

Scientists and Their Gods

(also known as Science and Christianity: Conflict or Coherence?)

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The Genesis of This Lecture

I first began teaching freshman chemistry at Berkeley in the spring of 1983. Typically we lectured in halls that held about 550. On the first day of class you could fit in 680, which we had that particular morning. It was a full auditorium. Those of you who have had freshman chemistry at a large university will know that many have mixed feelings about that course.

I had never addressed a group of 680 people before and was a bit concerned about it. But I had a fantastic demonstration prepared for them. At Berkeley in the physical science lecture hall, the stage is in three parts. It rotated around, so you could go to your part of the stage and work for several hours before your lecture, getting everything ready. My assistant, Lonny Martin who did all the chemistry demonstrations at Berkeley, was in the process of setting up 10 moles of a large number of quantities—10 moles of benzene, iron, mercury, ethyl alcohol, water, etc. At just the right time, at the grand crescendo of this lecture, I was going to press the button and Lonny would come turning around and show them the ten moles of various items. The student would have great insight as they realized that all these had in common was about the same number of molecules of each one.

It was going to be wonderful. We got to that point in the lecture and I said, "Lonny, come around and show us the moles." I pressed the button to rotate the stage but nothing happened. I didn't realize that he was overriding my button press because he wasn't ready with the moles. This was very embarrassing. I went out in front of the 680 students and was really at a complete loss of what to say, so I made some unprepared remarks. I said, "While we're waiting for the moles, let me tell you what happened to me in church yesterday morning."

I was desperate. There was great silence among those 680 students. They had come with all manner of anticipations about freshman chemistry, but stories about church were not among them!

I continued, "Let me tell you what my Sunday School teacher said yesterday." That raised their interest even more. "I was hoping the group at church would give me some support, moral, spiritual, or whatever for dealing with this large class, but I received none. In fact, the Sunday School teacher asked the class, in honor of me:

What was the difference between a dead dog lying in the middle of the street and a dead chemistry professor lying in the middle of the street?

The class was excited about this and I hadn't even gotten to the punch line. They roared with laughter. The very concept of a dead chemistry professor lying in the middle of the street was hilarious to them. I'm sure some of them began to think, "If this guy were to become a dead chemistry professor very close to the final exam, we probably wouldn't have to take the final exam. They'd probably give us all passing grades and this would be wonderful."

I told them my Sunday school teacher had said that the difference between the dead dog lying in the middle of the road and the dead chemistry professor lying in the middle of the road is that there are skid marks in front of the dead dog.

The class thought this was wonderful! Just as they settled down, I pressed the button and around came Lonny with the moles. It was a wonderful beginning to my career as a freshman chemistry lecturer.

About 50 students came down at the end of class. About half had the usual questions like "Which dot do I punch out of this registration card?" There is always some of that. But about half of these students all had something like the same question. Basically they wanted to know "What were you doing in church yesterday?" One in particular said, "The person I most have admired in my life was my high school chemistry teacher last year. He told me with great certainty that it was impossible to be a practicing chemist and have any religious view whatever. What do you think about that?"

We didn't have a long discussion at that time, but the students asked me if I would speak further on this topic. That became the origin of this lecture.

I gave this talk in Berkeley and in the San Francisco area many times. When I moved to the University of Georgia several years ago, the interest increased. And some faculty members complained to the administration. It was an interesting chapter in my life. The Atlanta Journal and Constitution, the largest newspaper in the southeastern United States, came out with an editorial supporting my right to give this talk, saying, "Fanatics are demanding rigorous control over the dissemination of ideas."

A Perspective on the Relation of Science and Christianity

Let's put this question of the relationship between science and Christianity with as broadest, most reasonable perspective we can. The relation between science and other intellectual pursuits has not always been easy. Therefore, many feel there has been a terrible warfare between science and Christianity. But I feel this is not the whole story.

For example, the recent literature text by Susan Gallagher and Roger Lundeen says,

Because in recent history, literature has often found itself in opposition to science, to understand modern views about literature the dominance of science in our culture. For several centuries, scientists have set the standards of truth for Western culture. And their undeniable usefulness in helping us organize, analyze, and manipulate facts has given them an unprecedented importance in modern society.

