

Charles H. Townes

“The Convergence of Science and Religion”

Episode 7 (transcript of audio) of The Advent of Evolutionary Christianity
EvolutionaryChristianity.com

Note: *The 38 interviews in this series were recorded in December 2010 and January 2011.*

Michael Dowd (host): Welcome to Episode 7 of “[The Advent of Evolutionary Christianity: Conversations at the Leading Edge of Faith.](#)” I’m [Michael Dowd](#), and I’m your host for this series, which can be accessed via [EvolutionaryChristianity.com](#), where you too can add your voice to the conversation.

[Charles Townes](#) is our featured guest today. [Charles](#) is one of those amazing individuals that virtually every human being can thank. If you use a CD player or a DVD player, or if you've ever burned a disk or if you have ever had laparoscopic surgery or eye corrective surgery, or if you just marvel at how we can measure the fact that the moon, for example, is moving away from the Earth at 3.8 centimeters a year: for all of these inventions, we can thank the man who invented the laser.

In 1964 Charles Townes won the Nobel Prize in Physics for exactly that, the invention of the laser. But he also wrote [a significant paper](#) for IBM's *Think Magazine* in the '60s that to this day is cited. In fact, he received the Templeton Prize in 2005 for contributions to the understanding of religion. Here today, I speak with one of the great elders of this movement on the subject of the convergence of science and religion.

Host: Hello Charles Townes, and thank you for joining this conversation on evolutionary Christianity.

Charles: Yes, hello, good to be here.

Host: So Charles, you are one of the distinguished scientists of our time in a special group of Nobel Prize winners. You won the Nobel Prize in 1964 for your work with the laser, and you've also had a distinguished honoring recently with the Templeton Foundation. You won the [Templeton Award](#). So, I wondered if you could share with us a little bit about how you came into a faith perspective that celebrates the discoveries of science, including the fact that our universe is billions of years old?

Charles: Well, I think religion and science, and faith and science. are really quite parallel. They both involve observations of what things are really like and trying to understand how to put it all

together. In the case of science, we examine just how things work and try to understand it and put it together. In the case of faith or religion, we try to examine what this world is all about, and what is life all about, and we try to put it all together and understand its meaning. So they are very parallel and very similar.

Host: I agree. One of the reasons why I was excited to have this teleseries is because what often gets portrayed in the media are the polar extremes: either science-rejecting creationists or religion-rejecting atheists. Your work and the work of all the people on this teleseries are examples that it is possible to be a committed Christian and to fully embrace the findings of science.

So Charles, could you say a little about your own upbringing; a little about your background. Did you grow up in the church? And then, a little about your scientific career.

Charles: I grew up in the church. My parents were religiously oriented, and I appreciated that very much, and I've been religious all my life. Now, I've also been very interested in science. My parents encouraged me to find out how things worked, and to understand nature and explore things, and so on. So I've been exploring and trying to understand things most of my life, and it's great fun. Science is fun, trying to see how things work. Religion is also very inspiring. And I've enjoyed and appreciated both of them very much.

Host: Could you say a little bit, Charles, about your scientific career for those who may not be familiar with it?

Charles: Well, as I say, I was always interested in natural history. I tried to identify plants and animals and so on. When I took my first course in physics, I said, "Oh, that's what I really like best!"—because physics tries to explain everything quantitatively, whereas my work on birds and so on was more identification, just naming things, whereas physics tries to understand just how things work. I said, "Oh, that's what I want to do."

So I went into physics and I took some graduate work at [Duke University](#). Then I took some graduate work at [California Institute of Technology](#). I went to the very best school that I knew at that time. [\[Robert\] Millikan](#) was there, and [\[Robert\] Oppenheimer](#) was there, and it was a great school.

My first job was at [Bell Telephone Laboratories](#), and I did science for a little while. The war was coming on, so I had to do engineering (of all things). Well, I was disappointed I had to do engineering, but I learned a lot from it. And engineering and science go close together. So, the engineering that I did—namely, doing radar—that's been very important as a contribution to my ability to do certain kinds of science and discover new things.

