“Same Universe, Different Lenses: Science, Ethics, and Religion in Dialogue”

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MICHAEL CROMARTIE: Ladies and gentlemen, Dr. Jennifer Wiseman is here speaking in her capacity as a Fellow of the American Scientific Affiliation and the new Director of Dialogue on Science, Ethics, and Religion for the American Association for the Advancement of Science. I’ll let you add.

JENNIFER WISEMAN: I am an astronomer with NASA. I do work with the Hubble Space Telescope Program, but I’m here mainly for another hat that I wear, which Michael just mentioned, which is with the American Association for the Advancement of Science, because I believe that my work with that organization is more relevant to this particular group in that I direct a program there called the Dialogue on Science, Ethics, and Religion, or DOSER program. So, we’ll get in to some of that. But as an astronomer I can’t resist showing you some things from space, so I’m going to do some of that as well.

This afternoon we are going to talk about how science impacts society, especially a society that’s filled with faith-based communities and people of religious faith, where our values are often shaped through lenses of religion and philosophy, and even how we look at nature.

So, I like to use slides because astronomy shows such beautiful visual images, and also I use them kind of as notes for myself.

I think the title of my presentation pretty much summarizes what I want to say, that we have the same universe that we live in, but we’re looking at it with different lenses, depending on what we’re thinking about or how we’re considering nature around us. And so, this brings in our society science, ethics, and religion together in dialogue. Sometimes that’s constructive, sometimes it’s not, and you all have a major important role to play about the health of that dialogue in our society.
I’m amazed by this comment by a philosopher, Kant, where he says two things continue to fill his mind with ever increasing wonder and awe the more often and intensely he reflected upon them. And those two things that he singled out were the starry heavens above him and the moral law within him.

And I think those are still the two realms of things that we as human beings continue to grapple with: the amazement and the majesty and the intrigue that we see in the universe around us, not only on the large scale, but also on the small scale, as science is telling us more and more about our genetic make-up, and about even subatomic realms of physics, and then of course on the large scale of cosmology. All of this makes us wonder about our origins and where we fit into the universe, and yet we also wonder, who are we? How do we fit it in? How should we live? Why do we have a sense of justice? Why do we feel that there are things that we need forgiveness for? Why is there a sense that there are wrongs that need to be righted? Where does that sense come from? And, in fact, it is that perception that everyone has some innate sense of justice that drew even C.S. Lewis, who was mentioned this morning, into his own faith in God. So these are the two kinds of things that I think still we are grappling with in society today.

I’m going to spend maybe the next ten minutes or so just giving you an update on the universe, and then we’ll return to that a little bit later as warranted.

We study the heavens with lots of different kinds of tools. We use telescopes. Telescopes can be on the ground, in deserts or in mountaintops, or they can be in space, such as this one. This is an orbiting satellite known to all of us as the Hubble Space Telescope. It’s about the size of a school bus. It is whizzing around the earth every 90 minutes or so and it’s still sending back marvelous data and images to us, even after being in operation for 23 years.

So, what we’re learning — and we are continually awed by — is that the universe we live in is beautiful, and the universe that we live in is active. It is not stagnant. The stars and planets and galaxies are not just sitting there. There is a lot going on out there. We’ve learned that by using different kinds of tools we can see the universe with different eyes. So this region will be recognized by many of you as the Orion region of the sky. You can see Orion’s belt and a sword here. And the bright star, Rigel, down here, and red giant
star Betelgeuse up here. This is an unstable star that may explode in a supernova possibly any day now, in the next 100,000 years or so, so kind of get your concerns in perspective.

This little nebulous thing down here — it’s much expanded and you see beautiful colors. And to astronomers, that’s not only a sign of beauty, it’s a sign of great activity. It means that new stars are still forming.

This is called the Orion Nebula and it’s a very active region of ongoing star formation, not only this colored region, which shows the result of recently formed stars, but if you look at this region with radio and infrared telescopes, you can see behind this into the darker regions where protostars are forming and heating up surrounding gas, but they haven’t yet turned on. Very active.
These clouds of gas, and stars within them and between them, fill up our galaxy. This is a galaxy — not our own. It’s beautiful, and it looks what we think our galaxy looks like in terms of its spiral structure. But here’s a similar galaxy that I think is quite beautiful.

Our sun, we think, is about two thirds of the way out in our own Milky Way galaxy, and one of several hundred billion stars. We are also learning that there are planets around many of those stars, which I will discuss later. Looking in the background of this picture you can see other galaxies, and in fact, we now know that there are hundreds of billions of galaxies in our visible universe. So if you can do the multiplication of hundreds of
billions of galaxies times hundreds of billions of stars in most galaxies you see that there is an enormous number of stars in our universe.

And galaxies can interact with one another. These are two different galaxies — actually three; there’s one here — that are starting to be pulled together by each other’s gravitational pull, and that starts to distort the spiral structure of these galaxies.

So, how are we learning such things? It’s through the advancement of technology and the curiosity to explore. I like to show this little chart which shows you over the last 400 years of time, graphically, how our technology has allowed an improvement in the sensitivity of what we can see in the sky over what we could just see with our bare eyes. And so this
scale here is logarithmic, so every little tic mark above the one below it is ten times more sensitive than the one below it. So these are enormous increases as we go up the scale here, starting with Galileo’s little telescope where he looked at Jupiter and noticed that there were these little moving blips of light around Jupiter. Every night they were in a different position; he realized that these were moons orbiting Jupiter. That, of course, had huge ramifications of human understanding of where we are in the cosmos and how things work.

And then, as eye pieces grew and telescopes enlarged, we were able to see distant star clusters, even other galaxies, faint galaxies, as we were able to record things with photography. Eventually, we began the idea of electronically recording images from the sky. You could receive light for hours or days on end, to see very faint things, and that’s how we really came to understand the enormous size and depth of our universe.

We went to space with the Hubble Space Telescope. That brought us two orders of magnitude more sensitivity just by getting above the blurring effects of our atmosphere. And then with servicing of Hubble, we went off the chart here because every time astronauts have gone up to this telescope they’ve put in new instruments and new things that have enhanced its capabilities. So we really are at the very peak of this particular observatory’s capabilities.

Here’s an example of technology being used and advanced for the good of humanity. We can think of ways in which technology has served humanity and served the world, and also ways wherein technology has been used for things that have been harmful. And so, again, you need a values system to decide what technologies are going to develop and how you’re going to use them.

