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*The Faith of Biology and the Biology of Faith*

Robert Pollack

*Buddhism and Science: Breaking New Ground*

B. Alan Wallace, ed.

*Environmental Ethics, Ecological Theory, and Natural Selection: Suffering and Responsibility*

Lisa Sideris

*William James and a Science of Religions: Reexperiencing The Varieties of Religious Experience*

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*Spirit, Mind, and Brain: A Psychoanalytic Examination of Spirituality and Religion*

Mortimer Ostow

*Contemplative Science: Where Buddhism and Neuroscience Converge*

B. Alan Wallace
Dr. Robert Pollack is professor of biological sciences, adjunct professor of religion, and lecturer in psychiatry at the Center for Psychoanalytic Training and Research; he is also director of the Earth Institute's Center for the Study of Science and Religion, all at Columbia University. Pollack graduated from Columbia College with a major in physics. He holds a Ph.D. in biology from Brandeis University and has been a research scientist at the Weizmann Institute and at Cold Spring Harbor Laboratory, an assistant professor of pathology at New York University Medical Center and an associate professor of microbiology at the State University of New York at Stony Brook. Pollack has also been a professor of biological sciences at

Philip Clayton interviewed Robert Pollack; Kevin Lucid edited the interview for publication.
Columbia since 1978 and was dean of Columbia College from 1982 to 1989. He received the Alexander Hamilton Medal from Columbia University and has held a Guggenheim Fellowship. Since 1997, he has been a member of the Century Association, a private club in New York City that was founded by William Cullen Bryant and named for its one hundred members. He was also president of the Hillel of Columbia University and Barnard College from 1998 to 2001.

Pollack is the author of more than one hundred research papers on the oncogenic phenotype of mammalian cells in culture. His 1994 book, *Sign of Life: The Language and Meaning of DNA*, received the Lionel Trilling Award. Pollack’s latest work, *The Faith of Biology and the Biology of Faith: Order, Meaning and Free Will in Modern Science*, was published by Columbia University Press in 2000. He is a Fellow of the American Association for the Advancement of Science and the World Economic Forum in Davos, Switzerland; a member of the American Psychoanalytical Association; a former director of Nutrition 21, Inc., a nutritional bioscience company; and a member of the scientific advisory board for Tapestry Pharmaceuticals, Inc., a pharmaceutical company that specializes in developing cancer treatments and therapies from “natural product sources.”

Robert Pollack is an intense discussion partner. He’s ready to go much deeper with a question or topic than one would expect, and his responses do not shy away from even the most controversial topics. Nor is the critical probing limited to people who are not present: the questioner can quickly find himself under question as well. Pollack is driven by uncompromising determination to say what is true and to know what is right—exactly the twofold position that he describes in the interview.

*In your career—from your early physics studies, through your work in cellular biology, and now on to your recent series of books—you seem to have moved*
from questions on a very small scale to questions of broader and broader significance. How would you characterize the growth of your career as a scientist?

I think at a very early age—way before college and probably sometime as a kid—I was made aware that something existed in the outside world that could be understood by quantitative measurement. That concept developed into something fruitful for me. As a scientist I scope out the possible quantitative ways to test ideas. So it has been in my work in physics, in looking at oncogenic viruses in developmental biology, and in writing books about science.

Someone once said, though, that life is lived forward and understood backward. What guided my career forward? I think early on in my undergraduate work at Columbia University, during a series of discoveries made with my fellow graduate student Arno Penzias, I saw and experienced the discontinuity between what science in fact offered me and what the content of that emotional experience of discovery told me. I came to this understanding emotionally as opposed to articulately, however.

I was drawn to science because I wanted to be part of that experience of discovery. I felt connected to it. I wanted to learn more about what it meant for me. I got a kick out reading about it, and I get a kick out of sharing and teaching the experience to students. I’m a good teacher of undergraduate biology and graduate biology because I make sure the students find that sense of discovery for themselves by reading original papers by the scientists who experienced the discoveries firsthand.

I also think I am entitled as an observant Jew to say what my observance teaches me about the boundaries of acceptable behavior within science, at least the science I know best. It teaches that certain behaviors in science are ethically better than other ones. These boundaries of respect and responsibility for someone else’s free will within scientific practice are more important than my ability to tell somebody what to do. Both qualities appear throughout my scientific work.

When I read your descriptions of how our world is mathematically expressible, they remind me more of the typical attitude and enthusiasm of a physicist. What brought you to doctoral work in biology?

Mine is a story that cannot happen today because of the privatization, commercialization, and professionalization of molecular biology.
At the time I received a B.A. from Columbia, I had a spotty academic record, but I knew that I was bright and that I talk and write well. But I knew I had no career. I took the GREs in physics, but the test did not go spectacularly well: I scored 97 percent or so—not enough to get a fellowship at Columbia. I took that as a sign that I shouldn’t do physics. So what should I do?

I read, and afterward, I found I should look into biology. I went to Brandeis to be interviewed in the physics department, and I found that they had a molecular biology program run by a biologist who was trained in physics. When I met with the professor at the physics department, he walked my application one floor down to the biology department and admitted me on an NIH [National Institutes of Health] fellowship as a biology graduate, along with enough money to get married.

[Laughs] No, that certainly wouldn’t happen today. But the professor at Brandeis recognized your potential?

Yes. As an undergraduate at Columbia in the late 1950s, I was at a place that had more Nobel laureates who were going to come out of that lab run by Isadore Rabi than any other physics department anywhere in the world. Eleven Nobel Prize winners came out of that lab. That’s off-the-scale different from the mean. But I can’t claim any great insight about why he recognized my potential over others’ beyond the luck of being surrounded by such terrific people at that time and taking it for granted that those high standards were what I should demand from my approach to science.

