

**A STUDY PROPOSING DIALOGUE BETWEEN NATURAL SCIENCE AND
THEOLOGY: AN INVESTIGATION INTO THE COSMOLOGICAL AND
THEOLOGICAL THEORIES OF BEGINNING**

by

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Declaration

I declare that **A STUDY PROPOSING DIALOGUE BETWEEN NATURAL SCIENCE AND THEOLOGY: AN INVESTIGATION INTO THE COSMOLOGICAL AND THEOLOGICAL THEORIES OF BEGINNING** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at UNISA for another qualification or at any other higher education institution.

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Abstract

The nature of existence, which science seeks to investigate, is dynamic as novel discoveries are constantly presented. To explain such a dynamic existence, science itself needs to be dynamic. Methodological differentiation is one way in which science expresses dynamism. Such differentiation led to the theological and the natural sciences, and conflicting views regarding the nature of existence: the theological worldview versus the natural worldview. This study is a comparison of the conflicting worldviews of the theological and cosmological (natural worldview) theories of the beginning of existence. The study compares them in an attempt to redress the conflict and encourage dialogue between the two methods for a better representation of existence.

The study exposes the limits of the theological and the natural worldviews. It proposes a relationship of dialogue between them so that they transcend their individual limits and are able to grow. Dialogue involves the interchange of ideas to broaden perspectives, which leads to growth. A relationship of dialogue emphasises similarities in presuppositions, methodology and content, and exploits these to attain a greater degree of certitude. Theology and natural science can be viewed analogically as two sides of the same coin, two aspects to one reality, that can collaborate, albeit independently, to reveal a broader view of reality. They can converse through dialogue, exchange ideas and share views, even though they remain methodologically exclusive, independent worldviews.

Finally, dialogue involves a transformation of reason in that it expects theologians and natural scientists to change the way they view reality. If we were to transform our reasoning into something more complete, our worldview should represent a more complete representation of existence. This means that the theologian and the scientist can, occasionally, go beyond their scope and method and push their knowledge towards progress through dialogue. This makes “transformed reason” the method of dialogue, which redresses the conflict between theology and natural science and encourages interchange between them. (Words: 336)

Abstract: isiZulu

Isifinyezo esiqukethe umongo wocwaningo

Inhlobo yobukhona, isayense edinga ukuphenyisisa ngakho, kuyashintshashintsha njengokutholwayo okusha okuhlala njalo kwethulwa. Ukuchaza lokhu kushintshashintsha okukhona, isayense ngokwayo idinga ukushintshashintsha ngokuhambisana nesimo. Umehluko wezindlela zokwenza ngenye yendlela lapho isayense ekhombisa khona ukushintshashintsha ngokuhambisana nesimo. Lo mehluko uholele abaholi bezenkolo kanye nabesayense yemvelo, kanye nemibono engqubuzanayo maqondana nenhlobo yobukhona; umbono ngezenkolo uma kuqhathaniswa nombono ngezemvelo. Lolu cwaningo luqhathanisa umbono ongqubuzanayo ngomhlaba ngenkolo kanye nekhosmoloji (indlela yokubuka izinto yemvelo), amathiyori okuqala kobukhona. Ucwangingo luqhathanisa lezi zinto ngemizamo yokubhekana nokungqubuzana kanye nokukhuthaza idayalogu phakathi kwezindlela ezimbili ukuze kube nokumeleka kahle kobukhona.

Lolu cwaningo luveza izihibe ezikhona kwindlela yokubuka izinto yezenkolo kanye nezemvelo. Luphakamisa ubudlelwane bedayalogu phakathi kwazo, ukuze kweqiwe imingcele yazo zombili ngayinye kanye nokukhula. Idayalogu ibandakanya ukushintshana ngemibono ukunabisa indlela yokubuka izinto, okuholela ekukhuleni. Ubudlelwane bedayalogu bugcizelela ukufana kwezilinganiso (presuppositions), izindlela zokwenza kanye nengqikithi, kanye nokucwaninga lezi zinto ukufinyelela ezingeni elikhulu lokuqiniseka ngendlela izinto eziyikho. Imfundo ngenkolo kanye nesayense yemvelo kungabonwa njengokulandelanayo kwezinhlangothi ezimbili kwikhoyini eyodwa, izinto ezimbili kwimvelo eyodwa, kungahambisana, ngisho noma okunye kuzimele ngokwehlukile kokunye, kuveza umbono obanzi walokho isimo esiyikho. Kungakhulumisana ngedayalogu, ukushintshana ngemibono kanye nokwabelana ngemibono, ngisho noma izindlela zakho zokwenza zehlukile, imibono ngomhlaba kwehlukile nokuzimela.

