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John R. de Laeter

Physics

Professor de Laeter is Emeritus Professor of Physics at Curtin University of Technology in Australia, where he was previously Deputy Vice-Chancellor of Research and Development. He holds a B.Sc. in physics and B.Ed. in education, both with first class honors, a Ph.D. in physics and a D.Sc. in physics, all from the University of Western Australia. Professor de Laeter has served as chairman of the International Commission on Atomic Weights and Isotopic Abundances, and presently is the Australian Academy of Science's representative on that commission. He has published approximately 200 research papers and was awarded the Kelvin Medal of the Royal Society of Western Australia in 1993. A minor planet is named after Professor de Laeter in recognition of his contributions to astrophysics. He is an Officer of the Order of Australia.

Can a scientist believe in God? I have been asked that question many times during my professional life as a physicist.

When I studied science at the University of Western Australia (UWA) during the early 1950s the conventional answer to that question was "no." Science and religion were incompatible!

The Australian student Christian movement at UWA attempted to convince people by logical reasoning that science and religion were compatible, but I was not particularly impressed with their approach, in the sense that faith and not logical argument is the way to the kingdom of heaven.

I later studied philosophy in an attempt to see if there were irrefutable arguments to prove the existence of God — but one

unit away from a bachelor of arts degree I gave up the study of philosophy because it did not answer my question.

However, there were two incidents at the UWA which had an important impact in my search for God, although, I have to admit, by instinct and upbringing I was always a believer.

The first occurred during my honors year in physics. One of the subjects we had to study was quantum mechanics, and I was struggling to understand the subject. I was getting desperate when I discovered a book on quantum mechanics written by a well-known theoretical physicist/applied mathematician named Professor C.A. Coulson. To my surprise (and delight) I found I could understand Coulson's approach to quantum mechanics and I subsequently passed the subject with flying colors. I then discovered, quite by accident, that Professor Coulson had written a number of books about science and religion in which he declared his Christian faith. So Coulson became, in a sense, my role model.

The second incident occurred when I was carrying out research on nuclear astrophysics for my doctorate in physics. My task was to separate minute amounts of tin from iron meteorites for mass spectrometric analysis. Knowing little about chemical separation procedures, I was directed to a book entitled *Ion Exchange Chemistry.* I had no sooner picked up this specialized treatise when I was amazed to read, in the preface, that the writer claimed that God was the first ion exchange chemist! His assertion was based on a story in the Old Testament covering the bitter springs of Marah (Exod. 15:25). Moses, under instructions from God, told the Israelites to put branches of trees into the bitter water and, lo and behold, the water became drinkable and the children of Israel were saved from dying of thirst. The author of the book went on to argue that early ion exchange materials used for water softening were, in fact, made of cellulose, a major constituent of wood, thus giving an explanation as to how the bitter springs of Marah were made sweet. He concluded by saying that if scientists had taken this Old Testament story seriously, ion exchange chemistry would have been developed much earlier than the 20th century.

This incident had a deep impact on me because it answered — at least in part — one of the criticisms of scientists,

and others, that many (or all) of the biblical stories were "fairy tales." I have since studied many of these Old Testament stories and satisfied myself as to their veracity, even down to the smallest detail.

But Why Do I Believe?

Most scientists accept that the universe is a rational place. In fact, the scientific method is based on the assumption that if you perform an experiment today and get a certain outcome, others can repeat the experiment under similar conditions, albeit in other places, and get the same answer.

To me, the Christian story as revealed in the Bible is a convincing account of human nature. As I observe my fellow human beings, the events of history, and the social phenomena of our times, I can perceive the age-old struggle between good and evil, of sin and guilt on the one hand, and the freedom of forgiveness on the other. I see people struggling with their personal demons, and others who have risen above their strife through faith in a personal God.

In some respects I find that being a practicing scientist helps me in my understanding of God. The Trinity, the godhead, the three-in-one, may be a stumbling block for some, but to a physicist, who accepts the concept of the wave-particle duality of matter, the Trinity is a perfectly acceptable concept of the nature of God.

In my own research area of nuclear astrophysics I am struck by the large number of cosmic "coincidences" which have occurred in order for the universe to be as it is and for life to exist on planet Earth. Far from weakening my faith, science has in fact strengthened it.

Why do we as human beings exist in this vast universe? For what purpose are we here? Is it by accident or design? Are we simply part of the flotsam and jetsam of the universe, or is there meaning in life?

