From Spinoza to Hawking: Analysis and Critique

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About the Author

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In addition to his scientific research, Aviezer has a long-standing interest in the relationship between Torah and science. He is the author of three books: In the Beginning (translated into nine languages); Fossils and Faith (translated into four languages); and Modern Science and Ancient Faith (recently published). Aviezer teaches a course at Bar-Ilan University on Torah and science, which was awarded the prestigious Templeton Prize. Aviezer is one of the organizers of an annual Torah and science conference which attracts hundreds of participants from all over Israel.

Born in Switzerland and raised in the United States, Professor Aviezer received his doctorate from the University of Chicago and subsequently held a senior research position at the IBM Watson Research Center in New York. In 1967, Nathan and his wife, Dvora, made aliya. Living in Petaḥ Tikvah, the Aviezers have four children and many grandchildren.

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ABSTRACT

There are philosophers and scientists who claim that nothing exists except the physical universe. They assert that what cannot be observed does not exist. This idea appears in the 1774 treatise Ethics by the philosopher Baruch Spinoza, as well as in the 1796 treatise Exposition of the System of the World by mathematician-astronomer Pierre-Simon Laplace. This idea has again been proclaimed by cosmologist Stephen Hawking in his recent book, The Grand Design, which presents his new theory for the spontaneous beginning of the universe. He generalizes Big Bang cosmology to include String Theory, Inflationary Cosmology, and Quantum Theory. Hawking concludes that “G-d is unnecessary because the creation of the universe follows directly from the laws of physics.”

Hawking’s new book became an instant best seller, to the delight of the atheists. Richard Dawkins gloats, “Darwin kicked G-d out of biology, and now Hawking has administered the coup de grace.”

I shall point out the error in the claims of Dawkins and Hawking, and show that there is harmony between the new discoveries and traditional Torah concepts.

INTRODUCTION

Many philosophers and scientists support the idea that the only meaningful data are those that can be measured in the laboratory or observed in nature. For them, nothing exists that cannot be measured or observed. Since the Revelation at Mount Sinai left no historical record, this idea implies that belief in the divinity of the Torah is meaningless.

This idea has a long history, in the realms of both science and philosophy. In his treatise Ethics, the Dutch philosopher Baruch Spinoza (1623–1677) wrote that the entire physical universe and the orderly laws of nature are part of G-d (Collins 1984). Spinoza was viewed alternately as an atheist or a pantheist or a deist. He believed that all aspects of the physical world are really aspects of G-d. This led Spinoza to conclude that the laws of nature must always apply because G-d is unchanging. Therefore, he did not believe in miracles or that G-d plays any role in human affairs (Bennett 1984). Because his teachings are contrary to Torah concepts, Spinoza was excommunicated by the Jewish community of Amsterdam.
Another proponent of the idea that there is no aspect of the universe that cannot be explained by the laws of nature was the French mathematician Pierre-Simon Laplace (1749–1827). When he sent his treatise on astronomy, *Exposition of the System of the World*, to Napoleon, his former student at the French Military Academy, Napoleon read the treatise and then asked, “Where does G-d appear in your theory?” Laplace cynically replied, “I have no need for that hypothesis.”

Recently, the question of the role of G-d in the universe has again reared its head. Stephen Hawking and Lawrence Krauss have proposed a new theory that explains how the universe could have appeared spontaneously from nothing. Both scientists published books for the lay reader explaining their new theory: *The Grand Design* by Hawking (in 2010) and *A Universe from Nothing* by Krauss (in 2012). Both books became instant best sellers.

Their new theory combines Richard Feynman’s novel approach to Quantum Theory with recent formations of String Theory and Inflationary Cosmology. Their proposal provides a seemingly scientific explanation for how the universe could have come into being spontaneously. The new theory is still at the level of speculation, but if we assume that the theory will be eventually confirmed, what are the theological implications?

**RICHARD DAWKINS’ REACTION**

Richard Dawkins holds a chair at the University of Oxford as Professor in the Public Understanding of Science. Dawkins also has the dubious distinction of being the world’s most famous atheist.

The world did not have long to wait for Dawkins’ reaction to this new theory: “Darwin kicked G-d out of biology, and now Hawking has administered the *coup de grace*” (Dawkins 2010 and Krauss 2012). Dawkins’ argument can be formulated as follows:

Fact: There exist many different species of animals.
Explanation: Darwin’s theory of evolution explains this fact.
Conclusion: Therefore, G-d is not the explanation of this fact.

Dawkins’ conclusion is based on his erroneous assumption that there can be only one correct explanation for the animal kingdom. If this
were the case, it would follow from Darwin’s explanation (or, more accurately, from neo-Darwinism) that all other explanations must be wrong, implying that “Darwin kicked G-d out of biology.”

