Owen Gingerich
"Evolutionary Creationism"

Episode 22 of The Advent of Evolutionary Christianity
EvolutionaryChristianity.com

Owen Gingerich is professor emeritus of astronomy and the history of science at the Harvard-Smithsonian Center for Astrophysics. A former vice president of the American Philosophical Society and a trustee of the John Templeton Foundation, his books include *God's Universe* and *The Eye of Heaven: Ptolemy, Copernicus, Kepler.*

HIGHLIGHTS

This is the best audio in the series for **learning scientifically why it is true that "We are made of stardust"**—and why many people (especially children) are excited to learn of their deep-time, intimate, and personal **relationship with ancient stars**. This is also one of a half-dozen interviews in this series that offer explicit arguments **against the so-called "Intelligent Design" movement**. Owen Gingerich (who is both a **scientist** and an **evangelical Christian**) uniquely employs **the distinction between *final cause* and *efficient cause*** to lay a mid-ground course.

This is possibly the best interview for learning that **scientific discoveries sometimes profoundly depart from commonsense assumptions**. Using the **Copernican revolution** in astronomy as the example, Gingerich dips into **the history of science** to demonstrate that when a new discovery *does* contradict commonsense—and especially when that discovery also contradicts traditional authority (such as the Bible)—not only will religious authorities oppose it, but even scientists themselves may refuse to make **the shift in paradigms**.

Another highlight is Gingerich's explanation for **why it is important for God to have a human face** (for Christians, that of **Jesus Christ**). Finally, this audio is where the host, Michael **Dowd**, does his most thorough job in presenting one of the tenets of evolutionary Christianity that he is best known for: the distinction between, what he calls, **"public revelation" and "private revelation."**

SUGGESTED AUDIENCES

Because Owen Gingerich is both a scientist and an evangelical Christian, this audio is highly recommended for all evangelical audiences. It is also recommended for Roman Catholics, as Gingerich talks about the role of Church authorities in holding back the progress of astronomical science by their silencing of Galileo. Science majors and college teachers of science will find this episode helpful, as well, because Gingerich tells the story of his own teaching experience at Harvard, where he pioneered the introduction of science-and-religion topics within standard science classes. Because Gingerich clearly presents the logic underlying various aspects of his scientific and religious views, and because Dowd's own exposition of the private v. public revelation distinction is well stated, this audio is also highly recommended for seminarians and theologians.

KEYWORD TOPICS

science education (engaging ways to teach), **religious implications of science** (dangers of attempting to explore in the classroom), **Psalm 104** (as contrary to heliocentric view), **Copernicus** (why his theory was resisted), **geocentric astronomy** (resistance to change), **astronomy** (shift from Earth- to Sun-centered view of planetary movements), **Galileo** (on the Bible not being a science text), **Arthur Koestler**, **American Scientific Affiliation** (of Evangelical scientists), **Intelligent Design** (controversy in teaching it), **Aristotelian logic**, **"deep time"**, **"evolutionary creationist"**, **"theistic evolutionist"**, **Young Earth Creationism** (religious arguments against), **chemical elements** (as formed inside stars), **age of universe**, "**stardust"** (as another name for atoms), **God** (importance of personal relationship with), **Jesus** (as offering a way to relate to God personally), **revelation**, **"public revelation**" (Dowd's term for scientific discoveries), **"private revelation"** (Dowd's term for insights and intuitions—including those that ground humanity's scriptures and holy books), **science** (as a primary form of "public revelation"), **collective intelligence** (distinguished from individual, untested insights)

BIOGRAPHY

Owen Gingerich is professor emeritus of astronomy and of the history of science at the Harvard-Smithsonian Center for Astrophysics. His research interests have ranged from the recomputation of an ancient Babylonian mathematical table to the interpretation of stellar spectra. Professor Gingerich undertook a three-decade-long survey of Copernicus' great book *De revolutionibus*, personally examining some 580 sixteenth-century copies in libraries scattered throughout Europe and North America, as well as those in China, Japan, and Australia. His annotated census of these books was published in 2002 as a 434-page monograph. In recognition of these studies he was awarded the Polish government's Order of

Merit in 1981, and subsequently an asteroid was named in his honor. An account of his Copernican adventures, *The Book Nobody Read*, is in fourteen foreign editions.

