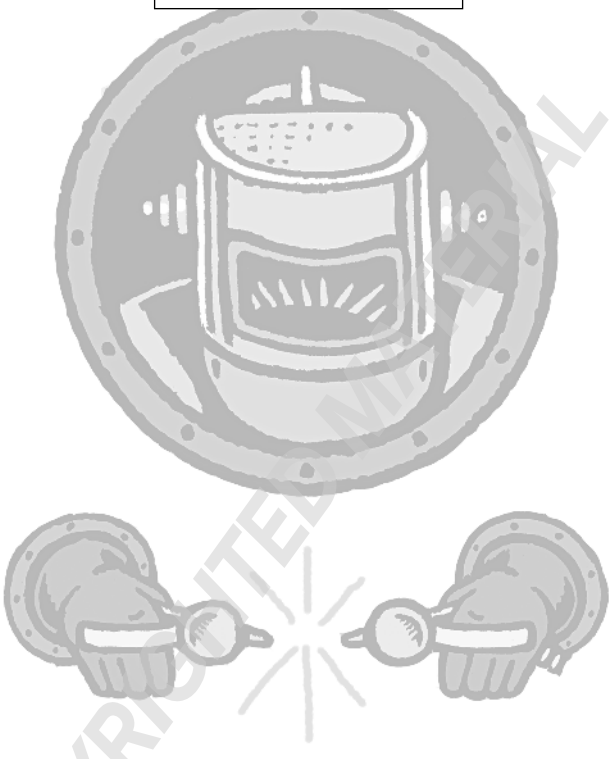
PART ONE



Why Would a Techie Believe in God?

CHAPTER 1

How Techies Believe

Proof or Belief?

A Baptist preacher, visiting Vermont, approached a Yankee farmer leaning on a fence post by the side of the road.

"Brother," he asked the farmer, "do you believe in Baptism by immersion?"

The Yankee farmer chewed on a blade of grass and then spit it out.

"Believe in it?" he replied. "Dang, I've seen it!"

I'm like that Vermont farmer. I'm an empiricist. I believe what I see.

Yet I also believe in things I can't see: electrons and black holes, for instance. They are theoretical constructs that allow me to explain the things I do see.

So does God fit into that category?

Even an atheist has to believe that the concept, at least, of "God" does exist, whether or not that concept is true or useful or the best way to approach things. Like the Yankee farmer, he merely needs to observe what we all have witnessed: some people do believe in God.

And some of those believers are hard-nosed, rational, dyed-in-the-wool techies—scientists, engineers, people whose deepest desire is to know how things work.

When I became a Jesuit brother, a member of a Roman Catholic religious order, I had been a scientist for fifteen years, yet—as is typical in our culture—most of my friends and colleagues had

no idea I practiced a religion. But once they found out I was a Jesuit, a surprising number came up and started telling me about the churches they attended. Religious belief appears to be just as prevalent among people working in technical fields as it is in the general community from which those people come. On the one hand, few British scientists are churchgoers, but then few Brits of any stripe go to church nowadays. On the other hand, scientists in, say, Chicago, seem to follow the national trend, with about half of them being regular church attendees. I recall a memorable dinner with half a dozen MIT professors where, over coffee, every one of them chimed in with complaints about the organists at each of their churches—some things are universal in all religions!

For what it's worth, in my experience astronomers are more likely than biologists to be believers. But several surveys, more scientific than my anecdotal experiences, have confirmed that in academic settings, the real atheists are to be found in English Literature departments.

Given that observation, an atheist (or anyone else) might want to ask, "How do these people, who are so dependent on empirical reasoning, find belief … believable?"

The answers I come up with here may not be the real answer to the question of why techie believers do believe. Heck, I don't even know if the motives I talk about here are exactly why I believe either; I only assert that they are some of the reasons I use to justify my religion to myself. But the real roots of one's personal faith are hard to untangle.

Choosing to believe or not to believe is wrapped up in so many things: family background; what the "religious people" we grew up around were like; our preconceptions and prejudices about one religion or another; the sort of self-image we want to project to the world. Some of our claim to religion, or lack of it, is simple posturing: "Look at me, I'm a rebel" or "I'm a good girl" or "I'm too smart for that stuff" or "I'm too humble to deny any possibilities." Some of the choice is a response to the religious desires of the people we live with, the people we love: our parents, our spouse, or even our children. And some of it is sincere angst, an honest attempt to deal with—or avoid—the scary questions of life.