So, there’s our telescope. There’s our astronauts that went up a few years ago for the last time to service the telescope because we don’t have a space shuttle anymore. The astronauts did a marvelous job in 2009 of putting in new instruments and doing repairs. And so, we get back to this image you saw in my beginning slide of a star cluster. You can see how amazing stars can be. Each star here is at about the same distance because these stars are in all one single cluster, and so they’re gravitationally held near to one another. So the brighter stars here really are intrinsically brighter. And you can see red stars and blue stars and white stars. Globular clusters are distributed around what we call the halo.
of our galaxy, and they tend to hold some of the oldest stars in our galaxy. So that’s the context.

We also have things happening on the other end of a star’s life. I talked about stars being born. Well, along with stars being born, there are planets being born. This is an image of an artist’s conception of a very real planetary system discovered with the Kepler space telescope, another observatory in space, and this system has six planets that are in tight orbits — if it were our own solar system they would be within the orbit of Mercury, so they’re zipping around very close to their parent star.

We have to do an artist’s conception because most of these planets we’re discovering right now outside of our solar system we’re finding indirectly, either because they transit in front of their parent star during their orbit, as these do — and you can measure the total amount of starlight that dips every time a planet orbits in front — or, they cause the star to wobble, as both the star and planets tug on each other during the orbital period. So you can actually detect the star wobbling and measure what kind of mass must be tugging on it. Hundreds of planets have been confirmed this way. Thousands of candidates have been found for planetary systems outside our own.
On the other end of a star’s life we have this marvelous ejection of material from stars. This is what’s called the Butterfly Nebula, and we have material here being ejected from this very mature star at hundreds of kilometers every second. It’s also indicative of how stars eject what they’ve produced through their whole life. Stars are little factories that during their process of shining, they’re actually fusing hydrogen into heavier elements, and then as they run out of inner fuel, they eject all of that into the interstellar medium. It can fill galaxies and eventually you can get stars forming out of that gas with heavier nutrients. We’ll talk about that later.

And then finally, for this little astro-intro, I want to show you what we’re doing with galaxies as a whole, what we’re learning. In fact, we find that it seems that most galaxies,
if not all, have something very dense in their inner core. We call it a black hole. It’s where so much mass has fallen into this gravitational well, if you call it, that it has coalesced into a very, very, dense region we call a black hole.

And as material falls into a black hole, it can do odd things. Here’s an example. This is a galaxy down here in this core, and there are lots of galaxies in the background here. These are jets being shot out far beyond the confines of the galaxy from material that has fallen in toward the inner black hole and then has been caught up in magnetic fields, ejected out of the galaxy, and is interacting with the intergalactic medium in quite a spectacular way. These jets are moving almost at the speed of light, so this is really energetic.

We do believe now that our own galaxy has a relatively quiet black hole in the core of it. We can tell because of the motions of stars in the core of our galaxy, but we don’t see any evidence of this kind of hyperactivity with jets going on in our own galaxy right now.
We do see evidence that galaxies like our own have gone through mergers, so here’s an example of two galaxies that are being drawn together. Again, they will be disrupted as they get closer and closer. There won’t be a lot of collisions between stars, but the disruption from tidal forces will end up like this pair, causing so much turbulence that you lose the original structure, and the turbulence spawns a whole bunch of new active star formation. So, all these little bright nebulae are spots where new stars are vibrantly and vigorously forming.

Our own galaxy is on a head-on collision course with Andromeda, our neighbor sister big spiral galaxy, and we just found that out for sure, by modeling done based on Hubble Space Telescope observations and other observations a few months ago. So, again, our night sky might look quite different a few billion years from now, but you don’t need to be too concerned because individual star systems don’t seem to be disrupted, at least not in the models. So we’re in a very active galaxy — in a very, very active universe.
The universe is enormous in both space and time. It turns out that galaxies fill the universe. This is the ultra-deep field of the Hubble Space Telescope. Each one of these little blobs of light is not a star, but is a whole galaxy with hundreds of billions of stars. And then this is just a little pencil beam area of the sky, so just imagine this extrapolated over the whole sky and you get a mental image of how enormous the universe is. Here’s a spiral galaxy somewhat like our own. There’s also a third dimension here, so some of these galaxies are very far away and some of them are closer to us.

Astronomers are very interested in these distances. That’s the hardest thing in astronomy, to find the distances to other galaxies, or to anything in space, but there are ways of doing it. And distance means time in astronomy, because if things are far away it takes a long time for the light to get to us, so you’re seeing things as they actually were in the past when they emitted that light.

So, in this case, when you look at certain galaxies, you’re seeing them as they were in the far distant past, especially the more reddened ones, because as the universe is expanding, light gets stretched as it travels through this stretching space to get to us, and so it becomes more red in its wavelength or its color. So many of the most distant galaxies appear the reddest to us.

Here’s an example blown up for you of this very reddened galaxy. This is one of the most distant things we’ve ever seen. It’s shining to us from the first few hundred million years after the Big Bang beginning of the universe. That sounds like a long time, but we think the universe had a beginning about 13.8 billion years ago. This is shining to us from within that first .8 of the 13.8 billion year history of the universe, so this is a very young infant galaxy. It hasn’t done a lot of these mergers yet. It hasn’t grown into the big spiral structure. We’re seeing it as it was, and maybe as our own galaxy was, a long time ago.

There’s a strong correlation between the improvement in telescope sensitivity and how far back in time you can see, because here you see telescopes getting better and better over time. As they get better and better, they get more sensitive, so you can see more faint objects. Well, many of the faint objects are the ones that are farthest away, which means you’re looking at them from far back in time.
We’re starting to see this age when the first galaxies began to form and come together, and then it took billions of years for these galaxies to merge, to grow, for stars to form vigorously within them, and to go through cycles where stars build up heavier and heavier elements within these galaxies to the point where galaxies today, like our own, have stars that are enriched with heavier elements and even planetary systems around them.

Things change over time and we can see that in astronomy. It’s one of the few sciences that has the advantage of being sort of like a time machine. We can look at a galaxy back here in time and compare it to a galaxy here in time, and see how they’re different, and that’s a really exciting privilege. We can see that things have changed and indeed evolved over time in our universe.
And again, stars themselves play a very active role in creating the habitat that we need for life. This is an old star that exploded about a thousand years ago. The remnants, or the debris, of this star is called the Crab Nebula, but Chinese sky watchers recorded this star brightening back about a thousand years ago and we’ve been watching the debris ever since.