OTHER REACTIONS TO DARWIN’S THEORY

Rabbi Samson Raphael Hirsch

Rabbi Samson Raphael Hirsch (Germany, nineteenth century) was known for his uncompromising opposition to any idea that deviated even slightly from Torah Judaism. Shortly after Darwin’s theory was published, Rabbi Hirsch wrote the following:

If the notion of evolution were to gain complete acceptance by the scientific community, Judaism would call upon its adherents to give even greater reverence to G-d, Who, in His boundless creative wisdom, needed to bring into existence only one amorphous nucleus and one law of “adaption and heredity” in order to bring forth the infinite variety of species that we know today (Hirsch 1997).

Charles Darwin

Rabbi Hirsch was preceded in his view by Charles Darwin himself, who ended his famous book, The Origin of Species, with the following stirring words:

There is a grandeur in this view of life, having been originally breathed by the Creator into a few forms or into one, and from so simple a beginning, endless forms most beautiful and most wonderful have been and are being evolved (Darwin 1958).

G-D AND EVOLUTION

Both Darwin and Hirsch viewed evolution as the mechanism used by G-d to produce the animal kingdom. Particularly interesting is Rabbi Hirsch’s statement that the evolution of the animal kingdom is even more impressive than producing every species by a separate act of divine creation. Although it is impressive to make a beautiful pair of shoes, it is much more impressive to make a factory that automatically takes
raw materials and from them produces “endless forms” of shoes “most beautiful and most wonderful.”

Rabbi Hirsch states that G-d works within the laws of nature (qlam k’minhago noheg. See, for example, MAIMONIDES, Mishneh Torah, Laws of Kings 12:1). This important Torah principle explains how G-d interacts with His world. It follows from this principle that no scientific discovery can cast doubt on the existence of G-d.

HAS G-D BEEN “KICKED OUT”? 

We now return to Dawkins’ assumption that there is only one correct explanation for the animal kingdom and the origin of the universe. We have seen that both Darwin and Hirsch reject Dawkins’ assumption. They write that the scientific explanation illustrates how G-d causes the phenomena of nature to occur. Science and belief march together.

In fact, the opposite of Dawkins’ conclusion is true. We expect G-d to have created the universe through the laws of nature because He usually acts through the laws of nature. Miracles do occur occasionally, but only when some particular human need is involved. Therefore, the recent discovery of Hawking and Krauss that the origin of the universe can be explained by combining Quantum Theory, String Theory, and Inflationary Cosmology actually serves as a confirmation of how G-d acts.

Charles Darwin concludes his book by expressing his awe for the grandeur of the Creator, which he sees in the development of the animal kingdom. By contrast, Richard Dawkins thinks that the development of the animal kingdom undermines our faith and justifies rejection of G-d. From Darwin’s theory, Dawkins has concluded the exact opposite of what Darwin himself concluded. It is with considerable irony that we note that Dawkins’ chair is in the “Public Understanding of Science.” Perhaps one can summarize this anomalous situation by saying that Darwin preemptively kicked Dawkins out of theology!

THE NEW THEORY AND QUANTUM FLUCTUATIONS 

A complete discussion of the new Hawking-Krauss theory for the spontaneous beginning of the universe is beyond the scope of this article.
However, we shall give the reader the flavor of the new theory by showing how modern science permits the possibility of “something coming from nothing.”

One of the most surprising features of Quantum Theory is Werner Heisenberg’s celebrated Uncertainty Principle, for which he was awarded the Nobel Prize. This principle states that there exist physical quantities the exact values of which can never be simultaneously determined under most conditions. The quantity relevant to our discussion is energy. The Uncertainty Principle states that the energy of a system cannot be known exactly at any given instant.

The Uncertainty Principle thus negates the Law of the Conservation of Energy. According to this law, the energy of a closed system is conserved, meaning that its value never changes. It follows that one can measure the never-changing energy of a closed system with perfect accuracy at all times. However, this result is inconsistent with the Uncertainty Principle. How can one resolve this inconsistency?

We first note that particles contain energy. This follows from Albert Einstein’s famous formula $E=mc^2$, where $m$ denotes the mass of the particle and $E$ denotes the energy corresponding to this mass, and $c$ denotes the speed of light, which gives the “exchange rate” between the mass of the particle and its energy.

A vacuum is a region of space that is dark (has no light energy) and contains no particles (no particle energy). The total energy of a vacuum would thus seem to be exactly zero. However, the Uncertainty Principle states that this is impossible because one cannot know the energy with perfect accuracy at any instant. Therefore, according to Quantum Theory, a zero-energy vacuum cannot exist.

What happens in reality is that particles are constantly “popping out” of the vacuum and then immediately disappearing. Thus the energy of the vacuum is never exactly zero. At every instant some particles have popped out and not yet disappeared. This remarkable phenomenon is called “quantum fluctuations” because the number of particles in the vacuum always fluctuates.

Particles always “pop out” in pairs — a particle and its anti-particle. The anti-particle of an electron is called a “positron.” When an electron pops out of the vacuum, a positron also pops out. However, when a particle collides with its anti-particle, they annihilate each other and...
disappear. This constantly happens in a vacuum. Electrons and positrons pop out, collide with each other, and thus disappear. Therefore, the energy of the vacuum is never exactly zero. The energy at any instant equals the energy of the particles and their anti-particles that exist at that instant, and which constantly changes.