Not everybody has liked that. For example, John Keats, the great romantic poet, did not like Isaac Newton's view of reality. He said it threatened to destroy all the beauty in the universe. He feared that a world in which myths and poetic visions had vanished would become a barren and uninviting place. In his poem *Lamia*, he talks about this destructive power. In this poem, he calls "science" "philosophy", so I will try to replace the word "philosophy" with "science" because that is what he means.

Do not all charms fly
At the mere touch of cold science?
There was an awful rainbow once in heaven
We knew her woof and texture.
She is given in the dull catalog of common things.
Science will clip an angels wings,
Conquer all mysteries by rule and line,
Empty the haunted air and gnome's mind,
Unweave a rainbow.

My point is there has been some sparring between science and virtually every other intellectual endeavor. So it should not be entirely surprising if there weren't a bit of that between science and Christianity.

Has Science Disproved God?

Nevertheless, the position is commonly stated that "science has disproved God." C. S. Lewis says, in his autobiography *Surprised by Joy*, that he believed that statement. He talks about the atheism of his early youth and credits it to science. He says,

You will understand that my atheism was inevitably based on what I believed to be the findings of the sciences and those findings, not being a scientist, I had to take on trust, in fact, on authority.

What he's saying is that somebody told him that science had disproved God and he believe it, even though he didn't know anything about science.

A more balanced view is this by one of my scientific heroes, Erwin Schrodinger. He was the founder of wave mechanics and the originator of what is the most important equation in science, Schrodinger's equation. He says,

I'm very astonished that the scientific picture of the real world is very deficient. It gives a lot of factual information, puts all our experience in a magnificently consistent order, but it is ghastly silent about all and sundry that is really near to our heart, that really matters to us. It cannot tell us a word about red and blue, bitter and sweet, physical pain and physical delight, knows nothing of beautiful and ugly, good or bad, God and eternity. Science sometimes pretends to answer questions in these domains, but the answers are very often so silly that we are not inclined to take them seriously.

People do tell good stories. Scientists do tell some interesting stories about religion. This one is from Chemistry in Britain, which is kind of like the Time Magazine of they chemical profession in England. Talking about the release of a new book on science policy, they explore an interesting idea.

If God applied to the government for a research grant for the development of a heaven and earth, he would be turned down on the following grounds:

- His project is too ambitious.
- He has no previous track record.
- His only publication is only a book and not a paper in a refereed journal.
- He refuses to collaborate with his biggest competitor.
- His proposal for a heaven and earth is all up in the air.

The Alternatives to Belief in the Sovereign God of the Universe

Lev Landau

I want to give examples of two atheists. The first is Lev Landau, the most brilliant Soviet physicist of this century. He was the author of many famous books with his coworker Lifchets. I actually used some of these books as a student at M.I.T. This is a story about Landau from his good friend and biographer Kolotnikov. This appeared in Physics Today. This is a story from the end of Landau's life. Kolotnikov says

The last time I saw Landau was in 1968 after he had an operation. His health had greatly deteriorated. Lifchets and I were summoned to the hospital. We were informed that there was practically no chance he could be saved. When I entered his ward, Landau was lying on his side with his face turned to the wall. He heard my

steps, turned his head, and said, "Kollat, please save me." Those were the last words I heard from Landau. He died that night.

Subrahmanyan Chandrasekhar

Chandrasekhar was a famous astrophysicist. He won the Nobel prize in physics in 1983. He was a faculty member at the University of Chicago for many years. At the back of his biography is an interview. Chandrasekhar says,

In fact, I consider myself an atheist. But I have a feeling of disappointment because the hope for contentment and a peaceful outlook on life as the result of pursuing a goal has remained largely unfulfilled.

His biographer is astonished. He says:

What? I don't understand. You mean, single-minded pursuit of science, understanding parts of nature and comprehending nature with such enormous success still leaves you with a feeling of discontentment?

Chandrasekhar continues in a serious way, saying:

I don't really have a sense of fulfillment. All I have done seems to not be very much.

The biographer seeks to lighten up the discussion a little saying that everybody has the same sort of feelings. But Chandrasekhar will not let him do this, saying:

Well that may be, but the fact that other people experience it doesn't change the fact that one is experiencing it. It doesn't become less personal on that account.

