

**“Science vs. Religion: What Scientists Really Think”**

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**MICHAEL CROMARTIE:** Professor Elaine Howard Ecklund has written this new book called *Science v. Religion: What Scientists Really Think*, which is a wonderfully unique take on the question because we usually read subjects on what religious people think about science. We are delighted to have Dr. Ecklund here this morning.

We're also delighted that Barbara Bradley Hagerty could be here because Barbara has written a *New York Times* best selling book on religion and spirituality and science. So it's wonderful to have you both here.

**DR. ELAINE HOWARD ECKLUND:** There's the perception out there that scientists are completely “areligious” and that they're even beyond being “areligious.” They are against religion completely, right?

I'm a sociologist, and I think sociology at its best often gives us research that's very deeply surprising and sort of challenges our worldviews and dispels common myths that we believe about ourselves and the world around us.

My most recent research is on religion, spirituality and ethics among scientists, research I've been working on for the past five years, where I've surveyed 2,500 natural and social scientists at the top U.S. research universities, and I've achieved a 75 percent response to the initial survey I did, which is very high for survey research.

I surveyed them at places like Harvard University, University of Chicago, top state schools like Michigan, Minnesota, Wisconsin, and I also followed up by having a lot of face-to-face

conversations. So I took another scientifically selected sample of those I surveyed and traveled around and did 275 personal interviews.

I've also developed a course at Rice University where I teach "Science at Risk: Out of the Lab and into the Society," where I teach students about the ways in which science has an impact on society and also the ways in which societal concerns have an impact on science, and a big part of that course is talking about science and religion and that is something the students are always the most interested in.

These experiences have shown me that the public, even bright students at Ivy League schools and top private schools like Rice, are simply wrong about what scientists think about religion, and that this wrong perception, I'm going to argue today, I think has a lot of consequences, consequences in the public imagination that potentially hurt science and also potentially hurt religious communities.

So I'm going to address six topics that I hope will bring light to the public's perception of how scientists think about religion. First, scientists are religiously complex.

Over the past 100 years scholars have continued to find that scientists are generally less religious than other Americans, pointing to this as proof that religion and science remain in conflict. So it's on us again. We have discussion of the God gene, embryonic stem cell research, and the religious implications that has, teaching evolution in public schools, and the religion and science conflict is returning with vengeance in the early 21st Century.

The debate, propelled by these current controversies is especially poignant in higher education where I make my living. In particular is the enemy of religion and the friend of science, and many Americans see scientists as not only lacking faith, but as actively opposed to religion, further sustaining this conflict paradigm.

Yet when we bring survey research and in depth interviews into this light, we see somewhat of a different story. When we look at religion in a traditional sense, in my study about 50 percent of scientists identify with one of the major world traditions. So some version of Protestant, Catholic, Jewish, Muslim, and a little more than 50 percent do not have any religious identity, would call themselves religious "nones."

But we also have surprising categories. A little over 30 percent of scientists consider themselves atheists. No surprise. Another 30 percent, agnostic, although agnosticism, I think, means something very different among scientists than it does in the general public. But among scientists, one in five of the atheist scientists considers themselves a spiritual person. So scientists are not all atheists, and even atheist scientists, I think, are different sometimes than we might think. Scientists have areas of religious overlap and religious difference from the general public. The biggest difference is in the proportion of evangelicals. About two percent of scientists see themselves as evangelical, believing that the Bible is the authoritative word of God, salvation through faith in Jesus Christ, and evangelizing to others about their faith, compared with and depending on how you ask that question about 28, 30 percent of the general population.

There's the biggest overlap between mainline Protestants, Presbyterians and Episcopalians, and scientists. About 15 percent of scientists and 15 percent of the general population are part of that category.

Interestingly, about one in ten scientists at top universities is a Catholic when compared to a little over a quarter of the U.S. population. So, again, not a gigantic number, but I compared my survey results to a survey done by the Carnegie Commission of Higher Education 40 years ago, and the proportion of Catholics has risen among elite scientists over the past 40 years, which there's lots of historical reasons, et cetera.

But I found through interviewing Catholic scientists that they were the ones who had a very well thought out idea for how they connected their faith and their science much more so than the Protestants. That was interesting.

Second point. Irreligious scientists use religion. I get two kinds of reviews to that statement. One from academic reviewers is, you know, why don't you condemn them? They're hypocrites, right? They still need religion even though they say they're atheists, and the other is like, you know, there's no place else you can turn for a good time other than religious communities.

So scientists go to church often or participate in other kinds of religious organizations even if they're atheists. For example, about 20 percent of atheist scientists who are

parents attend religious services regularly. This is particularly salient when they become parents.

I asked scientists, what are the reasons you do this, and they stressed spousal influence, of course, being married to a religious spouse; looking for a place of community, feeling like there's not good options for community when you have children outside of religion; and also the uses of their resources from their identities as scientists. Scientists really prize consistency, and they want to provide their children with religious choices. So the idea that just because I am an atheist doesn't mean you have to be, said child, and they want to provide them with a whole range of choices.

And the second way that irreligious scientists utilize religion is when thinking about science ethics, particularly scientists who have been raised in a religious tradition and have since decided not to be religious. They think that it might be helpful. They bring religion back up when dealing with complicated ethical issues that involve science, especially citing examples ranging from avoiding misrepresentation of data, so issues of research integrity, to things like human genetic engineering, how we think about that from a moral perspective.

When people in the general public, for example, attend religious services without believing in the tenets of the religion, Nancy Ammerman, who is a sociologist of religion at Boston University, calls this Golden Rule Christianity. So, you don't really believe, but you think, there's some good rules in Christianity.

The scientists I study were somewhat different. They utilized religious tenets without actually attending services and even sometimes while maintaining stance as an atheist, which I thought was very interesting.

Third, I also studied how religious scientists think about their faith in public realms when they're religious. For example, when I asked about expressing religious beliefs in their academic life, I found that religious scientists often practice what I call a secret spirituality. The majority of religious scientists are rarely public about their views in the academy. They often try to keep their faith to themselves because of the perception that other faculty in their departments think poorly of religious people and religious ideas.

Charles O'Reilly and Jennifer Chapman I think are at Stanford. They are business culture scholars and talk about the differences between strong cultures and weak cultures. So strong cultures within organizations are characterized by what they say is a system of values widely extended and intensely shared. Within a weak culture, shared values are fewer and the ties that they create among group members are less potent.

So if the desired outcome of an organization, for instance, is economic in nature to make more money, then groups with strong cultures are going to be more successful, right? Intense ties sort of foster common values, getting to the bottom line, and therefore high economic performance.