I've continued to do science all my life. Pretty soon after the war, I got a job at a university, which is what I wanted. I wanted to be in a university so I could be independent, explore the things I wanted to explore. I've been doing that all my life—and it's just great, great fun.

Host: Was that at [Columbia University](#)?

Charles: Yes, I went from Bell Telephone Laboratories to Columbia University. I was at Columbia for some years; then I went to MIT. I went down to Washington for a couple years. The government wanted me to advise the government, and I thought, “Well, I probably ought to do that.” I didn't especially want to do it, but I felt an obligation to do that. I went there for a couple years, then later came out to the [University of California](#), where I've been most of the rest of my life.

Host: That's great. Because your work with the laser, which is one of the technologies that has made an enormous difference in so many different applications, share a bit about how you came to work in that field, and then what it was like to be a part of the invention of the laser.

Charles: Well, you know, some inventions and discoveries come about by accident. But in the case of the laser, it was something I tried very hard to do for a long time. I was working with microwaves doing spectroscopy, and I realized if we could get down to shorter waves, that would be very valuable. Microwaves were produced by electronics, and they could get down to wavelengths about a quarter of an inch, or something like that. I wanted to get on down to shorter wavelengths and even down into the infrared, where I saw a lot of excellent work could be done in science. I thought about it and thought about it; I tried various things that didn't work. I was even appointed chairman of a national committee to try to examine how to make oscillators at shorter wavelengths. We had very important scientists and engineers on the committee, and we traveled all over the country looking at things. We didn't find anything, and after a year we gave up. I said, “We'll have to write a report that says, ‘Sorry! Nobody has any ideas.’”

I woke up early in the morning before that meeting, woke up early in the morning worrying about it, and I went out and sat on a park bench and wondered, Why hadn't we been able to get any ideas? I thought about this thing and that thing, and I said, Well, of course, molecules and atoms produce light. They produce short waves. But they can't produce more than a certain amount of power, because the amount of power they produce depends on the temperature. You can't make the temperature too hot, as they fall apart. I suddenly said, Hey, wait a minute! They don't have to obey temperature. We can pick molecules and atoms in special states where they don't obey temperature. We can have more in an excited state than a lower state. In excited states, they give up energy and produce light.

So I said, Hey, wait a minute! We can get amplification from molecules and atoms. So I wrote down some notes there as I sat on the park bench, and said, Hey it looks like it'll probably work. Well, I went home and then wrote it in my notebook as a possible patent and so on, as how to produce short waves.

I got one of my students to try to do it. We first worked in microwaves—that is, a wavelength of about one and a quarter centimeter, or half an inch—using ammonium molecules to amplify. He worked on it, and he worked on it. We worked on it for about two and

a half years, and it wasn't working yet. The chairman of the department and the previous chairman of the department—both of them got Nobel prizes, excellent scientists—they came to my laboratory and said, “Look Charlie, that's not going to work. We know it's not going to work; you know it's not going to work. You've got to stop. You're wasting the department's money.”

Well now, the great thing about a university is that you can't fire a person just because he's stupid. You can fire him if he does something morally wrong, but not just because he's stupid. So, I knew they couldn't fire me, and I said, “No. I think it has a chance of working, I'm going to continue.” Well, they marched out of my laboratory angrily.

About three months later, my student came into my teaching room where I was teaching and said, “Hey, it's working!” And so, oh boy! All the students dashed out and went in the laboratory and saw this thing was working. And wow! Then it became a very popular and exciting thing.

Host: That's an incredible story!

Charles: Well, that's the way somehow things work. You've got to be willing to differ with people, think hard about what you really think you want to do and what might be right—and don't let other people try to bend you away from it.

Now, we were working, as I said, in about a half a centimeter wavelength, and I wanted to get on down to shorter wavelengths. Nobody thought we could to get to shorter wavelengths. But a lot of people were then excited about the field. Once we got one working, then a lot of people entered the field. And industry got very interested. They hired all the students who had worked on these things in different places. And so industry had a lot of students trained in the field. But none of them were trying to get to light waves, and I thought, “Well, now look: I want to get on down to shorter waves. Let me think about just how to do that best.”