Okokugcina, idayalogu ibandakanya ushintsho lwembangela ngoba kulindele ukuthi abezenkolo kanye nososayense bashintshe izindlela ababona ngaso lokho isimo esiyikho. Uma bekufanele siguqule indlela esibona ngayo iziimbangela ukuya kwinto

ethile ephelele, indlela esibona ngayo umhlaba nayo kumele imele umfanekiso ophelele kakhulu ngobukhona. Lokhu kusho ukuthi abaholi bezenkolo kanye nososayense, bangathi ngezinye izikhathi, babuke ngaphezulu kwendlela abobona ngayo kanye nezindlela zokwenza, kanye nokududula ulwazi lwabo ukuthi luthuthuke ngedayalogu. Lokhu kwenza "imbangela eguqukile" ibe yindlela yokwenza idayalogu, okubhekana nokungqubuzana phakathi kwezenkolo kanye nesayense yemvelo kanye nokukhuthaza ukuxhumana phakathi kwazo. (Words: 289)

Abstract: seSotho

Kakaretso

Sebopeho sa boteng, seo mahlale a batlang ho se batlisisa, se ba matla ha ditshibollo tse ntjha di nehelanwa kgafetsa. Ho hlalosa boteng bo matla jwalo, mahlale ka boona a hloka ho ba matla. Phapang ya mekgwa ke tsela e nngwe eo mahlale a hlalolang matla ka yona. Phapang e jwalo e lebisitse ho thuto ya bodumedi le mahlale a tlhaho, le maikutlo a hanyetsanang mabapi le sebopeho sa boteng: dipono tsa lefatshe tsa thuto ya bodumedi kgahlanong le pono e akaretsang ya tlhaho. Phuputso ena ke papiso ya maikutlo a akaretsang a lwantshanang a dikgopolo tsa thuto ya bodumedi le dikgopolo tsa tshimoloho le ntlafatso ya bokahohle (pono e akaretsang ya tlhaho) tsa qaleho ya boteng. Phuputso ena e di bapisa ho leka ho lokisa kgohlano le ho kgothaletsa puisano dipakeng tsa mekgwa e mmedi bakeng sa boemedi bo betere ba boteng.

Phuputso ena e pepesa ditekanyetso tsa maikutlo a akaretsang a thuto ya bodumedi le tlhaho. E kgothaletsa kamano ya puisano dipakeng tsa tsona e le hore di fete ditekanyetso tsa tsona ka bomong mme di tsebe ho hola. Puisano e kenyeletsa phapanyetsano ya mehopolo ho hodisa maikutlo, e leng se lebisang ho kgolo. Kamano ya puisano e totobatsa ho tshwana dikgakanyong, mokgweng le ho dikateng, mme e sebedisa tsena ho fihlella tekanyetso e kgolo ya ho nepahala. Thuto ya bodumedi le mahlale a tlhaho di ka tadingwa ka mokgwa o tshwanang e le mahlakore a mabedi a tijelete e le nngwe ya tshepe, dikarolo tse pedi ho nnete e le nngwe, tse ka sebedisanang, leha di ikemetse, ho senola pono e pharalletseng ya nnete. Di ka sebedisana ka dipuisano, tsa fapanyetsana maikutlo le ho arolelana dipono, leha e le hore di dula e le dipono tse akaretsang tse ikemetseng, tse ikgethang mokgweng.

Qetellong, puisano e kenyeletsa phetoho ya mabaka ka hore e lebelletse ditsebi tsa thuto ya bodumedi le boramahlale ba tlhaho ho fetola tsela eo ba tadimang nnete ka yona. Haeba re ne re ka fetola monahano wa rona hore e be ntho e nngwe e felletseng, pono ya rona e akaretsang e lokela ho emela setshwantsho se felletseng sa boteng. Sena se bolela hore setsebi sa thuto ya bodumedi le ramahlale, ka dinako tse ding, ba ka feta maemo le mokgwa wa bona mme ba sutumeletsa tsebo ya bona tswelopeleng ka puisano. Sena se etsa "lebaka le fetotsweng" mokgwa wa puisano, o rarolang kgohlano

dipakeng tsa thuto ya bodumedi le mahlale a tlhaho le ho kgothaletsa phapanyetsano
dipakeng tsa tsona (Words: 436).

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Abbreviations

AP-*Aeterni Patris*

CCC-The Catechism of the Catholic Church

CTC-Catholic Theology of Creation

CMWBR-Cosmic Microwave Background Radiation

DNA-Deoxyribose Nucleic Acid

DV-*Dei Verbum*

FR-*Fides et Ratio*

GS-*Gaudium et Spes*

NO-*Novum Organum*

LG-*Lumen Gentium*

PBC-Pontifical Biblical Commission

PC- Planck Collaboration

QLG-Quantum Loop Gravity

RNA-Ribose Nucleic Acid

SC-*Sacrosanctum Concilium*

SCG-*Summa Contra Gentiles*

ST-*Summa Theologica*

WMAP-Wilkinson Microwave Anisotropy Probe

Chapter One:

INTRODUCTION

1.1. Background

This dissertation is primarily a comparative study of theological (focused here upon Catholic theology) and cosmological (focused here on contemporary cosmology) theories of the beginning of existence. The comparison is of Catholic Christian and natural cosmological sciences. These sciences constitute distinct methodologies. Theological sciences generally study immaterial phenomenon and focus on theoretical and rational propositions to formulate their considerations (Ellis, 2008:119). Cosmological sciences generally study material phenomenon and employ practical and rational propositions to conclude their propositions (2008:119).

