The God Particle

A Philosophical and Theological Account

Caner Taslaman

To

My Father…

Contents

Preface

No scientific issue has aroused so much public attention in recent years as the “God Particle” (the Higgs boson) and the related experiments conducted at the laboratories of CERN. In this booklet, first this particle and the related CERN experiments will be briefly described. Next, the erroneous views that this particle proves or disproves the existence of God will be critiqued. Then, an analogy between this particle and the hiddenness of God will be established. In addition, the philosophical implications of the comprehension of the universe by the human mind, through mathematics, will be touched upon. Lastly, the question as to whether or not all the fundamental problems of Physics are resolved with this discovery, and the limits of science, will be discussed.

In all of my works, as with this booklet, I struggle to show that no barriers can be built between science, philosophy and religion, and that these fields cannot possess independent truths. For my other works, and for comments and criticisms about this book, please visit my web page www.canertaslaman.com

Introduction

The micro world, beyond the perception of our eyes, first entered into the realm of philosophy about 2500 years ago, with the Atomism of Ancient Greece. In Ancient Greek, “atom” meant the indivisible, smallest unit. The Atomists of this period constructed ontologies on the grounds of this indivisible piece, and attempted to understand the change through different combinations of the unchangeable atoms.

The micro world remained in the focus of philosophical and theological discussions in the later epochs, with alternative approaches such as the Kalam Atomism of Islamic schools of thought. The micro world had not yet been a subject of experimental and observational science even in the 17th Century, when Newton explained the expansions of gases as the diffusion of atoms into free space.

The first theory of atoms based on experimental and observational data was constructed by John Dalton in the 19th Century: though he could not directly observe the atom itself. In 1897, John Thompson’s discovery in Cambridge, that atoms are made of particles in motion, revolutionized our views about the micro world. Even after the discovery that it can actually be divided - contradicting its literal meaning - the name “atom” persisted. In the 20th century, the atom has been more of a subject of science than philosophy and religion; thanks to technological developments, atomic and sub-atomic particles were observed in numerous experiments. The first picture constructed of atoms was similar to that of our solar system, with protons and neutrons centered in the nucleus and electrons orbiting around them.[1] Later, the technological marvels called “particle accelerators” enabled the discovery that the protons and neutrons are made of smaller units named “quarks”.

[1] The Quantum Theory has brought about an additional complexity due to the wave-particle duality. The scientific and philosophical implications of this theory are still under debate. For further discussions on the philosophy of the Quantum theory, you can refer to the following books: d’Espagnat, Bernard, Veiled Reality: An Analysis Of The Present Day Quantum Mechanical Concepts, Addison Wesley, New York, 1995; Gell-Mann, Murray: The Quark and The Jaguar, W. H. Freeman and Company, New York, 1995.

The final picture, now known as the "Standard Model", has gradually been constructed by the invaluable theoretical contributions of many prominent figures including Albert Einstein, Niels Bohr, Paul Dirac, Max Planck, Ernest Rutherford, Wolfgang Pauli and Abdus Salam, together with experiments performed in particle accelerators built with the highest available technologies and gigantesque budgets. This picture consists of "flavors" of quarks (up and down quarks etc.), pairs of leptons (electrons, electron-neutrinos etc.) and bosons acting as "force carriers". All elements of this model carry the virtue of perfect mathematical explanation and experimental verification.

However, in the above-mentioned form, the standard model does not answer the question: "How do these various types of particles come to possess immensely different masses?" In 1964, Peter Higgs established a model in which he explained the mass as an outcome of continuous interactions of the fundamental particles with a ubiquitous field (a.k.a the "Higgs Field").[2] The fundamental quantum of this field was christened the "Higgs boson", "Higgs Particle" or simply "Higgs". Later, this particle gained quite a popular nickname: the "God Particle". The first experimental observation of this particle (and hence of Higgs field) came with the announcements made by CERN in 2012, two years shy of half a century after Higgs' original theoretical work. During and after the experiments towards its discovery, the "God Particle" has long stayed in the focus of popular scientific debates. There have been numerous fallacious claims about the proof or disproof of the existence of God through this particle. Since Socrates' time, traditional philosophy has regarded the exhibition of the falsity of false arguments among its primary aims. Following this tradition, one of our main goals in this book is to show the falsity of the claims mentioned above. In addition, we will also discuss whether it is possible to establish an analogy between the hiddenness of God and the God Particle, and touch upon some philosophical lessons we can learn from the veritable success of the human mind in comprehending the universe. We will conclude the book by drawing attention to some open questions about physics and its philosophy, and the limits of science. Prior to this, we will briefly introduce to you the God Particle (and its significance) and give a brief outline of what is being done at CERN.