We can also analyze the debris and see that it’s full of these heavier elements that we need for life — carbon, nitrogen, oxygen. These are things that are produced in stars and in their explosions that get incorporated into subsequent generations of stars, enabling the formation of dust disks, and even planetary systems around stars — not the first generation of stars, but several generations on. So our own sun is not a first generation star. It’s taken several generations of stars to get those heavier elements that we needed for our sun and our solar system.

So, it appears that our universe, with seemingly perfect underlying physical laws that govern it, shows a progression over time toward the production of stars and heavier elements, planets, and eventually life.

Now, is that a sign of purpose? I’ve just taken a leap out of the science and into the philosophy, into the interpretation. What do we do with this? Here we start our conversation about how science, philosophy, religion and even ethics, start to converse with one another, using astronomy as an example.

Freeman Dyson, the physicist, said it wouldn’t surprise him “if it should turn out that the origin and destiny of the energy in the universe [could not] be completely understood in isolation from the phenomena of life and consciousness” and that the “design of the inanimate Universe may not be as detached from the potentialities of life and intelligence as scientists of the 20th century” — when he was writing — “have tended to suppose.”

So, is this progression of the universe toward life as we know it — at least on one planet — is that a sign that the universe was destined for this? Or is it just an accident? This is an interpretation question. You can’t measure that with science.

So what about this perspective of faith? Can you prove or disprove God through science and nature? And at this point it’s kind of good to point out what should be the obvious —
that science, as we know it today, is limited to questions of how and when and why, in terms of physical cause and effect of how nature works, basically, while religious faith is equipped better to address questions like Why — with a capital “W.” Is there a purpose? Is there a God? And how should we live? These kinds of things science is not really equipped to address, and religious tenets in faiths and texts are really not well equipped, usually, to address questions of how the natural world physically operates.

Now, of course there’s a lot of conversation now as to whether these realms are so separate or not. Can you explain religious thinking through scientific analysis? And so forth. So the conversation continues.

For many people in the scientific community, and in religious communities, the common ground that different groups can take regards ethics. How do we use science? How do we use technology? Whether or not you’re a religious believer, many people do care about how we are using science and technology and how it impacts humanity and the other creatures on this planet. So that can be a common ground where people of any or no religious faith can come together, regarding issues of science and technology.

So how do we relate science and religion? That’s a very big, difficult question. There are many books and many libraries. Many theologians, scientists, philosophers have been writing about this much more than I’ve ever read. I’m a scientist, not a theologian and not a philosopher. But there are some basic models that you’ll see out in the public sphere that are being assumed or adopted when talking about the interface of science and religion. This is not meant to be a comprehensive description, but rather just a helpful introduction here.
One model is this contrast model, which basically would state that there’s no conflict between science and religion since they’re responding to different questions. Somewhat what I just said: science is answering questions about the physical mechanics of nature and religion is asking more questions of meaning and value and purpose kind of thing.

There’s a contact model which is a little more interactive. This is a more positive approach, which doesn’t say that science and religion can just stay out of each other’s hair; it basically says there’s more to it, that it can be a positive approach which looks for dialogue and interaction, such as ways in which science can help shape religious understanding, such as understanding better what’s meant by the cosmos and the size and scale of the universe and the intricacies of life kind of thing.

And public service and religion — and how science can also shape public service by people being better informed as to what kinds of public service are most helpful using the science and technology knowledge we’re gaining, and how religion can often motivate scientific
pursuits. Many of the great scientists throughout history and today were motivated to do their research based on their religious convictions and their sense of worship, or of appreciation of the creation.

And then there’s the conflict model, which basically says that science and religious belief are inherently incompatible. I read a lot of comments out in the blogosphere about how science is based on testable information, whereas religious belief is based only on basically groundless faith — that these are two very different approaches to understanding things, and they’re incompatible — or even worse, that religious belief has maybe been an impediment to scientific advancement.

And so, you’ll see as you read and write assumptions from these different perspectives coming through.

For example, here are some perspectives. Again, I go back to the lauded physicist, Freeman Dyson, who said, “Why are we here? Does the universe have a purpose? Whence comes our knowledge of good and evil? These mysteries, and a hundred others like them, are beyond the reach of science. They lie on the other side of the border within, the jurisdiction of religion.” So he’s sort of speaking, at least in this quote, from that contrast point of view. These realms or approaches are asking different kinds of questions, and so they are separate.

Geneticist Francis Collins, who wrote this bestselling book, The Language of God — he’s more of the ilk of the contact model, that there’s something positive to be gained by having more contact and dialogue between science and religion. He said, “We cannot discover, through science alone, the answers to the questions ‘why is there life anyway?’ and ‘why am I here?’”

And then Richard Dawkins, who’s well known for advocating more of a conflict model. He says:

I think that when you consider the beauty of the world, and you wonder how it came to be what it is, you’re naturally overwhelmed with a feeling of awe, a feeling of admiration, and you almost feel a desire to worship something. I feel this, I recognize that other scientists such as Carl Sagan feel this. Einstein felt it. We, all of us, share a kind of religious
reverence for the beauties of the universe, for the complexity of life. For the sheer magnitude of the cosmos, the sheer magnitude of geological time. And it’s tempting to translate that feeling of awe and worship into a desire to worship some particular thing, a person, an agent. You want to attribute it to a maker, to a creator.

And here’s the punch line for him — “What science has now achieved is an emancipation from that impulse to attribute these things to a creator.” So, for him, science has basically emancipated us from earlier models that humans have made up, basically, to explain the inexplicable.

Of course, these are all from western perspectives of science and religion, being very different ways of thinking of things than that in many Eastern cultures and religions. Virchand Gandhi said, “In our country religion is not different from philosophy and religion and philosophy don’t differ from science.” So, this whole idea that science is a totally separate sphere of gaining knowledge and truth independent of anything else is a rather recent invention in the West.

Let me mention why scientific societies actually care about what our culture thinks about the interaction of science and religion. The American Association for the Advancement of Science, the world’s largest scientific society, has this program, which I direct, called the Dialogue on Science, Ethics, and Religion.