The nature of the existence which natural science seeks to investigate is dynamic as novel discoveries are constantly presented (2008:120). In order for science to explain such an existence, it needs to be dynamic as well, exploring every option and alternative (2008:120). Differentiating itself into a multiplicity of methodologies is one way by which science expresses dynamism (2008:120). This led to the existence of the theological and natural sciences. Another way science expresses dynamism is the fact that science is the result of differentiation itself (2008:120). Historians Samuel Stumpf and Joseph Fieser explain that philosophy was the first science from which natural science differentiated (2008:190). Such differentiation was done in order to gain access to “*foundational knowledge*” about a particular aspect of existence, whether of the natural world (cosmology) or of a theological realm (Ellis, 2008:120). They further explain that in ancient philosophical inquiry, “*foundational knowledge*” about both realities was assumed to be acquired when the causes of subjects observed could be identified (Stumpf & Fieser, 2008:192). This led early scientists, like Aristotle, to propose that there are four possible

causes present in all observable and unobservable subjects: material, efficient, formal, and final cause (Aristotle in Ross, 1924:85-87).¹

Subsequently, scientific inquiries of the late middle ages and early modern era developed, giving rise to an emancipation of human rationality and a rejection of theological hypotheses (Stumpf & Fieser, 2008:192). Scientists, like Francis Bacon distinguished natural (material and efficient) from theological (formal and final) investigative inquiry for the sake of properly focusing and studying the natural world (Rees & Wakely, 2004:52). Bacon chose to abandon theological science because he believed that it “*had become too caught up in superstition, [and] in speculation*” (Bacon in Rees & Wakely, 2004:182). Thus he endeavoured in “*wiping the slate of human knowledge clean and starting over, using a new method for assembling and explaining facts*” (2004:182).

This new method of natural science, void of the influence of theology, was not only perpetuated but exemplified by succeeding scientists in the generations that followed (Du Toit, 2007:86). Scientists of the twenty-first century, like Richard Dawkins, continue to neglect the theological reality with its theoretical investigative inquiry in favour of the natural world of natural science (1997:108). Dawkins sees no need for faith and other theological propositions, and holds:

There is no comparison of significance to be made between the two... I think a case can be made that faith [theology] is one of the world's great evils, comparable to the smallpox virus, but harder to eradicate (1997:108,110).

A negative attitude towards theology developed which perpetuated the differentiation between the methodologies of theological and cosmological sciences, to the detriment of scientific progress. The study of the material and efficient causes (i.e. the natural world) of things by itself cannot be a true reflection of existence if the formal and final causes (i.e. the theological realm) are neglected (Ellis, 2008:120). It can even be said that the study of the natural world by itself is a convenient compromise in an attempt to avoid investigating the complete yet complex nature of existence (2008:120). Though

¹ Material cause, the thing out of which every thing is made; efficient cause, the agent responsible for the formation of a thing; formal cause, the essence of a thing; and final cause, the purpose for which a thing is made (Aristotle in Ross, 1924:85-87).

theological science is generally theoretical, it includes natural methods (for example, in natural theology); natural science, however, is exclusively natural (2008:120).²

Nevertheless, natural science became the dominant and most influential science after the Scientific Revolution (2008:120). The revolution promoted the method of natural science to scientists, changing the way they viewed science (2008:120). The revolution:

[S]tressed the importance of observation, which implied the necessity of empirical demonstrations and the reality of developing and changing ideas with further empirical demonstrations (Kelder, Govender & Govender, 2007:80).

Thus investigating the essence (formal) and purpose (final) of things was neglected, for it was thought that the theoretical and rational propositions which such investigation promoted were considered inadequate (Ellis, 2008:120). It was only a matter of time before this differentiation gave way to conflicting views regarding the nature of existence: the natural worldview versus the theological worldview (2008:120). This dissertation compares these two conflicting worldviews regarding the beginning of existence as found in Initial Singularity theory (natural worldview) and the Catholic Theology of Creation (theological worldview). The comparison is done in an attempt to redress the conflict and encourage dialogue between the two methods for a better representation of existence.³

² With the exception of some natural sciences such as mathematics and theoretical physics, which rely heavily on theory and abstraction.

³ There is only one existence with different worldviews (Ellis, 2008:120). A complete representation of existence constitutes the addition of both the natural and theological worldview. The natural worldview exists in terms of empirical and mathematical phenomena (2008:120). Thus things that exist must be either observed (empirical) or unobserved (mathematical), yet the unobserved must be calculated from observable data, such as can be seen when determining quarks in particle physics (2008:120). The theological worldview views existence in terms of the natural world (observable) and the supernatural realm (unobservable) (2008:120). The theological worldview holds that there are certain realities which cannot be observed nor calculated yet which exist and can be accessed through human reason, realities such as deities (2008:120).