And Chandrasekhar's final statement:

What is true in my own personal case is that I simply don't have that sense of harmony which I'd hoped for when I was young. I've persevered in science for over fifty years. The time I've devoted to other things is miniscule.

Is it Possible to be a Scientist and a Christian?

So the question I want to explore is the one that I was asked by that young man after my freshman chemistry class at Berkeley, "Is it possible to be a scientist and a Christian." The student and his high school chemistry teacher obviously thought it was not possible.

C. P. Snow

Let me begin from pretty neutral ground by quoting two people with no particular theistic inclination. The first one is C. P. Snow. C. P. Snow used to be very famous as the author of a book called *The Two Cultures*. C. P. Snow was a physical chemist at Oxford University. He discovered about halfway through his career that he also was a gifted writer and he began writing novels. They are about university life in England. One in particular is called *Masters*, which I would

recommend. C. P. Snow became quite wealthy doing this and then he was able to sit in an in-between position, between the world of the sciences and the world of literature.

He wrote this book, which in its time was very famous, about the two cultures—the sciences and the humanities. He said statistically slightly more scientists are in religious terms, unbelievers, compared with the rest of the intellectual world, although there are plenty that are religious and that seems to be increasingly so among the young. So is it possible to be a scientist and a Christian? C. P. Snow, who was certainly not a Christian, said yes.

Richard Feynman

Richard Feynman, Nobel prize in physics in 1965, was a very unusual person. He said some 9 years before receiving the Nobel prize, "Many scientists do believe in both science and God, the God of revelation, in a perfectly consistent way." So is it possible to be a scientist and a Christian? Yes according to Richard Feynman.

A good summary statement in this regard is by Alan Lightman, who has written a very well-received book called *Origins*. He's an M.I.T. professor who has published this book with Harvard University Press. He says,

References to God continued in the scientific literature until the middle to late 1800's. It seems likely that the lack of religious references after this time seem more from a change in social and professional conventions among scientists rather than from any change in underlying thought. Indeed, contrary to popular myth, scientists appear to have the same range of attitudes about religious matters as does the general public.

Now one could regard that statement as strictly anecdotal. Americans love statistics. Here's the result of a poll of the professional society Sigma Xi. Three thousand three hundred responded, so this is certainly beyond statistical uncertainty. The headline says, "Scientists are anchored in the U. S. mainstream." It says that half participate in religious activities regularly. Looking at the poll is that 43% of Ph.D. scientists are in church on a typical Sunday. In the American public, 44% are in church on a typical Sunday. So it's clear that whatever it is that causes people to have religious inclinations is unrelated to having an advanced degree in science.

Michael Polanyi

Let go a little deeper with a statement from Michael Polanyi, professor of chemistry and then philosophy at the University of Manchester. His son, John Polanyi, won the Nobel prize in 1986. I think that it's probably true that when John Polanyi's scientific accomplishments, which have been magnificent, have been mostly forgotten, his father's work will continue.

Michael Polanyi was a great physical chemist at the University of Manchester. About halfway through his career, he switched over to philosophy. He was equally distinguished there. His books are not easy to read. His most influential book is called *Personal Knowledge*. He was of Jewish physical descent. He was born in

Hungary. About the same time he switched from chemistry to philosophy, he joined the Roman Catholic church. He said,

I shall reexamine the suppositions underlying our belief in science and propose to show that they are more extensive than is usually thought. They will appear to coextend with the entire spiritual foundations of man and to go to the very root of his social existence. Hence I will urge our belief in science should be regarded as a token of much wider convictions.

If you read the rest of the book, you will probably make the same conclusion that I make. I've concluded that Polanyi is pointing out that the observer is always there in the laboratory. He always makes conclusions. He is never neutral. Every scientist brings presuppositions to his or her work. A scientist, for example, never questions the basic soundness of the scientific method. This faith of the scientist arose historically from the Christian belief that God the father created a perfectly orderly universe.

Now I want to give you some evidence of that.