I wrote down some notes again as to how to do it. I said, “Hey! It looks like we *can* get right on down to light waves. Boy!” I knew it was such a popular field by then that if I started trying to do it, I'd have a lot of competition. So what I did was just to write a theoretical paper with my brother-in-law, Arthur Schawlow, who was at Bell Telephone Laboratories at that time. He and I did it together. We wrote a theoretical paper saying how this might be done—and everybody jumped into the field.

Now, it's amusing also that I told my brother-in-law, who was working at Bell Telephone Laboratories, “Look, we probably ought to take this to Bell Laboratories and let them patent it. We ought to give Bell Laboratories the patent.” I was consulting at Bell Labs; he was working there. So he took it to the lawyers, and he called me up a couple days later and said, “Well, Bell Laboratories' lawyers say, no, they don't want to patent it because light's never been used for communication. If we want to patent it, just take out a patent ourselves. Bell Labs doesn't want it.

I said, “Wait a minute. They don't understand. Of course light can be used for communication. You go tell them that.”

So he called me up and said, “Well, they tell me, if we can show that light can be used for communication, then they'll patent it at Bell Labs.” So we did that, and we wrote a patent called Optical Masers. We had coined the word [maser](#) from Microwave Amplification by Stimulated Emission of Radiation. We stimulate the atoms and molecules to radiate. So, Microwave Amplification by Stimulated Emission of Radiation: that's a maser. We called this an *optical* maser. We showed that of course light can be used for communication. So, they patented it, and then we published it. And then everybody jumped into the field.

The first lasers were actually built in industry, because they'd hired all these students who, in the field, knew how to do it—and industry can work very intensely. The first one was built at Hughes Laboratory, and the next one was built at Bell Telephone Laboratories by one of my former students, [Ali Javan](#), and they just grew and grew and grew. A lot of people have contributed. That's the way science goes. A lot of people contribute new ideas and new things, and I'm just very pleased and amazed at how lasers have grown.

Host: I'll bet. I was talking to somebody a few weeks ago—I don't even remember who it was —and I mentioned that we'd be having this conversation, and he spoke very admiringly of you. He said the amazing thing about the laser is that when it first was invented, it was kind of in search of an application. Nobody could see how it could be used practically. Now its uses are innumerable. You can't even count the number of ways it's being used.

Charles: That's quite right. When it first came about, people said that's a great invention, but it's looking for applications. It found them, lots of applications. [laughter] It's a big business now. And of course, there are lots of scientific applications, too. Masers and lasers have made a lot of scientific contributions. There have been 13 Nobel Prizes given to people who've used masers or lasers for their scientific work.

Host: Wow! That's extraordinary. What are the ones that you're most excited by, or impressed by?

Charles: Well, very high precision frequencies, very high precision distance measurements. The discovery of the production of very low temperatures. The production of very high temperatures—all kinds of special things lasers do.

Host: That's great. Charles, shifting from talking about your science career: What was it that led you into thinking and writing about religion in a way that could be enhanced or enriched by a scientific understanding of reality, an evolutionary understanding of reality?

Charles: Well, religion has always been very important to me and to my life. I was going to Riverside Church in New York at the time, and the editor of *Think Magazine* was there, and he knew I was a scientist, and he didn't know many scientists interested in religion. He asked me,

would you come and talk with our men's group about how you see religion? And I said, okay. So I thought about it, and I went and gave a talk. Then he called me up the next day and said, "Look, I'd like to publish this in *Think Magazine*. Would you please write it for me?"

"Oh, well, okay." So I did that. He published it, and it became very, very popular. What I talked about was the relationship between science and religion—the similarities, the parallelism. He published this, and it became very important—got published in a lot of different places. Then I was asked to give many other additional lectures and write additional papers. So that's how it started. I'm glad to do it, because I think spirituality is a very important aspect of our life, and I like to encourage people to think hard about that and live their lives well.

[Editor's Note: "The Convergence of Science and Religion" was published in the March-April 1966 issue of IBM's Think magazine. You can access it in PDF at <http://www.ocf.berkeley.edu/~jmcbryan/happy/documents/THINK.pdf>]

Host: That's great. One of the things I was impressed with in your article is that even though it was written in the 1960s, it's still cited *often*—even here in 2010, which is pretty extraordinary that that's the case.