Both the natural scientist and the theologian endeavour to make decisions based on reason rather than on emotion (Paley, 2009:241). When they come across unobservable data they stress that such phenomena are reasonable to propose, the natural scientist because she can calculate/prove it, the theologian when it is reasonable to believe so – the reasons of which can either be natural (natural theology) or divine (theology) (2009:241). Theology attempts to explain deities by what divine revelation (scripture) says about them while natural theology explains deities by what the world reveals about them (2009:241). Thus while the natural worldview considers what is mathematical and testable to be rational, the theological worldview considers what is reasonable and theoretical to be rational.

1.2. Literature review

The Scientific Revolution saw the subsequent concretisation of the differentiation between the theological and cosmological sciences, with explaining the beginning and nature of existence as their chief priority (Stumpf & Fieser, 2008:189). Cosmological scientists looked at existence and began to question it: “how did the universe begin?”, “how did the earth come about?”, and “how did life come to be?” The beginning of the universe formed a significant priority at this time because it was believed that the answers to all other questions lie in this very question (Stumpf & Fieser, 2008:189). In fact, the *question of beginning* has been a problem since antiquity; and it was not surprising that after breaking away from philosophy, cosmological scientists would begin by investigating this very question (2008:189).⁴

The beginning and evolution of life on planet Earth is referred to as “biological evolution”, or “abiogenesis”, which attempts to answer the question “how did life come to be?” (Ellis, 2008:25). The Neo-Darwinian hypothesis which stands holds that all life on Earth is the development of ribonucleic acid (RNA) (Campbell & Williamson, 2006:32). Organisms are assembled by the direction of enzymes such as protein, and are constructed under the direction of RNA (2006:32). Since RNA is single stranded and capable of its own replication, it precedes and even develops deoxyribonucleic acid (DNA): the building block of all life forms (2006:32). All living organisms possess either RNA or its subsequent (DNA), the earliest forms of which are said to have appeared between 3.5 and 4.3 billion years ago in hydrothermal vent precipitates (Campbell & Williamson, 2006:92; Dodd *et al*, 2017:60).

The hypothesis further asserts that life began in the form of simple single-celled organisms as a result of the assemblage of RNA and DNA into organic molecules, that is, organic chemicals (RNA/DNA) synthesising organic molecules (simple single-celled

⁴ Philosophers like Samuel Stumpf and James Fieser explain that in the history of philosophical thought, unravelling the beginning of the universe played a vital role in antiquity because not only did it demystify the prevailing magical thinking which dominated antiquity, but it also gave philosophers the scientific power of prediction (Stumpf & Fieser 2008:12).

organisms).⁵ How the transition from organic chemicals to organic molecules occurred is unclear as biologists are still challenged to replicate laboratorically the transition even when the exact conditions are present (Bowler, 1989:256). Much progress has been made regarding how organic matter is formed and how it developed into organisms, as well as the favourable conditions wherein life could have sprang forth, but the exact processes which brought about the organic phase remains ambiguous (Ward & Kirschvink, 2015:40). This ambiguity of the beginning of life remains a perennial biological concern which leaves biologists hard-pressed to define – using the natural worldview alone – pertinent questions such as how life came to be?

The question “how did the Earth come about?” refers to the beginning and evolution of planet Earth and is commonly referred to as “geological evolution” (Day, 1984:113). The insights obtained in geological evolution serve to, among others, assist on how to foresee certain disasters, assist in distributing the resources of the Earth more effectively, as well as assist in predicting uncertain changes in processes which are climatically and geologically natured (1984:113). Geologist William Day explains that the Earth, and all planets, were formed \pm 4.54 billion years ago when an interstellar cloud (nebulae) of debris and gasses collapsed as a result of a supernova shockwave (1984:113).⁶

At this proto-phase Earth was molten, composed of gases such as sulphur dioxide, nitrous oxide, methane and ammonia, and was bombarded frequently by planetary debris such as asteroids and comets (1984:113). The Earth was of an extreme temperature because of the heat caused by accretion as well as because of the decay of radioactive elements trapped inside (1984:113). As Earth started to cool it formed dense compounds which sank to the core, while the less dense formed the crust, with the mantle between them (1984:113). The absolute ages of planetary development, the length of time between different phases, and the phases as they occurred in the past cannot really be known to an absolutely determinable chronology (1984:88). There is a certain level of

⁵ All living organisms can be divided into prokaryotic cells – cell with no membrane-bound organelles (Bacteria and Archaea) – and eukaryotic cells – cells with membrane bound organelles (Protista, Fungi, Plants and Animals) (Ward & Kirschvink, 2015:6).

⁶ Scientists use radiometric dating to determine the Earth’s age since the radioactive elements decay at a stable rate (Day, 1984:82).

speculation used in order to bridge the gap between the recorded history and what exactly happened in the past (1984:88).