Science Developed in a Christian Environment

I'd like to begin with an outrageous statement that always causes reaction. This is a statement from a British scientist, Robert Clark. It will make you think. He says,

However we may interpret the fact scientific development has only occurred in a Christian culture. The ancients had brains as good as ours. In all civilizations, Babylonia, Egypt, Greece, India, Rome, Persia, China and so on, science developed to a certain point and then stopped. It is easy to argue speculatively that science might have been able to develop in the absence of Christianity, but in fact, it never did. And no wonder. For the non-Christian world felt there was something ethically wrong about science. In Greece, this conviction was enshrined in the legend of Prometheus, the fire-bearer and prototype scientist who stole fire from heaven thus incurring the wrath of the Gods."

I'd prefer if he had said "sustained scientific development." I think he's gone a little too far here, but this will certainly give people something to think about.

Francis Bacon

Let's explore the idea involved in the statements that Clark and Polanyi made, that is, that science grew up in a Christian environment. I was taught that Francis Bacon discovered the scientific method. The higher critics now claim he stole it from somebody else and just popularized it. We'll leave that to the science historians to settle.

One of Francis Bacon's statements is called the two-books statement. It's very famous. He said:

Let no one think or maintain that a person can search too far or be too well studied in either the book of God's word or the book of God's works.

He's talking about the Bible as the book of God's words and nature as the book of God's works. He is encouraging learning as much as possible about both. So right at the beginning of the scientific method, we have this statement.

Johannes Kepler

Johannes Kepler posited the idea of elliptical orbits for planets. He's considered the discoverer of the laws of planetary motion. He was a devout Lutheran Christian. When he was asked the question "Why do you do science?", he answered that he desired in his scientific research to obtain a sample test of the delight of the Divine Creator in his work and to partake of his joy. This has been said in many ways by other people, to think God's thoughts after him, to know the mind of man. Kepler might be considered a Deist based on this first statement alone. But he later said:

I believe only and alone in the service of Jesus Christ. In him is all refuge and solace.

Blaise Pascal

Blaise Pascal was a magnificent scientist. He is the father of the mathematical theory of probability and combinatorial analysis. He provided the essential link between the mechanics of fluids and the mechanics of rigid bodies. He is the only physical scientist to make profound contributions to Christian thinking. Many of these thoughts are found in the little book, *The Pensees*, which I had to read as a sophomore at M.I.T. (They were trying to civilize us geeks at M.I.T., but a few years later decided that it wasn't working, so we didn't have to take any more humanities courses.)

Pascal's theology is centered on the person of Jesus Christ as Savior and based on personal experience. He stated:

God makes people conscious of their inward wretchedness, which the Bible calls "sin", and his infinite mercy. Unites himself to their inmost soul, fills it with humility and joy, with confidence and love, renders them incapable of any other end than Himself. Jesus Christ is the end of all and the center to which all tends.

Pascal also said:

At the center of every human being is a God-shaped vacuum which can only be filled by Jesus Christ.

Robert Boyle

Robert Boyle was perhaps the first chemist. He developed the idea of atoms. Many of my freshman chemistry students know Boyle's law. Every once in a while I'll meet one of my former chemistry students. I ask them "What do you remember from the course?" Occasionally they will say: $pV = nRT$. Then I know I was successful. This is the ideal gas law of which Boyle's law is a part.

Boyle was a busy man. He wrote many books. One is *The Wisdom of God Manifested in the Works of Creation*. He personally endowed an annual lectureship promoted to the defense of Christianity against indifferentism and atheism. He was a good friend of Richard Baxter, one of the great Puritan theologians. He was governor of the Corporation for the Spread of the Gospel of Jesus Christ in New England.

Isaac Newton

Although I disagree, a recent poll on who the most important person of history was gave that honor to Sir Isaac Newton. Newton was a mathematician, physicist, co-discoverer with Leibnitz of calculus, the founder of classical physics. He was the first of the three great theoretical physicists. He wrote about a lot of other things. He tried to do chemistry, but was a little bit before his time. He wrote more books on theology than on science. He wrote one about the return of Jesus Christ entitled *Observations on the prophecy of Daniel and the Revelation of Saint John*. He said:

This most beautiful system of the sun, planets and comets could only proceed from the counsel and dominion of an intelligent and powerful Being.

One might assume from this statement that Newton was a Deist (system of natural religion that affirms God's existence but denies revelation). However, quotes like this shows this is not true:

There are more sure marks of authenticity in the Bible than in any profane history.