But what about when organizational goals are not economic in nature? What if the desired outcome, for example, is expanding understanding like it is in an educational setting or the spread of knowledge? Is a strong culture that suppresses discussion of religion, I think we need to ask ourselves, the best one for an academic science department?

So here's what my evidence shows, that scientists perceive that a strong culture governs discussion of religion in the academy. One characteristic of this strong culture is that it's generally considered better not to discuss religion than to discuss it. When religion unavoidably comes up, such as when discussing news events, the conversation ends abruptly or everyone, religious and nonreligious alike, tacitly agrees that religion is generally negative and has a negative relationship to science. It's sort of what we all do in the culture, or at least that the subject is very delicate and best avoided.

The hallmark of a strong culture is that there's widespread public agreement or appearance of a public agreement even in the context of individual dissent. Strong departmental cultures make religious scientists feel that they cannot openly talk about being religious because they might face negative sanctions from their colleagues, whether or not this is actually true.

When religious individuals participated in and upheld this strong culture surrounding religion, they are then sort of perpetuating it. So I'll give you an example of one, a physicist I interviewed, Janice, who's an example of a scientist who said that she feels trapped in a closeted faith. She landed a job early in her career at a prestigious university. So Janice

feels marginalized in the world of physics as a woman, as a young person — she's quite young — and, most germane to our discussion, as a religious person.

I asked her to describe her particular religious beliefs. Her long silence becomes uncomfortable. She later explained just how difficult it is for her even to have conversations about religion in the academic setting. She knows a few others in her department or broader university are religious, but said that they talk about their faith only occasionally, and then only what she put as offline, her shorthand way of saying these conversations simply don't occur in the work environment.

She said, in particular, that these recent controversies about intelligent design have made her even more reticent, reluctant to discuss religion with her colleagues. She said, "I think of academia as not always an accepting environment. Intelligent design has made it a whole lot worse. Intelligent design has made it really hard to be a religious academic because they polarize the public opinion, making it seem as if you're either religious or you're a scientist."

Janice went on to say that to let others know that you're religious might undermine how colleagues view your academic work. So I asked her, "Have you personally experienced this sort of discrimination?"

She quickly added that she has not because no one actually knows she's religious. See, so it's not like she's even experienced it personally, but she has such a strong perception that she can't talk about it.

So regardless of whether or not scientists do or would experience religious discrimination, to paraphrase sociologist W.I. Thomas' famous maxim, if men define situations as real, then they become real in their consequences.

I think there's some evidence for her perception actually. For example, she recounts the experience of talking with colleagues about teaching and her colleagues are dismayed that students come to their university with much less background in math than should be expected, and a colleague quips to Janice, "It's stupid intelligent design. It's stupid Christianity." The fact that Janice's colleague immediately assumes that all Christians reject evolution makes her personally uneasy about being open about her faith.

Fourth, I asked scientists how they practice science within their faith community, thinking that perhaps in their actual communities of faith they feel the sort of warm welcome where they can be themselves. Not so. I found that scientists within faith communities practice what I call a secret science where they are hesitant to discuss what they do as scientists for fear of offending people in the pews who are not scientists, and these were mostly in Christian communities.

They may not have tried to discuss their work once. They may have tried to discuss their work once and found that it didn't go over well. Maybe they brought up something about evolution and found that their views were not well met, and then they decided that they just were not going to talk about it anymore, and they sink into a sort of secret science within their faith communities. While this is not something that they're generally pleased about, they didn't know how to change.

Fifth, I found that social and natural scientists are very similar in how they think about science. So I actually started this study in part to compare natural and social scientists. So social scientists, like in my own field of sociology, or in political science, are often thought of as being kind of the village atheist. We're supposed to be, you know, especially virulent and negative against religion, especially unfriendly.

And natural scientists, our researchers have found in the past, are ironically more religious than social scientists, and so people will say, "Well, what's that about? It must be because social scientists are so politically liberal," and that's correlated with being against religion.

My work actually found no religious differences between the natural and social scientists. I should add the one caveat that economists were slightly less religious than other disciplines, but I don't know what to do with that.

Max Weber described people he called carriers who were sort of types representative of the various classes who were like the propagators of the major world faiths. Carriers perpetuate an ideology that can seem almost salvific in kind, which most readily conforms to their social position. Scientists have been perceived in the academy as sort of carriers of a secularist impulse, a group responsible for building the modern research university, which is completely at its core based on science and undermining religious authority by

their success in deciphering the mysteries of the natural order without recourse to supernatural aids or frameworks.

On the one hand, I found that Weber's ideals are still true. As I said, I started out this study by examining both natural and social scientists and found that the social scientists in the study, like economics, psychology, political science, my own field of sociology, had absolutely no problem with me labeling them as scientists. Now, natural scientists do not necessarily see social scientists as scientists.

The relationship between these two groups is sometimes uncomfortable, but they were uniformly of one mind in the defense of science. Both of these fields saw themselves as really engaged in a search for the truth of scientific fact, and actually it was surprising to me how closely these social scientists' conceptions of science and the general scientific fact meshed with the views of the natural scientists.

The most reflective of the natural scientists I talked with wanted to actually move beyond what they call the "scientism," what the philosopher Gregory Peterson and others have seen as an unthinking capitulation to a totalizing scientific world view, and beyond a sort of unthinking relativistic post modernism which they see as characteristic of some corners of the humanities, and instead what scholars now see as this post positivism, which takes seriously the desire to see that science has truth but not total truth, and that science needs the thinking humanities like philosophy, theology, literature to make sense of the most pressing issues facing science today, like science education, how best to reach out to the general public, how to think about a robust science ethics, those kinds of issues.

Sixth, I think these findings show that understanding religion is crucial to public science and our efforts along those lines. As we've discussed, there are huge religious differences between the religiosity of the public and scientists, like the 14 times more self-identified evangelicals.

And more than 50 percent of Americans agree, according to recent surveys, that we depend too much on science and not enough on faith, and that scientific research these days doesn't pay enough attention to the moral values of society. And 25 percent of the American public thinks that scientists are hostile to religion.



Religion and, more importantly, the intersection between religion and science cannot be ignored by scientists who care about the public's knowledge of science and its propagators. These scientists should set forth an agenda for dialogue and de-privatization of discussions about religion, one that emphasizes a more nuanced view of religion, one that's more accurate to the reality of the American public, and a more realistic view of the limits of science.

Those who did want to talk with members of the general public about science face what they call somewhat of a language deficit. Since they did not learn a religious vocabulary as children often, they find themselves without the right tools with which to engage religion, and I think that's where your work is so, so vitally important as you're really educating. You know, scientists are part of the public. You're educating them about the depth of religion in American society.