Charles: Well, things that are right or things that are true remain that way.

Host: Exactly. Charles, I'm wondering, if you were talking to a young person—you're in your mid-90s, now?

Charles: I am 95, right—95 and a half, actually.

Host: [laughter] If you were speaking to a young person who was struggling with how to think about science and religion, how to integrate the two, what advice, or what counsel would you offer?

Charles: Well, I would advise them to think hard about what is the meaning and purpose of life, and how can I live best? Think hard about that. How did this all begin? Why am I here? What is the purpose? Think about that, and then try to understand the meaning, and live accordingly the best you can.

Host: Yeah, that's great. As I think you know, my wife [Connie Barlow](#) and I—she's a science writer—we've been traveling for nine years, living out of the generosity of people who open their homes to us, speaking and preaching and teaching in all kinds of different religious and nonreligious settings. In fact, I think we're over [1,500 different groups](#) we've spoken to—from devoutly religious groups of all kinds, as well as groups of freethinkers and humanists and secular and college, that sort of thing. And one of the things that amazes me is how many

people have never been exposed to a way of thinking about the deep-time past, our evolutionary history, in ways that touch them and move them and inspire them—in ways that call them into a greater Christ-likeness or commitment to living a life of integrity and generosity and compassion and that sort of thing.

I'm wondering, how has science enriched your faith, or in some way shifted or enhanced your relationship to God, or your relationship to your faith?

Charles: Well, I think for one thing, science makes us realize more and more what a fantastic universe this is. It's a very special universe. Firstly, we recognize that the universe had a beginning, of all things! Now [Einstein](#) thought the universe couldn't have a beginning. He said, of course it can't have a beginning. But now we know scientifically: yes, it *did* have a beginning. It began about 14 billion years ago. How could it possibly have a beginning? That shed some light on religion and creativity. In addition, the laws of science have to be almost exactly the way they are for us to *be* here. The relation between electric forces and nuclear forces have to be just right for all the nuclei to exist that make all the chemicals of which we're made, and so on. It just goes on and on. The more we understand, the more we recognize how very, very special this universe is. It's not only fantastic and beautiful; it's also very special. It has to be very specially *planned* exactly the way it is.

Now, if people don't want to think this was a *plan*, well, [they say] there has to be an infinite number of universes—each one is a little different, and this one just happened to turn out right. Well, in the first place, why would each universe be different? And it has to be so very special: there have to be billions and billions and billions of different universes. But we can never test that. That's just a postulate that people like to make if they don't want to believe this was specially planned. It's just a postulate. We can never test it, we can never see if there are any other universes out there or not. And I think that's kind of a wild postulate.

Host: I used to be someone who rejected evolution and actually would argue with people who thought the world was more than 6,000 years old. And I came to embrace evolution at a conservative evangelical college, and then was introduced to the work of [Thomas Berry](#) and [Brian Swimme](#) and many others who were sharing the science-based history of the universe—what's sometimes called “[Big History](#)”—in a sacred, meaningful, inspiring way. And I've recently thought about it that, for me, studying evolution is kind of like following cosmic breadcrumbs home to God. For me, dinosaur bones and prehistoric artifacts, Hubble space photos and DNA strengthen my faith; they don't test it.

Charles: Well, I think this universe was carefully planned in just such a way that evolution could occur the way it has occurred. And it's amazing.

Host: Charlie, I wanted to run one thing by you that I'm trying to get a sense of: What is it that we can all speak with one voice about? *Is* there anything that all of the different diverse thought

leaders involved in this teleseries—from liberals to conservatives to Protestants and Catholics and different forms of Christianity—we're all committed Christians, even though we may think about it or interpret it differently. And I'm trying to think through and offer and get feedback on, What do we share in common?