Those kinds of people at the lab saw that there were ways to approach biology through physics. They saw not biophysics, as such, but that physics principle of looking for the simplest possible system. The approach required stripping away all variables that you couldn’t control and matching the simplest building block with the minimal definition of being alive. That is what they would call biology. They didn’t postulate the wedding of chemistry to biology but the wedding of the physicist’s idea of a simple, elegant, quantitative model with biology. This imprint was what I took to Brandeis.

What did it mean, more precisely, to take this background in physics and apply it to molecular biology?
The real questions for me came when I removed the thought of the luck that happened at that particular age and with the cohorts I kept. I was led to find that the ancestry of these notions was in Mendel’s idea of genetics. When you read Mendel’s paper, which is nearly 150 years old, what jumps out at you is the abstraction of it—the complete absence of a biological entity to explain the behavior of the characters that we now call genes. He says at the end of his paper, I don’t understand how this can be, but this is what I see. To my mind Mendel was in the world of physics at that time. He was a statistician so he applied statistical principles to his counting. But the idea that you reduce a biological question to a quantitative one by stripping away the variations worked against the entire spirit of biology, even fifty or one hundred years ago. At those times biology was meant to understand the diversity of nature, not the variations.

You were already familiar with that discontinuity of Mendel’s emotion with his discoveries. So what you are saying is that molecular biology as we now know it could not yet flourish at that time, even given Mendel’s luck at his particular age. But the foundations of molecular biology were built on these successive discoveries.

Absolutely. Molecular biology was invented by physicists who became biologists. Max Delbrook is the father of molecular biology. But I think Irwin Schroedinger wrote the most prescient book there is in science called What Is Life? It describes what DNA must be on the general physical principles of what inheritance tells you it must be. You read that book and you say, “This is uncanny. This guy must have known where science was about to go.” It was another ten years before that book formed in the minds and in the approach of people like [James] Watson and [Francis] Crick. In the laboratory of a physics place—and, remember, crystallography is a physics place—Watson and Crick asked the right question: How can a structure of a molecule carry genetic information? I consider that to be the question of the century. It was answered by physicists applying the principles and tools of physics to a biological question. I’m in that school.

And Crick and Watson’s results were just being digested as you were completing your physics training and beginning Ph.D. work. What did the NIH grant allow you to do?
I studied something in phage genetics and went from there to study cancer as a disease, reducing it to a question of the behavior of a virus so small it has only four or five genes, and yet it has the capacity to convert a normal cell to a cancer cell. This was my first real science: a study of cancerous cells where I basically applied a piece of physics thinking onto biology through this medical research. The approach paid off. I really made a bump in the medical field.

What I did was to take tumors and grow them in culture. I’d take a single cell and I’d grow from that cell a clone of tumor cells, so that is as genetically homogeneous as you could get in the system of mammalian cells at that time. Then I’d let these cells reach a cell density in a dish that emulates tissue density. Normal cells should stop dividing under that tissue density. That’s what a normal tissue is. It’s a bunch of cells that are under growth regulation by density.

*That was a remarkable discovery, but what led you to discover this?*

I intuited that if you apply what is called, in bacterial genetics, negative selection and kill the dividing cells under that condition, any preexistent Darwinian random variants, which are more normal than the tumor clone should be, will survive the killing. I then selected revertant-phenotype, normal-behaving cells that still contained within them the viral genes responsible for the initial transformation. In doing this, I showed that the virus is working through modulation of cellular genes, and if you knock out one of those cellular genes, you get the normal phenotype back.

What did this mean? In medical terms I did something that I think is as important as anything I will ever do in science. I showed that, intrinsically, the growth of a tumor in a body is not an irreversible fate. What it represents is Darwinian selection for the worst kind of cell against the body’s defenses. If you rejigger the selection system so that the better kind of cell is the only kind to survive, the cells that vary in the direction of normality will survive. This means that what is present, always, is intrinsic, random variation. Today we know that once p53 deletion ups the frequency of surviving mutant cells, all kinds of variants will emerge that can survive any chemotherapy.

*Is this when your values started to figure in your science … when you saw that your approach improved medical understanding?*
I did not come to value the relation of the two from that instance; my values adapted to the situation and existed before that work. There was a moment, however, when I became quite conscious of how important my values became in my choices at work. In my field the way investment money came to us was changed by the Bayh-Dole Amendment. The amendment obliged the NIH to seek private funding [through exclusive licensing] for the discoveries made in NIH-funded laboratories. At the same time the Hughes Institute came in with separate money for top labs. So the notion of being a government servant and looking at nature in order to help people was diluted by money coming from these well-meaning funders and by the push for profit from the government. My values to act with autonomy and independence took hold as I saw this happening. I became opposed to institutionalization, corporatization, privatization, and working in big systems, but I had become obliged to play a game that was as fraught as Defense Department–supported physics. I got away from that game by becoming a biologist.

I remember at Columbia, there was a guy named Walter Faust, a graduate student in the same lab. Faust received a $50,000 grant from the Defense Department because his work was on what we now call lasers. At that time lasers were only just being discovered. His work involved developing a laser that worked in the infrared spectrum. The Defense Department wanted it so they could detect the tails of rockets being fired from overseas. Faust hired technicians and got his Ph.D. a few years after he started on that grant. When I saw this, I thought, “No harm to him but harm to the institution.” Columbia was now assisting the Defense Department to achieve its military ends.

I'm seeing two things here: an intellectual movement toward these more holistic questions from your early training in physics but also a certain growing skepticism about the politics of science, about science as an institution.