Such scientists do not need to become religious believers, I would argue, to have more productive discussions about science with people of faith, but they do need to know more about religion from an intelligent perspective, at least basic facts about the variety of the world's traditions, the kind of diversity that the world's traditions have with relationship to science so they might more effectively engage with a variety of religious people in a way that advances science.

Scientists routinely criticize the American public for their lack of appreciation for science relative to that of other developed nations, and I agree with them, but to better engage the broader public with science, scientists must be more introspective about their own relationship to religion, how they talk to the broader public about the connections between religion and science.

Regardless of what scientists personally believe about matters of faith, there's a surrounding social environment, right? Public debates about intelligent design, which you've addressed here, human cloning, public funding for science, science education. That simply can't be avoided.

Scientists tend to view the impact of religion on science education entirely through a lens of conflict or deficit, often blaming Americans' poor understanding of science on religion, arguing in particular that fundamentalist forms of Christianity inhibit science learning.

There's some evidence for these accusations. About 40 percent of Americans believe that creationist accounts of earth origin should be taught in public schools instead of evolution and another 20 percent think that some form of creation should be taught alongside evolution.

In comparison, nearly all of the scientists I surveyed think that evolution is the best explanation we have for the development of life on earth. As debates about teaching intelligent design in public school classrooms continue to rage, outspoken scientists have lashed out, perhaps angered by what they see as an outright attack on evolution.

But I quote political scientist Sanford Lakoff who says that much more needs to be done by scientists to overcome public indifference or outright hostility to science. It's clear that scientists at elite universities do shoulder the responsibility of translating science to the broader American public. They've signed up to be educators. But this public includes a great many religious people.

Beyond their own personal attitudes towards religion, scientists in my research revealed that they know little about how their own colleagues came to their views on religion and much less about what drives the typical American worshiper. Scientists without faith, I think, would get better information to think through how to engage the believing public and their own religious scientists about matters of faith and science. Without this knowledge to serve as a bridge, boundaries can't be crossed. The benefits of common dialogue are wasted, and potential allies, I think, for science remain virtually untapped within a religious American public.

**MR. CROMARTIE:** Thank you. Well, Barbara is the Religion and Culture Correspondent for NPR, and she has written a *New York Times* best selling book called *Fingerprints of God: The Search for the Science of Spirituality*.

**BARBARA BRADLEY HAGERTY:** Instead of thinking about how scientists view religion, I want to talk today about how religious believers might view science — or what they need to know about science, and specifically, the challenges that science presents to core religious beliefs, core religious doctrines.

I want to focus on three. First, science raises questions about whether one religion has an exclusive claim to truth. Second, science is challenging whether believers can say that certain behaviors are sinful and contrary to God's will. And I want to talk specifically about homosexuality. And third, science is disputing this notion of free will. And if we don't have free will, then what happens to sin, which is basic to religious doctrine?

I personally think we're in the middle of a theological revolution. I mean, humans have closely tied their moral beliefs to religion for thousands of years, and it's really only been in the last few decades that science has begun to tease those beliefs away from religion, away from Scripture, away from what religious believers consider to be God's commands. And I think that chipping away at what many people think is the bedrock of morality has real implications, especially here in the United States, where you see that how you read the Bible often drives the culture wars or can tip the electoral balance. So I think these challenges by science to religion are really no small thing, and I think there's a big question about what's going to fill the void.

I began thinking about religion's exclusive claim to truth when I was researching my book on the science of spirituality, and I talked to a lot of people who had had spontaneous mystical experiences who told me that they had suddenly and without warning touched another dimension of reality and it had transformed them as a result.

And dozens of people told me their stories, and what was interesting was that their descriptions of this encounter with another reality were very similar. Their descriptions of this "Other" that they encountered — and they usually didn't use the word "God" — were uncannily similar. They described things like: a definite but gentle presence drawing them to it; an overwhelming light; a nonverbal voice encouraging them and telling them that all would be well; a sense of having no boundaries, that they were connected to all things; that this was an eternal moment. Interestingly, people who had near-death experiences also described the very same phenomenon.

But here's the rub. In general there was no religion associated with this "Other." I interviewed Catholics and Protestants and Jews and Sufis and Buddhists and people who said they were religious, spiritual but not religious, and after those experiences that they had, they might still go to church. They still might go to synagogue. They might go to the

mosque or whatever, but no one claimed that his or her God was the only authentic God. They all said they had shelved that notion.

It was as if they had witnessed God from different angles, during that transcendent experience, and they came to conclude as a result of that this “Other” was too big for a particular religion, and what religion was, was an attempt to understand the spiritual experience. But a Jew or a Buddhist was not going to deny the reality and the authenticity of the Christian experience, and vice versa. I found this kind of uber-tolerance after these people had dramatic spiritual experiences.

Later, I encountered this same idea in science — that is, that no religion has an exclusive claim to truth — when I was talking to scientists about the neurology of spirituality or what happens to the brains of people when they are having an ecstatic moment, moments which they consider a union with the divine. Several scientists are looking at this, including Richard Davidson at the University of Wisconsin, and Andrew Newberg at the University of Pennsylvania. It’s a new area of science called neurotheology.

Newberg has been studying the brains of very religious or spiritual people for several years. I call these people “spiritual virtuosos” because they spend hours every day in prayer or meditation. These are like the Olympians of prayer and meditation. He studied Buddhist monks. He studied Carmelite nuns. He studied Sikhs. He studied serious practitioners of a few other religions, and here’s what he does. He asks these people to meditate or pray. You meditate (in the case of monks) and pray (in the case of nuns) or chant (in the case of Sikhs), and after a few moments when they’re in their zone, he injects a dye that shows the blood flow in their brains. They’re hooked to an IV, and he injects a dye, and the dye goes into their brains, and a few minutes later he puts them in a SPECT scan which then takes a picture of their brain essentially in that ecstatic moment. It’s like a freeze shot: this is what a nun’s brain looks like when she’s communing with God.

Certain parts of the brain light up and certain parts of the brain go dark in this moment, and what Newberg found was that the same parts of the brain lit up or went dark in all the subjects. It didn’t matter if you were a Catholic or a Buddhist or a Sikh. The frontal lobes — the executive part of the brain that has focused attention — that part of the brain lit up because the people were focusing their attention on the prayer or the meditation at hand.

Now, another part of the brain, the parietal lobe, went dark. The parietal lobe is a part of the brain that orients you in time and space, and so when this part of the brain goes quiescent, the nuns and the monks and the Sikhs felt their boundaries drop. They felt — this is what they told me — they felt at one with the universe or God, depending on your particular doctrine. They felt timelessness and spacelessness. As one monk put it, it's as if the present moment expands to fill all eternity. It's as if I was living in the eternal now.