[2] Higgs, Peter, "Broken Symmetries, Massless Particles, and Gauge Fields", Physics Letters, No: 12, 1964, p. 132-133; Higgs, Peter, "Broken Symmetries and the Masses of Gauge Bosons", Physical Review Letters, No: 13, 1964, p. 508-509.

The CERN Experiments and the "God Particle"

An object without mass is so incomprehensible to most of us that we hardly ever think about the immensely important question: "How does the mass come about?" In fact, prior to the 20th century, even the "giants" of Physics never raised such a question. Mass is inertia; without it, everything would fly off at the speed of light, just like massless photons. Neither the stars, nor the earth, nor we would have existed in a universe without mass. How the mass comes about and related questions became a notable topic of scrutiny among physicists from the 20th century on. Among them, Higgs proposed a very successful mathematical model that explains how fundamental particles acquire mass, as well as other connected issues. The model was also successfully utilized in other fields of research, further solidifying its reliability. For example, in their work to combine two of the four fundamental forces, the electromagnetic and weak forces (thence known as the "electroweak force"), Nobel Laureates Abdus Salam and Steven Weinberg made use of Higgs mechanisms.[3]

A close look at the history of science reveals that many notable discoveries have taken place: first in theoretical grounds, and later witnessed experimental verification. Notwithstanding, there have also been cases where experimental discoveries happened independently from a previously established theory. A famous example is the discovery of the expanding universe. When Edwin Hubble discovered that the universe was expanding, he had not been doing his observational research in an attempt to verify the theoretical propositions of George Lemaitre and Alexander Friedmann.[4] Yet another possibility is, while some researchers struggle to confirm an existing theory, success serendipitously comes for others. The discovery of the cosmic background radiation is a well-known example of this. While Robert Dicke and his coworkers had long been searching for the theoretical radiation proposed by George Gamow and others, its discovery and a subsequent Noble Prize happened to be in the hands of Arno

[3] Weinberg, Steven, "A Model of Leptons", Physical Review Letters, 19, 1967, p. 1264–1266.
[4] Alpher, Ralph A.; Herman, Robert, Genesis Of The Big Bang, Oxford University Press, Oxford, 2001, p. 17-19.

Penzias and Robert Wilson, who coincidentally discovered the radiation while working on something totally unrelated (had the theory not been already established, they would have probably not made sense of what they were observing).[5] In more "orthodox" cases, experiments are performed on the grounds of a firmly established theoretical framework; when successful, the theory is verified. Most fundamental particles of the standard model have been discovered in this way (e.g. the discovery of the top quark, in 1995).[6] The discovery of the Higgs boson also falls in this class. Indeed, the experiments which have proven the existence of Higgs were performed in quite sophisticated, high-technology and expensive laboratories that were specifically built with this particular goal: a serendipitous or theory-independent discovery would have been extremely unlikely.

The Higgs Field describes a phenomenon omnipresent in the universe. In fact, we live inside this field (which is the very cause of our masses) unaware of it, like fish do not know they are in water. Let us try to better understand the Higgs Field through the following analogy: imagine a crowd of people in a town square, representing the Higgs field. A very famous singer, a not-so-famous one and a totally unknown person try to walk across this square. The famous singer would hardly be able to move due to the passion of his fans (remember that mass in inertia), while the less-known one would experience less hardship (except sporadic fan encounters) and the unknown person would walk across most easily. Analogously, the massless photons do not interact at all with the Higgs field and move at the highest possible speed (the speed of light), whereas interaction with this field grants the top quark 40 times more mass than its partner, the bottom quark. Just as the crowd in our analogy can occasionally congregate here and there, the Higgs field can reveal itself as the Higgs Particle.