WHAT IS “NOTHING”?

When one says that “nothing” exists in a certain region of space, one does not mean “nothing” in the popular sense of no light and no particles. That would violate the Uncertainty Principle. One means, rather, a “quantum nothing” in which nothing exists except for the tiny particles and their anti-particles that constantly pop out of the vacuum and then immediately disappear. In fact, they disappear so rapidly and exist for such a short time that they are called “virtual” particles. This terminology distinguishes them from “real” particles, which have a much longer existence. Even unstable particles that rapidly decay exist for much longer than the “virtual” particles that pop out of the vacuum.

INFLATION AND “SOMETHING FROM NOTHING”

Now we come to another strange phenomenon. According to the modern theory of cosmology, the universe underwent a very brief period of extremely rapid expansion early in its history. Space “stretched” to a remarkable extent during a tiny fraction of a second. This sudden enormous expansion of space is called “inflation.”

Consider an electron and a positron that popped out of the vacuum just before inflation. Ordinarily, they would immediately collide with each other and disappear back into the vacuum. However, if the inflation occurred right after they popped out but before they had a chance to collide, the expansion of space would separate the electron from the positron. When the particle and the anti-particle become separated, they can no longer collide. As a result, they remain in the vacuum. In this way, “virtual” particles and “virtual” anti-particles become “real” particles and “real” anti-particles. One could describe this situation by saying that “something” has come from “nothing.”

The new theory is much more complicated than the simplified
explanation given above. An important role is played by String Theory, which predicts multiple universes. However, this above explanation suffices to explain how the laws of modern physics permit the possibility of the universe spontaneously appearing from nothing.

IS SCIENCE THE ONLY SOURCE OF RELIABLE INFORMATION?

Atheists commonly assert that science provides the only reliable source of information about the world. Religious beliefs are only mass delusions — “The G-d Delusion,” proclaims Richard Dawkins. Scientists obtain data by observing nature or by carrying out experiments in the laboratory that can be confirmed by other scientists. This yields data that lie in the public domain. Dawkins asserts that only data in the public domain are meaningful because only such data can be verified by others.

BRIAN PIPPARD: “THE INVINCIBLE IGNORANCE OF SCIENCE”

Professor Brian Pippard, Cavendish Professor of Physics at the University of Cambridge, challenged this contention in his Eddington Memorial Lecture delivered at the University of Cambridge on January 28, 1988. Holding the most prestigious physics professorship in Great Britain, Pippard entitled his lecture “The Invincible Ignorance of Science.” His thesis is that human consciousness is inaccessible to science, and that we shall always remain ignorant of this phenomenon. Pippard’s thesis constitutes a denial of Dawkins’ contention.

There exists a class of systems beyond the scope of physical theory — conscious human beings — and thinking is something that living things do that cannot be understood from the laws of physics. Note that I do not say that consciousness is not at this time understood from the laws of physics. I say that it cannot be so understood. The phenomenon of consciousness is intrinsically beyond the range of the scientific method.

I am not referring, of course, to the physical processes that occur in the brain, which can be studied as public events like other phenomena. Consciousness refers to private self-awareness, which is a
uniquely important fact of observation. You cannot share my self-awareness and I cannot share yours. The laws of physics relate to the public domain. No amount of mathematical juggling can use an input of public facts to generate an output that is not equally public.

It is not part of the scientific method to deny awkward evidence because science only knows how to handle data that belong to the public domain. One must admit that *there are real problems beyond the scope of science*. When consciousness is involved, we do not possess a scientific technique to handle its effects.

In the contemplative role of the conscious mind, science has nothing to say. It is tempting for the scientist to dismiss religious experience as a delusion. But belief is not to be dismissed simply because it is inconvenient and unshared. One may lack the gift of belief himself, just as one may be tone-deaf, but it is unbecoming to deny a truth which is not less true for being incommunicable (Pippard 1988).

Professor Pippard emphasizes that there is an important body of information about human beings that is *inaccessible to science*. Ignoring this information would prevent one from understanding what it means to be human.

**CONCLUSION**

Two centuries ago, Laplace described human beings as collections of molecules acting via their intermolecular forces. But today, few scientists hold this simplistic view. Pippard is not alone in subscribing to the thesis of “The Invincible Ignorance of Science.” However, the existence of a non-material aspect of human beings — called in Genesis 2:7 “the soul of life” (*nishmat hayyim*) — continues to be a subject of debate. Torah-observant Jews believe that the spiritual soul exists and possesses the same level of reality as the atoms and molecules that comprise our tissues and organs, and that the source of both phenomena is G-d. This belief, which can never be proven, has always been the essence of our life and faith.
REFERENCES

Dawkins, R. Quoted in the newsmagazine The Economist, 5 Sep 2010, “Science and Religion.”

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