Now, what's interesting is that what the brain is saying is exactly what they're feeling. It's not surprising, but it's kind of interesting. Not only are they feeling the same things and the brain is kind of doing the same stuff, but the same physiological process happens even though these people hold very different doctrines. It's as if the nuns use MapQuest and the Monks use Google Maps and the Sikhs use Yahoo, and they all go to the same place using the same routes. They have the same sense of transcendence using the same neurological routes. In other words, from the point of view of the brain, spiritual experience is spiritual experience. Doctrine doesn't matter.

I'm not suggesting that people throw out their faith simply because of some brain scans. But I do think that the basis for religion is spiritual experience, an encounter with the transcendent, whether it be Moses and the burning bush or Jesus or Paul on the road to Damascus or Mohammed or Joseph Smith or Mary Baker Eddy. Religions begin with spiritual experience, and the people who tend to keep going with religion are those who have spiritual experiences. And now the studies suggest at least neurologically that spiritual experiences are really similar — and so perhaps what science is saying is that the distinctions between religion are more artificial than true believers want to admit.

The next thing I want to look at is how science treats behavior proscribed by the Bible and specifically homosexuality. This is obviously a major issue for a large segment of the population who read the Bible literally, such as evangelical Christians and black Protestants, and this behavior has sparked a huge debate in California and churches like the Episcopal Church have split up over it.

But for the most part it's not because people dislike gays. Rather, conservative believers see this issue as an assault on the moral authority of the Bible, and (to use another metaphor) if you pull one thread, the whole sweater unravels. That's one of their major problems with homosexuality.

Interestingly, young people, even young evangelicals couldn't care less about this issue. Fifty two percent of young evangelicals support gay marriage. Now, that's compared to 22 percent of older evangelicals who support gay marriage. So there is a generational divide, and I think it derives from experience. How many of our grandparents knew openly gay individuals or had friends who were gay, and yet kids who are in college probably have roommates or good friends who are gay. What's happening is that these young people are discarding the half dozen passages in the Old and New Testament that condemn homosexuality because their experience is at variance with Scripture.

Well, now science is presenting the same sort of challenges — not sociological but neurological challenges to Scripture. What happens if being gay is not a choice but it's a wiring issue? What if it's not an aberration, but kind of a fairly common tendency? After all, you see homosexual behavior in every society in the world — and not just in human society. You see it in primates. You see it in lions. You see it in deer, in Rocky Mountain sheep.

Enter neuroscience. The studies are very, very young, but one of the most intriguing studies that I saw was conducted a couple of years ago by scientists at the Karolinska Institute in Stockholm, which is the institute that is most closely associated with the Nobel Prizes. What researchers there did is they took brain scans of 90 volunteers — 25 heterosexuals and 20 homosexuals of each gender. Boiled down to the essence, they found that the brains of straight women looked like the brains of gay men, and the brains of straight men looked like the brains of lesbians.

Here's what they did. In terms of brain structure, they looked at what a brain looks like, how it's shaped. Lesbians and straight men had asymmetric brains with the right hemisphere slightly larger than the left. Gay men and straight women meanwhile had symmetrical brains.

The scientists then looked at how the brains worked when processing information using PET scans. They watched the blood flow, and specifically, how the amygdala, which plays a key role in emotional reactions, was connected to other parts of the brain. And once again, when looking at blood flow, the patterns in gay men matched those of straight women. The signals from the amygdala ran straight into the regions of the brain that mediate mood and anxiety.

In lesbians and straight men meanwhile, the amygdala fed their signals into the areas of the brain that trigger fight or flight, responses to fear. In other words, the researchers wrote, faced with an emotional situation, gay men and straight women were more likely to internalize and become depressed. By contrast, for straight men and lesbians, the parts of the brain that say, "Hey get up. Do something. Fight or flee!" — those parts lit up.

Obviously, this is preliminary research. There's a lot more to be done, but I do think that this is raising the question: what if you're gay from birth? What if your brain is different? Are you destined for hell? Should people be condemned for their wiring or their genetic predisposition?

And what are evangelicals and black Protestants to do with these findings? Of course, some would argue that your genetics or brain structure is not your destiny. Just as a married person can resist adultery or an alcoholic can resist a drink, so people can resist acting on their sexual orientation — although of course a lot of people would say, "I'm this way, so why should I resist that?"

But what I do want to say is I think science is going to continue to chip away at this notion that homosexuality is a sin and that Scripture, which is God's word to many people, should be read with a modern eye just as we no longer consider stoning our children when they disobey us.

The final thing I want to talk about is I actually think one of the most interesting and overarching challenges to religion, and that is the issue of free will. Do we actually make choices? Do we control our destiny?

And if we don't have free will, then we can't sin. Why? Because sin is deliberately choosing to disobey God. I mean, think about Adam and that apple, about going against the moral order. Sin is central to Christianity, to Judaism, to Islam. Take away sin, and you take away the religious narrative, and that's particularly true for Christians, I think. The entirety of the Bible is a journey to undo that initial sin in the Garden of Eden or, for more sophisticated believers, one's tendency towards selfishness and sin.

The whole story of the Bible is about making it up to God for our sin through animal sacrifices or other sacrifices in the Old Testament, and finally throwing up your hands and

saying, "You know, we're just sinners in need of a Savior. We're too sin stained to redeem ourselves. So God sent His Son to sacrifice himself and wash us clean with his blood." Sin is central to Judeo-Christianity, but what if we don't make choices at all? What if our genes and our brains and our personal experience steer us in certain directions such that we have no free will?

What if Francis Crick was right? Crick, as you know, co-discovered the structure of DNA, and he captured the sentiment of a lot of elite scientists when he wrote this. "You, your joys and your sorrows, your memories and your ambitions, your sense of personal identity and your free will are, in fact, no more than the behavior of a vast assembly of nerve cells and their associated molecules."

Okay. To me that just feels wrong. I don't know about you, but I think I make choices every day. I don't think I was predestined to marry Devin Hagerty. I don't think that I was predestined to select chicken salad for my box lunch rather than turkey on rye. How can my brain and my experience possibly make choices for me?

And yet many scientists, many, many scientists have concluded that free will is an illusion. They conclude this from a test, designed by a neuroscientist named Benjamin Libet. Libet took a group of volunteers and wired them up with electrodes on their scalps and their wrists. The scalp electrodes recorded the brain signal that precedes any voluntary action. It's called a readiness potential. And the wrist electrodes showed when the muscles were actually moving. So you get intent and movement. And then he asked these subjects to stare at a clock. Stare at a clock and flick their wrists whenever they felt like it. And they were supposed to report when it was that they were first aware of the intention to move their hand.