Why would a scientific society do this? This program has been around for probably 17 or 18 years now. I’ve only been on board with it for three. But the program is established not to try to solve these theological issues or philosophical issues of whether science and religion are compatible or complementary, or irreconcilable, or actually necessary for one another. Rather, it simply brings religious communities and scientists together to have dialogue on issues of common interest and concern. So, this program facilitates communication and understanding between scientific and religious communities, building on the AAAS’s longstanding commitment to relate scientific knowledge to the concerns of society at large.

Here’s the issue. Many, many people in society are religious believers, or their views on the world or their values are shaped through lenses inherent to religious faith, through
values shaped by their religious faith, and if science is always discussed completely apart from that, it’s not serving society, it’s not interacting wholly with society, even if science itself does not address issues of religious faith directly.

The Society publishes *Science*, which is well-known scientific journal; it represents millions of scientists worldwide, and here’s the mission: to advance science, engineering, and innovation throughout the world for the benefit of all people. Our little motto is “Advancing Science, Serving Society.” Here we have this idea that having a conversation about — or a dialogue between — science and religion is a way of serving society.

This fits into this scientific society’s goals of fostering communication among scientists and the public, producing responsible conduct and use of science, enhancing the workforce so people aren’t wrongfully keeping themselves out of being a part of the scientific workforce due to a misunderstanding of what science is, appreciating or helping the public appreciate science and technology more, and strengthening support for science and the technology enterprise.

What are some of those perceptions? For some, science itself is actually a kind of religion that conflicts with their own religious beliefs and they resent that being imposed upon them. And so there are often challenges in public school systems regarding what’s taught in the classroom. Many people feel a sense of concern and threat about science — a concern that science carries along with it some baggage beyond just the scientific knowledge, that there’s an implication of materialism or atheism or some other baggage that’s being brought along with the science.

And then what about scientists? What are they concerned about? Here we have Richard Dawkins on *The Daily Show with Jon Stewart*, and Stewart asked him whether the end of human civilization was more likely to come through religious strife or scientific advancement. In other words, Stewart wasn’t so convinced that scientific advancement necessarily meant a wonderful, positive progression for society.

Dawkins ultimately said that he thought that religious fanatics with access to the most destructive products of science pose the biggest danger to human civilization. But then Stewart countered, arguing that science contained certain risks in and of itself, in the form
of extreme or incautious advancement. So, kind of an interesting little exchange there, which is, which carries more risk?

And then there are questions of ethics that are coming before us often. For example, the ethics of vaccines. Of course, we’ve heard about the controversies of whether vaccines produce other health problems and whether that’s really true. But there are also conversations about whether we can afford to vaccinate children, and here’s a lash out at that kind of thinking.

The ethics of using technology for increasing human capabilities. We have the ability now to restore movement and things in people that have lost it, through technology. That’s terrific, but what about technology that’s designed to make humans superhuman? We’ve thought about artificial intelligence or even human enhancement through drug therapy and so forth, making people better than they would naturally be. Or this whole transhumanism idea that humanity will supersede our being attached to a body at some point. What should we be doing about that? These are the ethical questions.

I think all of us need to beware of what is sometimes referred to as “Nothing Buttery.” In other words, when science comes up with an explanation for something it’s tempting to interpret it as though the phenomenon or issue is nothing but what the science describes.

So the question is, is the scientific explanation for a natural phenomenon, including things like our human behavior, is that the whole story? If we find out that there’s a natural explanation for altruism, does that mean that there really isn’t such thing as selfless caring? Or, if there’s a natural explanation for why people are drawn to religious faith or religious belief, does that mean that that’s all there is, that there’s no such thing as an external spiritual reality or an external God? There’s some point where the science only tells you the first part but doesn’t say anything about the second part.

We find even in animal species examples of animals helping other animals when it’s of no benefit to themselves, like birds helping other birds to raise their young. You can almost see how that would help the group as a whole. Or monkeys giving alarm calls to warn other monkeys of the presence of predators, even though by doing so they’re attracting attention to themselves and their own possibility of being attacked. So what are we to
make of that? Is altruism real or is it something that’s basically still part of a selfish motive deep down inside for survival? Those conversations come up at this interface of science, religion, and ethics.

Human morality was not formed from scratch, but grew out of our primate psychology. Primate psychology has ancient roots, and I agree that other animals show many of the same tendencies and have an intense sociality.

The question here is if we see that other animals have some of these characteristics that we would have previously incorporated only to human morality and a human sense of empathy and cooperation, does that mean that there is no external ultimate right and wrong, or God-directed values, as religious communities would see it? Is it all nothing but an evolutionary process that comes through the survival of species?

That’s the kind of interesting interface where the science itself can be correct, but the question is, is that the whole story? And that’s where religious communities are particularly interested.

I think for writers, such as yourselves, it’s crucial to dig deeper in some of these stories when you’re talking about this interface between science and religion, because values and world views shape many of the concerns and interests regarding science. For example, authority figures. Who are people actually listening to and trusting in terms of information about science, and do deeply religious people look to different authority figures for questions and answers regarding science than do non-religious people?

That’s something a new AAAS survey is going to get at, but it baffles a lot of scientists that I interact with when we put forth a lot of data on something, and yet the audience doesn’t always just say, “oh, I see.” Scientists will say that the climate is getting warmer, because “here’s the data.” But many people are also getting information from other authority figures, either a religious authority figure saying that God has different plans, or a different science authority that has been filtered through their religious communities.

And scientists are just the same. We look to authority voices that we trust to help us interpret what we’re hearing if we’re not experts in the subject matter. But if society is
divided on which authority figures we’re looking to for matters of science, is that going to cause a problem as our society moves forward?

And then there are concerns about motivations and agendas that people sometimes wonder about, these other groups that they’re not as familiar with. Do scientists sometimes wonder if religious communities are trying to incorporate religion into the science classroom or something like that? And are religious communities concerned that scientists, as we saw before, are sometimes trying to bring secularization or materialism, or even atheism — along with the science as a kind of baggage? So what are the perceptions of motivations on each side?

And there’s also a very interesting sense that people don’t realize that scientists themselves have a very broad range of personal religious and philosophical beliefs. In other words, this perception that scientists are all atheists is not true. Certainly, the spread of beliefs that scientists hold is not exactly the same distribution as the general public, but many, many scientists identify as adherents to traditional religious faiths, or would identify themselves as “spiritual but not religious.”