The three things that I've been thinking about, and I want to run these by you and see if these make sense from your *own* perspective, or if you have some different way of thinking about this: It seems to me that, in addition to being committed Christians, we all value an *evidential* worldview. That is, we value evidence as divine communication, or divine guidance, if you will. And we all have a deep-time understanding of the past. I think we can say that pretty confidently—that we all have an evidential, deep-time perspective given by science, and that we value that, and that that strengthens our faith, or in some way enriches our faith. It doesn't threaten it. Does that ring true to you?

Charles: Yes, I would generally agree with that. I think it's clear, if we think hard about it, it's clear that this universe has a design and a purpose. And I think our fitting into this purpose, and trying to fulfill that purpose, enhances the meaning of life.

Host: The second thing that I *think* is accurate—I'm testing out to see whether it's accurate, that we all can agree on—is that we all have a commitment not merely to our own soul salvation, or to our own religious group or to our own nation-state. But it seems to me that we're all committed to a healthy future for evolution itself—for the body of life itself—that we all have (what I'm sometimes thinking of as) a *global heart* and commitment. Does that seem true to you? The Christians that you know that embrace an evolutionary understanding, do you think it would be accurate to say that we all share a global heart or a global commitment?

Charles: Well, I think we should all be committed—and I think we are mostly committed—to try to follow God's will, to enhance his purposes in this universe. And, as we understand how the universe works, to assist it and be helpful and positive in helping other people.

Host: That's great. I was speaking to a young person just the other day, a 22 or 23 year old, and my way of understanding from an evolutionary perspective what it means to be in the center of “God's will” is to be committed to being a blessing to the world—an incarnation of grace, to use traditional religious language—such that one's legacy, one's contribution is a blessing to others and is in some way a furthering of God's work in the world, God's creativity in the world.

Charles: I agree.

Host: And I guess the third thing that I'm seeing if we can have some agreement on —and there may be other things as well, of course—is, it seems to me that we all recognize the

necessity of interpretation, and that there's no one way to interpret something. So the responsibility is for us to interpret what science is offering in ways that are inspiring, in ways that are empowering, in ways that are bridge-building. Would you agree that a God-honoring interpretation, or a heartfelt interpretation, is something that's necessary and that's it's not a *given*; we have to do that ourselves?

Charles: Of course, interpretation is necessary. That's a critical part of life. Science itself is an interpretation, and our understanding of life is an interpretation, and so on. So we must try to understand what this is all about, and hence how we should cooperate and live.

Host: Yes. When I was a student at Evangel College, one of the things that I found challenging was that there were few people who were interpreting science in a deeply inspiring, soul-nourishing way. It seemed to me that much of what I was exposed to—at least at that time, in the early '80s—was an understanding of evolution that could be crassly said this way: “If you *really* understood evolution, if you really *got* science, you'd be left with a depressing and meaningless worldview.” As long as that opinion is out there in a strong way, I don't think it's a surprise that conservatives especially—or *any* religious people—are going to be jumping over each other to be embrace an evolutionary worldview. I think it's important that we show how the same science, our best evidential understanding of the history of the universe, can be understood in, to use religious language, a God-glorifying, Christ-edifying, scripture-honoring way—in ways that call us to greater integrity.

Charles: Yes, I generally agree.

Host: A lot of people get their primary feeling states that help them thrive in the world—feeling states like trust when we look to the future, or gratitude when we look to the past, or inspiration to be in action in the moment and to be of service to the world, as well as comfort in times of sorrow and suffering—and I'm wondering, when you look at the big sweep of what science has revealed in terms of this 14 billion year magnificent unfolding of grace and creativity, what are you most grateful for in terms of this larger big picture? Where do you find that your heart is filled with gratitude when you look at the sweep of evolutionary history?

Charles: Well, I'm very grateful for what a wonderful universe this is. I'm very grateful for life, for being here. It's a wonderful experience, and it's really quite remarkable, and I'm just very thankful for it—both the universe and my being here, and for other people too.

Host: Yes, exactly. I'm wondering, on the other end, when you look forward into the future, are there any things about our evolutionary story that particularly give you hope or inspire you, or nurture your faith?