One concludes that Newton was a Biblical literalist. It was not enough that an article of faith could be deduced from Scripture, he said:

It must be expressed in the very form of sound words in which it was delivered by the apostles. For men are apt to run into partings about deductions. All the old heresies lie in deductions. The true faith was in the Biblical texts.

George Trevellian, a secular historian, summarized the contributions of these individuals as follows:

Boyle, Newton and the early members of the Royal Society were religious men who repudiated the skeptical doctrines of Thomas Hobbs. But they familiarized the minds of their countrymen with the idea of law in the universe and with scientific methods of inquiry to discover truth. It was believed that these methods would never lead to any conclusions inconsistent with Biblical history and miraculous religion. Newton lived and died in that faith.

Michael Faraday

My very favorite—and probably the greatest experimental scientist of all—is Michael Faraday. The two hundredth birthday of Michael Faraday's birth was recently celebrated at the Royal Institution (multi-disciplinary research laboratory

in London). There was an interesting article published by my friend Sir John Thomas, who said if Michael Faraday had been living in the era of the Nobel prize, he would have been worthy of at least eight Nobel prizes. Faraday discovered benzene and electromagnetic radiation, invented the generator and was the main architect of classical field theory.

Let me contrast the end of his life with the end of Lev Landau's life. Faraday was close to death. A friend and well-wisher came by and said, "Sir Michael, what speculations have you now?" This friend was trying to introduce some levity into the situation. Faraday's career had consisted of making speculations about science and then dash into the laboratory to either prove or disprove them. It was a reasonable thing to say.

Faraday took it very seriously. He replied:

Speculations, man, I have none. I have certainties. I thank God that I don't rest my dying head upon speculations for "I know whom I have believed and am persuaded that he is able to keep that which I've committed unto him against that day."

James Clerk Maxwell

The second of the three great theoretical physicist of all time would certainly have been James Clerk Maxwell. Someone has documented Maxwell's career this way:

Maxwell possessed all the gifts necessary for revolutionary advances in theoretical physics—a profound grasp of physical reality, great mathematical ability, total absence of preconceived notions, a creative imagination of the highest order. He possessed also the gift to recognize the right task for this genius—the mathematical interpretation of Faraday's concept of electromagnetic field. Maxwell's successful completion of this task resulting in the mathematical [field] equations bearing his name, constituted one of the great achievements of the human intellect.

I disagree with one statement made above. If Maxwell indeed had a total absence of preconceived notions, he would have accomplished a total absence of science. So this is obviously written by somebody who is not a scientist (a squishyhead). However, this statement is basically good.

Maxwell said:

Think what God has determined to do to all those who submit themselves to his righteousness and are willing to receive his gift [of eternal life in Jesus Christ]. They are to be conformed to the image of his Son and when that is fulfilled and God sees they are conformed to the image of Christ, there can be no more condemnation.

Maxwell and Charles Darwin were contemporaries. Many wonder what he thought of Darwin's theories. In fact, once he was to go to a meeting on the

Italian Riviera in February to discuss new developments in science and the Bible. If you've ever spent time in Cambridge, England, you know it is very gloomy in the wintertime. If I had been a faculty there, I would have taken an opportunity to go to the Italian Riviera at this time of the year.

Maxwell turned down the invitation. He explained:

The rate of change of scientific hypotheses is naturally much more rapid than that of Biblical interpretation. So if an interpretation is founded on such a hypothesis it may help to keep the hypothesis above ground long after it ought to be buried and forgotten.

This is true. An example of this is the steady-state theory, which was popularized by Fred Hoyle and many others. It is one of the two competing theories of the origin of the universe. The steady-state hypothesis basically says that what you see is what was always there. It became less tenable in 1965 with the observation of the microwave background radiation by Arnold Pansias and Robert Wilson. There are not very many people left who believe in the steady-state hypothesis. It is interesting to go back to about 1960 and find commentaries on the book of Genesis and see how they explain how the steady-state hypothesis can be reconciled with the first chapter of Genesis. Any reasonable person can see that Genesis is talking about a beginning from nothing (ex nihilo), so it takes interesting explanations to reconcile a beginning with the steady-state hypothesis.

