THE SCIENCE BEYOND SCIENCE

Humbert Kilanowski, O.P.

Philosophy is dead." Thus speaks Stephen Hawking, the best-known physicist of the contemporary age and author of *A Brief History of Time* and *The Theory of Everything*. This bold claim appears at the beginning of his latest popular-science book, *The Grand Design*, co-authored with physicist Leonard Mlodinow. Throughout the book, Hawking and Mlodinow seek to explain everything about the origins and operations of the universe, using a model called "M-theory." According to the authors, only science is properly equipped to tackle the "big questions" of existence, and because philosophy has not kept pace with modern science, it is useless and lifeless.

Many have already disputed this proposition, some quickly noticing that such a statement is itself philosophical. But if science, the reasoned study of the material world through causes, can answer all the questions of the universe, is there any reason for studying philosophy, or for that matter, theology? For if everything that exists is material, then the universe, as Hawking explains, would have brought itself into being: "M-theory predicts that a great many universes were created out of nothing. Their creation does not require the intervention of some supernatural being or god. Rather, these multiple universes arise naturally from physical law."

By claiming that everything that exists falls under the domain of science, Hawking sees not only the death of philosophy, but also the death of God. Yet, Hawking's explanation for how the universe came to be and is sustained in existence does not pass muster; rather, scientific reasoning shows that philosophy is also necessary to describe the universe and all its causes.

Raphael - The School of Athens

To a student of philosophy, Hawking's claim seems outrageous: how can a scientist deny the need for the related discipline of philosophy, which has developed alongside science for millennia? People around the world have always wondered at the spectacle of nature that surrounds them, pondering not only how the heavens, the seas, the plethora of animal and plant life, and their own bodies and souls operate, but also *why* they are the way they are.

Among the ancients, no one inquired into the workings of the natural world as thoroughly as Aristotle, living in Athens in the fourth century before Christ, writing extensively on biology, astronomy, and physics, as well as philosophy. While other philosophers previous to Aristotle believed, as Hawking does now, that all things that exist were made of matter, or held, as Plato did, that material things are merely imperfect representations of immaterial ideas, Aristotle proposed a middle ground, acknowledging the reality of both physical and immaterial beings, and concluding that all knowledge begins with sense perception, for everything we learn, we either observe directly, or read, or hear from someone else.

Our minds can then reason from these things better known to us—that is, sensible, material objects that we can grasp directly—to what are better known in themselves, namely, the *reasons* for which things are the way we see them. For example, we readily see that the sky is blue, but by investigating the nature of light, we can come to understand that the earth's atmosphere bends sunlight in such a way that results in a wavelength corresponding to the color blue. In fact, St. Paul speaks of the same method of reasoning by which one can come to a basic knowledge of God through nature: "Ever since the creation of the world, his invisible attributes of eternal power and divinity have been able to be understood and perceived in what he has made" (Romans 1:20).

In his logical and philosophical writings, Aristotle actually laid the foundations for the study of science. Examining any object or change that he saw with his eyes or considered with his mind, he would inquire into its four causes, outlined in his major treatise on natural science, the *Physics*: the material cause, which describes what something is made of; the formal cause, which answers the question of what it is; the efficient cause, which denotes who or what made it the way it is; and the final cause, which names the purpose, function, or goal of the item.

For example, the material cause of a pencil is the wood, graphite, and rubber that go into making it; its formal cause is its properties like its color, size, and long hexagonal shape; its efficient cause is its manufacturer; and its final cause is the activity of writing or drawing. Only by understanding all four causes, according to Aristotle, can one truly know an object, event, or concept.

Modern science, on the other hand, focuses its attention almost entirely on the efficient causes of the natural world, sometimes considering the material cause, relegating the formal cause to mathematics, and completely ignoring the final cause. But while science has narrowed its scope in more recent centuries, philosophy has not adjusted accordingly, leading to Hawking's obituary for the discipline.

Yet, this is not a change that philosophy is capable of making—it is not simply a subfield of natural science. In addition to the studies of logic, human interactions, and the arts—which cannot be tested by the scientific method—philosophy also includes a unifying, all-encompassing field that studies everything that exists. This field can be demonstrated to have a wider scope than science. In his quest for knowledge, Aristotle sought to establish this highest form of wisdom, the one architectonic study on which all others depend. This is the study of being in general, or "all that is," and while he called the discipline "first philosophy," his later students noticed that his writings on the topic came after (*meta*) the *Physics*, and coined it *Metaphysics*. The name also applies to the fact that its scope extends *beyond* (*meta*) physics.