Charles: Well, of course, humans have developed: we've developed understanding and knowledge. We continue to learn more and more and understand better and better. And I would hope we can continue to go—and understand more and more, and understand religious views and creation, and understand God's will more and more. We are learning all the time, and we keep adding on. That's the great thing about human behavior: we learn from each other, we interact, we save this information, it grows and grows and grows. How far will it grow? How far *will* we go? I don't know, but there's no special limit. I just look forward to what we will possibly know and understand in the future and be able to do in the future.

Host: Yes, I agree. I'm wondering—this is a question that just occurred to me the other day; I don't think I've asked it yet of any of our other participants: How would you imagine religious education happening in the future, in ways that are more integrating of science, in ways that help young people to see that [God didn't stop communicating truth vital to human wellbeing](#) back when people believed the world was flat and religious insights were recorded on animal skins—that [God is still communicating faithfully today through evidence](#)? I'm curious, are there any changes you'd like to see in religious education, where young people can see what they see on the [Discovery Channel](#) or the [History Channel](#) (what they're learning about science) and see all that in a way that enriches their faith? I'm curious if you have any thoughts about religious education that would integrate faith and reason?

Charles: Well, I think science and religion are coming together more and more all the time. I think as we understand more, they will continue to come closer together. So, let's keep trying and working, and I believe it's basically a question of, How completely do we understand? Let's keep trying more and more, and these two fields will come together. And all the understanding will come together, and they'll be better integrated.

Host: That's great. What would you say to someone who fears that embracing evolution will have negative consequences?

Charles: I don't see why in the world it has negative consequences. I don't see why that would be. Now, of course, if they have certain beliefs that disagree with evolution, then this will change their beliefs. But changing their beliefs can be a *positive* thing. I think understanding more and more is always positive, and understanding evolution is positive.

Host: I agree. That's certainly been my experience—and for a lot of young people, as well. We've had families share with us in emails after we presented to their kids—we do programs sometimes, during the children's story time in a church service, on how we are made of stardust—where we show how the atoms of our bodies were made in stars, and that we now *know* how God created the very atoms of our bodies. That aspect of creation isn't a mystery.

And it's amazing: kids get really excited thinking that they can look up into the night sky and there's this relationship they can feel that they didn't have before.

Charles: Yes, well, it *is* exciting to think about it. Now, of course, we don't understand how life began. We know it began long ago. We know it began, essentially, only once, because all of life on Earth is related. It began once—*how* it began we don't know, but we *do* think we understand more about evolution and how life developed: more and more complex things and finally humans. Let's hope we can develop more.

Host: In my experience, a lot of people have never been exposed to the understanding that we now have—and understanding that's not really even controversial—that there's a *trajectory* to history, [there's a trajectory to evolution](#). Evolution keeps producing [greater spheres of cooperation and complexity](#) at larger and wider scale, and we're an expression; we're part of that. A lot of people still have this misguided assumption that there's just randomness or chance, there's no direction to evolution.

Charles: Well, that's too bad. I hope they'll understand better.

Host: Me, too. I'm wondering, Charlie, if everything in the universe is evolving—including our faith traditions—I'm wondering, How do you see Christianity moving forward? Where do you see examples of our faith tradition evolving?

Charles: Well, I think as we understand more, I believe we will—I *hope* we will—come closer and closer to understanding about God's relation to this universe and to us. As we develop, we understand more—and I hope that will become more and more important to us. And I believe it will.

Host: I want to ask a question that—feel free to not answer this if you don't want to—but I'm wondering if this deep-time understanding has allowed you to think about your own death from a place of greater faith?

Charles: Sure, I think about my own mortality. I'm now 95 and a half; I don't have many more years to be here in this body. On the other hand, I do think the spirit is something special, and probably will remain. For example, we don't really understand what a human *is*. Where is this human? We think of the human as being up here in the brain somewhere, but *where* is it? *What* is it? What is an individual? Why do we have consciousness? Do we have free will? Free will isn't allowed by science, and yet we *think* we can do this and that. Well, I believe there's something here beyond our present knowledge of science. I believe there's a spirituality there, and that as our bodies give up, I think there will be something remaining. And I look forward to that.

Host: That's great. . . Thank you so much, Charles Townes, for sharing your ideas, your perspective, and your experience with us here today on the leading edge of faith.

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