The primary reason why the Higgs Particle has been so elusive for 48 years is the need for attaining extremely high levels of energies. Being about one-hundred times more massive than a proton, the Higgs Particle requires much higher energies in the particle accelerators, and it lives only for a very brief amount of time. This necessitated a gigantic particle accelerating machine, requiring high technology, sophisticated international teamwork and,

[5] David Filkin, Stephen Hawking's Universe: The Cosmos Explained, Basic Books, October 9, 1998.
[6] F. Abe et al. (CDF Collaboration), "Observation of Top Quark Production in pp Collisions with the Collider Detector at Fermilab", Physical Review Letters, 74 (14), 1995, p. 2626–2631.

last but not least, billions of dollars. The observation of the Higgs Particle would have been impossible without the “Large Hadron Collider”, the largest and most expensive piece of scientific equipment built in human history, constructed on the site of CERN (Conseil Européen pour la Recherche Nucléaire) on the French-Swiss border, hundreds of meters below ground, with a circumference of about 17 miles.[7] In this facility, hundreds of millions of protons per second are accelerated via thousands of magnets, collided against one another and the outcomes of collisions are detected with sophisticated techniques and equipment (due to its extremely short lifetime, Higgs’ trace could be seen only via highly specialized methods). Two collaborative teams (CMS and Atlas) have worked independently and they both announced their discovery of Higgs in 2012. With this discovery, the ongoing philosophical/theological discussions about the particle reached their climax.

[7] Cf. the official CERN web page: www.cern.ch

Can the “God Particle” be a Base for an Argument for Whether God Exists or Not?

The term “God Particle” was first used as a nickname for the Higgs Particle by Nobel Laureate Leon Lederman in his eponymous book published in 1993:[8]

“This boson is so central to the state of physics today, so crucial to our final understanding of the structure of matter, yet so elusive, that I have given it a nickname: the God Particle. Why God Particle? Two reasons. One, the publisher wouldn't let us call it the Goddamn Particle, though that might be a more appropriate title, given its villainous nature and the expense it is causing...”

This name thence has attained so much public popularity that it is used more than the name “Higgs boson”. Peter Higgs himself, however, was not so comfortable with this and complained about this nickname, primarily due to potential offense against religious people.[9] Some people have perceived his reaction as personal, since the nickname effaced Higgs’ name off the particle. Moreover, some supported that the name has done a good service to science as it triggered immense public popularity of a scientific subject, whereas others claimed that it has done more bad than good as it initiated many misconceptions. In technical terms, most physicists prefer to use “Higgs”, and when they use “God Particle”, they typically do it metaphorically. Yet, laymen have quite often taken it literally. Therefore, contrary to widespread opinion, the choice of this particular nickname has nothing to do with any claim related to the existence of God; it is rather related to other things like the fundamental nature of the particle, sense of humor and marketing strategy.

[8] Lederman, Leon; Teresi, Dick, The God Particle, First Mariner Books, New York, 2006, p. 22.
[9] Sample, Ian “Anything But The God Particle”, The Guardian, 29 May 2009, http://www.guardian.co.uk/science/blog/2009/may/29/why-callit-the-god-particle-higgs-boson-cern-lhc

Claims about the Higgs Particle - that it proves or disproves the existence of God - amplified the confusion initiated by its naming. The following excerpt is an example of the particle being regarded as in favor of God and Christianity:[10]

"If you're a Christian, then you're enjoying the Higgs boson news because it only confirms what you've already personally experienced: There is a God and you can have a relationship with Him by believing in Jesus Christ."

Theist thinkers might tend to utilize the mass-possession mechanism through this particle-field as part of the design argument, as it is part of the grand design in the universe. However, since there is already significant material about the fine tuning in the universe, and since discussions in this regard are primarily focused on issues like whether or not multiverse hypotheses could be presented against the argument that the universe is designed, this particle received little attention to this end.[11] The approaches that present the particle as "a proof for the existence of God" are rather baseless and rhetorical, as in the excerpt above.