The intellectual movement you pegged exactly right. The political movement, socially and sociologically, was actually a movement around me, while I stayed still. I don't think I changed in terms of what I think science is about. I think that the science I first entered into changed to an institutionalized place where I didn't choose to go. I write that in my books over and over again.
There is something different in the Signs of Life book than the way you described your entry into biology. Can you describe what changed in your view?

These are tough questions for me because I am tempted in two opposite directions. I'm tempted on the one hand to tell a pretty story that makes sense of the stages of my career, but I'm also tempted to be honest about data—which is to say, I know none of these life decisions were rational at the moment they happened. All throughout my career I was like the roadrunner in the _Road Runner_ cartoon. I ran off the edge of the cliff, not just away from the wolves, but because I didn't look down, I just kept running.

I went from Charles Townes's laboratory, [where I was] working for Arno Penzias on the construction of instrumentation, which led to the discovery of the big-bang data point. I then entered a postdoc program at the NYU pathology department, where I was able to apply the principles of molecular biology to cancer, helping to bring cancer into the world of molecular biology with great fruitfulness.

Then I started work at Cold Spring Harbor Laboratory. There I reported directly to Jim Watson and was member of a group of guys in their early thirties who were setting up laboratories with NIH funding and private funding. The laboratory was a pure situation, the purest kind of science I can imagine. Watson stood between us and the world. He was completely altruistic about not putting his name on anything we did, and also we had no tenure concerns, no teaching concerns, no money concerns, no calendar concerns, no private concerns. Two-thirds of the marriages broke up there in five years. I had to leave because I valued my wife and my child more than I valued my work.

You left your work at the Cold Spring Harbor lab because that environment was too intense?

Too intense, yes, but, more important, I found myself in an environment where nothing else seemed to matter to my colleagues. If somebody's wife developed cancer, as happened to a colleague of mine, I was told that Watson paid for the doctor to send the woman back to Germany so that the guy wouldn't be distracted. That's the kind of stuff I am talking about. The best example I have that mimics my experience at Cold Spring Harbor is Solzhenitsyn's book _The First Circle_. It is a
brilliant novel of an imagined situation in which Stalin decides that it’s not enough to wiretap phones because everybody knows the phones are wiretapped. He wanted to know who is the person making the call. So Stalin decides he needs quantitative, computer-driven voice recognition instead. He arrests all the appropriate people to develop the technology of computer voice recognition. He arrests them on what he claims are political charges. Only the jail is a laboratory in Moscow. He furnishes them with all the Western equipment they call for, but they cannot leave. They are driven around in bread trucks. The point of the book is—they love it.

That is what Cold Spring Harbor was. Nobody said you couldn’t leave, but there was such a strong selection for work that people were becoming dysfunctional for the world. You didn’t have to carry money. In religious terms I was not an observant person at all then, but it was amazing to me that nobody knew what day it was. The notion of the sabbath was perpendicular to the operation of the place. The atmosphere created and nurtured the perspective that where you are didn’t matter, because where you are is determined by where you are in your work. It reified work to God. It made work the reason for existence, and it provided the resources to make that work. I have never been, nor can I imagine being, in a place where, for no other reason than a good idea, you could have all the resources possible to test your idea.

*What effect did the experience at Cold Spring Harbor have on your attitude toward your scientific work?*

At Cold Spring Harbor I had found the best position for doing science that existed in the world at that time—but I couldn’t work under those conditions. Not that I couldn’t do the science. I pumped out more papers there than before or afterward, but I couldn’t enjoy it. I didn’t have the emotional kick I had when I approached science as a kid or [was] working for Penzias or doing my work in a pathology department. That fabricated world wasn’t connected to life and death. It was emotionally blinded.

But as a scientist—let me put it as strongly as I can—my work and the others’ work at Cold Spring Harbor denied data. As pure as it was about the data of the laboratory, it was fraudulent about the data of the heart. You could not be a full person there. There a scientist could not
say, “I’m scared of sickness. I want to work on this sickness because it troubles me.” You could not say, “My father got Alzheimer’s. I want to worry about that and take it on for that reason.”

But, sadly, isn’t that how great research comes out of these fields?

Yes, so I felt. I don’t want to say this as if I came to this insight only by my autonomous nature, though. I’ve been married now almost forty years. My wife is an artist; she is not a scientist. She reads people by her perceptive assessment of their character, behavior, and presence. When she saw, she warned me—alerted me—over and over again that this situation was not healthy. It was not a healthy situation for us. Our life together was predicated on an honest assessment of our feelings as well as our intellectual capacities, and we recognized that our feelings were being submerged, denied, ignored, obliterated, suppressed. I was forced to accept my inability to become the person I had thought I had wanted to be. I would say that is—forgive me for a jump out of the frame, but in retrospect I would say—that was my first religious experience that I could acknowledge.

But that’s not a jump out of the frame at all. The story that moves from biological research to the concern with science and religion is the story from the very specific to the holistic. It’s fascinating that the time when you turn away from the mechanistic, physics-based approach to biological science is also the time when the religion begins to become important.

I think that the causality, if it’s there in any direction, is backward. I first became bereft of connection to other human beings and from that decided to leave the work. It wasn’t that the work drove me away. The absence of emotional bonding, the absence of real, true, deep, reliable human connection—a failure to recognize and value those connections above all things—came to me packed with great force because, by imitating that model in those experiences, I was in danger of alienating my own family structure. I saw what was really important. I asked myself, “What do I want to base my life on?” The simple answer would be, “Don’t be a jerk. You can have both. You have a private life too. This is America.” But the fact is, America or not America, science as a religion is too demanding. I would say in retrospect that I experienced the invitation to join the high church of science and found I was not a member
of it. I could imitate belief, as I’m sure in every religion there are people who go through the motions, but I’m not that kind of guy.