What Libet and others found was that the brain was getting ready to move the hand *before* the person was conscious that he wanted to move their hand. What they concluded action preceded the conscious intention to act by a third of a second.

Now, look. I've looked for other studies that decimate free will. This is it. To me, it seems like a pretty thin reed to hang all of free will on, but this is it. And a lot of people accept this. I have a friend who was a serious believer at *New Scientist* magazine, and he did this test, and now he no longer believes in free will. So, this is the test that many scientists,



neuroscientists believe proves that we only *think* we make choices, but that, in fact, those choices are predetermined.

Now, you can dismiss this as extreme reductionism. And I think we need a little bit more evidence that we conclude don't have free will. Before you do dismiss it, let me tell you how this is actually seeping into real life and into the courtroom.

I'll just end with these two stories. This summer I did a series on the criminal brain — and forgive me if anyone has heard this series. It was a series really about the emerging argument that “my brain made me do it.”

In one of the pieces, I looked at the brain mechanisms of psychopathy, and I flew out to New Mexico where a neuroscientist named Kent Kiel is doing some really fascinating research on psychopaths. He's kind of a wunderkind, and the way the University of New Mexico lured him out there was to give him a mobile brain scanner, which he drives from maximum security prison to maximum security prison, and he scans inmates' brains.

The inmates love it because they're so happy to have a break in the boredom, and so he's now scanned about 1,100 brains of maximum security prisoners. Interestingly, only about 20 percent of violent criminals meet the criteria for being a psychopath. So he's scanned normal brains. He's scanned the brains of violent criminals who are not psychopaths, and then he's scanned psychopaths' brains.

And he's concluded that psychopaths process information differently from other people. In one kind of study that he showed me, he slides the prisoner into a brain scan and then flashes a few hundred photographs in front of him. He can see the photographs while he's lying in there. There are three types of pictures. For example, take the subject of *fire*. One photography is neutral — a few kids standing around a Bunsen burner. Another is violent, but morally ambiguous. It could be a car on fire, but you don't know why. And a third is morally objectionable — three KKK members lighting a cross on fire.

Kiel then watches to see what the brains do as the subjects process his photos, and he found a key neurological difference between you and me and the maximum security prisoners who aren't psychopaths, on the one hand, and then the psychopaths, on the other. When a normal person sees a morally objectionable photo, part of the limbic

system lights up. It’s what Kiel calls the “emotional circuit” involving the orbital cortex above the eyes and the amygdala deep in the brain.

But when psychopaths see the KKK picture, their emotional circuit does not engage in the same way. The early evidence is that they process this morally objectionable picture in the language area of the brain. So they know that burning a cross or doing something like that is wrong, but they don’t *feel* it’s wrong. It’s not going through the emotional circuit. It’s going through the language circuit. They don’t feel it’s wrong even though they know it is.

Kiel says the emotional circuit may be what stops a normal person from breaking into that house or killing that little girl. But psychopaths the brakes don’t work for them, and he and others believe that psychopaths are a little like people with very low IQs who aren’t fully responsible for their actions.

The courts treat people with really low IQs differently. For example, they can’t get the death penalty, and so now Kiel and others involved in this emerging science called “neurolaw” believe that psychopaths shouldn’t be given the death penalty either — because they couldn’t help it, that they were born with brains this way. They’re not fully culpable, which doesn’t mean they shouldn’t be in prison, but just that they shouldn’t get the maximum punishment.

And what’s interesting is that Kiel made this argument in a murder trial. I mean, this stuff is actually coming to the courtroom. He testified in the murder trial of Brian Dugan. Dugan is a serial killer who had been convicted already for killing two girls and had a life sentence for those murders, but now he had confessed to killing a third girl, and he faced the death penalty. And what Kiel was saying is that you should not give this man the death penalty. It was a “my brain made me do it” defense. He wasn’t fully culpable.

The jury didn’t buy the “my brain made me do it” defense, but it’s significant that the evidence was allowed in court, and legal philosophers at places like Princeton and Harvard argue that neurology is going to up-end our legal system. Our legal system is based on the notion that a person is guilty if he knew what he did was wrong at the time of the crime. Legal philosophers say this neurological evidence is going to revolutionize not only our legal system, but our whole notion of crime and punishment, morality and culpability.

And in fact, another story shows how this defense is actually beginning to get traction. A few years ago, there was a guy named Bradley Waldrop who basically went ballistic one night. After telling his kids, "You'd better tell your mother goodbye," Waldrop proceeded to shoot his wife's friend to death and then go after his wife with a machete and cut off a few of her fingers.

And during the trial there was a forensic scientist from Vanderbilt who testified that Waldrop had a variation of something called the MAOA gene. This variation of the gene has been dubbed "the warrior gene" because it has been associated with violent and explosive behavior. The Vanderbilt scientist told the jury that while the warrior gene didn't make Waldrop kill one person and try to kill another, it created a *risk factor*. In the end the jury refused to give Waldrop the death penalty, which prosecutors had been seeking, and instead found him guilty of voluntary manslaughter.

I went down to Tennessee and I talked to some of the jurors, and they told me that the evidence about the warrior gene had had a major impact, and that Waldrop wasn't fully responsible for his actions. So it's clear that we're all predisposed to certain types of behaviors and proclivities. You know, some people have OCD. It's a brain wiring problem and it ruins lives, but no one would say it's sinful. But what if you're predisposed to fly off the handle, to be violent, to become addicted to drugs or alcohol, to manipulate and lie and cheat? Are these behaviors immoral in religious language? Are they sinful if a person's brains and genes push them to do it?

And I would suspect that most of us would say there's a difference — people who behave badly or immorally have a choice about whether to cheat or kill, for example. The sin is a conscious decision to make the wrong choice. But I actually think that science is turning black and white into gray here. After all, a few years ago everyone believed that alcoholism was nothing more than weak and sinful behavior, right? Now, we know that an addict's brain simply functions differently, and that alcoholism runs in families. So there is a genetic component as well. It has changed the way we think about alcoholism.

So what does that mean for religion? Well, is this is the end of morality, of sin? I don't think so. I think that more people believe in free will and our ability to choose well than don't believe in that stuff, and personally I think scientists have to come up with a slightly

better and more compelling evidence that free will has gone by the wayside rather than hooking you up to some electrodes and seeing when you flick a wrist.

But I do think that religions should probably take note of these developments and come up with perhaps a more nuanced view of sin and morality than just taking a strict reading of scripture.

**DR. ECKLUND:** So Barbara raises really good points and ones which some of the scientists who have thought most about these issues that I interviewed actually raised. One is we need to have more discussion in the academy about the nature of the human person, and that's a consequence of disciplines being in their silos, right? So there's a lot of lip service right now in the academy to interdisciplinary work, but very few models of how we do it.