The point is, within every individual, the good motives and bad motives are so intimately mixed together that it's impossible to separate them out. That's what it means to be human.

But I would expect that even the most skeptical of atheists would concede that good motives for believing in God could exist. Any person of reason should be able to appreciate that belief in at least some sort of God is one viable choice. Just as I can at least understand intellectually why someone might enjoy a movie or a hobby or a kind of food that doesn't necessarily appeal to me, I should hope that even the most severe skeptic will grant me the observation that some reasonable people can and do believe in God and that for them, positing the existence of some sort of God is not wholly illogical.

This is the only really "proselytizing" part of this book: I'm asking you to acknowledge that there could be legitimate reasons for belief in some sort of greater being (or beings). If I can't convince you that theism is not an unreasonable assumption for someone to adopt, you should put this book down right now; the rest of the chapters will make no sense to you, or worse, you'll read things into them that aren't there. Nevertheless, I do not insist that you personally adopt any sort of theism yourself, much less mine.

I understand, you may be suspicious. Whenever people hear that I am a Jesuit scientist who writes popular books, I get the impression they assume that I'm planning to write the great "science and religion" book that will Explain It All. It's not clear what they're actually expecting me to explain. Or to whom. A lot of people, I am afraid, are looking for a book that will use science to "prove" religion—*their* religion, of course.

But such a book would be a misapprehension of what science is all about. And any faith that is "proved" by science would be a poor imitation of a real religion.

Back when I was a student at MIT, I had the chance to sit in a radio studio at Boston University while two hippie radio announcers—this was a long time ago—with a show called Cosmic Vibrations or some such thing, were interviewing a young up-and-coming astronomer from Cornell named Carl Sagan. He had just published his first book, *Cosmic Connections,* and

I guess they thought with a title like that, he must be a fellow cosmic voyager. But a series of answers from him made it quite clear that whatever their vibrational modes, he was on a distinctly more mundane wavelength. Finally, in frustration, one of the hippies shot at him, "you're just a Western scientist!"

"Western New York," admitted Carl from Cornell.

Now, I may disagree with Carl Sagan's personal theology; he stopped shy of calling himself an atheist only on the grounds that, as he put it, "an atheist is someone who knows more than I do." But in this case, I'd say he had a valid point. I, too, am a Western scientist, and not just because my doctorate is from Arizona. And I, too, get fed up with people who try to dress up their theology with scientific-sounding jargon. It rings false.

Science is not in the business of dealing with specific religious questions. That would be science making the same mistake that religion made with Galileo. (Don't get me started on Galileo. . . .) Science can't prove or disprove religious tenets any more than religion can prove or disprove a scientific discovery.

Furthermore, any "religion" based on science would be subservient to science and prone to collapse when its underlying science is replaced by next year's model. We've already seen that happen throughout history, with the passage of time and new discoveries inevitably revealing the absurdity of such science-based philosophies.

It's a mistake that has been made too often already. In the thirteenth century, when the Moors were expelled from Spain, they left behind libraries with the writings of Aristotle and other ancients, books that hadn't been seen in the non-Muslim world for centuries. Aristotle's view of how the universe worked was decidedly different from what is found in the Bible. But then Saint Thomas Aquinas did such a good job of reconciling the two that within a hundred years, it seemed like Christianity was actually based on Aristotelian physics. A few centuries later, when Galileo and Newton came along and made Aristotle's physics obsolete, that was regarded, ironically, as a threat to Christianity. And that led to a new kind of religion, Deism, based on Newton's ideas of a clockwork universe, which was popular for another few hundred years until quantum theory showed up the shortcomings of Newton's

physics. Now there's a rush of people who want to equate quantum uncertainty with free will. Some people never learn.

Proof and the Scientist

Conflating this year's latest physics with theology is just a thinly disguised attempt to use science to "prove" the existence of God. And most assuredly, that is something I am *not* at all interested in trying to do. Such proofs are useless; a "God hypothesis" cannot be subjected to "scientific" or rational proof.