My scientific colleagues will accept the rationality of the universe and be prepared to concede that there may well be a "designer." In fact, most people around the globe and from the beginning of human existence have reached the same conclusion. Most of my colleagues will also accept that Jesus was a

person who shaped history, who was a good man, who gave us the secret of how to live by the "golden rule." However, there is a "quantum jump" in thinking from the concept of a rational designer of the universe, to an acceptance that a person called Jesus is the Son of God, and that we can have a personal faith in Him.

In circumstances like this, I remind my colleagues that science is based on testing the theory or model by experiment. If it turns out that the model fails in the light of the experimental evidence, then we discard the model and seek a better one. Science proceeds by a rigorous regime of putting theories to the test. There is no reason why the scientific method should not be used in everyday life, and likewise that people should put the gospel to the test, and see if it works for them.

If we were prepared to study the Bible in the same manner that we study our scientific texts, we would discover a convincing description of human nature and behavior, akin to our scientific investigation of the physical world around us, which leads me to conclude that the Bible is indeed the living Word of God.

My testimony is that a faith in a personal Savior has worked for me and for my family and countless numbers of other people. I have based my adult life on the maxim that "I can do all things through him [Christ] who strengthens me" (Phil. 4:13; NRSV). My experience is that a belief in a personal Savior has been the cornerstone of my life.

Gary D. Gordon

Aerospace Engineering

Dr. Gordon is an aerospace consultant. He holds a B.A. from Wesleyan University and an M.A. and Ph.D. in physics from Harvard University. Dr. Gordon worked as an instructor at Harvard before entering private industry as a research scientist in the area of satellite technology. He was a senior engineer in the team that designed the first weather satellite, TIROS. Dr. Gordon is co-author of the reference book Handbook of Communications Satellites *(Wiley, 1989) and the graduate level textbook* Principles of Communications Satellites *(Wiley, 1993).*

Why I Believe in Science

I believe in physics because it works. In 1959 I was on a team building the first weather satellite, TIROS. We had to predict the temperature of the satellite, and the critical temperature of the batteries. If they got too hot or too cold, the satellite would not work. No one at RCA had any experience in predicting satellite temperatures. So I used the Stefan-Boltzmann law to calculate expected temperatures. The satellite was launched on April 1, 1960. The temperatures followed our predictions, TIROS 1 worked, and this first weather satellite transmitted the first photographs of the earth from outer space.

The law of gravity. Physics is based on a few fundamental laws. One of these is the law of gravity. This law is not proved

by logic. There is no simple derivation of this law. Isaac Newton proposed this law to explain the motion of the planets. As a matter of fact, when he first thought of it, the motion of the moon did not match the acceleration of objects on earth (such as the fall of an apple). Newton set the law on the shelf because it didn't work. Twenty years later this changed, with a new measurement of the distance from the earth to the moon. Now the law agreed with the experimental data, and he published his theory. Centuries later, I use Newton's law of gravity to calculate satellite orbits, and where the satellites will be in the future. It still works.

I teach courses on satellite orbits, and start by assuming that the law of gravity is true. I can then teach the students how to calculate satellite orbits, and when to fire thrusters to keep the satellites in the desired orbit. If asked, I usually say I believe in the law of gravity. But I have studied the general theory of relativity, and I know the law of gravity does not always yield the right answers. It has limitations. Usually these don't apply, so I continue to believe, and use, the law of gravity. But my belief in this and other laws of science does have limitations.

Observation and experiments. Science took a giant leap forward when Galileo started to observe the planet Jupiter with a telescope, and drop balls to observe the effect of mass. Early in life, Galileo refused to accept any scientific fact based on Aristotle's authority. Galileo repudiated mere appeal to authority, and in its place pioneered the investigative technique of combining mathematical argument with an appeal to observation and experiment. Since then, science has never been the same. Now, most educated individuals have an implicit faith in science. Sometimes incorrectly, they blindly accept whatever any scientist says as an absolute truth! They accept science much as people of old accepted Aristotle's teachings. And yet, many dismiss religion because it can't be proven; and they don't think of looking to see whether it works. It is time for people to follow Galileo, and to accept or reject religion based also on observations.

I believe in science written by authorities I respect. I examine the experimental evidence and observe how it applies to the world. I use the laws of physics in my profession — and they work.