The demands of the scientific priesthood were too inhuman.

Too inhuman. I couldn’t do it. We reached a point in our lives where our daughter was getting close to thirteen, and we had to decide, are we Jewish in any way besides our parents’ being Jewish or not? If we are, then we had to break completely away from the mocking tone that science often takes about any religious observance and do something in our private life that would be outside that frame. And we did. Having done it, I realize that this is as important to me as anything I’m doing in science, and I’d better damn well pay attention to that fact.

Was the beginning of serious observance in conflict with science as such, or did you experience it as supplementing the “science side” of being a person?

I see the categories you are using, but I don’t like either of them. Observance was neither of those. Observance was in service to feelings. Now, there are people, and among them very good people, for whom feelings are served through science. I’m not one of those people. There are great scientists who are humane characters and who have no religious conviction that I’ve ever been able to surface, but I haven’t the strength to be one of those people. I wish to be very plain about that. One of the people I am grateful to have as a teacher is a rabbi named Adin Steinsaltz. He is a translator of Talmud into many languages. He lives in Israel. I refer to him in my book, in The Faith of Biology and the Biology of Faith. I asked Rabbi Steinsaltz the following question: I had been confronted by a colleague who was a very articulate nonreligious person. A person whose articulate nonreligiousness stems from his certainty that there are no data for the presence of any governing power beyond the data. To me it’s a circular argument of saying that the absence of data is data for absence. Our exchange had challenged me with the realization that—point for point, issue for issue, behavior for behavior, value for value—this man and I are identical in our ideas, and yet he gets there without God. Therefore I had to ask myself, “What am I talking about?”

That is a powerful critique. How did you respond?
I was unable to answer it. I went to my rabbi and asked, “What do you say to this?” His answer was immediate. He said, “There are people for whom the throne of God is empty. When you find such a person, you hold tightly to them because they are among the most powerful and good people in the world. But most people who claim the throne of God is empty actually secretly put themselves on it, their money on it, their boss on it, their work on it, some hoist a flag onto it. At that point they are doomed to idolatry, and you stay away.” And I thought, “That’s great.” From there, what he said to me about himself, and me, was true. Those of us who accept God on the throne of God are too weak or too small, or too bounded in our immodesty, to claim that anybody or anything else should be on that throne—and we can’t live with an empty throne.

I think in the end it comes [down] to an emotional state. That is why I am so strongly emphasizing emotional rather than intellectual judgment. Emotionally, to say that there are no data for the presence of any governing power is too empty. Too empty, if you don’t put yourself on that throne instead, but you simply say, as Sherry [Sherwin B.] Nuland says in his book on dying, “It’s great to die.” All my big molecules go back to small molecules and get incorporated into other living things, and what is wrong with that? If you can pull that off, it’s terrific. I can’t do that.

The trick to being a scientist is when you can’t do something, you have to say so. You can’t just say what people want because then it makes them nervous to tell the truth. You’ve got to tell the truth. I realized that my truth is, I can’t do it. I can’t live in a world in which that throne is empty. And I will not put myself on it because it is in such bad taste to do so, even if many scientists do. Some put science itself on that throne; the future capacity of science to discover anything it wants then becomes the occupant of the throne of God. That is as if to say that some number of new facts will provide the reason for living. I can’t put science on the throne; I don’t think I ever tried to.

I didn’t see the bigger question clearly until my kid got to a certain age, until I saw my parents reach a certain state, and until I realized that the immortality of discovery was an all-too-fleeting version of the immortality that people think about. More data was not enough for me.

Many people share with you this critique of science, of science’s being placed on the throne, and then conclude, “Science and religion stand in a fundamental
tension." Do you agree with this sense of an ultimate incompatibility? Or is it possible, once this insight has been reached—once one becomes observant or finds a religious faith—that one can return to science with a different attitude?

I have a two-part answer for that one. First the argument, then the feelings. The argument makes sense to me, but it’s a controversial leap. Science makes the following claim for itself, legitimately: most of what is knowable is unknown at this moment, and most of what is unknown will be knowable eventually through science. The faith of science makes a further claim: all that is unknown will be knowable through science. The distinction between the two turns on the question: Is there anything unknown now, whether or not it lies on the outer edge of what is knowable, that will never be understood, anything that is ultimately unknowable? No one denies that science will push the margin ever closer to full knowledge. The issue is whether some unknown will always remain. That question about science is by its very nature not answerable by science. Therefore to claim there is nothing unknowable is an act of faith, and to affirm this statement makes science into a faith.

Further, this statement is incompatible with any other religion, and it’s this statement of faith that makes it incompatible. The actions of a scientist, short of that statement of faith, are completely compatible with any religion. The actions are to understand God’s creation. But to say further that the understanding reached is the only understanding possible is neither right nor wrong. It’s untestable and therefore unassertable by an honest scientist within science. It is only sayable by a person of faith within faith.

A person who puts all faith claims in science as the locus of faith cannot then also say, as another statement of faith, God sits on the throne and therefore the universe is reasonable as well as understandable. That’s my distinction. It depends, in other words, on which scientist you are talking to. There are some scientists who, regardless of whether they have any faith or not, do not have faith in science as a religion. There are others for whom the faith in science as a religion makes them zealots for science and angry at any other religion. And in fact it makes them missionaries of science. Like other missionaries, some would kill you rather than lose you by conversion.

Some very popular, widely published people seem to take that attitude.
I don’t think that the missionary zeal emerges from science itself; it emerges instead from a religion that cannot be part of science because it cannot be tested as a hypothesis. This is the important thing to realize: science lives in the world of testable hypotheses. The hypothesis that there is something unknowable to science is not testable. You either say this or you don’t, but what you say is as much a statement of faith as the statement of any religion.