It’s helpful to dig deeper for these kinds of perception questions that motivate many people’s concerns. And there are tough questions that are often beyond science, as we think about life on planet earth here. What will, for example, the long-term future of the universe hold? Are we significant given the vastness of the universe in space and time? And now we even talk about this possibility that there’s a multi-verse — that there may be other universes with different physical forces and so forth. Does that just compound our sense of insignificance? Or does our significance come from something else, from our ability to look around and to make these observations? Does that actually imply that we have great significance? That’s a philosophical question.

So that’s one perception you can take by looking at science, and especially the universe, and seeing its vastness and our place in space and time. It’s not the only possible response. The biblical psalmist wrote, “Oh Lord, our Sovereign, how majestic is your name in all the earth! When I look at your heavens, the work of your fingers, the moon and the stars that you’ve established, what are human beings that you are mindful of them, mortals, that you care for them?” — so that sense of insignificance is right there, and yet the psalmist goes on to say, “And yet you’ve made us just a little lower than God and
crowned us with glory and honor. You’ve given us dominion over the works of your hands. You’ve put all things under our feet.” So basically, in the psalmist’s view, our significance has come from God’s endowment of that significance to us.

There are more tough questions that arise: why do the same natural processes that are operating in the universe and on the planet also cause pain, death, and grief? Is it just the random coldness of nature or is there something more theological? I think of plate tectonics, the motion of the earth’s plates that creates earthquakes and causes so much suffering. Plate tectonics also seem to recycle our atmosphere and give us more livable conditions, so are plate tectonics good or bad?

What about what creatures do to each other? Is this okay? Is it neutral? Is there really such a thing as evil? Science can’t really address that.

I think about what’s happening to other creatures. There are elephant populations in Africa that are being attacked with military-style assault weapons, gunned down, whole families, just for their tusks. And then elephants, who have very strong familial connections, their relatives will come mourn and grieve their dead, and then they get gunned down too as they come to grieve. Is this okay? We know something about the social nature of elephants now. Are we not responsible to treat them with compassion?

On a more positive note, the universe always holds new discoveries and new surprises, and human beings seem to recognize the beauty of nature, and for some reason we’re drawn to the beauty of nature, and we’re drawn to explore it, sometimes with varying responses. I think that’s why people love science. It’s telling us more and more about nature.

So, how do we think about science and religion here? Alfred North Whitehead said that “when we consider what religion is for mankind, and what science is, it is no exaggeration to say that the future course of history depends upon the decision of this generation as to the relations between them.”

And I like the perspective of Sir John Polkinghorne, who spent his life as a physicist and the president of Queens College, eventually, in Cambridge, and then he decided to become an Anglican priest, and he’s written some very helpful books on the interface
between theology and science. And he says that “science and theology are both concerned with the search for truth. In consequence, they complement each other rather than contrast one another. Of course, the two disciplines focus on different dimensions of truth, but they share a common conviction that there is truth to be sought.”

The reason people get energized about conversations about science and religion is that both scientists and many devout religious believers all believe that there is something called truth, something to be sought, something to be grasped, something to be learned about, as opposed to just total inconsequential relativism. And so, I think, in that sense, it drives a commonality between, in some cases, scientists and religious believers.

We should all, regardless of our faith convictions, be good caretakers of this place where we live.

MICHAEL GERSON, The Washington Post: I look at all those beautiful pictures and the ultimate reality that we’re seeing there is not so much progression but decay, and eventually all those stars will die. And if you wind the process back, which is 13.8 billion years, it means that the beginning had very low levels of entropy. So I’m just wondering how cosmologists explain why the earliest moments of the universe should be the most highly structured and organized. It doesn’t seem obvious to me.

Some propose the multi-verse as part of an explanation, but it raises the question that doesn’t seem open to verification, even in theory, and so I’m wondering if that’s really science at all?

JENNIFER WISEMAN: If entropy is increasing, why would we see increasing complexity? It depends on what system you’re looking at. It may be that entropy is increasing with the universe as a whole, but in certain subsystems within that universe you’re getting more and higher complexity, so you’re getting this development of stars, you’re getting development of life.

The ultimate fate of the universe is a very good and somewhat troubling question because if nothing changes, it looks that eventually the universe will expand forever, accelerate out, stars will eventually stop forming because we run out of this interstellar gas from which they can form. You run out of fuel. Stars eventually die out. You eventually have
something that you could envision as a very cold and dark place filled with a few black holes and dead stars and nothing more.

And so, that is a kind of a dire prospect. In fact, we already know that we’ve already peaked and the highest rate of star formation was a few billion years back, and so we’re already on the down slope.

As we compare these distant galaxies to our nearby galaxies, you can see, over the first few billion years of the universe, star formation began to become more and more energetic; but as we compare galaxies at what we call a “red-shift of two,” the time and distance when the star-formation rate peaked, and on to our current epoch, we can see that star formation is now declining a bit. So we already feel like we’re on the kind of post-peak of the universe in terms of the production of stars. How should we feel about that?

The amazing thing about science is that we often get surprised. So that’s the projection right now, but there may be something that we don’t understand that will affect the long term future of the universe. This whole dark energy thing was a complete surprise, so if there are aspects of gravity that we don’t quite understand, then we may not be able to predict the long-term future of the universe. And maybe it doesn’t even matter. If there is this multi-verse, maybe the question is, what’s the long-term future of the multi-verse?

Now, is the multi-verse something scientifically real? Is it testable? And right now, the answer is, no, you can’t test it. It’s a mathematically viable possibility based on string theory, and string theory can explain some of the phenomena that we see at least in our own universe, and you can tie those observations back to some aspects of string theory. It allows for this idea that there are other universes with other forces, but we can’t see outside of our own universe in order to test whether that’s actually happened.

It provides a philosophical mode of thinking for some people who are troubled by the fact that our universe does seem to have produced life, and does that imply some sort of specialness that is philosophically uncomfortable. But if you have a whole bunch of other universes and we’re just kind of a random accident, if you will, then that kind of provides a philosophical way out of this conundrum.
But that is not science itself. That’s kind of philosophy, so personally, I don’t have an opinion as to whether the multi-verse theory is correct or not, because like you say, you can’t observe it. But it wouldn’t necessarily surprise me. We’ve been amazed so many times by how much grander our universe is than we ever envisioned before. We never knew there were other planetary systems until just recently, and we didn’t know that there were other galaxies until just a few decades ago. So what if there were other universes? Would that threaten the faith view? Well, not if the faith perspective is based on the idea that whatever God or spirituality is responsible for the universe could be equally responsible for a multi-verse, so it just kind of pulls the question back.

