Professor Stephen William Hawking: The Way Of Life

Professor Stephen William Hawking was born on January 8th 1942 in Oxford, England. At the age of eleven, Stephen attended St. Albans School before moving on to his first alma mater, University College, Oxford in 1952, where he pursued a degree in physics and received a first-class honours degree in Natural Science after three years of study. In October of 1962, Hawking began his studies of Applied Mathematics and Theoretical Physics at the University of Cambridge. Years later, he was employed as a research assistant at Cambridge, and published his first academic book, The Large Scale Structure of Space-Time, with George Ellis. After these achievements, Hawking received a succession of awards and distinctions for his contributions to theoretical physics, including the Fellowship of the Royal Society (1974), Professor of Gravitational Physics (1977), the Presidential Medal of Freedom (2009), and Lucasian Professor of Mathematics (1979-2009) - a position that was formerly held by renowned figures such as Isaac Newton. From 2009, he held the honourable position of Director of Research at the DAMTP in Cambridge. Throughout his lifetime, Hawking was known for his extensive research on black holes and became universally acclaimed for discovering “Hawking Radiation” - the substance emitted from black holes. For most of his life, he worked with colleagues on a possible resolution to the black hole information paradox. Stephen passed away in early 2018 at the age of seventy-six due to the development of his Motor Neurone Illness, ALS. In spite of being wheelchair-bound and dependent on a computerised voice system for most of his life, Stephen Hawking has forever changed physicists’ understanding of theoretical physics and published an abundance of books (bestseller A Brief History of Time, Black Holes and Baby Universes and Other Essays, The Universe in a Nutshell, The Grand Design,...etc.) related to his perception of the world and the cosmos accessible to the general public.

Stephen Hawking’s most recent publication, Brief Answers to the Big Questions, which was released posthumously in the fourth quarter of 2018 (October 16, 2018) gives the public Hawking’s final words and thoughts on some of the most pondered scientific and ethical questions throughout history - including one of the greatest philosophical questions - Is there a god? According to Hawking, a universe is a machine governed by principles or laws that can be grasped by the human mind. In his writing, he proclaims, “I believe that the discovery of [the universal laws] has been humankind’s greatest achievement, for it is these laws of nature - as we now call them - that will tell us whether we need a god to explain the universe at all”. With this proclamation, Hawking applies the principles of Ockham's Razor, the logical problem-solving entity that eliminates possible unnecessarily complex scenarios and shows preference to the most logical conclusion. He explains that the laws of nature are a description of how things work in the past, present and future and the spontaneous creation and expansion of the universe is not a result of traditional determinism, but rather a product of determined probabilities. Hawking states, “[The universal laws of nature] may or may not have been decreed by God, but he cannot intervene to break the laws, or they would not be laws. That leaves God with the freedom to choose the initial state of the universe, but even here it seems there may be many laws. So God would have no freedom at all.” Almost intriguingly, Hawking even states that there is a scientific law to explain that The Big Bang was able to materialize out of nothing - the uncaused cause; the unmoved mover. To elucidate this matter, he explains that the laws of physics demand the existence of something called “negative energy”. This is easily

illustrated by Hawking's Analogy of the Hill: Imagine that one is digging a hole in the ground; as dirt is removed from the hole, it creates a resulting pile or "hill" of substance. In this analogy, the hill and the hole symbolize negative and positive energy, respectively. If this is applied to the workings of the universe, it means that when The Big Bang produced a massive amount of positive energy, it simultaneously emitted the complementary amount of negative energy. In this way, the positive and negative energy always result in zero; another fundamental law of nature. What does this mean for humanity's quest to find the answer to the God Question? If the universe essentially adds up to nothing, the simplest explanation is that there is no God. Ultimately, The Big Bang is the unmoved mover - the uncaused caused - the force of resultant space and time.

Hawking is most famously known for the theories he developed due to the parallels drawn between Einstein's Theory of General Relativity and The Quantum Theory; in other words, the relationship between time, thermodynamics and black holes. His research with Roger Penrose showed that once a dying star had contracted to a certain radius, there would inevitably be a singularity, that is a single point where space and time could come to an end (as explained by Minkowski's Space-Time Cones and Oppenheimer-Snyder's Gravitational Collapse). In other words, eventually, when a star has shrunk to a critical radius, the gravitational field at the surface becomes so strong that the light cones are bent inward so much that light can no longer escape, resulting in the creation of a black hole. When Hawking began his studies with Penrose in this field, he knew that nothing could prevent a massive cold star from collapsing under its own gravity until it reached a singularity of infinite density. Similar arguments could be applied to the expansion of the universe. In 1970, Hawking developed his first theory about the correlation between black holes and space time. He speculated that "If general relativity is correct and the energy density is positive, the surface area of the horizon - the boundary of the black hole - has the property that it always increases when additional matter or radiation falls into it". Hawking then drew a second conclusion, which hypothesized that "If two black holes collide and merge to form a single black hole, the area of the event horizon around the resulting black hole is greater than the sum of the areas of the event horizons around the original black holes". With these hypotheses, he combined The Theory of General Relativity with The Quantum Theory to form the following premise: If there is a correlation between these theories, can one have atoms in which the nucleus is a tiny primordial black hole, formed in the early universe? When answering this, he asked, "how could the radiation left over from a shrinking black hole carry all the information about what was made in the black hole?". He later discovered that information in a black hole was returned in a useful way, which would lead him to his most eminent discovery. When studying how quantum fields or particles would scatter off a black hole, Hawking noted that the incident particle was not absorbed and scattered, as previously hypothesized. Instead, there seemed to be an emission from the black hole, which was required to identify the area of the horizon with the entropy of a black hole and ultimately increased the disorder in the universe, expressed as S=Akc3 4G?. The emission of thermal radiation from a black hole is now known as Hawking Radiation, named after Stephen Hawking.

In his most recent work, Hawking reflects on the future of humanity and the probability of humankind's survival on Earth as a species. By taking the logical scientific evidence and ethical perspectives on the issue, Hawking offers society unique insight and predictions about the fate of Homo sapiens on Earth. First, he recognizes that the Earth is becoming too small to support the population due to the geological resources that are being drained at an alarming rate. In Brief Answers to the Big Questions, he affirms that "One way or another, I regard it as almost inevitable that either a nuclear confrontation or environmental catastrophe will cripple the Earth

at some point in the next 1000 years which, as geological time goes, is the mere blink of an eye". Although this may seem disheartening, Hawking remains sanguine about the prospects of the Earth's future and the survival of the human population as a whole. As explained in his book, he concludes that the human race will most likely find a way to slip the surly bonds of Earth and will therefore survive the impending disaster. Unfortunately, Hawking indicates that we are the only species equipped with a level of ingenuity that is developed sufficiently to allow for space travel and colonization, thus, these looming threats will wipe out millions of species inhabiting the Earth, including humans who have not had the chance to evacuate. He warns that this loss may pervade the conscience of those who manage to escape, as humans are ethically-ground creatures. Despite the unnerving consequences and moral dilemmas, Hawking deems that space colonization is a necessary sacrifice to avoid the extinction of the human race. In his final work, he states "At the moment, we have nowhere else to go, but in the long run the human race should not have all its eggs in one basket, or on one planet". Leaving the boundaries of the Earth demands international cooperation and a concerted global approach.