Let’s explore the other paradigm. Describe for me what the practice of science might look like for people whose religious faith is classically religious—Jewish, Christian, or another specific religion—and who continue to practice science.

Here I can only mention *The Faith of Biology and the Biology of Faith*, published by Columbia University Press, since it is my answer to that question, my attempt to say what I think my science should look like from the point of view of my religion. The answer is intrinsically and intentionally personal. I don’t think it is right as a person of faith to say what a Christian should do with his or her science. But I think I am entitled as an observant Jew at this point to say, “This is what my observance teaches me about the boundaries of behavior within the science I know best.” What it teaches it that there is a world of important, critical medical science to be done now, first rather than later, because of religious convictions.

My answer in the broad sense is that one should be able to say, “My religious faith teaches me that these questions in science are more important than those questions.” These behaviors in science are better than those behaviors. These boundaries of respect and responsibility for someone else’s free will are more important than my ability to tell somebody what to do. These social structures protect religious faith in the patient, the doctor, the scientist, the administrator, and the dean, whereas social structures like those can make everybody slaves, de facto—the way Jews were slaves in Egypt. I therefore think that the first answer is that a religious person who is a scientist must come out from behind the bench and enter the world. You should not take positions that are called political just because you are religious but because you are also a scientist. You must care about the world and not just your work. All of those are answers. Does that make sense?

That’s a very clear answer. Many of the implications you just hinted at are ones that you explore more fully in your book. Perhaps the most controversial
implication of your approach to integrating scientific work and religious practice is that one’s religious commitment would affect even the types of questions that one asks and researches. Since that’s the claim that, for a lot of practicing scientists, will be the biggest shock, could you describe a bit more about what it entails?

We could light a bomb here and talk about abortion. But let’s set that aside. Not because we should never talk about it but because it is too explosive an issue at the moment and thereby prevents further discussion. Instead, of the two universal events around which we revolve, birth and death, let us examine what death is and the distinction between dying and being dead.

I would say I am taught from my religious tradition, written and oral, through prayer and through study of texts, that I am obliged—for people in my family, for friends, for strangers, for the religious and scientific and medical structures I am a part of—to assure that a person until dead is socialized in the world to the extent they are capable of being so and never [is] abandoned on the grounds that there is nothing more to keep them alive with.

*To be treated as human beings in the fullest possible sense all the way through their lives—*

To the last moment. The Talmud is stunning about this. A person who is defined by the best medical ability of the day as certain to die within three days may marry, may sign a contract that is legally binding, may vote, may divorce his wife, may do anything that a man may do otherwise. By the same token, a person who is going on the sabbath to pray walks by an accident, a building falls down, and he sees somebody is going to die from being crushed within the next ten minutes. He is obliged not to pray but rather is obliged to save that person’s life. As a religious obligation he must “violate” the sabbath to save a life.

Now the third story from the tradition. Someone wishes to say the final confession and die. He is tired of living, he is suffering, and he can’t concentrate because a woodcutter is chopping wood outside his window. You are allowed to tell the woodcutter to stop chopping. And by the extension of this tradition to medical practice, you are allowed to withhold interventions that keep a suffering person alive.
I am the most trivial of Talmud scholars. At this point I depend entirely on friends to point me in the right direction, although I’m starting to study a little more. But I see how rich this tradition is in providing guidance to me and my colleagues. When I teach people who are going to be doctors, or when I sit on panels of the medical school curriculum committee, as I do, and when I write books, I try to steer the ship a little bit away from the machinery that puts you in a room with tubes and coldness, and you die only connected to machines. One doesn’t have to do that. I admire the Anglican and Catholic hospice movements from the bottom of my heart, and I work, as a scientist, to make that kind of facility available to people of my own religion.

What I’m understanding is that one’s religious commitment, and the values of one’s religious tradition—yours and others’—lead to the humanization of the medical sciences.

Correct. I would say, again at a deep level, that such an approach is absolutely legitimate and not just fancy talking. Because at the deep level, having had the gift to experience it a few times, I recognize an astonishing similarity between the moment of scientific discovery and the feeling of God’s presence—a revelatory state. Both of these moments are very rare, very transient. You would be lucky if the experience happens even once. But when it happens, what is common to both moments is that you are overtaken. You are not in charge. That should lead to modesty in science, as it certainly leads to modesty in religion. I think the convergence of behavior in science and behavior in religion is not driven by some kind of synthetic religion that includes science but is driven by the similarity of the data. A human being can be overtaken by insight, and a human being can be overtaken by revelation. Should a human being be lucky enough to have that happen in both ways, that person ought to have the wit to see that the data tell him or her to be modest and to care for others.

In theological terms is this not a way of saying that there are two forms of the manifestation of God? There can be a more direct revelation, say, through religious experience. In your tradition is there also an indirect revelation of God’s nature in the physical world?

I love the question, and I’m going to flip it back to you by answering it with the full ambiguity it deserves. That is to say, you asked me
about my tradition. But we are talking about two different traditions. In the tradition of science you would not state the question that way. You would say it something like this: there is a brain state, a neurological organization, driven by the history of the organism and by the sequences of DNA that constructed a brain that has the capacity to experience such brain states. We also recognize a brain state called insight that comes from revelation. Here is the point: the same brain state, whether it comes from one place or the other, is common to both traditions. Eventually, science may understand that brain state. I would say that there is an example of a piece of science and [of] religion’s coming together. What is that brain state? What happens? What’s going on in the brain of a prophet that doesn’t go on in the brain of you or me? What goes on in the brain of a genius that doesn’t go on in the brain of you or me? Where does the difference lie? It doesn’t lie in a DNA sequence. It lies in the sum of a DNA-constructed brain and a life’s experience. Where is it? What is it? Those, I think, are questions that are wide open at this point. And yet one can restate the overlap or similarity of the two experiences without mentioning God.