On the other extreme, there have been claims that the discovery of the "God Particle" completed the standard model and no place is left for the existence of God. The following words, for example, have spread over the internet: "*On the 4th of July, 2012 God became totally unnecessary*".[12] First of all, let us understand that the standard model does not present "all" the information about the universe; it does not, for example, explain gravity (we will discuss the remaining open questions in modern physics and the limits of science in a later chapter). More importantly, however, the main flaw in such claims is related to the "God of the gaps" approaches. In our opinion, such approaches constitute an important issue in the philosophy of religion and they lay beneath certain important misconceptions and speculations. "God of the gaps" is a means of arguing for theism by appealing to God's capacity to fill explanatory deficits in non-theistic explanations. Proponents of such arguments claim that the main evidence for the existence of God is such explanatory gaps.

---

[10] "Will The Recently Found Higgs Boson (God Particle) Bring Atheists and Agnostics To Believe In God?", 5 July 2012, http://notashamedofthegospel.com/apologetics/god-particle/

[11] To read more on the multiverse, see, for example, Collins, Robin, "The Argument From Design And Many-Worlds Hypothesis", Philosophy Of Religion: A Reader And Guide, Ed: William Lane Craig, Rutgers University Press, New Brunswick, 2002.

[12] http://wecreatedgod.com/god-particle/

Indeed, many theists put forward arguments such as “We do not perfectly understand how the heart works, so it must be created by God” or “We do not know how the stars produce their light, so God created the stars”. However, virtually all contemporary theist philosophers and theologians hold that we ought to avoid appealing to the “God of the gaps”. Modern interpretations like the cosmological and design arguments are grounded on the findings of modern science: not on our ignorance.[13]

As a consequence, those who claim that the observation of the God Particle fills a gap and hence diminishes the need for God are thereby committing the “straw man fallacy”. The straw man fallacy involves ignoring the main arguments of one’s opponents, and alternatively presenting counter-arguments against bad or exaggerated arguments misattributed to those opponents. Stephen Hawking has committed this fallacy in his well-known books.[14] It is important to note that not all statements of physicists are about physics; they sometimes cross into the domains of philosophy and theology. However, their audience (often misguided by academic titles) sometimes do not distinguish between the scientific and experimental results and personal philosophical interpretations.

We can further comprehend the lack of connection between the discovery of the God Particle and the (non)existence of God from the following: this particle/field was first theoretically proposed in 1964, and there had also been alternative (albeit less popular) models and mechanisms suggested to be the provider of mass. Yet after the Higgs’ model, we had not witnessed any sharp division between theist and atheist physicists, philosophers and theologians, about the real existence of this particle. Such a division would be inevitable had the particle presented an argument for the (non)existence of God. Indeed, before scientific discoveries revealed that the universe has a beginning, there had been a division between theists who claimed that the universe has a beginning and atheists who claimed otherwise. Apart from certain exceptions,[15] this division was quite evident. The lack of division in the case of the God Particle further supports that the particle cannot constitute an argument for whether God exists or not.

---

[13] For an example of such sophisticated argumentation, refer to: Swinburne, Richard, The Existence of God, Clarendon Press, Oxford, 2004.
[14] Stephen Hawking, Leonard Mlodinow, The Grand Design, Bantam, 2012.
[15] Aristotle and Avicenna are among the most famous figures who do not fit in either category.

An Analogy between the “God Particle” and the Hiddenness of God

The Hiddenness of God is an important title in the philosophy of religion. While atheist philosophers argue against theism by asking: “If God exists, why does He hide himself?”, theists defend their positions by claiming that He is not completely hidden since there is sufficient evidence for His existence (e.g. the cosmological argument, the design argument etc.), and His more apparent manifestation would have contradicted with the notion that mankind is in an arena of trial with his freewill. The details of these debates are beyond our scope here; instead, we will draw attention to an analogy between this issue and the “God Particle”.