The famous medieval proofs of God, such as those of Aquinas or Anselm, are not proofs in this sense. Rather, they are demonstrations that belief in God is reasonable to anyone steeped in Aristotelian philosophy, or they are expressions of delight that God does exist. They may use the format of a mathematical proof to communicate philosophical information, but they never actually claim to be rigorous mathematical proofs.

For one thing, a supernatural God would be bigger than any natural, logical system—that's what *supernatural* means. The supernatural is, by definition, above, outside of, or bigger than the natural. So trying to pin down or limit, to prove or disprove, the supernatural in terms of what's natural is a pointless exercise.

For another, we know that every logical proof must start with some assumed axioms or self-evident truths. Change your axioms, and you can prove whatever you want. In practice, it's the "whatever you want" that comes first, and that determines the axioms you decide to adopt. In essence, it is not God that you find at the end of your logic; rather, your God is the unshakable axiom that you used when you started your chain of logic. Belief comes before the explanations.

Consider how you decide about something mundane, like buying a car. You may choose the Firebolt over the Nimbus because it offers better gas mileage. But on what basis did you decide that gas mileage was more important than, say, resale value? And is mileage important to you because it saves you money or because it saves the ecology? And why do you want to save money—out of greed or to feed your family better? Each reason is based on a previous reason. But this chain of reasons can't

go on forever; there has to be some ultimate value, some initial axiom that you believe in before you start your chain. A different but still perfectly logical chain of reasoning could lead to a completely different conclusion if you change your starting value. Otherwise, everyone would buy the same car.

And sometimes you don't even realize what those initial axioms are. Sometimes you lie to yourself. You may say your ultimate value is feeding your family when in fact what is more important to you is feeding your ego. The Firebolt comes in a snazzy red that gets your pulse going, but its only socially correct benefit is its marginally better gas mileage, so you then "decide" that mileage is the most important factor in your decision.

The one thing that you can't do is use your logic to justify itself. "Of course gas mileage counts more than anything else. You want proof? Just look at the Firebolt in my driveway." The fact that you bought the Firebolt may demonstrate that you think (or pretend to think) that mileage is the most important value; it doesn't prove that your sense of values was correct.

The same logic is true for buying a philosophical system. For instance, look at the way that Newton's laws of physics describe the universe. Everything, from the motions of the planets to the reactions of the chemicals in our brains, is governed (they say) by rigid, inflexible laws; give me the precise location and velocity of each particle in the universe and a complete description of all the forces acting on it, and I can calculate the outcome of every future action, completely and irrevocably determined by the laws of cause and effect. Newton's worldview does lead to a mechanistic, deterministic view of life; all things, down to the atoms that mirror the thoughts in our brains, are slaves to the cold equations. So does this prove that there is no freedom, that everything in life is predetermined? No; that kind of determinism is just the assumption we started with when we adopted the Newtonian view of the universe.

Likewise, start with the assumption that everything is chance, the way that some formulations of quantum theory describe things (once we found the places where Newtonian physics failed in describing how the universe actually behaves), and you have no problem "proving" that life is random and meaningless. Again, all you're doing is recovering the assumption you started with.

The eighteenth-century argument from design, recently repackaged as "intelligent design," falls into the same trap. Only when you assume a designer God in the first place does the evidence of design "proving" His existence leap out at you. Yes, the order in the universe can be seen as consistent with the assumption of an "intelligent designer"; it's a fine consistency argument. But it proves nothing—atheists can also come up with their own self-consistent explanations with no place for a designer. (And relying on design as your demonstration of God's existence carries with it the danger that you'll stop looking any further for explanations of why things are the way they are. The argument from design, if held too rigidly, can become very limiting of both your view of nature and your view of God.)

Most fundamentally, striving for a "scientific" proof of the existence (or nonexistence) of God is a meaningless ambition, because in fact science just doesn't do "proofs" the way that mathematics or philosophy does. No assumption, assertion, or conclusion of science is ever held to be unassailable.