Gingerich has served as vice president of the American Philosophical Society (America's oldest scientific academy) and he has served as chairman of the U.S. National Committee of the International Astronomical Union. He has been a councilor of the American Astronomical Society, and he helped organize its historical astronomy division. In 2000 he won the division's Doggett Prize for his contributions to the history of astronomy. The AAS awarded him their Education Prize in 2004. In 2006 he won the most prestigious award of the French Astronomical Society, their Prix Janssen.

Gingerich has written some 200 technical or research articles and 300 reviews, as well as more than 250 educational, encyclopedia, or popular articles. With a strong interest in the science–religion dialogue, in 1999 he delivered an Advent sermon at the National Cathedral in Washington D.C. Harvard University Press published the 2005 William Belden Noble Lectures, *God's Universe*, which Gingerich presented at Harvard's Memorial Church.

SUPPLEMENTARY VIDEO

"Divine Handiwork: Evolution and the Evolution of Life" - Gingerich lecture at Cornell (75 min)
http://www.youtube.com/watch?v=VbxfZRMSAak

SUPPLEMENTARY WEBPAGE

Listener comments to this audio can be found (and new ones posted) at the following url:
http://evolutionarychristianity.com/blog/general/owen-gingerich-evolutionary-creationism-withi-gods-universe/

QUESTIONS FOR REFLECTION AND DISCUSSION

1. **The dangers of bringing religious issues into science class.** Owen Gingerich recounts **his early years of teaching a science course for non-science majors at Harvard** University. He says,

> **I was told when I started that you can ask the students to write an essay on any possible topic—except religion.** If they write a paper about a religious topic, and it's a lousy paper and you give it the grade it deserves, they will take it as a personal attack on their beliefs. I thought about that for a few years when I started teaching, but I realized that there were important religious and science issues that were bothering a lot of students. And there were probably a lot of very uninformed bull sessions in sophomore rooms. So I thought people should learn that there is, in fact, **a serious literature on this subject**. If they're prepared to write an essay on it and engage in some of the books, this could be okay.
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> So I told the students that, on the list of essay subjects, I had added a new topic that related to **the historical development of science and its relation to Christianity**. I said, "This could be a controversial topic, and I'll be grading those essays myself." Well, what do you know?! Nearly half

> the class decided to write on that. So I had a huge stack of essays to read. I read these with one of the other teaching fellows, and we independently graded them—and we didn't have any deviation more than a plus or minus sign. So I decided, okay, this *can* be objectively done.

Question 1: *What is your response to hearing about* ***the dangers for teachers*** *of inviting students to ponder* ***the religious implications of science within the context of a science class*** *for non-majors? Overall, when and where in their education should children, youth, and young adults be encouraged to think about how the interface between science and religion might affect their own beliefs, as well as their understanding of the world?*

2. **When did YOU begin to ponder the religious implications of science?** Owen Gingerich first began to ponder the religious implications of science when majoring in science as an undergraduate in college.

Question 2A: *When did YOU first realize that what you were learning about science might not mesh easily with your religious beliefs—and might even be in* ***conflict****? And what did that feel like: Were you eager to begin thinking about this topic—or did you turn away from it?*

Question 2B: *Obviously, you are exploring right now how science and religion intersect. What led you to be* ***curious*** *about this topic at this stage in your life?*

3. **How much is still unresolved in your own quest?**

Question 3: *How satisfied are you right now with the way that you, yourself, have meshed science and religion? What questions, if any, are* ***still unresolved*** *in your mind and heart?*

4. **Commonsense experience v. science.** Owen Gingerich is well known for his historical work on why **Copernicus's discovery** (in 1543) that the planets move around the Sun took so long to be accepted—not only by religious authorities, but also by common folk. He explains,

