, because it seemed to negate the idea of a creator. So there was a real clash for a while between science and religions.

But science has been digging deeper and deeper, and as it has done so, particularly in the basic sciences like physics and astronomy, we have begun to understand more. We have found that the world is not deterministic: quantum mechanics has revolutionized physics by showing that things are not completely predictable. That doesn't mean that we've found just where God comes in, but we know now that things are not as predictable as we thought and that there are things we don't understand. For example, we don't know what some 95 percent of the matter in the universe is: we can't see it — it's neither atom nor molecule, apparently. We think we can prove it's there, we see its effect on gravity, but we don't know what and where it is, other than broadly scattered around the universe. And that's very strange.

So as science encounters mysteries, it is starting to recognize its limitations and become somewhat more open. There are still scientists who differ strongly with religion and vice versa. But I think people are being more open-minded about recognizing the limitations in our frame of understanding.

Who created us? U.S. vs. UC Berkeley beliefs

A Nov. 18-21, 2004 New York Times/CBS News poll on American mores and attitudes, conducted with 885 U.S. adults, showed that a significant number of Americans believe that God created humankind. UC Berkeley's Office of Student Research asked the same question on its 2005 UC Undergraduate Experience Survey, results for which are still coming in. As of June 8, 2,057 students had responded.

Which of the following statements comes closest to your views on the origin of human beings?

	NYT/CBS	UC Berkeley
1. Human beings evolved from less advanced life forms over millions of years, and God did not directly guide this process	13%	56%
2. Human beings evolved from less advanced life forms, but God guided this process	27%	31%
3. God created human beings in their present form	55%	13%
4. Don't know	5%	N/A

You've said "I believe there is no long-range question more important than the purpose and meaning of our lives and our universe." How have you attempted to answer that question?

Even as a youngster, you're usually taught that there's some purpose you'll try to do, how you are going to live. But that's a very localized thing, about what you want with your life. The broader question is, "What are humans all about in general, and what is this universe all about?" That comes as one tries to understand what is this beautiful world that we're in, that's so special: "Why has it come out this way? What is free will and why do we have it? What is a being? What is consciousness?" We can't even define consciousness. As one thinks about these broader problems, then one becomes more and more challenged by the question of what is the aim and purpose and meaning of this universe and of our lives.

Those aren't easy questions to answer, of course, but they're important and they're what religion is all about. I maintain that science is closely related to that, because science tries to understand how the universe is constructed and why it does what it does,

including human life. If one understands the structure of the universe, maybe the purpose of man becomes a little clearer. I think maybe the best answer to that is that somehow, we humans were created somewhat in the likeness of God. We have free will. We have independence, we can do and create things, and that's amazing. And as we learn more and more — why, we become even more that way. What kind of a life will we build? That's what the universe is open about. The purpose of the universe, I think, is to see this develop and to allow humans the freedom to do the things that hopefully will work out well for them and for the rest of the world.

How do you categorize your religious beliefs?

I'm a Protestant Christian, I would say a very progressive one. This has different meanings for different people. But I'm quite open minded and willing to consider all kinds of new ideas and to look at new things. At the same time it has a very deep meaning for me: I feel the presence of God. I feel it in my own life as a spirit that is somehow with me all the time.

You've described your inspiration for the maser as a moment of revelation, more spiritual than what we think of as inspiration. Do you believe that God takes such an active interest in humankind?

[The maser] was a new idea, a sudden visualization I had of what might be done to produce electromagnetic waves, so it's somewhat parallel to what we normally call revelation in religion. Whether the inspiration for the maser and the laser was God's gift to me is something one can argue about. The real question should be, where do brand-new human ideas come from anyway? To what extent does God help us? I think he's been helping me all along. I think he helps all of us — that there's a direction in our universe and it has been determined and is being determined. How? We don't know these things. There are many questions in both science and religion and we have to make our best judgment. But I think spirituality has a continuous effect on me and on other people.

That sounds like you agree with the "intelligent design" movement, the latest framing of creationism, which argues that the complexity of the universe proves it must have been created by a guiding force.

