Examining the god particle philosophy essay

At the moment of the Big Bang, when the universe was first created, scientists believe that there was a moment of perfect symmetry. The four forces of the universe: the weak force, the strong force, electromagnetism and gravity, and the tiny particles that made up those forces had yet to separate. As the universe cooled everything started to break apart and scatter and the perfect symmetry was lost and what was left is the complexity that we know today. Which is " The goal of modern theoretical physics is to reveal the universe's lost elegance. A major breakthrough in that effort came in 1964, when Peter Higgs, a shy British scientist in Edinburgh, introduced a theory that could explain how particles carry two of the four forces – those that carry the electromagnetic, and those that carry the weak force – came to have different masses as the universe cooled (Harrell)." Scientists today are on a quest to discover this elusive particle. The discovery of the God particle plays an important role in the Standard Model of particle physics and with the discovery we would know why particles have mass. Then we can move on to exploring the possibilities of supersymmetry and string theory.

To understand the God particle and the Higgs Field, we must first understand the Standard Model of particle physics. " In quantum physics, there are basically six types of quarks, six types of leptons, and four bosons. Quarks are the building blocks of all hadrons in the universe and they can never exist as a single entity in nature. The " glue" that holds the quarks together to hadrons is governed by the " strong force," a powerful force which acts over very small distances (nucleon-scales). Bosons are the particles that carry the force and each force has their own unique boson. In addition to six quarks in the Standard Model, we have six leptons; the electron, muon and tau particles plus their neutrinos; the electron neutrino, muon neutrino and tau neutrino. Add to this the four bosons: photon (electromagnetic force), W and Z bosons (weak force) and gluons (strong force), we have all the components of the Standard Model (O'Niell)." However the model leaves out the fourth force, gravity. There is one big problem with the Standard Model and that is that the model does not explain why things have mass. This is where Higgs theory comes in.

Higgs believes that there is a field that permeates the whole universe and interacts with the particles in it, giving them mass. The Higgs field is made up of particles called the Higgs boson, more famously known as the God particle, and as particles flow through the field the Higgs boson cluster around the passing particle there by weighing it down and giving it mass. " Some particles, such as photons, which are weightless particles of light, are able to cut through the sticky Higgs field without picking up mass. Other particles get bogged down, accumulating mass and becoming very heavy (Harrell)." To find the elusive Higgs boson, an environment that mimics that moment of perfect symmetry after the Big Bang would have to be recreated. To recreate this moment scientist are using the Large Hadron Collider (LHC).

The LHC works like an atomic pea shooter. It was built by CERN and is located on the Swiss-French border. It is the world's largest and highest energy particle accelerator and is contained in a circular tunnel about one hundred meters underground with a circumference of twenty seven kilometers or seventeen miles. It works by shooting " two beams of particles in opposite directions around the tunnel. The particles will be guided by more than a thousand cylindrical, supercooled magnets, linked like sausages. At four locations the beams will converge, sending the particles crashing into each other at nearly the speed of light. If all goes right, matter will be transformed by the violent collisions into wads of energy, which will in turn condense back into various intriguing types of particles, some of them never seen before (Achenbach).” The LHC runs at up to seven trillion electron volts (TeV) per particle which is equivalent to one micro-joule per particle. A micro-joule is equal to one one-millionth of a joule. One joule is equal to the amount of energy that is required to lift a small apple straight up one meter. This amount of energy allows the scientist to get the required amount of energy needed to mimic the moment post Big Bang.

The purpose of the LHC is to figure out what the universe is made of. Physicists hope that the LHC will help answer many of the most fundamental questions in physics. Questions concerning the basic laws governing the interactions and forces among the elementary objects, the deep structure of space and time, especially regarding the intersection of quantum mechanics and general relativity, where current theories and knowledge are unclear or break down altogether. “ High energies are needed, because the Higgs is thought to be quite heavy. In Einstein’s famous equation E= MC^2, C represents the speed of light, which is constant; so in order to find high-mass particles, or M, you need high energies, E (Harrell).” When the particles collide they will create a shower of particle debris. The physicist will not be about to see the Higgs boson but two of the detectors are capable of recording the telltale sign that a Higgs boson is disintegrating. The assumption among the physicist is that only one in a many trillion collisions will produce a Higgs boson. After the Higgs boson is found, if it does exist, what would that mean for everyone?

If the Higgs boson is discovered than that means that science has come one step closer to a fundamental and quantitative understanding of the physical universe. It plays a key role in the standard model of physics, providing the existence or nonexistence of the Higgs boson could change the entire foundation of physics, indicating the existence of particles and forces not yet imagined and paving the way for an entirely new set of laws. " On one hand, it completes the Standard Model, tying together the successful description of the microscopic physical world, which scientists have sought to understand for many centuries. This description tells us how the physical world works. At the same time, the form the Higgs physics takes points to how the Standard Model can be strengthened and extended to describe not only how the world works but why it works that way. The Higgs boson is important because it is the transition to why (Kane)." When we know why things work we can start to understand the world around us better. Then the next step would be exploring the possibility of supersymmetry and string theory.

If we were to assume that the Higgs boson has been discovered, we can turn to the hypothesis for creating a more fundamental theory of particle physics. Not much is known about String theory, however, there is enough known that we can some make connections to our world. " Before such connections can happen, we will have to learn how our actual world can emerge from the higher dimensional theory and how the elements of the Standard Model can emerge from string theory. Most important, string theory seems to require our world to have a property called supersymmetry. A supersymmetric

Standard Model with string theory boundary conditions has Higgs bosons and explains their properties. Whereas the mass of the Higgs boson cannot be calculated in the Standard Model, in the supersymmetric Standard Model the mass can be calculated approximately to be 90-40 GeV, a range that contains the likely discovered value (Kane).” Discovering the Higgs boson strongly supports the supersymmetric Standard Model, therefore it supports the idea that string theory can more accurately describe what happens in nature. The Higgs boson offers many possibilities with its discovery.

Wither it be completing the Standard Model or exploring the possibilities of supersymmetry and string theory, the existence or possible absence of the Higgs boson will progress science. Scientist would come up with more ambitious theories to explain what happens in nature. Humans have a natural ambition to understand everything. There will always be someone looking for answers. In light of all the complexity and strife, if the God particle were to be discovered then we can infer that our universe came from peace, unity, and beauty.