Numerous postulations exist regarding “how did the universe begin?”, including “Initial Singularity theory” (Monsignor Georges Lemaître) and “Steady State theory” (Fred Hoyle) (Lemaître, 1931:36; Hoyle, 1948:118).⁷ This dissertation will discuss the former theory as it is the most compelling and thus the widely accepted cosmological theory at present.⁸

1.2.1. Initial Singularity theory

Initial Singularity theory proposes that “*an immense expanding of highly dense and hot matter forms the [beginning] of existence*” (Preparata, 2002:119), a theory introduced by Lemaître.⁹ But even before him, archaeologists and evolutionary biologists slowly gained ground regarding the natural laws of how things began and emerged (Chambers, 1844:54). This development came as a result of geological discoveries of sequential fossil remains – by Robert Chambers – which suggested the idea of a gradual evolutionary process (1844:54). This discovery inspired Darwin’s *On the Origin of Species* (1859), which not only proposed that all things are the result of a timeous evolutionary process, but popularised this evolutionary notion in the late nineteenth and early twentieth centuries (1859:116). These theories of evolutionary biology lent some inspiration – because of the law of continuous development – to various geological and cosmological theories of beginning in the twentieth century. Edwin Hubble (1927:170) discovered the expansion of the universe and Lemaître inferred that the expanding universe could be traced back in time to an initial singular point:

We could conceive the beginning of the universe in the form of a unique atom, the atomic weight of which is the total mass of the universe... We may speak of this event as of a beginning. I do not say a creation. Physically it is a beginning in the sense that if

⁷ The Initial Singularity theory, and natural science in general, focuses on the “*beginning*” rather than on the “*origin*” of existence, a nuance which shall be explained in the next chapter.

⁸ Dominant cosmological models such as those explaining the curvature of space as well as the nature of matter and energy rely on singularity (Hawking & Penrose, 1970), Albert Einstein’s field equations presuppose a singularity, contemporary cosmologists who study alternative cosmological models ascertain that singularity is still a necessity in cosmological science (Padnamabhan, 2015:118).

⁹ The ‘Big Bang theory’ of the beginning of the universe was taken from the proposed hypothesis of Lemaître of ‘the primeval atom’ (Gamow, Alpher & Herman, 1948:128).

something has happened before, it has no observable influence on the behaviour of our universe... Any pre-existence of our universe has a metaphysical character. Physically everything happens as if it was really a beginning. The question if it was really a beginning or rather a creation, something starting from nothing, is a philosophical question which cannot be settled by physical or astronomical considerations (Lemaître, 1931:98-99).

Cosmologists George Gamow, Ralph Alpher and Robert Herman confirmed the existence of this singular point of beginning, proposing that the point was a high energy state consisting mostly of radiation rather than particles (1948:128). Modern cosmology supports Initial Singularity theory, as the works of Roger Penrose and Stephen Hawking demonstrate that a universe governed by the renowned theory of relativity must have an initial singular point (1970:539).¹⁰

The Steady State theory lost momentum in favour of Initial Singularity theory, though there are other more recent alternatives to the theory of singularity which came about. A scholar of the alternative theories of String theory and Quantum Loop Gravity (QLG), Thanu Padmanabhan, echoes Lemaître when he admits that competing theories to the Initial Singularity theory appear very interesting, but lack substance once thoroughly investigated (Padnamabhan, 2016:149). Both String theory and Quantum Loop Gravity accurately replace the Wilkinson Microwave Anisotropy Probe (WMAP), as well as replace the Planck mass constant with generic mass density functions (2016:149). However, he explains that their attempt to disregard the vital principles of the inexplicable theory of general relativity led to unreasonable considerations such as “*assuming the existence of a Pre-universe... [and that] our universe is not the result of a ‘creation process’ but of a mysterious transformation*” (2016:149). This led Padmanabhan to the conclusion that pre-singularity falls outside the ambit of physics and cosmology as a philosophical debate:

“[W]hat happened before the big bang? We really have no idea. String theory offers no insight; the implications of loop quantum gravity on quantum cosmology are too disastrous” (2016:199).

¹⁰ The theory of relativity relates to the nature of particles and their interaction with natural forces (Penrose & Hawking, 1970:539)

Thus the answer to the above questions (i.e. how life began, how the Earth began, and how the universe began) demonstrates that the explanatory ability of the natural worldview has limits. The dissertation proposes that among the many reasons for the limits, the abandonment of theology by natural science forms one of them.¹¹ This abandonment formed a void in the investigative method of natural science, and this dissertation seeks to fill this void by proposing dialogue between the worldviews of theology and natural science.