The steady-state hypothesis is going to be, within about 20 years, gone and forgotten. These commentaries will probably still be available in libraries and no one will be able to understand them.

Science is Inherently a Tentative Activity

[Shaefer shows audience a well-known cartoon].

In checking with several mathematicians, I came to realize that the equation in this cartoon means absolutely nothing at all, but the punch line is appropriate. [One character] says, "What is most depressing is the realization that everything we believe will be disproved in a few years." I hope that is not true of my work in quantum chemistry. I don't think it will be true, but there is some truth to this in that science is inherently a tentative activity. We come to understandings that are subjected to, at least, some further refinement.

Somebody who obviously not an admirer of the Christian of Faraday and Maxwell said:

The religious decisions of Faraday and Maxwell were inelegant, but effective evasions of social problems that distracted and destroyed the qualities of the works of many of their ablest contemporaries.

What he is saying is that because they were Christians, Maxwell and Faraday did not become alcoholics nor womanizers nor social climbers as their able colleagues appeared to do.

Organic Chemists

William Henry Perkin

I need to put a little organic chemistry in here so that my colleagues on the organic side will know that I paid a little attention to them also. William Henry Perkin represents perhaps the first great synthetic organic chemist. Discoverer of the first synthetic dye and the person for whom the Perkin transactions of the Royal Society of London is named, Perkin sold his highly profitable business and retired to private research and church missionary ventures at the age of 35 in the year 1873.

George Stokes

We can read about George Stokes in any issue of the *Journal of Chemical Physics*, which is the best journal in my field. In recent issues, Coherent Anti-Stokes Raman Spectroscopy (CARS) has been a subject of discussion. He is one of the great pioneers of spectroscopy, study of fluids and fluorescence. He held one of the most distinguished chairs in the academic world for more than fifty years, the Lucasian Professorship of Mathematics at Cambridge—a position held by Sir Isaac Newton and currently by Stephen Hawking. He was also president of the Royal Society of London.

Stokes wrote on other topics besides organic chemistry, including the topic of natural theology. Concerning the issue of miracles, Stokes said:

Admit the existence of a personal God and the possibility of miracles follows at once. If the laws of nature are carried out in accordance with his will, he who willed them may will their suspension....

William Thomson

William Thomson was later known as Lord Kelvin. Thomson was a fantastic scientist. He is recognized as the leading physical scientist and the greatest science teacher of his time. His early papers on electromagnetism and heat provide enduring proof of his scientific genius. He was a Christian with a strong faith in God and the Bible. He said:

Do not be afraid to be free thinkers. If you think strongly enough, you will be forced by science to the belief in God.

J. J. Thomson

In 1897, J. J. Thomson discovered the electron. He was the Cavendish professor of physics at Cambridge University.

The old Cavendish laboratory sits in the middle of Cambridge campus. So much was discovered there that it was turned into a museum. A total of fifteen Nobel Prizes resulted from work done there. Inscribed over its door is a Latin phrase "The fear of the Lord is the beginning of wisdom." [A new] Cavendish laboratory was rebuilt out in the country. However, it also has this sentence from the book of Proverbs written over the door, but in English rather than Latin.

J. J. Thomson made this statement in Nature,

In the distance tower still higher [scientific] peaks which will yield to those who ascend them still wider prospects and deepen the feeling whose truth is emphasized by every advance in science, that great are the works of the Lord.

Theoretical Chemist

Charles Coulson

Charles Coulson is one of the three principal architects of the molecular orbital theory. He probably would have received the Nobel prize but he did not pass the first test. The first test to get the Nobel prize is to live to be 65 years old. The second test is to have done something very important when you were about 30 years old. Coulson did very significant work when he was in his thirties, but he died at 64, thus disqualifying himself from the Nobel prize.

Coulson, a professor of mathematics at Oxford University for many years was also a Methodist lay minister. He was a spokesman for Christians in academic science and the author of the term "God of the gaps" theology.