> If one does some modern science, you get a good clue as to how science works. But also, if you look historically, you can often have even greater perspective. So I was interested in the great astronomical revolution when the geocentric (the Earth-centered) system was overthrown by the heliocentric system. And it surprised some commentators that **when Copernicus proposed the heliocentric system, there wasn't a great a wakening.** [There is no evidence that] all of a sudden people were saying, "Wow, that's it! Why didn't we think of this before?"
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> Rather, as I look at it, you see people looking at this novel idea that the earth is in motion and thinking, "Wait a minute, if the earth is spinning every twenty-four hours, **why don't people fly off**? And if the earth is going around the sun every year, how in the world can it keep the moon in tow? This business is all ridiculous!"
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> As one person noted, "If the earth is spinning, it's going to be a lot harder to walk west than to walk east."

Later in the interview, Gingerich says of Copernicus's 1543 book, "**It took well over a century before the majority of *astronomers* were willing to take the moving Earth as objective reality**." Gingerich concludes that during the first hundred years following its publication, professional astronomers were using Copernicus's ideas mostly as a kind of "cookbook" for predicting how the planets would be seen to move across the sky, rather than as an accurate portrayal of the way things really are.

Question 4: *Do you recall as a child (or later) ever **being shocked** by what you were learning about science — not shocked from a religious standpoint, but shocked because what you were being told just didn't seem to make natural sense? For example, do you have a memory of when you first had to accept that, rather than the sun rising and setting, it was Earth that was actually moving—that **Earth was rotating**, and so you were rotating along with it? Do you remember being surprised by that? Please elaborate.*

5. **The Church v. Galileo.** Historically, it was Galileo who carried forward Copernicus's ideas that Earth was not standing still in the center of the Universe. **Galileo gathered additional data that supported the Copernican theory when, in the early 1600s, he became the first person to use a telescope to study the night sky.** The Catholic Church, however, put Galileo on trial for **heresy**, and then put him under house arrest. More than three centuries would pass before the Vatican would officially **express regret** for how the Church had handled Galileo's scientific pronouncements. In 1992 Pope John Paul II issued a formal apology.

Question 5A*: Owen Gingerich humorously describes how Copernicus's ideas seemed very wrong from a commonsense perspective. He also mentioned that a theory that would have the Earth zipping through space was deemed to contradict Psalm 104 in the Bible. Do you now have a better understanding of **why the Church would have felt that natural as well as biblical evidence made Galileo's support for the Copernican theory heretical**?*

Question 5B: *Before listening to this interview, do you recall having learned that **the Vatican only recently apologized for its actions against Galileo** more than three centuries ago? What did you think about that apology when you first heard of it? And what feelings arise for you now?*

6. **The Bible is not about science.** Owen Gingerich, an evangelical Christian, recites the famous quotation made by Galileo, when he was being charged with heresy for making astronomical claims that contradicted specific Bible passages. Galileo said, **"The Bible teaches how to go to heaven, not how the heavens go."**

Question 6: *Is that statement made by Galileo more than three centuries ago still relevant today? And does it represent your own way of working through science v. religion issues? Why or why not?*

7. **Nuances of the "Intelligent Design" controversy.** Owen Gingerich makes a point of distinguishing "Intelligent Design" as a ***movement*** from "intelligent design" as a religious ***belief***—a belief which cannot be disproved by science and which he himself holds. As he puts it, **one can religiously hold as a *final cause* that "a God-given design or purpose"** is broadly evident in this universe, perhaps as a kind of divine "intention." Seeing design in the universe in this way, he suggests, does not conflict with science. But when leaders in the so-called Intelligent Design movement try to *scientifically* argue for the presence of design in the universe as manifest in the technicalities of *how* things came to be and how things work, such advocacy *does* conflict with the way science operates— and thus also with the way that science should be taught. Notably, **Owen Gingerich makes a distinction between 'final' and 'efficient' causes in his criticism of the Intelligent Design movement.** Here is the full text of his statement:

> **I believe in intelligent design with a lowercase "i" and a lowercase "d." That's something quite different from the Intelligent Design movement, which seems to me to be largely: (1) an anti-evolution movement, and (2) an attempt of some sort to prove the existence of God.** I think that *that* is conceding too much to the **atheists**—that somehow science is all-important and the only way we interpret things. Science is very important, but it's not necessarily the *end* of it all or the entire reality.
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> So what I say about intelligent design and about the idea of teaching it in high school biology classes, it's something that has to do—well, let's put it this way—with Aristotelian logic: about ***efficient* causes** (*how* things are done) and ***final* causes** (*why* things are done). John Polkinghorne asks a very interesting question: "Why is the water in the teakettle boiling?" And you can say, "Well, the heat coming in from the bottom makes the molecules of water go faster and faster, and eventually some of them fly out the top, and the water boils." You can also ask why the water in the teakettle is boiling by saying, "because I want some tea." Now, *that* is a *final cause.* The motion of the molecules is the *efficient cause*—how it's done. Today, **science works mostly by efficient causes**. In Aristotle's day, final causes were seen as very important. I would say that "because I want some tea" is an example of a final cause.
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> Similarly, **when we talk about Creation and how life came to be on Earth, scientifically you're looking for an efficient cause**: *How* did this happen? *How* did you have natural selection, variations, mutations, all working as a kind of an engine that can bring new forms of life on board?
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> **It may *be* that there is a God-given design or purpose—not necessarily an exact blueprint, but an intention. *That* would be what I would call a final cause.** And I think it's a serious category error to say that you should be teaching intelligent design in a biology classroom as an alternative, because **it doesn't answer the basic questions** that biologists want to answer: Why is our DNA so much like the DNA throughout the whole rest of the kingdom of life? Or, How can you explain the particular fauna and flora that you would see in the Galapagos? Why are certain forms of life there and essentially no basic mammals?

Question 7A: As a renowned teacher of science at Harvard University, it is not surprising that Owen Gingerich begins with a vivid example to lay the groundwork for his conclusion about the proper purview of "intelligent design." He also introduces the logical concepts of "efficient" v.

"final" causes. *What do you **most appreciate** about his statement on "Intelligent Design," and where (if at all) **do you depart** from his worldview?*

Question 7B: *Based on this interview (and on anything else you have learned about the Intelligent Design controversy), where do you stand on how biological evolution, the age of the Universe, and the long geological history of Earth should be **taught in high schools**? What about in **church youth groups**?*

8. **Religious arguments against Young Earth Creationism.** Owen Gingerich recounts how he responds *religiously* to counter some of the main advocacy points by those who believe in a young Earth in which biological evolution played no role. Gingerich says,

> I've had a lot of very earnest Christians ask me, "Well, why does the universe have to be so old?" And I say, "Well, I believe that God, in God's might and power, could have created the universe in many ways. But it's part of **our job as scientists to figure out *which* way God did it**."
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> And if someone says, "We've got a very *young* universe and all of those fossils were just *put* there," well then, I have to say, "You know, your *memories* could have been put there yesterday; you could have been created with all your memories in place. That strikes me as a **trickster God**—and that's not the kind of God I want to believe in."

Question 8A: *What do you think about **Owen Gingerich's tactic** for countering anti-evolutionary Christian believers? **Have you ever had to respond** to arguments posed by those who believe that Creation occurred in six literal days? If so, please share your experience.*

Question 8B: Owen Gingerich is a scientist and a historian of science at Harvard University, so he could have just gone directly into the science when countering Young Earth Creationist statements. Yet, as an **evangelical Christian**, he chose to first use religious arguments against that position. *So here's the question: Because religiously moderate Christians, such as Owen Gingerich, can employ religious arguments as well as scientific ones**, do you think it makes strategic sense for secularists (including atheists and agnostics) to cast a very broad net in deciding who is "on their team" in promoting a modern, scientific view of the material world and in how science itself is taught?*** *Why or why not?*

Note: The interview with **Joan Roughgarden**, episode 31, is another opportunity to learn how a worldclass scientist chooses to counter anti-evolutionary viewpoints among Christians by first pointing to Bible passages congruent with the science.