Now the religious perspective. I’m sensitive to the fact that when I’m talking about religion, I’m really talking about Abrahamic religions. I have a very wonderful Buddhist colleague, Bob Thurman at Columbia, for whom a lot of this is nonsense. When you deal, as he does, with reincarnation and the absence of a Creator God, then a lot of what we talk about doesn’t fit his religion at all—and yet he is very religious. I really struggle to find inclusive explanations, but I’ll fall back on the words I am comfortable with. So take the example we discussed earlier. When your faith is that God sits on the throne of heaven, then you might say this of the larger question: In creating the world God says, as it were, “Give me a creature who can choose to pray to me or not, and then I will watch to see if the creature chooses to do so. But I don’t care how you get that creature.” In this context, for humans the purpose of everything is to ask questions like this, to be in conflict like this, to wonder about this, to struggle with this—and to decide in the end to accept it. To worry in the end that you made the wrong decision and then go back on it. All those struggles and affirmations legitimately become part of God’s intention. Otherwise, why not be created as a machine that can just run well? God’s risk in creating free-thinking creatures who can choose to do evil is an astonishing statement about the natural world.
That’s how I would answer your question. The scientific insight—to
discover an aspect of the natural world that can then be made useful—and
the revelation—to discover that God’s intention is that we live this
way and not that way—come to the same thing. They come to a piece of
God’s intention: that we choose to figure out what to do and then do it.

Some people take this interconnection of the two spheres of science and religion
so far as to say that the full substance of God’s revelation can be revealed by
science or, coming from the other direction, that religion can judge the results
of science. For instance, some argue, “I know that Darwinian evolution is
wrong because my inspired documents show that the world was not created
that long ago.” Do you agree? Or is there a certain autonomy of the two sides,
a point where the overlap ends?

I think it’s wonderful that we got this far without that question’s
arising, since most discussions of science and religion begin and end
with that question. So let me make a dogmatic set of statements. First,
neither I personally, nor the Center for Science and Religion at Colum-
bia, have any intellectual or emotional investment in the idea that our
purpose should be to find God’s thumbprint in the natural world. Nor
do we have any idea or intention to naturalize religious observance, to
show that, for instance, kashruth [keeping kosher] exists in the Jewish
tradition because it is hygienic.

What is demanded is demanded, and what is understood by data is
understood by data; in that sense there are nonoverlapping aspects of
human behavior. But where science and religion merge is in how you or
I as individuals deal with the simple requirement that we must make a
decision on a matter of faith. Do you or do you not think that the sum
of what will be understood by human beings is all that is? That cannot
be a statement of data; it must be a statement of faith.

So, again, I don’t think that the categories, the “magisteria,” are sci-
ence and religion. The magisteria are of those who believe everything is
understandable and of those who believe some things are intrinsically
not understandable. You will find scientists and religious people in both
categories. I think the world of scientists and religious people who ac-
cept that not everything will be understood is a world in which people
can talk to each other with complete ease and naturalness. One by rev-
elation, the other by data.
The world in which people say, “What is known now or will be known by human beings is all there is,” is a world of rigid fundamentalism, both in religion and in science. That is, as I explained, not a world that I like to be in because there is nothing to say. The worst outcome in the world, I think, is that somebody turns up a proof and says, “Here are the ridges of God’s thumbprint on this rock.” What do you say? You say, “Then there is no work left. There is nothing to do anymore. There is no struggle. There is no gift to God in prayer anymore because it is given.”

And no faith.

And there is no faith. Bob Thurman told me the following story. He is the Dalai Lama’s representative in the United States and was once with the Dalai Lama while he was being interviewed by Carl Sagan on television. Sagan said to the Dalai Lama, “Your Holiness, what would you do if you saw the evidence from a research project that proved to you beyond doubt that reincarnation was impossible on the grounds of the second law of thermodynamics, the return of complex molecules to smaller ones, breaking the information that is present in the larger ones, the facts of universal entropy—” and on he went. “And you became convinced that reincarnation was not possible. What would you then do? What would happen to your faith?”

The Dalai Lama said, “Well, I would stop believing in reincarnation, of course. I’m not stupid. But tell me, do you know of such an experiment?” That was a great answer, and Sagan basically ended the discussion. There was nothing he could do. Sagan had hoped to get him to say, “I am a fundamentalist. I turn away from evidence because my faith is so strong.” I agree with the Dalai Lama 100 percent. God’s creation is to be understood. Beyond what is understandable is God. The creation is not the Creator. People who mistake the creation for the Creator are in the end worshipping idols.

But the devil sometimes lies in the details, especially in the fields in which you work in the medical sciences. There can be guidance from the religious traditions to make sure that death is not dehumanizing. There also can be guidance from them to determine what kinds of questions are important. But there is a fine line between the guidance about what questions can be asked and about what answers are allowable. It’s in those gray areas that the difficult question of overlap arises.
Okay. In my world there is rhetoric and there is reality. The issue is not “where does religion affect the rhetoric?” but “where does religion affect the reality?” The rhetoric goes like this: All scientists are members of the guild of free men and women. They each make decisions as to their work, and they receive the funding for that work by the judgment of their peers. That peer review is sufficiently pure that it needs no external boundaries on it, because all scientists are interested only in what is the best question to be asked with the tools available now. And they will agree on that question when given the chance. That is the rhetoric.