From the biographical memoir of the Royal Society after Charles Coulson's death, we read a description of his conversion to faith in Jesus Christ in 1930 as a 20-year-old student at Cambridge University. Coulson testified:

There were some ten of us and together we sought for God and together we found Him. I learned for the first time in my life that God was my friend. God became real to me, utterly real. I knew Him and could talk with Him as I never imagined it before and these prayers were the most glorious moment of the day. Life had a purpose and that purpose coloured everything.

Coulson's experience is fairly similar to my own at Berkeley. It would be nice if I could say there was a thunderclap from heaven and God spoke to me in audible terms and that is why I became a Christian. However, it did not happen that way, but I did have this same perception Coulson is talking about—this sense of purpose and more of a vividness to the colors of life.

The successor to Coulson as theoretical chemistry professor at Oxford, was Norman March, a good friend of mine. He as well is a Methodist lay minister.

Robert Griffiths, a member of our U.S. Academy of Sciences, Otto Stern professor of physics at Carnegie Mellon University received one of the most coveted awards of the American Physical Society in 1984 on his work in physical mechanics and thermodynamics. Physics Today said he is an evangelical Christian who is an amateur theologian and who helps teach a course on Christianity and science.

He recently said:

If we need an atheist for a debate, I'd go to the philosophy department—the physics department isn't much use.

At Berkeley University, among 55 chemistry professors, we only had one who was willing to openly identify himself as an atheist, my good friend Bob, with whom I still have many discussions about spiritual things.

Richard Bube

For many years, Bube was the chairman of the department of materials science at Stanford and carried out foundational work on solid state physics concerning semiconductors. He said:

There are proportionately as many atheistic truck drivers as there are atheistic scientists.

John Suppe

Member of the U.S. Academy of Sciences and noted professor of geology at Princeton, expert in the area of tectonics, began a long search for God as a Christian faculty member. He began attending services in the Princeton Chapel, reading the Bible and other Christian books. He committed Himself to Christ and had his first real experience of Christian fellowship in Taiwan, where he is on a fellowship. He states:

Some non-scientist Christians, when they meet a Christian, will call on to debate evolution. That is definitely the wrong thing to do. If you know what problems scientists have in their lives—pride, selfish ambition, jealousy—that's exactly the kind of thing Jesus Christ said that He came to resolve by His death on the cross. Science is full of people with very strong egos who get into conflict with each other. The gospel is the same for scientists as it is for anyone. Evolution is basically a red herring; if scientists are looking for meaning in their lives, it won't be found in evolution. I have never met a non-Christian who brought up evolution with me.

Charles H. Townes

My candidate for the scientist of the century is Charlie Townes. (Of course, he is a friend of mine and there could be some bias here.) He did something fairly significant when he discovered the laser. He almost got a second Nobel Prize for the first observation of an interstellar molecule. He has written his autobiography, entitled Making Waves (a pun referring to the wavelike phenomenon of lasers).

An excerpt from his life's story:

You may well ask, "Where does God come into this," to me, that's almost a pointless question. If you believe in God at all, there is no particular "where"—He is always there, everywhere....To me, God is personal yet omnipresent. A great source of strength, He has made an enormous difference to me.

At eighty [years old], Charlie Townes still has a very active research program at Berkeley.

Arthur Schawlow

Schawlow won a Nobel Prize in physics, 1981, serves as physics professor at Stanford and identifies himself as a Christian. He makes this unusual statement which I think could only be made by a scientist:

We are fortunate to have the Bible, and especially the New Testament, which tells so much about God in widely accessible, human terms.

Allan Sandage

The world's greatest observational cosmologist, an astronomer at the Carnegie Institution, was called the Grand Old Man of cosmology by The New York Times when he won a \$1 million prize from the Royal Swedish Academy of Sciences. He said:

The nature of God is not to be found within any part of the findings of science. For that, one must turn to the Scriptures.

In one book, Sandage was asked the classic question, "Can one be a scientist and a Christian?" and he replied, "Yes, I am." Ethnically Jewish, Sandage became a Christian at the age of fifty—if that doesn't prove that it's never too late, I don't know what does!

This is the man who is responsible for our best values for the age of the universe: something like 14 billion years. Yet, when this brilliant cosmologist is asked to explain how one can be a scientist and a Christian, he doesn't turn to astronomy, but rather to biology:

The world is too complicated in all its parts and interconnections to be due to chance...I am convinced that the existence of life with all its order and each of its organisms is simply too well put together.