In the theist perspective, God is omnipresent and omniscient; we owe our very existence to Him, at every instant. On the other hand, he is hidden from our senses of perception. Likewise, the “God Particle” also permeates into every corner of the universe at every instant of time; our mass (hence our existence) perpetuates thanks to this particle/field. On the other side, such a fundamental particle is also hidden from our senses. Consequently, a theist might develop arguments like: “A particle so fundamental that we owe our existence to it is hidden from our senses; yet its existence is proven by modern science. Likewise, there is no logical contradiction to the hiddenness of God from our senses and Him being more fundamental (transcendental) over everything and us owing our existence to Him”.

Much has been said about the limits of analogies in the literature of philosophy; at any rate, the intuitive and stimulating aspect of analogies cannot be denied. Indeed, this is the most common reason why they are used so broadly in various fields. The analogy presented above can also be utilized, provided that its message is not stretched too far. However, it can only be used in a defensive manner: it cannot be explanatory. In other words, it can be utilized as a defensive tool against objections to theism based on the “hiddenness of God” by stating that being concealed from our senses does not necessitate non-existence, and hence an atheistic

ontology cannot be constructed upon the hiddenness of God. Nonetheless, it cannot be used as an analogy to explain why God is hidden, nor as a support for explanatory arguments.

The Rational Structure of the Universe and its Comprehension by the Human Mind

The discovery of the "God Particle" is one of the greatest achievements of mankind. Behind this achievement lays many interesting elements like the gathering of numerous nations who fought against one another in the two world wars during the past century, scientific collaborations between countries that were on opposite sides of the divided world during the Cold War era, and the collection of billions of dollars with contributions from many countries; interesting subjects of international relations and the philosophy of politics. Here, without delving into these fields, we will draw attention to an important and fundamental aspect of this discovery related to philosophical theology. Higgs' mathematical model provided a theoretical basis to resolve certain vital problems in physics like the origin of mass in the standard model. This theory brought about a particle/field, which we all live in and interact with, beyond our perceptions. The experiments at CERN confirmed such an incredible claim. In addition, these experiments also re-confirmed another phenomenon: the mathematical structure of the universe. In other words, it is not the human mind that shaped mathematics to fit the universe; rather, the mathematical structure is intrinsic to the universe and our minds are compatible with it. Many prominent philosophers/scientists including Pythagoras, Plato, Descartes, Galileo, Kepler, Newton and Einstein established their philosophical/scientific views on this a priori assumption.

Einstein often expressed his astonishment about the comprehensibility of the universe, the importance (although often overlooked by many) of the compatibility of the human mind with the universe, the relations between these facts and religious feelings, and his belief in God stemming from the rational structure of the universe pointing to an All-Rational God.[16] As Eugene Wigner states:[17]

---

[16] Einstein, Albert, Ideas and Opinions, Tr.: Sonja Bargmann, Dell, New York, 1973, p. 255; Ian G. Barbour, When Science Meets Religion, Harper Collins Publishers, New York, 2000, p. 53.

[17] Wigner, Eugene, "The Unreasonable Effectiveness of Mathematics in the Natural Sciences", ***Communications in Pure and Applied Mathematics,*** Vol: 13, No: 1, February 1960.

"The miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics is a wonderful gift which we neither understand nor deserve."

We should pay attention to three related, but distinct phenomena here: first is the universe to be of a rational structure, compatible with mathematical laws. The second is the fact that humans possess a mental structure that is also rational thanks to its functioning via consciousness and logic. The third is the comprehensibility of the universe via its accord with the human mind. From the angle of philosophical theology, the most important conclusion here is that the existence of a conscious God, as supported by theism, is more successful in explaining these three phenomena as compared to naturalist-atheist ontologies. This perspective attributes the roots of the accord between the mind and the universe to the creation of both by the same God, and His conscious establishment of this accord. Indeed, Anthony Flew – viewed as one of the most sophisticated atheists of the 20th century – considered the mathematical structure of the universe to be one of the main reasons for his conversion to theism.[18] John Polkinghorne says that it is expected of natural selection to make the human mind evolve to better handle troubles in daily life, but it cannot explain our mental structures suitable to understand the consequences of the quantum theory, cosmology or relativity, as those are not at all related to survival. He also states that theism is more successful than naturalist-atheism in explaining these phenomena. Once it is accepted that the universe and man are created by an All-Rational God, the order in the universe and the comprehension of this order by the human mind can be successfully explained.[19]

The Higgs boson sets a striking example to the rational-mathematical structure of the universe and the penetration of the human mind into it. However, it should not be attributed a meaning beyond being a good example. It is a philosophical topic reminded of by the Higgs boson, rather than explained by it.