The reality is that money talks. Peer review is one of the most risk-averse, socialist systems you have left in the United States. It is not corrupt. It is an absolutely honest, risk-averse selection system. So everybody knows that when you write a grant, you include as “to be done” some things you have already done, because you are certain they will work. If you have a really good idea, everybody knows that you first get your money for something that will work, and then you use some of that money on your idea, because it may not work. If you ask for something that may not work, you’ll never get the money. Everybody knows that. Yet everybody pays lip service to another set of values, and the NIH grant forms require one to do so. In the “Aims” section they always ask, “How will what you do affect medicine?” So you answer as expected. Some people who are interested in viruses study AIDS because there is money in AIDS—not because they are really driven by the thought of a million babies’ dying in Africa.

If you start with the rhetoric, all that religion can do is perturb peer review. If you take the reality, then what religion can do is make scientists more honorable and more honest about their own impulses and less risk averse in their work. No one I know would say from a religious perspective, “You can’t do that experiment because it may offend my religion.” But I would definitely say that you should not give money away, or take it, without answering the question, “What does your heart tell you that you are afraid of?” That is where the religion comes in. The separation of church and state is a great principle; it is why you and I can talk to each other. But there is no separation of church and state for the church of science. The church of science is a state church. I would just like to see the separation of church and state applied to the church of science.
What I'm beginning to understand is the role of your critique of science in your understanding of science and religion. My question made the assumption that science is an objective practice; hence for any subjective influences, such as religious influences, to affect it would be to corrupt it. And your answer is, You have misunderstood science, my friend.

Yes. Science is done by scientists; it’s not done by God. Scientists have put themselves on the throne, saying, “I am the agent of absolute objectivity.” They are lying to themselves and lying to you. They are, as we all are, wet weak mortals. They are made of tissues like us all. They have inside their skulls dark wet things that guide their thought. They are going to die like the rest of us. They should accept that and then do what they want with that gift. If they have the strength to say, “I accept all that but I’m going to run my lab,” all well and good. But most of them have those fears and deny those fears for the simple matter that it gets them money.

Can I switch the emphasis a little bit and ask you, on a more experiential level, about the practice of religion and the practice of science? Some people say that these are two vastly different parts of their lives, whereas others speak of certain parallels in their experience of the world in these two areas. You’ve hinted that yours is more like the latter position, for instance, when you talked about the sense of revelation through a text and the sense of discovery in the study of the natural world. Are there other areas where, at the experiential level, you find parallels between these two?

Yes, I like that question a lot. In my tradition the three aspects of religious observance are prayer, the study of Jewish texts, and the doing of deeds of kindness, usually called good deeds. Kindness, though, is a specific concept, distinct from deeds of justice. Good deeds are also those beyond justice. So the doing of those three things is the sum of religious observance for a Jew today. Why? Not because that is the original intention of the covenant of Abraham, Isaac, and Jacob to their descendants, the Jews of today, but because that is what is left for us to do in the two thousand years since the Romans destroyed the temple at which we were to bring sacrifices.

These acts, then, stand in place of the sacrifices that God asked of our ancestors as our side of a covenant that assures our persistent survival and our capacity to redeem the world. So our deeds today are the deeds
in exile, left to us now that we no longer have the place in which to work inside the covenant to bring the eventual redemption of the world. Your religion and mine come out of that moment. It’s worth another conversation at another time [to explore] how we each learn that lesson of living in exile differently, because that temple, having been destroyed, was destroyed for both Christians and Jews. Therefore my tradition is the tradition in exile now. For me as a serious Jew, you are asking a very important question. The question, to my mind, is, “In what ways is the doing of science like the carrying out of sacrifices at the temple?”

That’s a fascinating way to put it.

In what way am I to acknowledge that the very fact of life and death is in God's hands and do so every day? The temple was a slaughterhouse. You couldn’t be a Jew and not know that the life you bore out in your herd was going to be killed on an altar to God. The firstborn was killed. Modern Western civilization says that’s disgusting, yet it then carries out the slaughter of human beings at a rate that far surpasses any in previous historical time. What we have in my tradition is an acknowledgment, by the death of our animals’ firstborn, that we are not in charge of life and death. The redemption of our firstborn sons is a tradition carried out by Jews today. For three thousand years, regardless of the temple, it is commanded that your firstborn son be given to temple worship. Not for sacrifice but be given to work in the temple, unless a priest redeems that son so you can have him back. So my grandfather redeemed me—and, God knows, one wants that, because it is holding on to an aspect of the original covenant.

Science is like sacrifice in that original covenant. You kill experimental animals to understand. You take dominance over the natural world for the sake of understanding on the one hand and for the sake of saying thanks on the other. But in both cases you act against the natural world for your own interests, your own survival, and your own covenant. That’s where it is the same. What is left over, in the absence of the temple, is much more civilized, and its similarities may be harder to see.

I would also say that the doing of good science is the doing of a good deed. If your intention is to help sick people, then the doing of science is a religious act. But my first answer is the stronger answer. My religion, the way it was intended in the text, includes the action of animal sacri-
fice. The secular version of this is a laboratory that sacrifices animals to understand human disease.

*I want to ask you about a change in the broader cultural climate that many people today are perceiving. In numerous ways the modern world has been understood through the opposition of science and religion. Today that opposition seems to be dropping, for example, through the work of centers like your own. There is a widespread sense that we are looking forward to a century in which humans will do great science but will no longer do it in the form of a battle with the religious side but, perhaps rather, through an alliance between the two. I wonder, is this sense of a major shift overblown, in your view? Is the prophet speaking too early? Or do you see that sort of change in the air?*

Well, I don't see that change at Columbia. If I consider the 500 people in the faculty of the arts and sciences departments, 300 are tenured, and, of those, 150 will be scientists or social scientists. If 5 or 10 percent of those 150 tenured faculty are interested in what we are doing, that's a lot. If it ever flips from 5 percent to 50 percent, it would be a different institution. My work is to move it along in that direction, but I certainly am not coercive. We just make interesting things happen and see who comes.