William Phillips

Now in physics, you can be a lot younger and get the [Nobel] Prize. Phillips is not even 50 years old and he's got it already. His citation was for the development of methods to cool and trap atoms with laser light. At a press conference following the announcement of his winning the Nobel Prize, he said:

God has given us an incredibly fascinating world to live in and explore.

According to The New York Times, Phillips "formed and sings in the gospel choir at Fairhaven United Methodist Church, a multi-racial congregation of about 300 in Gaithersburg, Maryland. He also teaches Sunday School and leads Bible studies." If you read further in that article, you find out that every Saturday afternoon, he drives with his wife into downtown Washington, D.C. to pick up a blind, 87-year-old African American lady to take her grocery shopping and then to dinner.

David Cole & Francis Collins

Since my area of expertise is right between chemistry and physics, I cannot speak as well for the field of biological sciences. However, my longtime

colleague, Berkeley biochemist David Cole and cystic fibrosis pioneer, Francis Collins—director of the Human Genome Project, the largest scientific project ever undertaken—are both well-known as outspoken Christians.

Why Are There So Few Atheists Among Physicists?

Many scientists are considering the facts before them. They say things like:

The present arrangement of matter indicates a very special choice of initial conditions.

—Paul Davies

In fact, if one considers the possible constants and laws that could have emerged, the odds against a universe that produced life like ours are immense.

—Stephen Hawking

A common sense interpretation of the facts suggests that a superintellect has monkeyed with physics, as well as with chemistry and biology, and that there are no blind forces worth speaking about in nature.

—Fred Hoyle

As the Apostle Paul said in his epistle to the Romans:

Since the creation of the world, God's invisible qualities—His eternal power and divine nature—have been clearly seen, being understood from what has been made.

Why the Perception of Ongoing Battle?

The last question I want to ask, then, is this, Why do so many people still think that there is an ongoing battle between science and Christianity? I don't deny that there is an ongoing discussion. But I think the facts are that, what you think about God doesn't depend on whether you have a Ph.D. in the sciences.

Why would some people like to think that this supposed battle rages on? At least in part, I honestly feel it is a misrepresentation. Let me give you just one example. Andrew Dickson White was the first president of Cornell University, the first university in the United States formed on strictly secular principles. (All others had been founded on a Christian basis.) He wrote a very famous book, *The History of the Warfare of Science With Theology*, in 1896. An excerpt:

[John] Calvin took the lead in his commentary on Genesis, by condemning all who asserted that the earth is not the center of the universe. He clinched the matter by the usual reference to the first verse of the 93rd Psalm and asked, "Who will venture to place the authority of Copernicus above that of the Holy Spirit?"

(This is not making John Calvin look very good!) What's the real story behind this? Alistair McGrath, Brampton Lecturer at Oxford University and perhaps the greatest living scholar on Calvin, has recently written an authoritative biography of Calvin, in which he goes into question with great detail:

This assertion of Calvin is slavishly repeated by virtually every science writer on the theme of religion and science, such as Bertrand Russell in his *History of Western Philosophy*. Yet it may be stated categorically that Calvin wrote no such words in his Genesis commentary and expressed no such sentiments in any of his known writings. The assertion that he did is to be found characteristically unsubstantiated in the writings of the nineteenth century....

It would be fair to ask what Calvin really thought of Copernicus' heliocentric theory of the solar system, and the answer is that we don't know. He probably didn't even know about him—Copernicus was not exactly a household name in France or Switzerland in 1520. But in his preface of his translation of the New Testament into French, Calvin wrote:

The whole point of Scripture is to bring us to a knowledge of Jesus Christ and, having come to know Him with all that this implies, we should come to a halt and not expect to learn more.

Conclusion

I hope that I have given you a flavor of the history of science. Those of you who have taken a freshman chemistry or physics course will surely find many of these people familiar. In fact, the reason I have prepared this talk is that these represent the very people I have taught in such courses.

There is a tremendous tradition of distinguished scientists who were and are Christians. I hope that my work is considered sufficiently outstanding to fall into the distinguished among that category. I also hope I have given you enough evidence that you will never again believe that it is impossible to be a scientist and a Christian.