I do believe in both a creation and a continuous effect on this universe and our lives, that God has a continuing influence — certainly his laws guide how the universe was built. But the Bible's description of creation occurring over a week's time is just an analogy, as I see it. The Jews couldn't know very much at that time about the lifetime of the universe or how old it was. They were visualizing it as best they could and I think they did remarkably well, but it's just an analogy.

Should intelligent design be taught alongside Darwinian evolution in schools as religious legislators have decided in Pennsylvania and Kansas?

I think it's very unfortunate that this kind of discussion has come up. People are misusing the term intelligent design to think that everything is frozen by that one act of creation and that there's no evolution, no changes. It's totally illogical in my view. Intelligent design, as one sees it from a scientific point of view, seems to be quite real. This is a very special universe: it's remarkable that it came out just this way. If the laws of physics weren't just the way they are, we couldn't be here at all. The sun couldn't be there, the laws of gravity and nuclear laws and magnetic theory, quantum mechanics, and so on have to be just the way they are for us to be here.

Some scientists argue that "well, there's an enormous number of universes and each one is a little different. This one just happened to turn out right." Well, that's a postulate, and it's a pretty fantastic postulate — it assumes there really are an enormous number of universes and that the laws could be different for each of them. The other possibility is that ours was planned, and that's why it has come out so specially. Now, that design could include evolution perfectly well. It's very clear that there is evolution, and it's important. Evolution is here, and intelligent design is here, and they're both consistent.

'Faith is necessary for the scientist even to get started, and deep faith is necessary for him to carry out his tougher tasks. Why? Because he must have confidence that there is order in the universe and that the human mind — in fact his own mind — has a good chance of understanding this order.'

-Charles Townes, writing in "The Convergence of Science and Religion," IBM's Think magazine, March-April 1966

They don't have to negate each other, you're saying. God could have created the universe, set the parameters for the laws of physics and chemistry and biology, and set the evolutionary process in motion, But that's not what the Christian fundamentalists are arguing should be taught in Kansas.

People who want to exclude evolution on the basis of intelligent design, I guess they're saying, "Everything is made at once and then nothing can change." But there's no reason the universe can't allow for changes and plan for them, too. People who are anti-evolution are working very hard for some excuse to be against it. I think that whole argument is a stupid one. Maybe that's a bad word to use in public, but it's just a shame that the argument is coming up that way, because it's very misleading.

That seems to come up when religion seeks to control or limit the scope of science. We're seeing that with the regulation of research into stem cells and cloning. Should there be areas of scientific inquiry that are off-limits due to a culture's prevailing religious principles?

My answer to that is, we should explore as much as we can. We should think about everything, try to explore everything, and question things. That's part of our human characteristic in nature that has made us so great and able to achieve so much. Of course there are problems if we do scientific experiments on people that involve killing them — that's a scientific experiment sure, but ethically it has problems. There are ethical issues with certain kinds of scientific experimentation. But outside of the ethical issues, I think we should try very hard to understand everything we can and to question things.

I think it's settling those ethical issues that's the problem. Who decides what differentiates a "person" from a collection of cells, for example?

That's very difficult. What is a person? We don't know. Where is this thing, me — where am I really in this body? Up here in the top of the head somewhere? What is personality? What is consciousness? We don't know. The same thing is true once the body is dead: where is this person? Is it still there? Has it gone somewhere else? If you don't know what it is, it's hard to say what it's doing next. We have to be open-minded about that. The best we can do is try to find ways of answering those questions.

You'll turn 90 on July 28. What's the secret to long life?

Good luck is one, but also just having a good time. Some people say I work hard: I come in on Saturdays, and I work evenings both at my desk and in the lab. But I think I'm just having a good time doing physics and science. I have three telescopes down on Mt. Wilson; I was down there a couple nights last week. I've traveled a lot. On Sundays, my wife [of 64 years] and I usually go hiking. I'd say the secret has been being able to do things that I like, and keeping active.