[18] Flew, Antony, There Is a God: How the World's Most Notorious Atheist Changed His Mind, Harper Collins, New York, 2007, p. 96-112.
[19] Polkinghorne, John, Science and Theology, SPCK, London 2003, p. 72-73.

The “God Particle”, the Remaining Unsolved Puzzles of Physics and the Limits of Science

Another erroneous surmise widely spread after the discovery of the “God Particle” at CERN is that the most important puzzles in physics are already resolved and physics can answer everything about the universe. This also gave way to views that there is no need for God anymore, since our knowledge about the universe is now complete. In a previous chapter, we categorized the assumption that increased knowledge about the universe reduces the need for God, as a “straw man fallacy”. Here, we will concentrate on two other mistakes about the views above. The first one is about whether all fundamental problems in physics are resolved by the discovery of the “God Particle”. The second is a more profound mistake and is about scientism: a belief that science can explain every fundamental question about life, a view that has been particularly influential in the past century.

We can comfortably say that with the observation of the “God Particle” at CERN, the standard model is completely verified. This is truly a triumph in human history (with further endeavor to better understand the particle). However, the standard model does not explain gravity and cannot reconcile the theory of relativity with the quantum theory.[20] This problem remains to be resolved not only in physics but also in the philosophy of science.[21] According to the modern theory of cosmology, the four fundamental forces of nature were inseparable at the beginning of the universe. Gravity first separated from the strong, weak and electromagnetic forces. Later, the other three split. All these separations happened prior to the emergence of mass through the “God Particle”. As a result, discoveries about this particle do not answer critical questions about the processes prior to it. Furthermore, questions related to dark matter and dark energy remain indifferent to this discovery.[22] As a result, several puzzles

[20] Lykken, Joseph , “Beyond the Standard Model”, arXiv:1005.1676 [hepph], 2010, p.2.
[21] Barbour, Ian G., When Science Meets Religion, Harper Collins, New York 2000, p. 65-89.
[22] Lykken, 2010, p. 1.

of physics and philosophy remain to be solved, even after the discovery of this particle. Nevertheless, let us imagine for a moment that all these problems are also resolved; the theory of relativity and the quantum theory are combined; the standard model is modified to encompass gravity; we completely understand what dark matter and dark energy are etc. The critical question here is the following: When all these fundamental problems in physics are resolved, will those also be the answers to every basic question about the universe and life? A naïve scientist would answer affirmative, whereas our answer is negative. It should be remarked upon that science provides knowledge about what the laws of nature are and what they cause; yet, questions like "Why do laws exists?" are beyond the realm of science. Even when all the remaining questions mentioned above are resolved, they would not answer Leibniz's famous question "Why is there something rather than nothing?";[23] nor questions like "Why do we have laws instead of chaos?", "Why do laws of nature allow the emergence of life?".[24] These, and similar questions, fall into the domains of philosophy and theology. While trying to answer these questions, philosophy and theology can utilize the outcomes of science (as in natural philosophy and natural theology), but even then the final answer can be given only by crossing back into the borders of philosophy and theology. Furthermore, questions related to the methodology of science also fall within the territory of philosophy. Notice that the statement "The method of science is experiment and observation" itself cannot be a subject of experiment and observation. This critical line between the domains of science and philosophy is often overlooked, even by some renowned physicists. Consider the following statements by Stephen Hawking, for example:[25]

"…Traditionally, these are questions for philosophy, but philosophy is dead. Philosophers have not kept up with modern developments in science. Particularly physics. Scientists have become the bearers of the torch of discovery in our quest for knowledge"

When making these statements, it is almost as if Hawking was unaware of how closely modern philosophers of science follow the scientific developments and how much they publish in parallel to scientific publications. More interestingly, his book from which we have taken the excerpt contains numerous instances of philosophy of science (such as "model-