Hawking and others, however, contend that natural science is self-contained and all-inclusive, and that the material world is "all that is." Aristotle presciently analyzed this claim in Book VI of the *Metaphysics*:

> We answer that if there is no substance other than those which are formed by nature, natural science will be the first science; but if there is an immovable substance, the science of this must be prior and must be first philosophy, and universal in this way, because it is first.

Thus, metaphysics is a distinct discipline from science, provided that there is some entity not produced by nature, and not movable or changeable, as all physical substances are.

An all-encompassing scientific theory, such as the M-theory that Hawking promotes, rests on the assumption that everything that exists is material. This is an understandable assumption; after all, we cannot see God, or angels, or the souls of the deceased, nor can we detect them with a radio telescope, as we can with quasars or some black holes. But everything physical requires an efficient cause to make it the way it is. If all that exists is material, then the

universe as a whole must either have always existed, or its efficient cause of being is within itself.

It is the latter explanation that Hawking advocates. According to M-theory, our universe is but one of many, each with its own set of physical laws. Thus, the particular properties of nature that make human life possible, such as the fine structure of the hydrogen atom, the size of objects in our solar system, and even the fact that our universe has three dimensions, are nothing special. Rather, universes pass in and out of existence just from fluctuations in the gravitational force field, and a few have laws such that they reach a critical size, large enough to form stars, planets, and rational beings.

Hawking argues this by observing that the universe cannot be explained by known physical laws for a fraction of a second after the Big Bang, as the whole universe is small enough to be jointly subject to general relativity and quantum mechanics in this interval. The mathematics introduced by the notion of multiple universes is coherent, agreeing with observations within our own universe.

But coherence is not enough to imply truth: the math also made sense in Ptolemy's model of the solar system, in which the sun and planets spun within epicycles as they revolved around the earth. This model was eventually discarded upon the discovery of the laws of gravity and planetary motion, rooted in observation; yet Hawking's explanation is not scientifically testable. By postulating a higher set of physical universes as necessary for the generation of our own universe, he clearly wishes to dismiss any notion of the supernatural or metaphysical.

Rather, Hawking posits that the laws that *describe* nature also *generate* it: "Because there is a law like gravity, the universe can and will create itself from nothing." However, a physical law is nothing more than a relation among existing material things. An Aristotelian approach maintains that the laws are better known in themselves (e.g. that massive objects attract each other—the law of gravity), and we come to know them through what is better known to us (observing that objects, when dropped from a height, accelerate toward the earth). Rather than matter depending on laws,

the laws depend on matter for their existence. Fr. Benedict Ashley, O.P. provides a concise analysis in *The Way toward Wisdom*:

> To imagine that the universe arose from quantum fluctuations in nothing, however, is absurd since natural laws do not have disembodied existence but are properties of matter. To posit a law of quantum dynamics according to which such quantum fluctuations must occur requires that this law be based on the observed properties of matter and energy, and matter and energy are nothing but just that changeable being whose initial existence demands to be somehow explained.

In short, the argument central to M-theory employs circular reasoning: physical laws cannot bring the matter of the universe into being out of nothing, because there are no laws without matter for them to describe.

If the conclusions of M-theory regarding the origin of the universe are unprovable and logically unsound, then there must be another explanation. Hawking and other materialists deny the need for, and even the existence of, any immaterial being to cause the universe that would fall outside the bounds of science. Catholic tradition maintains, however, that the existence of such an uncaused cause can be established by an argument that begins in natural science. "It is certain, and evident to our senses, that in the world some things are in motion," as St. Thomas Aquinas begins his argument in the second question of the *Summa Theologiae*.

No physical body can cause its own motion; as Aristotle proves in Book VII of the *Physics*, everything in motion must be put in motion by something else. A boat, for example, does not move unless rowed, or carried by the wind and current. If the efficient cause of the motion is something material, then it too must undergo motion as it moves the first body, and so it must be moved by a third thing, and so on.