Religious communities would say that there’s more to the story than just what looks like the natural projection of the universe. Christian communities believe that Christ will return and make some sort of noticeable change in the universe, so it’s not the whole story, but those are religious beliefs.

ANDY FERGUSON: Scientists still are an amazingly secular group. It’s something like 35% or something believe in some kind of God, and much less of those believe in sort of a traditional notion of God, compared to the 90% of Americans who say they believe in God. How do you account for that? Is it something in the people who are inclined to go into science, that they just have a more secular or unreligious point of view? Or is it something that in the practice of science itself that makes somebody less religious?

JENNIFER WISEMAN: Many scientists had been raised in religious families, but their love of science had caused them to ask questions that were not always favorably entertained in their religious congregation or church, or whatnot. And so it made them feel eventually that they had to basically leave their religious faith behind because it wasn’t helping them with their questions about science. So that may be one reason — is that people who are scientifically inclined may not find their religious upbringing to be relevant or helpful.

Then the question then is, does science itself make one deduce that religious faith is irrelevant or illogical or false? I’m not sure. Since I’m not a sociologist, I haven’t done this, I can’t speculate quantitatively on whether that’s the case.
I have interacted with a whole lot of scientists and they all have a story, just like all of us do. Everybody in this room has a story as to why they’re at a certain place in their belief or nonbelief in terms of religious faith, and I found many scientists who are people of faith who said that they came to it as adults, as scientists, like Francis Collins — it was a journey that included both their intellect, but also their heart, a sense of maybe repentance or maybe a longing for God, or something like that, along with fitting it in an acceptable way with their intellect such that they became believers. I’ve interacted with many people who have stories along that line.

I’ve also interacted with many people of the other line, who were religious believers and maybe fervently so, but the more they looked at what we’re learning in science, be it biology or behavioral evolution, or even cosmology, they began to doubt many things that they had been taught in their religious heritage and have turned away from it.

And of course, there’s always the question of whether religious belief been good for society or harmful for society as a whole, and that gets bantered around a lot in public dialogue. But I think the real question that nearly everyone grapples with at some point in their life is why is there evil and suffering in the world? Why do innocent people or animals or whatnot — why are they suffering? Why is evil allowed to take place? Some people answer that as a sense of proof that God must not exist, or at least not in any useful or tangible way, or else this God would not have allowed these horrible things to happen. Or others can come to a different conclusion, such as that in Christian heritage with the idea is that God doesn’t generally intervene to stop either the freedom of nature or the freedom of human action and its consequences — but God has joined in the suffering in the incarnation in Jesus Christ, and somehow redeems it and promises a new type of future.

There’s different ways of dealing with suffering, but depending on how one grapples with this ubiquitous question of why is there injustice, why is there suffering, it can direct how they respond to religious faith and whether they embrace it or reject it.

WILL SALETAN: Do you talk to people who are creationists about exactly what they believe in relation to science and what else they believe, and do you have the impression that this is something that we could sidestep and they could be perfectly functional with respect to understanding and incorporating science in their lives?
JENNIFER WISEMAN: Most people are very interested in science, and that goes for people of very conservative fundamentalist religious views. What concerns people is when they perceive that science is trying to edge out God, or trying to make God irrelevant, and if God is the center of your life, this can’t fly.

So, your question is, could people who have trouble accepting that, can they accept other parts of science and is that okay just to go with that? I guess it depends on what it is that they are doing in life. Some students come through with creationist beliefs in high school, and then they come to college and they go to a secular university and they want to study science, they have problems because suddenly they are introduced into science classes where an acceptance of evolutionary science is assumed, and they sometimes feel marginalized or challenged. In that sense I think it doesn’t work very well.

For most people, just daily life, getting along — I don’t think most of us in this room think very much on a day-to-day, moment-to-moment basis about whether we have a common ancestor with other primates. So it’s not something that affects us in our daily life in that sense, but I do think people miss out. My perspective is that I’m a religious believer myself and I think we miss out on some of the glorious revelations, if you will, of the magnitude, the evolution of the universe, and the complexity and intricacies of life, the interrelatedness of life. These are things that don’t necessarily have to conflict, but it can augment one’s faith in God if you are a person of faith.

And so, I sort of lament when religious communities set up a kind of conflict, and usually it’s not about the science, it’s about the interpretation of Scripture: how do you interpret this particular biblical passage? Is reading, let’s say the opening versus of Genesis, really telling us the details of the time scale and mechanisms of creation? And if it really isn’t meant and never was meant to convey that kind of knowledge, even if you believe it is the word of God, it can be freeing to find that out so that the religious believer can go on and embrace the science, and so thereby be blessed both by the science and by a deeper understanding of their religious text.

DAN HARRIS, ABC News: When confronted with the sheer magnitude of the universe, these basic facts, does that allow you to put the basic crap of daily life into a greater perspective than the rest of us? And you talk about the universe expanding — we often hear that the universe is infinite, so can infinity expand?
JENNIFER WISEMAN: When cosmologists use the word “infinite,” it is very hard to comprehend because the way the words are used, infinity does mean infinite, but originally the size scales, the spatial scales within that infinity, were very, very small. So what’s been happening since the beginning of the universe is that spatial scales have been expanding and so space itself is stretching within an infinity, and you can’t really talk about boundaries in that sense. What you can talk about is boundaries in terms of how far we can see, because we can only see as far back as time has existed, and time as we know it has existed for about 13.8 billion years, so we can only see about 13.8 billion light-years out in the distance because that’s as far as light could have traveled in the history of the universe, to get to us. But there are things in the universe that have expanded beyond that distance. A light-year is a unit of distance, and so there are things that have expanded out beyond our visible horizon that we’ll never be able to see.

One way I think of it is that when we talk about the Big Bang, it isn’t that it happened right there and then everything has been expanding out from that ever since; it basically happened everywhere. The Big Bang happened everywhere at the beginning of time, it’s just that everywhere had very small spatial scales and everywhere is expanding ever since.

And you can see the remnants of the Big Bang everywhere you look, so it’s not that we look off in one direction and see the remnants of the Big Bang over there, it’s that you can see this leftover cosmic microwave background radiation any direction you look because the Big Bang happened everywhere all at the same time and we’re still receiving that background radiation from everywhere.

Space does not appear to be curved; it appears to be flat in that sense. Sometimes you hear people or scientists say the universe is flat. Parallel lines should remain parallel forever in that sense.