9. **We are made of stardust!** Owen Gingerich, as an astronomer, explains why the Universe *must* be old. That is, in order for there to be carbon-based life, such as we have on this planet, billions of years had to pass before our Solar System formed. He says,

> So why is the universe so old? Well, it's an interesting picture, but we see that **life could not have formed in the very earliest days of our universe because the proper elements weren't in**

> **place**. In the Big Bang you get hydrogen in great abundance, a substantial amount of helium, maybe a little bit of lithium, and just bare traces of anything else. To make life on Earth, we *have* to have **carbon**. We just can't figure out how to do it without an atom that can bind to itself and make the complexity that's necessary.
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> It helps an awful lot to have oxygen. If you don't have **oxygen**, you can't have H_2O—water. So, oxygen and carbon, nitrogen, phosphorous, sulfur—these essential elements for life—come much later in the picture. They are formed in **hellishly hot cauldrons in the cores of stars**. And it isn't a terribly efficient process, so it takes an enormous length of time for these elements to form in the nuclear reactions. Eventually, some of **the more massive stars blow themselves up, and the elements get scattered back into space.** And a newer generation of stars can have an abundance of iron, carbon, oxygen, and so on.
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> For example, **our sun** did not exist in the earliest stages of the universe. It's quite old—maybe five billion years old—but that's not nearly as long as the universe itself has been in existence, which is something in the order of thirteen billion years. So, strangely enough, **the universe we inhabit required this *long time* for things to develop and for the elements to be born. But to me, that's an awesome picture.** Don't you find that amazing, that over this period, the elements gradually emerge, and then life can form?

Question 9A: *What is your response to Owen's scientific explanation for why the universe has to be old — and why our Solar System cannot be as old as the universe? Please elaborate.*

Question 9B: *Before you listened to this conversation, had you already learned from somewhere else that "**we are made of stardust**"? If so, do you remember where? If not, what do you think and feel now, learning that this is how the chemical elements evolved?*

Question 9C: *Hearing how old and how big this Universe is can be **frightening** for some people. Others report feeling a profound sense of relatedness in learning that our ancestors include stars and that **we are made of stardust**. How, if at all, has this knowledge made a difference for you when you look up into the night sky?*

Question 9D: After Owen Gingerich explains the chemistry underlying the scientific proposition that "We are made of stardust," the host, Michael Dowd, explains how he brings this understanding into his own work with churches. **Dowd** says:

> We now have an understanding of **how God created the very elements of our bodies**. I have found that it's probably **the most inherently interesting part of this universe story**, this epic of evolution. **Kids** can visualize it, because you can show pictures from the **Hubble** or other telescopes. There is also a sense of **relatedness**—that when you look to the stars, in a very real way, it's like the "Lion King" was right: the **stars are our ancestors**. They're not our *direct* ancestors, but stars just like the stars we can see today went through this process, long ago, of creating the various elements that we're now made of. And that is a **divine, creative process**.

*What do you think about how **Michael Dowd added interpretive meaning** to the straight science of atom creation, and how he connected the science with religious language?*

Question 9E: ***Michael Dowd tells three stories of how children*** *have delighted learning that they are made of stardust. What is your response to these anecdotes?*

Question 9F: When talking about the stardust stories, Michael Dowd mentions the Disney movie **The Lion King**. Dowd says, "There is also a sense of relatedness—that when you look to the stars, in a very real way, it's like **the "Lion King" was right: the stars are our ancestors**." *If you have seen the movie or stage production of The Lion King, do you know what Dowd was referring to — and can you now understand that pivotal scene in a deeper way?*

NOTE TO TEACHERS/FACILITATORS: You can access the short script of this particular segment of The Lion King at http://www.thegreatstory.org/lion-king.pdf