Second, we need to have more conversations about the limits of science. Is science limitless, and what are the consequences for our society if we treat science as limitless? Are there certain types of knowledge?

I haven't seen these studies, and I'm probably not the right person to accurately judge them, but as you presented them, they seem compelling. But what kinds of frameworks do we use for interpreting what we do with that kind of information, what we do with those studies?

Is science so self-contained that it can tell us what to do and how we ought to answer those questions of "ought?" How we ought to live, given the results. It certainly changes the game. So I think the question is not, you know, is there morality, but is morality what we thought it was, right? So there are those kinds of questions: can science tell us what to do with this information? This brings into question choices along a variety of dimensions.

But all kinds of religious and spiritual experience and traditions make claims about free will and its implications, and how we understand free will within constraints is another issue we need to have more discussion about.

And fourth, if we care about science education and science ethics, I would still argue that scientists need to be in conversation with smart religious people. So just because it

doesn't matter sort of what those traditions are, the reality from all the very best social science research is that the American public does take religion seriously, is a religious public, does use religion to answer these kinds of things. So whether or not you are personally religious, as a good scholar you need to be in conversation with those traditions in order to translate your scholarship to a broader public.

And then we're at a point in our society and the very best scientists will say this; we're at a point in our society where the pace of scientific discovery is so great that our religious traditions and the best theological thinking and the best philosophers of ethics who have even a secular ethics as well have not caught up in thinking to the rapid proliferation of scientific discovery in the end.

**LAUREN GREEN, Fox News:** When you talk about the MAOA gene, the warrior gene, how do we know how genes interact then with the environment? Just because a gene is present, does it necessarily mean that you are destined to behave in a certain way, in a certain kind of unsociable kind of way?

**ROSS DOUTHAT, *The New York Times*:** It seems like there's a lot of sort of "is/ought" conflation going on there where scientists say, "Well, we're only studying the natural world, but by the way, having studied the natural world, we figured out how people should behave." I'd just like you to talk a little bit about that possibility.

**DR. ECKLUND:** So question 1, which I think is how do we know that the effect of genes interacting with the environment. So the scientists that I have talked to would say we don't. The religious scientist would say, you know, that's where a robust morality comes in, and there are other kinds of knowledges that are important to figure out these questions of "ought."

The nonreligious scientists that I've interviewed would say it's only a matter of time before science fully explains how genes interact with the environment and our models become more complicated to completely explain these questions. That's a minority of scientists.

So we also need to ask not just how scientists view religion, but how scientists view science, right? Do they see science as a totalizing world view or do they see science as having limits, and there is a range among even the most elite scientists of how science is viewed as well.

**MS. HAGERTY:** The overarching comment I have is to quote a scientist who said to me, “You know, 96 percent of the universe is dark matter. We don’t have a clue,” and for us to say that we have definitive answers on any of this stuff is absolutely ridiculous, especially when it comes to ideas about morality and spirituality. I mean, when did we begin really trying to understand the brain? It’s only been few decades since we could actually look into the brain.

So all of this is really, really new science, and what I was trying to do today is just say, this is a coming storm. This is what’s being put out there, and believers who often don’t engage with scientists might want to be apprised of some of these arguments.

Like your question about the MAOA gene, Lauren. When it comes to things like is the MAOA gene, your destiny and how does it how does it interact? You know, I interviewed one neuroscientist who studied psychopaths — not Kent Kiehl — and he actually got a brain scan and did genetic testing of himself and his entire family, and he found that the way his brain responded to emotional things was just like a psychopath; he had the brain function of a psychopath. He also had the warrior gene, as well as a number of other genes that seemed to predispose him toward violence. But he wasn’t violent. He’s this nice guy.

Why is that? Well, some of the early research seems to suggest that people who become violent, who have kind of that brain or genetic predisposition, many of them have suffered violence as young children and experienced a lot of abuse. So it’s nature and nurture. It’s experience as well as genes.

Ross, one reason I think scientism getting a lot of play is that there are very loud neo-atheists right now who are talking about these things, and they’re shouting so loud it’s making it a big debate. But when you look at it from a kind of reductionist point of view, in many ways these scientists choose where to place the goal posts, right? They choose what you’re allowed to measure. So they would say, we can’t measure God. We can’t

acknowledge a spiritual dimension or a higher reason for morality because we can't measure God because by definition God is outside of the tools of science to measure. So they just discard God or a higher purpose and take them out of the equation, and so all they are measuring is physical stuff. And so you can see why this would lead to a materialistic view.

Right now there's a very robust emerging science of morality, the evolution of morality, and a lot of the scientists believe that morality doesn't require any sense of the holy or a sense that we were created in the image and likeness of God. They say that morality is just evolved and we don't need God. I have trouble with that. I think that there's a hierarchy of morality that religion answers better than science does. Theologians would say that comes from God. I'm agreeing the free will has been debated for a long time, and we're not nearly at the end of this debate.

**PETER BOYER, *The New Yorker*:** Barbara, I wonder if you might share with us what you found other scientists think about Francis Collins because he's such an outspoken, born again evangelical Christian.

**DR. ECKLUND:** I did these 275 interviews with a random sample of those who responded to the survey. So I'm very confident in the interview responses as well. And what I did is I and students coded the resulting 5,000 pages of transcribed materials systematically for people scientists mentioned. Francis Collins was mentioned the most often. Richard Dawkins was also a close second, and Richard Dawkins was pretty uniformly described in negative terms for his impact on issues of public science. You know, the common phrase was, "I'm also an atheist, but no friend of Richard Dawkins," because of his perceived impact on public science and particularly perpetuating the view that scientists are uniformly against religion. I mean, scientists are savvy, intelligent people, and they know that they're dependent on the public for funding. They're very concerned about science education, and so they don't want to do anything that's going to give the sort of public impression that they're uniformly against religion.

I started this study in 2005, which was the Dover trial. And so all the scientists initially wanted to talk about in the first year of the study was intelligent design and the negative feelings that they had towards evangelicals. So on the one hand, they're describing

evangelicals in very negative terms, but then describe Francis Collins in very positive terms, which was interesting, and actually called him a boundary pioneer, someone who's able to cross the boundaries between science and religion, while maintaining the integrity of both his scientific commitments and in their perception his faith commitments as well.

So they saw him in pretty uniformly very positive terms, and they were actually looking for someone, you know, who could help them navigate that for the sake of public science. Now, they weren't like looking to Collins to figure out more about religion, but they were like here's someone who could help us have a sort of intelligent voice among religious people.

**DAN HARRIS, ABC News:** Elaine, I don't remember your top line number about people's feelings about religion, but I think you included Unitarian Church attendance in there, and I wonder if that doesn't skew the numbers somewhat.