Now, you asked, does it reduce my sense of being perturbed by daily life. I feel a great sense of appreciation for the universe that we’re a part of, and I feel a sense of sorrow that so many people do get trapped in just mundane issues that are not of what we would call eternal value. For some, it’s because they have no choice. They are trapped in poverty. They are trapped in a war zone. They are trapped in some situation where survival is all
they can think about. So it’s no fault of their own, but that’s a tragedy to me. And when we have such beauty in nature to explore, to learn about, to influence how we think of ourselves — and many people don’t even get the privilege, the luxury, to have those kinds of thoughts.

Also, though, more tragic in some ways are those of us who do have plenty of freedom to go and explore, and don’t. Look at these images. You can go to a website like this one and see all these images that I’ve shown you. You don’t have to be an astronomer to explore the universe. You can just go out for a walk in a park or somewhere to enjoy the wonders of nature, and yet people choose not to, to focus on trivialities of human conflict or material wealth, or distractions of just survival when it’s not even necessary for them, and I think that’s kind of a loss.

ERICA GRIEDER, Texas Monthly: If we framed the conversation this way, as religion and science, or religion versus science, in the meetings you have or the dialogues you have, do you find that that comes at the expense the sort of other perspectives—economic perspectives, constitutional legal perspectives — do you find that kind of angle on things being disadvantaged in these discussions you guys have? And secondly, I’ve always wondered, do you know or do you have a sense of what the universe is expanding into? What we are in?

JENNIFER WISEMAN: Second question first. The universe is not expanding into anything because that implies that there’s something outside the universe. It’s that the whole universe is infinite but stretching. That’s not the way our minds are built to envision things, but it isn’t the case that the universe is this ball of energy that’s expanding into something else. It’s that everything is expanding in its internal spatial scales.

The intersection of science and religion with other things, economics and politics and all of that...this is, of course, all wound up together when we come to the rubber meets the road issues of policy, and national priorities, and funding, and science policy, and so forth. That can be a very huge mystery to people from these different communities who come together, who can’t understand why the rationale that would drive decisions or priorities from one of these perspectives is not necessarily influencing what actually ends up happening in the larger society.
I think of scientists who’ve gone to work on Capitol Hill, such as myself. I was a Congressional Science Fellow for a year and a half and I worked for a committee on Capitol Hill as a staffer there.

I was amused just to see how scientists would say that, to make a decision on national policy that involves science or technology, you need the scientific data. Here it is and that’s what you work with. And yet, they were sort of surprised to note that the political ears of leaders on Capitol Hill also had to take into account economic impact, political impact, and all these other kinds of things that would go into a decision about whether you would implement a certain policy.

And this is a really difficult area. This gets into values. It gets into ethics. If the science is telling us one thing but the economics tell us something else, what do you do? What wins? Who gets to make the decision? Who makes the choices? What are the impacts? These are things where we need people who are well-versed on all facets of issues to be able to come together with wisdom and make good choices.

MICHAEL CROMARTIE: I want to go now to Gregory Jones and to Tim Dalrymple on the theological way of viewing these questions.

DR. L. GREGORY JONES, Duke University Divinity School: In particular areas, theologians are working on evolution. And I think what we need to be doing is looking, not so much about religion and science as abstractions — because there’s a particular ideology as to how that has been framed— but looking at particular issues so that the conversation between theology and physics is a different set of issues than between theology and biology, although synthetic biology raises some really interesting, different kinds of questions that are particularly significant resources for how we think about human sociality and the shaping of community, and so I think there is some significant opportunity.

So, if we look at it in relation to brain science, if we look at it in relation to biology, if we look at it in relation to physics, as well as fields within those, there’s actually a lot of fertile territory.
The trouble, it seems to me, is that we’re trapped in a really pretty sterile set of debates about religion and science, articulated with a peculiar modern history, and that’s where we end up getting stuck. It is as if there’s one set of conversations, which largely goes back in the popular imagination to the Scopes trial, and that’s what frames everything and what leads to people being motivated in very fearful ways, I think, in that debate. And this is where, actually, seminaries are complicit with science departments in that neither one does a very good job of teaching the history of the debate about religion and science. Now, science departments aren’t known for doing a lot of history and philosophy of science because you’re actually doing the practice of the current science.

To what extent in your dialogue are you actually trying to think about and engage the kind of history of the debates in a way that might lead to a reframing of questions of religion and science — as a peculiar topic apart from the substantive advances that are going on in theology and science in particular fields? Are you all trying to look at that, because that’s where I think that trying to get at the history of how we’ve framed the issues could actually perhaps provide some breakthroughs.

TIMOTHY DALRYMPLE, Patheos.com: Yeah, that’s right, and the early Church Fathers had some very sophisticated ways of thinking about the Scriptures. Jewish philosophers, as well, had very sophisticated ways of thinking about Scriptures and how they should be interpreted when they’re talking about natural processes.

I take it to be a matter largely of historical accident that there is this perception of a conflict between science and religion...as long as they take their vaccinations, does it really matter that there’s a large group out there that believes in Young Earth creationism?

I would say that it does for a couple of different reasons. A large part of why this perception arose in the first place — so earlier generations of Christians, I think furnished the intellectual underpinnings for the rapid growth of Western science. But there was a period in which a lot of Christians took a stand on bad science and said that this is the only way that you could properly understand the natural world and still be a Christian, and because they did so, there arose this perception that from a Christian perception has been enormously damaging, and has given rise to atheist critics of Christianity.
So, if it’s been that damaging to see those places where people have taken their stand on bad science masquerading as good theology, then I think permitting that, again, is just furthering that God of the gaps kind of approach that is disproven as science marches on, to the great discredit of Christian intellectual quality.

The damage for young people can be really profound, and I saw this a lot in the churches that I’ve worked with, where if you do get that perception that you either believe this or else you’re no longer a Christian, and then you go and find all sorts of articulate people who explain with greater amounts of evidence and logic and force, why you should believe otherwise, then it just puts the young people in a very bad situation.

And I think there are broader problems, too, with the perception that science is the enemy that comes across with this kind of — it can lead to withdrawal from the processes of scientific advancement, to bad policy making decisions, and to a kind of Luddite attitude toward technology.