Science in itself never deals with certainties. Rather, we scientists are satisfied if we can come up with a theory that's merely consistent with what we think we've observed up to now. Even long-held axioms like conservation of mass ("no matter is ever created or destroyed") have been found to be incomplete in the light of new experimental evidence. As an example from my own field of astronomy, for a generation everybody studying solar systems knew that rocky planets like Earth and Mars are found close to the sun, while gas giants like Jupiter and Saturn were farther out; this was a fundamental starting point in every theory of how planets were formed. Then we learned how to detect planets around other stars and found hundreds of cases where gas giants orbit very close to their stars. Time to rethink our theories.

Everything in science is always subject to further review. Even our experimental data can be found to be biased by unsuspected error, and their interpretation can be distorted by our theoretical preconceptions. (It turns out that star systems with gas giant planets close to their stars are the easiest kinds of systems to discover. Have we found so many of them only because they are easy to find, or is the overwhelming number of such systems

evidence that this is a fundamental characteristic true for most stars with planets? We still don't know.)

Indeed, sometimes the fact that the evidence is merely "not inconsistent with" our theory is good enough to let us keep believing in that theory. We can measure the law of gravity over small distances in the lab or very large distances on the scale of planets and stars; we assume the same law holds for intermediate distances simply in the absence of any data to the contrary. But we could be wrong.

Science is successful only as a way of approaching the truth asymptotically, as it were, getting closer and closer without ever quite fully arriving there; it's constantly self-correcting because it continually recognizes its need to correct itself. That works only if you admit from the beginning that you don't already have the truth, whole and completely understood, and that you'll never have the truth in that way. This humility in the face of the universe is an essential element of a properly functioning techie mind-set.

If you limit yourself to science, you always have to accept the possibility of a God—and the possibility of no God. Even Carl Sagan knew that. Neither belief in God nor the denial of God is necessary to do science. And in any event, choosing to believe or not believe in the God axiom comes first, before you even start to do the science.

Faith in Reason

On the other hand, Stephen Jay Gould in his book *Rocks of Ages* makes an argument, often heard, that an impermeable barrier stands between the worlds of science and religion and that neither can make useful contributions to the other's realm. But certainly that can't be entirely true. For one thing, our contemporary understanding of the universe means that we must recognize today that any God responsible for creating it must be much bigger than they could possibly have imagined in 1000 B.C. That shouldn't be surprising or disturbing. After all, the picture of God I had when I was five years old was pretty limited, too. (So was my understanding of science.)

More profoundly, without a certain philosophical predisposition, I would have no reason to think that science was worth doing, much less possible to do. It has been argued that belief in a creator God who is reported to have looked at his creation and called it "good" is what gave early Jews, Christians, and Muslims the motivation—or at least the political cover—to get the resources they needed to do pure science, to study the universe just for its own sake.

Believing in a capricious God, a God of chaos who constantly changes the rules of the universe, would play havoc with some of the other assumptions we believe in as scientists because science relies on being able to count on the stability of certain rules. But even that doesn't disprove the existence of such a chaotic God. Perhaps instead it's the axioms of science that we techies choose to believe in that are not correct. I can't prove that every scientific law isn't just a long string of coincidences. But instead I tend to believe the opposite, that a sufficiently long string of coincidences is evidence of a scientific law.

It's important to remember that the scientist is no stranger to belief in and of itself. We believe our yardsticks are actually a yard long. We believe in the authority of the CRC Handbook when we look up physical constants or standard formulas. We believe that the laws of physics that worked yesterday will still work the same way tomorrow. Sometimes we even believe our data.

More subtly, scientists and engineers start every new project with a belief that a solution does exist. We believe that there is an objective reality and that in at least some limited way we can make progress in understanding the truth about that objective reality. That's a huge assumption to swallow. Some nontechnical people are just as happy thinking that "everything is illusion" or "reality is what you make of it yourself." Solipsism—the philosophical theory that suggests that the universe is just a projection of an individual's own imagination—starts with the mind-set that "I am the only mind that exists." The story goes that one such-minded amateur philosopher once said to George Bernard Shaw, "I am a Solipsist, and most of my friends are, too." Shaw was understandably amused.

Most fundamentally, underlying every logical system, every scientific data point, are the nonrational human beings whose desires, intuitions, and hunches led them to do that bit of science in the first place.