**DR. ECKLUND:** But a very small proportion are Unitarians. So I can't remember right now, but actually putting together, you know, outside of Jews, Catholics, and Protestants only, you know, less than I think like three percent or like all the other religious categories together. So there's a pretty small proportion of Unitarians.

**MR. HARRIS:** And on this professed admiration for or professed aversion to Dawkins, you know, I think the atheist pushback on what you were saying would be it's fear based.

**DR. ECKLUND:** Un-huh.

**MR. HARRIS:** Scientists worry. I mean, I've heard Sam Harris say this, that scientists worry. Sam is obviously a scientist himself. Scientists are very sensitive to public perception because that's where they get their money, as you acknowledge.

**DR. ECKLUND:** Yeah, funding and education. I mean, this is so dominant.

**MR. HARRIS:** So on the merits they may agree with everything Dawkins says. It's just they don't like that he's saying it and the way in which he's saying it. So I actually think that's a key point that may or may not be fleshed out in your research.

**DR. ECKLUND:** It is, I think, assessed pretty strongly in the book if you read it thoroughly. So 34 percent of this population, and these are academic scientists, so then we need to ask questions about, you know, would scientists be different in other kinds of corners, are



committed atheists, and I think, you know, I totally stand by that, but then there is complexity among the atheists.

So I think it's a different kind of atheist to be totally sold out to a modernist way of thinking, right? And then another kind of atheist to say, "I see myself as a spiritual person, you know, having, you know, developed a sort of spiritual world view." I think those are different in kind.

And so one in five atheists see themselves as spiritual and have a codified way of thinking about that, but a big proportion of this population, I wouldn't want to, you know, come away having anyone believe that I'm trying to obscure that. A big proportion of this population are atheist. Another big proportion is agnostic, so not knowing whether or not they believe in God.

I didn't get a chance to say this in my talk, but Dan's question maybe is a good opening. Agnostics are also considerably more complex than we might think, with a good proportion of them being part of religious communities.

So my suspicion is that agnosticism means something different in the scientific community than it does in the general population, you know, because scientists aren't really sure. You know, you're going to press a scientist to the wall, and they're not going to say, "I'm 100 percent certain" about anything. So saying, you know, I'm an absolute theist sort of means something different, and so there is a variety.

I mean, there's agnostics that are almost like atheists, right, you know, just say, well, the most defensible intellectual position is I'm not sure whether or not there's a God. That's the most intellectually defensible position.

And then there are ones where I'm not totally sure there's a God, but I'm mostly sure, right? Those are different, and that's the beauty of having a mixed method data collection where you both ask people to check off boxes where you constrain them, and you follow up by, you know, collecting rich interview data.

That's a good question.

**MR. HARRIS:** When you say things like selling out to a modernist version, does that expose some of your bias?

**DR. ECKLUND:** I don't think so. I don't think I said “selling out.”

**MR. HARRIS:** Yeah, you did.

**DR. ECKLUND:** Other scientists see them as saying that. I don't really have any — you know, I really wanted to figure out what they believed, and I think that this study, I mean, if you just want to ask me how this study changed me, I was actually surprised at the presence of religion.

But I want to be really clear. It's a different kind of religion, I think, than in the general public. So if you, you know, look at how others have utilized these results, I think you're right in bringing up issues of bias that others have used these results to sort of say, “Oh, my gosh, scientists are so religious,” and I think it's a very different kind of religiosity than the general public, and in a research perspective that needs to be strongly underscored.

**MR. HARRIS:** Barbara, [neuroscientist] Sam Harris says we don't know where thought comes from and had said to me once in a private conversation that he doesn't feel comfortable taking credit for anything he's done because he doesn't know where thought comes from. And I wonder what your thoughts are about that and what that says about free will.

**MS. HAGERTY:** I think that line highlights the most important debate in neuroscience today, which is the mind-brain question. A lot of neuroscientists think that our minds, our thoughts, are nothing more than brain activity. It's all brain function, and all our thoughts are nothing more than the firing of cells.

And yet there are a large number of very prominent scientists who believe that that question hasn't been answered yet. Does consciousness or mind emerge from the brain? Is it a separate property? Does it have separate properties?

And no one knows the answer. It's a pretty new area of study right now. One [piece of evidence] involves consciousness — the mind brain question. Is it possible that our consciousness can operate when the brain is not functioning well, or not functioning at all? I did some research on this. And if it's true that your consciousness can operate when your brain is off-line, does that suggest that maybe we're not just a bunch of molecules?

**KIRSTEN POWERS, *The Daily Beast*:** Barb, when you were talking about people's brains, and you're sort of born this way and this is the way your brain is and what does it mean, what you think about the plasticity of the brain and how it changes, and is it possible maybe they're born with a, quote, unquote, normal brain and then something happens that changes it which then would suggest that it, of course, could change back. So that's one thing I'm interested in.

The other thing, as someone who is a believer and who has seen miraculous things happen through prayer, you know, I think things that are actually supported through studies that have been done, you know, meditation can actually change your brain, things like that. The belief of a lot of Christians at is, sure, maybe somebody is a psychopath, but someone could have cancer and God can cure that, and somebody God could cure that they're a psycho.

I mean, you can pray about things and change them, and I think that's why a lot of Christians have such tension with science, because you're telling them it just is this way and there's nothing that can be done, which goes completely contrary to their day-to-day experiences.

**MS. HAGERTY:** Neuroplasticity, it's really important. It's really true. The brain changes. The brain changes with thought and the brain changes with experience. And one reason religious practices have worked through the years, chanting, praying, meditating, is because it's like going to the gym. Richard Davidson at the University of Wisconsin gave me this analogy. It's like going to the gym every day and sculpting your brain the way you'd sculpt your muscles.

So you can change your brain, and in fact, Richard Davidson has found in a study that he did that if people who have never meditated before meditate for 45 minutes a day over two months, he found their brain functions changed as measured by MRIs and EEGs.

Not only that — their immune system was boosted. So what is clear is that any kind of practice and any kind of trauma, especially ones that last more than 30 minutes, for example, will absolutely change your brain.

That's the basis of cognitive therapy in many ways. Jeffrey Schwartz at UCLA did some really interesting studies. It has been going on for quite a while. Jeff Schwartz is a neuroscientist who specializes in OCD. People with OCD seem to have what he calls a "worry circuit." Most of us don't routinely trigger this "worry circuit." For people with OCD, it's like a bad loop, with one part of the brain triggering another. So what Jeff Schwartz has done is put his patient into a brain scanner and takes the FMRI. And he shows the patient the brain scan and says, "Okay. What this is is a faulty circuit. This is faulty wiring. The reality is you do not need to wash your hands. This is a faulty circuit in your brain, and every time you feel that you need to wash your hands, I want you to think, 'This is a faulty circuit.' This has nothing to do with reality and with cleanliness so to speak, that kind of a reality."