1.2.2. Catholic Theology of Creation

Some of the voids which the natural worldview has is its abandonment of alternative theories in the theological worldview and the impact these worldviews can have on the general understanding of existence. While this dissertation considers both worldviews, the focus of this section is on the theological theories of the beginning of existence. These theological theories are further reduced to the Catholic theological tradition since it is one of the world's oldest, largest and most universal religions (Speake, 1979:118). Catholic theological reflection regarding the beginning of existence permeates a three-pronged approach which needs to be seen in its totality for a complete view of Catholic theology: Sacred Scripture, Aquinas and Augustine, and contemporary theologians. Collectively, we term this approach the "Catholic Theology of Creation" (CTC).

1.2.2.1. CTC in Sacred Scripture

¹¹ Theology was abandoned by natural science because it studied immaterial phenomenon and focused on theoretical propositions (Godfrey & Petto, 2008:106). Immaterial phenomenon and theoretical propositions were rejected by natural science because they cannot be empirically verified, making empirical verification an important part of natural science (2008:106). This development of natural science as a purely empirical endeavour led to empiricism and later positivism. Empiricists held that all our knowledge comes from sense experience alone while positivists claimed that all processes need to be subjected to empirical verification if they are to be considered meaningful (2008:106). The focus of theology on immaterial phenomena cannot be verified and thus theology can be considered as having no meaning: "*commit it then to the flames: for it can contain nothing but sophistry and illusion...it gives the illusion of knowledge without actually giving any knowledge. This is the reason why we reject it*" (Hume, 1999:312)

While knowledge does begin with sense experience there is no indication that knowledge cannot go beyond sense experience or that knowledge stops at sense experience (2008:106). It is possible for knowledge to go beyond sense experience, as for example the knowledge which is gained through abstraction, and unlike sophistry and illusion, abstract knowledge has meaning (2008:106).

Sacred Scripture forms the basis upon which Catholic doctrine is based, for it contains the Word of God (*Dei Verbum* [DV], §2). God freely chose to inspire specific people to write and convey His Word through specific texts that the Catholic Church confirms as Sacred Scripture, “*God chose to reveal Himself and to make known to us the hidden purpose of His will*” (§2). The rationale for God’s choice of these people and not present day believers, or why God chose writings and not some other perhaps more convincing medium, are theological problems that are not the subject of this research. The reason for and the manner in which God created the universe is the subject of our concern, and it is these concerns which shall be discussed below.

CTC declares that God existed before all things, having Himself no beginning or end, analogically in the same way a Steady State universe does (*The Catechism of the Catholic Church* [CCC], §65).¹² But unlike a Steady State universe – which comprises finite matter and energy, God is infinitely spirit, and therefore infinitely other: “... *the spirit of God hovered over the waters*” (Gen 1:1b). Being uncreated, God, through command and nothing else, brought everything into existence out of nothing (*creatio ex nihilo*), that is, without pre-existing matter or energy (Rom 4:17; Heb 11:3). The creation of the universe by God out of nothing is known as *creatio ex nihilo*, and it expresses the powerful nature of God, and defeats any assumption that anything existed before God.

God creates by wisdom and love; He created the world according to His wisdom (CCC, §65). Being an all-powerful timeless spirit, it is not the product of any necessity whatsoever, nor of blind fate or chance that God created the universe, but out of love and wisdom did He create it (§65). God created it in order to allow His creation to share in His love, in His wisdom and in His infinite goodness: “*you made all the universe and it was only by your will that everything was made and exists*” (Rev. 4:11).¹³ By analogy, just as

¹² Analogy is the process of comparing one thing to another thing which displays similar features for the purpose of explaining it (Speake, 1979:15). Since God is infinite and theological, it is only through analogy that one can say anything about Him, and through such analogy we only understand in a limited comparative way.

¹³ God has no gender, and while the passages of Scripture often refer to God in the masculine, this is due to the historical patriarchal context and not because of God’s Divine nature (Speake, 1979:118). In fact, there are passages in Scripture which already point to this fact: the book of Exodus speaks in the feminine (*shekinah*) of the presence of God which shielded the Israelites in the desert (Ez, 17:15); the prophets Amos, Hosea and even Isaiah, in pleading faithfulness to God from the Israelites and warning them of the destructive consequence of infidelity, use maternal imagery in their descriptions, attesting to the feminine

the love between a man and a woman overflows into children, so too did God's love overflow into creation (CCC, §65).

1.2.2.2. *Aquinas and Augustine*

Both Saint Augustine of Hippo and Saint Thomas Aquinas upheld the teachings which have been handed down from generation to generation regarding Catholic principles and practices (*Pontifical Biblical Commission* [PBC], §4). These teachings came as a result of apologetic clarification and development of official doctrine by theologians in defence of various heretic dangers which ensued at each generation (PBC, §20). These developed doctrines were promulgated by Councils and handed over to succeeding generations for the propagation of the faith (PBC, §20).