10. **Jesus as the personal face of God.** As an astronomer, Owen Gingerich cannot avoid contemplating **a vast and ancient universe**. Yet as an evangelical Christian, having a personal relationship with God is very important to him. Though he spends only a minute or so on the topic, Owen explains **why the divinity of Jesus is important to him**. He says,

> When you study Creation and are looking for God, you're apt to find **a God of very large numbers**—which may not be the kind of God one wants to worship. It's *awesome*—that, I grant—as in, "the heavens declare the glory of God." I go along with that. But there *has* to be something more. And that "something more" has got to come through an understanding of the *human* relationships. So I would have to say that, for God to establish a human relationship, it has to be done through human persons—and most particularly through **Jesus Christ**.

Question 10: *What is your response to this? Please elaborate.*

12. **Public v. private revelation.** In this series of conversations, Michael Dowd, as host, is a peer. Thus he usually expresses his own ideas, as well as posing questions. One of the philosophical points that Dowd is best known for is a distinction that he calls, "public revelation" versus "private revelation." Here is how **Dowd explains the distinction**:

> I've found it vital in my own ministry to help people see and value both, what I call, *private revelation* and *public revelation.* ***Private revelation*** entails those insights that come to us privately—through dreams, through intuitions. It's as though God is speaking to us personally, individually. But private revelations, because they are **subjective experiences** that each one of us can have, don't lend themselves to be adopted by millions or billions of people as easily as *public revelation.*
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> ***Public revelation*** is what God is revealing publicly—that is, through the entire human community. And I see **science** as, in a very real way, expressing or exhibiting God's public revelation. In some ways, science could be seen as humanity's collective intelligence—that today we are more *collectively* intelligent than we were 500 years ago or 5,000 years ago, or even 50 years ago. In a way, that could be called *public revelation*: as what God—Reality—is revealing publicly. That doesn't dismiss or dis or put down *private* revelation. As you and I know, most things that we now consider to be *public* revelation first came into being through *private* revelation. For

example, Einstein has a vision of riding a beam of light: that's a private revelation. But then he publishes a paper, and the whole scientific community goes to work trying to *disprove* it.

The skeptical scientific tradition is all about (it seems to me) trying to discern, "Is this true in a measurable, empirical way?" That is, is it true in a way that all of us can agree—no matter whether we are Buddhists, Christians, atheists, Hindus, or anything else. Whatever our religious or philosophical background, we can agree that this is so. Or, is it merely *said* to be true, because some charismatic or authoritative person said it—or because it's been passed down through so many generations by tradition that we assume it *must* be true?

Public revelation isn't really *better* than private revelation. But it's almost always more widely useful. More people, and more diverse kinds of people, can agree on something being the case—because of public revelation. I've also found it useful because it really values both the personal, intuitive. But it also lifts up what God's been doing in the last several hundred years through the evidential traditions.

Question 12A: *What do you think about Dowd's distinction between public revelation and private revelation?*

Question 12B: *The final step that Dowd takes in distinguishing public forms of discerning truth (notably, science) from private forms of discerning truth (notably, those spoken by religious prophets and recorded in holy books) is that Dowd presents "public revelation" as the way that* ***God continues to communicate today****. How do you respond to Dowd's use of religious language ("God is still communicating") as a metaphor to describe the importance of ongoing scientific discoveries? Or do you prefer that scientific discovery and religious revelation be kept in entirely separate realms? Please elaborate.*

13. **Science and religion in dialogue.** If you have already listened to, or talked about, the conversation that Michael Dowd conducted with **Ian Barbour**, you will recall that Ian Barbour is well known for his "**Four Types**" model of the ways in which individuals and institutions relate to both science and religion.

Question 12A: *According to the "Four Types" model, and based on the following statement drawn from this interview, which of the types of interaction does Owen Gingerich favor? Gingerich said:*

> I would say that the religious movements are extraordinarily powerful and important in our country in holding the social fabric together. I would say that the scientific understanding is another important cultural unity and it's time for both of these important cultural forces to talk to each other.

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