[23] Leibniz, G.W., "The Principles of Nature and of Grace, Based on Reason," Leibniz Selections, Ed: Philip P. Wiener, Charles Scribner's Sons, New York 1951, p. 527.
[24] Taslaman, Caner, ***Evrim Teorisi, Felsefe ve Tanrı,*** İstanbul Yayınevi, İstanbul 2012, p. 231-243.
[25] Hawking; Mlodinow, 2012, p. 11.

dependent realism"), yet this book full of philosophical claims starts off with the claim "philosophy is dead". Here, we observe another transparent example of the fact that not all opinions of physicists are necessarily scientific; they often cross into the domains of philosophy and theology, yet their arguments in these domains are (wrongly) perceived to be scientific.

Even inquiries about the fundamentals of physics extend beyond the territory of physics-science. Moreover, questions related to meaning, morals, axiology etc. (all closely related to our understanding of the universe and life) are all beyond the borders of physics in particular, and science in general; they are rather about philosophy, theology and related fields. Questions like "What is the meaning of the universe", "What is the meaning of life", "What is the rational basis for good and bad", "Is beauty relative" are all beyond the borders of science. For this reason, neither the discovery of the "God Particle", nor any other triumph of physics can provide answers to these questions or reduce their significance. Science does not attempt to answer these questions. We hold the opinion that it is vital to carefully draw the lines between science and philosophy, and thereby avoid the mistakes of scientism discussed above.

Conclusions

The observation of the “God Particle” at CERN, with the most sophisticated and most expensive scientific machinery in the world, is one of the most significant discoveries in the history of science. The nearly half a century long quest for this particle-field was accompanied by the development of many philosophical and theological arguments. Since traditional philosophy after Socrates regarded the resolution of false arguments among its primary goals, and in order to determine the philosophical implications of such an important step in science, this book is devoted to the philosophical scrutiny of the discovery of the “God Particle”. It was first shown that the claims about the particle’s proof or disproof of the existence of God are erroneous. These arguments were also supported by the lack of any apparent division between theist and atheist philosophers before and after the theoretical model of Higgs in 1964. It is then shown that claiming a reduced need for God as the result of a scientific discovery is an example of “straw man fallacy”; almost no genuine modern philosopher and theologian adopts the “God of the gaps” notion, a poor attempt to reach God based on our ignorance about the universe.

Moreover, an analogy was touched upon that can shed light on certain issues in philosophical theology. The hiddenness of this particle, despite its omnipresence and it being the source of mass for everything, can set an analogy for the hiddenness of God – an important title in the philosophy of religion. It should be noted, however, that while this analogy can form a defense against objections coming from atheism, it cannot be used as an explanation for the hiddenness of God.

The comprehensibility of the universe by the human mind is another important item in the philosophies of science, mind and religion. This comprehensibility is tightly linked to the mathematical structure of the universe, the rational structure of the human mind and the coherence between the universe and the mind. Many prominent figures in the history of science and philosophy admit that this coherence is best explained as both the mind and universe being created by a transcendental God. In this regard, the Higgs Particle sets a

perfect example as it was first predicted by a very successful mathematical method, and then observed through the comprehensive capabilities of the human mind (together with its potential to develop sophisticated experimental equipment). The discovery of the Higgs boson, together with the entire process behind, forms a capital example in this critical philosophical topic.

Lastly, we draw attention to the falsities of assumptions such as; with the discovery of this particle “all problems in physics are resolved”; or, “science can answer every question about the universe”. First, even though the discovery of this particle completes the standard model as is, the model itself does not cover gravity. The reconciliation of the quantum and relativity theories also remains to be resolved by both science and philosophy. Moreover, subjects like the existence of laws in nature, the methodology of science, ethics, aesthetics and meaning are all outside the domain of science and are more about philosophy and theology.

In conclusion, the discovery of the “God Particle” is one of the greatest achievements of the human mind and modern science, yet one should avoid falling into the falsity of regarding the epistemological borders of physics and science beyond their actual place.