Apart from the belief of the Catholic faith, few could accept the Genesis creation narrative wherein God created the universe in six days. Some believers, like the Manicheans, even disputed the narrative by studying and identifying discrepancies in Scripture itself (Martos, 2001:206). They argue that two separate accounts of creation are recorded side by side and, thus, contradict each other, "*the dilemma in the first chapter of the Book of Genesis where creation is seen to have taken place both at once (Gen, 1:1) and over six days (Gen, 1:2ff)*" (Kelly, 1997:62). It was Augustine who defended the Catholic doctrine, counter-arguing that all of creation is indeed the result of the creative power of God (Brown, 1967:100). He explained the reality that such a 'dilemma' occurring in the same passage of Scripture only presents a distinction between being (Gen, 1:1) and doing (Gen, 1:2ff) and demonstrates the complex nature of Scripture (Brown, 1967:108). Augustine concludes that "*no contradiction truly exists: 'He who lives for ever created the sum of things' (Sirach 18:1)*" (Brown, 1967:96). Augustine's teachings were adopted by the Fourth Lateran Council, which held:

Firmly we believe and simply we confess that the one true God...
by His own almighty power at once (*simul*) from the beginning of
time made each creature from nothing, the spiritual and the

aspect of God (Amos, 2:8; Hos, 5:2; Is, 41:16). It is only because this dissertation is historical that the masculine pronoun is used.

corporeal, namely, the angelic and the earthly, and then man (Fourth Lateran Council in DV, §80).

In the *Summa Theologiae* (ST), Aquinas developed the creation doctrine of Augustine. Aquinas incorporates the Scriptural teaching that God both created all things – being – *ex nihilo*, including time, together at the first moment (ST I, q. 66, a. 4), as well as the chronological ordering of creation which follows (doing) (ST I, q. 66, a. 4). He affirmed that it is this dichotomy of creation in time (being-[Gen 1:1]) and through time (doing-[Gen 1:2ff]) which Scripture does well to elaborate and which some scripture scholars have difficulty understanding (ST I, q. 66. a. 4). By clarifying the creation account against the Manicheans and other controversial teachings, both Augustine and Aquinas sought to demonstrate the authenticity of Scripture and to allay the confusion which contradictory views of creation could have on faithful believers:

It would lead an unbeliever to deride God as incapable of accomplishing the task instantaneously. To avoid the ridicule of unbelievers, it is incumbent upon exegetes to look for an explanation which does no violence to Scripture yet satisfies the reasonable expectations of one who derives his knowledge from most certain reasoning or observation (Kelly, 1997:67).

How society views creation plays a significant role in the way creation is treated, and this formed the basis upon which an acceptable understanding of creation is emphasised. Pope Leo XIII endorsed the teachings of Aquinas when in his Encyclical Letter *Aeterni Patris* (AP) he affirmed that “among the scholastic doctors, the chief and master of all towers is Thomas Aquinas” (AP, §65). The subsequent Second Vatican Council also affirmed and solidified the Catholic Theology of Creation when in the Dogmatic Constitution on Divine Revelation (*Dei Verbum*) it affirmed the creation of the universe by God out of nothing (*creatio ex nihilo*) (DV, §18; Hamilton, 2004:291).

1.2.2.3. CTC from contemporary theology

The previous two approaches (Scripture, Augustine and Aquinas) still took for granted the existence of God regarding the theory of creation.¹⁴ The introduction of materialism after the Second Vatican Council exposes the reality that God's existence was now called into question for contemporary theology.¹⁵ Contemporary theology affirms the teachings of the two approaches. It held that God created the universe without pre-existing materials by divine command out of love as recorded in the Genesis creation narrative (CCC, §65). It also held that even though a literal interpretation of the Genesis narrative is discouraged (PBC, §20), that the narrative does explain a non-contradictory theological reality of vital importance to the understanding of creation (DV, §18).¹⁶

Contemporary theologians were challenged not only to develop more convincing arguments in order to stay relevant, but also to prove the existence of God. The challenge led them to developments of teleological arguments and natural theology. The teleological argument maintains the creation of existence from a benevolent agent for a benevolent purpose, with humankind taking a special role because of the likeness it shares with its creator through intelligence (Gula, 1994:148). While natural scientists dispute this purpose-driven understanding of existence by attempting to show that existence emerged because of structures and mechanisms, theologians argue that for as long as these structures and mechanisms continue to demonstrate biological, geological and cosmological limitations, their dispute is not conclusive (1994:150).

As scientific realities attempt to shed light on the nature of existence, Richard Gula held that the issue of the Initial Singularity theory (natural science) and the Catholic Theology of Creation (theology) have less to do with the specific conclusions of research and more to do with the implications of a purposeless existence on humankind (1994:155).¹⁷ His proposal influenced theologians and led to developments in natural theology (1994:155). Natural theology is a type of theology which attempts to prove and explain divine entities

¹⁴ Atheistic denial of the existence of God indeed existed even prior to Christianity, for example in the ancient Greeks like Xenophanes, Anaxagoras, Leucippus and Democritus, it is only regarding the Christian theory of creation that God's existence was taken for granted (Stumpf and Fieser, 2008:51).

¹⁵ Materialism is a modern form of empiricism which teaches that only what is physical and tangible is real.