DAVID RENNIE, The Economist: There’s plenty of religions which are extremely literal-minded and willing to commit violence against people who are not so literal-minded. When creationists are saying scientific education is a challenge to a kind of theist world view, they’re right. It’s just you’re too polite to say they’re right, and you’re too polite to say that an awful lot of religious explanations for the universe, seen from an atheist perspective, look essentially anthropological. And the reason that you have Muslim scientist organizations is because they were born in Muslim countries to Muslim families, and Jewish scientists were born in Jewish families and that’s their thing, and the thing they agree on is science, and that’s not static and is rather adaptive to new discoveries and their anthropological traditions, which we’re very polite about because we’ve learned to be polite people and rational, enlightened people — they’re losing these arguments.

Aren’t you selling yourself short when you’re saying that there is this dialogue possible? Why not just call it and say the Muslims and the Jews and the Christians don’t believe that they’re mutually compatible, so why are we being so reasonable?

JENNIFER WISEMAN: It certainly is the case that there are topics and issues where a particular religious belief is in conflict with a particular consensus view from the scientific community. No doubt about that, and that can cause great problems, as I’ve mentioned
earlier, in what you teach in schools and so forth. But I don’t believe, and neither do these national science organizations, that these conflicts fundamentally have to exist. Again, the issue for them is often how they interpret their own religious text and so forth, so many Christians, Jews, Muslims, would say that those religious texts that they revere as the word of God, were never intended to convey information about the creation of life or the history of the universe, and so that would be a misuse in their view of their own religious text.

So, in that sense I do believe dialogue is possible and constructive, both within religious communities amongst themselves, and also between communities where we find issues of common interest, such as, what do we do with our technology? What do we do if we are finding things that are of interest in terms of mapping our genetic code, finding that some people are predisposed to certain diseases or certain conditions; and what do we do about that? So, how do we take the knowledge we’re given and do something with it? There’s common ground there. I think that’s the place where there’s the most productive conversation to go on.

DAVID RENNIE: But that is a very small and very rational piece of deist common ground. But does it actually accurately reflect religions as are experienced by the vast majority of religious believers or not? Haven’t you just found a kind of happy, rational place that you can talk to each other, but it doesn’t reflect religion as it’s lived by an awful lot of people?

JENNIFER WISEMAN: When I say common ground, I don’t mean necessarily common agreement or perceptions, but maybe what I should say is common interest. For example, earth care, environmental stewardship, there can be tremendous common ground in trying to understand what the human impact is on the environment.

For some religious communities it can be their sense that they were placed here by God, that the earth is the garden that they were sent to tend, and we’ve not done a good job and it is an act of worship to God and repentance for sin to stop pollution, to stop environmental degradation. And not only that, but it’s an act of service to other people because people are suffering due to environmental degradation, and if you’re supposed to love one another and you don’t do anything to help uplift the environmental condition, you are hurting others.
So, it can be religiously motivated, and yet there can be others who have no such necessarily religious beliefs but have that same common conviction that we are impacting our environment and we need to do something about it, simply for the common good of all living creatures here — kind of a humanistic or inclusive world view that would uplift everyone, that doesn’t necessarily tie itself to religious faith.

So, can people who have perhaps different motivational backgrounds but the same interest and goals and the same interest in understanding what the truth is that science is telling us about the natural world, can people work together from that? I think so.

FRED BARNES, The Weekly Standard: I am interested in the subject of how one can be a scientist and a believer, a Christian believer, as you are. How do you as a scientist and a believer deal with matters like the Virgin Birth, the Resurrection, and the existence of the Holy Spirit, things that we’re required or at least asked to believe as Christians?

JENNIFER WISEMAN: Some people take the perspective that the miraculous does not happen, and so that even some religious people who are science-savvy would say that miracles do not happen, that science basically explains the way things work, and so we understand the working of God through natural processes. And that they still believe in God and all that, it’s just that they don’t see the logic of how a god could intervene and tweak the knobs of natural forces and so forth at certain times.

And then there are those on the other extreme that say that God is basically in there all the time, basically injecting new information or shaping things, or guiding all these kinds of natural processes.

I tend to think of a miracle as possible, and that miracles actually have happened, but they are just what they sound like. They are a miracle. There’s something that’s outside of the natural working of the forces of nature, and so science is not equipped to address that one way or the other. Science is equipped to address how things normally and naturally work, so as a scientist I study the universe in the way it normally and naturally works and has worked throughout the whole history of time. I don’t look for anything else because my scientific tools are not equipped to measure anything else, but does that mean that nothing outside of the normal natural physical processes that science can address ever happened or ever does happen? Well, science can’t answer that question, so I have to
answer that question in some other way, and to me, the answer is yes, because I see both historical and personal evidence for God’s actions, so now here I am talking from my own personal perspective.

But I do see evidence for things, in particular, the resurrection of Jesus Christ. There is to me ample evidence that that event in the course of time changed history and changed lives and people are experiencing the living Christ today. Is that a scientific conclusion? Absolutely not. But is there enough evidence for one to believe it? For me, yes.

What about answered prayer? That’s something that no one can prove to someone else unless it’s something really off the wall, like, I prayed that my amputated arm would grow back and it did. But that doesn’t seem to be the way people experience the answered prayer. People experience prayer when they pray for a change in their lives, to become more forgiving or to become free of a certain bad inclination, or they pray for someone else’s well-being, even for a healing, and that healing may not be a physical healing, it may be a healing of spirit or so forth. And when you sense God’s answering of that prayer, it’s usually in such a way that you can’t prove to someone else that that’s actually what happened — it’s always explainable by some other way.

And so, do I believe that God is active in our lives? Yes, I do. Do I believe that God regularly changes the forces of nature, or goes in and tweaks things or adds more information into the systems and so forth? No, I don’t. In fact, the biblical record is that God typically works through nature as it is, or works within situations of suffering and enters in and works with people, or helps us through science and technology to help one another. These kinds of things are how I perceive God being most active today.

JENNIFER WISEMAN: There’s a survey that’s been done, like 40 years ago and then recently, the same question was asked of all the membership of a certain scientific society: do you pray to God expecting an answer? Something like that. And the same percentage of scientists, and I can’t remember whether it’s 30 percent or something like that, had said yes decades ago and still say it today. So, there is some significant, though probably minority, percentage of scientists who believe that there is some reason to pray, to talk to God, and so why is that?
MICHAEL CROMARTIE: Well, on that note, thank you, Jennifer so much. You all join me in thanking Dr. Wiseman.