And within a couple of months, and sometimes sooner, the brain circuit is changed. It's broken. And these people get over OCD. It's huge. Clearly what he is showing is that *thought*, in fact, *changes the brain*, changes brain patterns. Now, if that isn't neuroplasticity, I don't know what is.

So clearly, people can rewire their brains. The issue of prayer is really problematic in terms of science because the studies are so mixed, and the headline on the most recent and most rigorous prayer studies seem to show that my prayers do *not* affect your body. However, what has become pretty standard science, it's now called psychoneuroimmunology, is that my thoughts affect my body.

**E.J. DIONNE, *The Washington Post*:** My son is involved in something called Public Forum Debate, and the debate topic that he just debated in New York this last weekend was something like public forums should not engage in controversial religious questions. One of the arguments they made is that both scientists and religious people operate on a certain level of faith in an approach to the world. They ran into some resistance from some judges on this argument. I'd love to know what would you say to my son's argument in terms of what you know about what scientists think. What was right about it? What was wrong about it?

**DR. ECKLUND:** So you want to know if I think scientists are operating on a set of faith assumptions.

**MR. DIONNE:** Yes, and would they think that they are operating on a set of faith assumptions.

**DR. ECKLUND:** I think that scientists have a range of ways of viewing science, and this is somewhat correlated with their religiosity. So the scientists who are avid atheists of the type that believe that science is a totalizing world view that can explain all of reality are tending to believe just that, that they don't have any kind of faith assumptions, that they only believe what is completely testable. So they see themselves as complete modernists and are comfortable with that.

But science as sort of totalizing, you know, sold out to modernity I think is getting a bit smaller. There's a more reflective science going on. There's a group of scientists who are now becoming more vocal within their community, especially with people who are very concerned about teaching, who are very concerned about issues of public science, saying, gosh, we need to think about what kinds of answers science can provide, what kinds of issues science is not equipped to deal with. Stephen J. Gould's ideas about non-overlapping magisterium, that there's a religious realm and a scientific realm, and that the two don't overlap, have become fairly popular.

So you have to ask then what do you believe about science and what do you believe about religion. So do you believe that they are non-overlapping because you are a religious person who believes that science is dangerous, so it should stay out of religion? So what does your circle look like?

Or are you a scientist who thinks that, you know, science is gigantic and friendly and most of the world and religion is a little teeny, teeny part and it has fangs and, you know, needs to be kept out of science because it's so dangerous?

**MS. HAGERTY:** On this issue of non-overlapping magisteria, I actually think there's something to it in a way because I think science and religion answer different questions, and you know the science is more the how and the religion is more the why. And I think

it is possible to tease those apart, and one of the frustrations of both scientists and believers is that the ground rules are such that you can't study God or the transcendent. We can study the effects of religion, but we can't study the supernatural. We don't know how to do it.

And so it's almost an argument for me that's circular that doesn't have an answer. Scientists will say we can't study God and, therefore, we can't find evidence of God. And religious people would say everything that happens is from the mind of God, and so they step outside of science to find God.

**DR. ECKLUND:** And we're talking about these issues in philosophic terms and sort of abstract terms, right? And then we have to come down a level and talk about scientists as people and science as an institution, which necessarily means to deal with religious people and, right, you can't sort of keep it. You have this sort of magical idea of non-overlapping magisteria, but that doesn't deal with, you know, how do scientists deal with religious students in their classrooms who bring up these issues right in front of them.

Do they say, "well, you know, I believe in the non-overlapping, so don't talk about that." Or maybe that's a fine response. Maybe that's a kind of strategy.

**CARL CANNON, PoliticsDaily.com:** This predisposition to being a psychopath based on brain waves...that strikes me as, well, not junk science, but a junk application of science. Those people are on death row. I mean, wouldn't you have to know what their brain waves look like as children?

**MS. HAGERTY:** I think one reason we haven't seen that much neurology come into the courtroom is partly because judges are afraid — a lot of people are afraid of how jurors interpret it. Are they sophisticated enough to say sure, this is brain activity, but there are a lot of people out there with perhaps the same brain function who don't who are not violent?

And they're worried that when you see these pretty pictures of the brain with red and green and blue, that jurors will be misled that committing the crime was an inevitability. So some people do think that these defenses are the Twinkie defense. It's just a neurological, you know. Instead of sugar levels, we're talking about brain activity.

**MR. CANNON:** Well, what about those brain scans? Wouldn't you have to know what they looked like when they were young?

**MS. HAGERTY:** And I've asked scientists about this. I've asked, couldn't the brain you do now while he's on death row be different from the one when he was young, or when he committed the crime? If it's a different brain scan, how can you use it in his defense? And what at least some of them say is, well brains really don't change that much. Well, I don't believe that. Neuroplasticity suggests that brains do change and being on death row will change it.

One other thing there I'll say is that psychopathy is not determined by brain scans. It's really determined by a history of your behavior and a lot of psychological testing. What psychiatrists have come to believe who have studied this is that you can tell if someone has psychopathic tendencies by age four or five. So what do you do with those kids? Do you leave them to their fate? What if these are kids who have been raised in abusive homes, have abuse in their backgrounds? Do you say, "Oh, they're even higher risk. We put them away"? What do you do? So I guess what I'm saying is that all of this is really new science, which has, I think, a potentially very large societal impact, and we have to be extremely careful both in the law and in treating younger people with these tendencies. We have to be really careful about how we treat them, especially given the fact that brains change both for the better and for the worse.

**ELIZABETH DIAS, *Time*:** Elaine, I'm curious about the play-out in actual scientific work and if these perceptions of discrimination are actually impacting the kinds of studies that people feel they can publish.

**DR. ECKLUND:** I never asked religious scientists, "So do you do the same type of science as a non-religious scientist," but most religious scientists wanted me to know that they did the same type of science, which is interesting sort of social science finding when a group of people bring up something when you didn't. So they feel a little bit defensive about that.

Sociologists of science will tell you that scientists are people, and they're influenced by things people are generally influenced by, like power structures and things like that. So I

guess you could hypothetically conjure up a situation where, you know, these sorts of lack of conversations lead to not hiring of certain kinds of people. I didn't find evidence for that necessarily, but you can imagine and does that have a negative impact on science. I didn't find any evidence for religious scientists doing something different with the actual nature of their scientific work.

**MR. CROMARTIE:** Okay. We appreciate you coming, and we are going to do it again. So thank you.

♦ END ♦

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