When you take a hard look, you realize that most of our work is shot through with nonrational behavior. When I say "nonrational," I don't mean "irrational." Our nonrationality is in fact quite reasonable. It's necessary, because our very rationality itself relies on insight: we techies usually start our problem solving with a hunch—an insight about where we should look to find the solution, what the answer is going to look like, how this problem will parallel or differ from similar problems of our experience. Without those hunches, we have no idea where to start. And without knowing ahead of time what the solution is going to look like, we would have no way of recognizing it once we found it; we'd have no idea when to stop looking.

If you don't think this is the case, try teaching physics to first-year college students. You can have a classroom full of incredibly bright kids, but until they have developed their own set of intuitions, they find physics utterly mysterious. That's why freshman physics and engineering classes concentrate on examining previously solved problems: the point is to force-feed some "canned" experience into the students, cramming into them many examples of solutions that work, in the hope that these students will become more able to recognize a given sort of problem (and how to solve it) when they see one. What we are teaching isn't a collection of facts or formulas; I'd let my students bring equation sheets to the exams and they'd still manage to flunk the test. No, what is being presented in physics class is the habit of intuition.

Reason itself is based on intuition. "All men are mortal; Socrates is a man; therefore, Socrates is mortal." But how do you know that all men are mortal? Or that Socrates is a man? And what spark inside you allows you to deduce that this demands that Socrates must be mortal? Each of these steps involves a nonrational intuition.

"Cats are small and black and furry; this animal is small and black and furry; therefore, this animal is a cat." It takes a bit of education to be able to name all the flaws in that syllogism. But

if you don't learn to do so, you're likely to find yourself cuddling up to a skunk.

We know that in practice our logic alone is untrustworthy; our habits of intuition are imperfect, our premises are incomplete, and sometimes we misstep. That's why we also demand experimental evidence.

Notice how we techies handle the things we believe. First of all, we always recognize that we could be wrong. Logic can be flawed. Tables have been known to contain misprints. Hunches sometimes turn out to be mistaken. Next, we allow our beliefs to be tested by results. If we get an answer that works, it confirms our trust in the data, and it strengthens our preconceptions the next time we're looking for a hunch. We allow our beliefs to be confirmed by our experience. And finally, we're a whole lot more comfortable with our results if there is more than one line of evidence leading to the same conclusion.

At a fundamental level, these attitudes and practices are fraught with philosophical peril (as you'll see). There is actually no logical support for that kind of reasoning, and trying to construct a mathematical proof with arguments like that would get you laughed out of a mathematics department. (It's like the joke of the physicist's proof that all odd numbers are primes: "Three is prime, five is prime, seven is prime, nine must be experimental error, eleven is prime, . . .") Indeed, every obsolete theory in the history of science—which is littered with obsolete theories—is an example of a well-established idea supported by multiple lines of evidence and good observational data that seemed to work for a while but still turned out to be wrong. Yet for most everyday techie activities, most of the time, this way of thinking seems to work.

A big reason that the techie way of proceeding works is that we pay attention to everyone else in the community of science and engineering. We love this techie stuff, and we love showing it off and watching other techies strut their stuff even when it isn't in our corner of the playground. Our work isn't finished until it's been presented to the larger community. And almost always, what we do is done as a part of a team. We check our results against what others have done. Implicit in this is the unspoken but fundamental techie assumption that one answer is the right answer,

objectively and demonstrably right, and anything that disagrees with that answer is wrong. And we're more interested (usually) in finding the right answer than in stroking our own egos.

Sure, sometimes the lone outcast is the only one to get it right; but let's face it, that doesn't happen very often. If everyone else's calculations come up with 7 and you get 700, then everyone—including you—will agree on whose result you're going to check first to look for the mistake. It is illogical to assume that you're always smarter than everyone else (even if, alas, it's an all-too-common techie failing).

And so, simply by force of habit or out of comfort and trust in familiarity, the same techniques can be applied by a scientist or an engineer to understanding what God is or at least what God might be. The techie credo is to keep an open mind but trust your common sense. Compare what you hear with what you've actually experienced of how the universe works. And listen to not only your own common sense but also the experiences and common sense of the rest of the world.

If most of the people in most of the world over most of human history have believed in some sort of God, that doesn't prove that there must be a God. But it's a reasonable presumption that all those people must be getting some good out of believing in one. So let's see what good that might be, from a techie perspective.