Yet, this process cannot continue *ad infinitum*, in which case there would be nothing to set everything in motion at once. The earth is moved by its gravitational interaction with the sun, and the sun by the rotation of the Milky Way galaxy, but what moves each galaxy away from the others? At some point along any chain of movers and moved objects, there must be one mover that is unmoved, and thus immaterial (such as the soul for a human action, or the first mover for the whole universe). Since this mover is not physical, it cannot be examined by natural science—some other discipline must be engaged. Therefore, science establishes both the need for metaphysics, and its distinctness from the study of nature.

Similarly, by considering the efficient causes of things, one naturally arrives at one first cause, itself uncaused, that not only brings everything into being, but sustains it in existence. Notably, the theory of the Big Bang, invoked by Hawking as the origin of our universe, agrees. This commonly held theory, formulated by Belgian priest Msgr. Georges Lemaître, holds that all the matter in the universe can be traced back to a single point in space and time. The efficient cause of its rapid expansion, which continues to this day, and of bringing the totality of matter into existence, must be separate from the universe.

While Hawking postulates other material universes as this cause, and other competing theories posit an eternal cycle of Big Bangs and "Big Crunches," in any case, some immaterial cause must have brought the universe (or multiverse) into being from nothing. Either this efficient cause is itself uncaused, or else something else brings it into existence. As before, the impossibility of an infinite regress emerges; consequently, there must be one uncaused First Cause responsible for the existence of all that is.

This act of causing something to exist when previously there was nothing is properly called not generation, as a pencil is produced from existing wood and graphite, but creation. As such, it cannot be described in the same way as a physical motion. Many

materialist physicists ignore this distinction and assume that the creative act is an isolated event in the far-off past. However, creation is not constrained by time, for it is not physical, but metaphysical. Dr. William Carroll explains: "Creation is not primarily some distant event; rather, it is the on-going, complete causing of the existence of all that is. At this very moment, were God not causing all that is to exist, there would be nothing at all." Therefore, the First Cause, which brought the whole universe into existence, also explains why anything exists right now.

Thus, the most scientific explanation for how the universe came to be and still exists is that its First Cause is non-physical. Yet, Hawking refuses to concede this: "This is known as the first-cause argument for the existence of God. We claim, however, that it is possible to answer these questions purely within the realm of science, and without invoking any divine beings." Since God is immaterial, He is not within the scope of natural science, and thus He does not fit into a scientific theory of everything of the kind Hawking wishes to develop.

St. Thomas responds to Hawking's unoriginal contention that natural laws make God unnecessary. "Since nature works for a determinate end under the direction of a higher agent," he argues, invoking the long-neglected final cause, "whatever is done by nature must also be traced back to God, as to its first cause." Therefore, God is not merely outside of science. Rather, He governs and directs all the objects of science, as the creator of all matter from nothing, as well as the originator of the laws that denote the marvelous order of the created world, according to His divine plan. Thus even the laws of nature, which Hawking proposes as the first cause, require another cause higher than themselves.

This first cause, in turn, requires a field of study to explain it that transcends the bounds of scientific inquiry. Because there are some beings that are unchangeable and undetectable by our senses, and thus cannot be described using science, the broader field of metaphysics is needed to study them, because even immaterial beings fall under the category of "all that is." Likewise, the First

Cause (which Thomas says "everyone understands to be God") is important enough to merit its own discipline, in which we can investigate how God has willed to reveal Himself to His creatures. This is the field of theology. Only by all of these studies, taken in combination, can one come to knowledge of the entire universe, and thus formulate a true theory of everything.

Near the end of the book, Hawking does admit of some limitations of modern science: "The laws of nature tell us *how* the universe behaves, but they don't answer the *why?* questions." Such questions about the purpose and final cause of the universe, about why there is something rather than nothing, are beyond the bounds of modern science: they are proper to philosophy. Just as Aristotle and St. Thomas, using science, demonstrated that the subject of natural science is not "all that is," so we can conclude that the broader study of metaphysics is necessary to answer the questions that even the most renowned scientist of our age cannot. With all due respect to Dr. Hawking, philosophy is alive and well, and through it, we can raise our minds from the passing splendors of the natural world toward contemplation of God, the Creator of all things visible and invisible.

Humbert Kilanowski entered the Order of Preachers in 2010.