Now the medical school is a different question. With the medical school you are probably dealing with a large number of people whose religious impulses are repressed for professional reasons. The liberation of physicians and medical scientists is an act that any religious organization can undertake, as it undertook it for patients in the hospice movement. There is an obligation not yet met: to provide for healthy doctors what is provided for terminally ill people. I'm being dramatic, but I really believe this. One doesn't need a hospice as a scientist or a doctor; one needs what a hospice provides: the certainty of safe human contact and a place in which to admit one's fears. If you have ever been sick and seen a doctor who doesn't like telling you that you are not well, you get the burden of that doctor's weakness. The institution needs to protect you against that. And for that, nothing beats a religious context.

There was a very important article in the *New England Journal of Medicine* by a colleague of mine in about July 2000. Richard Stone wrote an article arguing that doctors should not know about the religious observance of their patients, and doctors should not use religious observance in
their practice because it instrumentalizes religious practice into an aspect of health care and thereby diminishes the religious content of what happens to zero. It is a very interesting ethical question. I think the most fruitful place to ask your question about integration would be in a medical context, not a basic science context. With a basic science context I don’t think it is going to be the case that most people who pass through the selective system of tenure are going to be people who remember what it is to speak from the heart. The “either/or” is usually constructed as science or religion. I would say that the real “either/or” is emotional honesty or tenure. That has been my experience.

*What is interesting about your answer is that you give the word religious the broadest sort of meaning, one that would incorporate most of the world’s religious traditions. You come close to equating it with being fully human.*

Correct. Initially, as I found myself falling into this position, I found myself drawn to it by an obligation to accept all the data, including emotional data. That’s the point. When somebody says, “Scientists are different from religious people because they are totally objective,” what I hear them saying is, “Scientists are less than full people because they are afraid of their emotions.” That fear that I see drives a religious use of science, which is inappropriate for science and doesn’t in the end work.

*Conversely, if one begins with a deeper understanding of the human person and expands it outward—from physical reductionism, from biological reductionism, from reduction to brain states—expanding it to include the emotional, the moral, and the aesthetic realms, would not religion inevitably enter in?*

Absolutely. I have a colleague at Columbia, Rita Sharon. She is a Harvard M.D. She has been an internist at Columbia Medical Center for twenty years. She runs a program in humanities and medicine at Columbia, and she has a writer-in-residence program to have doctors and medical students write about their experiences. Her work fosters these people to write about their religious experiences, to get them to write beyond the chart, and to say something about how they feel about a patient. Dr. Sharon was born Catholic, and I don’t know her religious observance, but to me she is a religious person in a medical context.

What we have avoided are the particularities of one religion’s obser-
vances against another. I have run into that issue over and over again. By the luck of my life, I have lots of friends of different religious backgrounds, and I'm much more comfortable sitting and talking to somebody who is a serious Catholic than an absolutely secular and therefore emotionally frightened Jew. I have addressed audiences after mass, and I have had no difficulty doing that, although there are points of religious ideology in my religion and between religions that are unbreachable. You must either walk away from a person in need or say we have to agree to disagree on that if we are to keep talking. What we share as religious people, I think, are two elements: curiosity and a humility about the limits of human intelligence. I want to know how far I can go, but I no longer claim I can go as far as I want to go.

That's a beautiful summation of many things you've said since the very beginning of the interview. The word humility conveys a transformation of character and a particular attitude about one's science and one's life in the world. It seems to express a deeply religious orientation.

Yes. One person I've met who understood this best is Sir John Templeton. A very misunderstood character, as I suspect that, on a small scale, I am a misunderstood character. I think most people, when they hear him speaking of the theology of humility, don't believe it; they think it's a cover for the theology of one version of Christianity. But I believe it explicitly, from meeting him and reading his writings. There are indeed behaviors like humility that are driven by emotional states common to all religions.

I think religion is an aspect of the human species. It emerges the way that family structures emerge. To deny it because it cannot be pinned down, or to deny it because it takes on different manifestations in different parts of the world, is like denying meaning because meaning is expressed in six thousand different languages. To say there is no religious truth because there are so many different religions is like saying there is no literature because literature is written in so many different languages. This is just not the case. The case is that different people are born with different languages, and they come to the same point. The poles of that point are humility on the one hand and curiosity on the other. Humility without curiosity means you are a zombie. And curiosity without humility means you can be a fascist—you can really kill somebody.
What has struck me in this conversation is the way that you have consistently and relentlessly challenged the dichotomies that are part of the popular perceptions of science and religion. Science as objective and religion as subjective? You’ve taken this dichotomy away. Religion as otherworldly? No: in your view religion is a humanizing influence on medical science. In discussing the differences between the religious traditions, you emphasize the richness of particular features of the Jewish tradition, and yet at the same time you find general features of the religious face of humanity that run across traditions. You seem in many ways like the great attacker of dichotomies.

I don’t mind being that. I’m very impressed with your line of questioning; you are making me see myself clearly, and this is terrific. You’ll notice that we left out one word, which I happen to be allergic to, and I’m very grateful you did not mention it. That is spirituality—the idea that somehow the religious impulse is unworldly or otherworldly. Spirituality defaults on the fact of curiosity about the world. But the religious impulse, at its core, draws on the obligation to take care of other people.