¹⁶ Aquinas endorsed the ontological and chronological ordering of creation presented by Augustine (ST I, q. 66, a. 4).

¹⁷ "How we view creation has an impact on how we treat it" (Gula, 1994:155).

by including what the natural world reveals about them (Vorgrimler, 1992:124). In attempting to explain the beginning of existence through natural means, Herbert Vorgrimler held that theology would avoid the mysticism associated with it and compete with natural science as a scientific means of explaining reality (1992:130).

The Catholic interpretation and the CTC do not reject natural theology as a natural attempt to prove God as creator (1990:310). They also do not support the debate which holds natural revelation as superior to divine revelation or vice versa, but rather they hold both in high esteem (Brennan, 2012:55).¹⁸ Instead, like Gula, the CTC is deliberately cautious of natural theology out of concern for the implications of a purely physical theory of beginning (Brennan, 2012:55). This is why the CTC forms the foundation upon which the dignity of creation, and human dignity in particular, is built:

[W]hen we deal with each other, we should do so with the sense of awe that arises in the presence of something holy and sacred. For that is what human beings are: we are created in the image of God (Emrich, 2008:13).

With a focus on the doctrinal teachings of Catholicism, this dissertation proposes a relationship of dialogue between cosmological science and what we call the “Catholic Theology of Creation”, in order to facilitate a more complete representation of existence. There is no question the independence of the theological and natural methodologies, and as far as their role in society is concerned, both play a pivotal one (role) which cannot be denied (Barbour, 2000:187). Nevertheless, they still can maintain their independence in dialogue. Dialoguing between them serves knowledge in general in the interchange of methods for a broadening of perspectives, and pushes knowledge forwards (2000:187). A relationship of dialogue emphasizes similarities in presupposition, method and concept, and exploits these in order to gain access to a greater degree of certitude (2000:69). Both methods are enriched, reaching amicable consensus and making inclusive far-seeing conclusions (2000:69). They maintain independent and dialogue in order to pursue their own individual ends in a broader way (2000:70). Thus the method of dialogue proposed seeks to broaden the individual worldviews of theology and natural science, to assist them

¹⁸ [S]cience can purify religion from error and superstition; religion can purify science from idolatry and false absolutes. Each can draw the other into a wider world, a world in which both can flourish (FR, §34).

in seeing past their individually limited methods (2000:70).¹⁹ Through dialogue, theology and natural science – and Catholic theology and cosmology in particular – are transformed.

1.3. Research question and objective of the study

The dissertation seeks to promote a complete view of theological and natural scientific considerations through dialogue. It achieves this by investigating theories of beginning as found in Catholic theology and cosmology, and asks:

What are the theories of beginning in natural science (Initial Singularity theory) and theology (Catholic Theology of Creation); how do they compare and how can they dialogue with each other?

The comparison is done in order to shed insight into both methodologies and to present a relationship of dialogue between them whereby they can collaborate and broaden their independent worldviews by sharing and discussing ideas for a better view of reality.

1.4. Research problem

The reality that theology and natural science are separate and independent methods should not excuse the fact that both methods are limited. Natural science is limited in its biological, geological and cosmological theories of beginning. Theology is limited in its theoretical and highly speculative theory of beginning. While being limited is a human reality, the individual methods limit themselves further if they do not broaden their worldviews and consider the conclusions of other methods. Such consideration can be done through dialogue between individual methods. Furthermore, since each theory of beginning proposes different considerations, the implications of all these considerations for the benefit of the whole of creation is lacking if each worldview is exclusive. Through dialogue, the considerations of each are interchanged whereby theology talks to natural science, and natural science talks to theology for a better view of reality.

¹⁹ The natural and theological worldview are transformed when the scientists of these respective worldviews change the way they view reality, this is known as a “transformed reason” (Barbour, 2000:70).

1.5. Limitations of the study

The dissertation intends to focus on the Catholic interpretation of the concept of “God”, as well as on Catholic theologians and teachings about God and His attributes. Though some Protestant theologians are included for diversification, generally the “God” described by and believed by other world religions is neglected. The God of other religions does share in many common attributes with the Catholic Trinitarian God, but their unique contributions are not included. Furthermore, the dissertation focuses on physical cosmology and Catholic Christian theology, and with references to the biological and geological sciences, does not include other relevant sciences of the study of beginning such as anthropology, sociology and other Christian and even non-Christian theologies. This presents a particular yet limited approach to the subject of the beginning of existence.

1.6. Methodological approach

The dissertation proposes to be predominantly **comparative**, identifying similarities through comparison between the considerations of Catholic Christian theology and natural cosmology regarding their respective theories of beginning. The dissertation is **theoretical**, using the rational assertions formulated in Catholic Christian theology and natural cosmology to compare and encourage a dialogue between the two. The dissertation is **qualitative** in that it collects, analyses and interprets information received, making it a more subjective study of the comparison between theological and cosmological theories of beginning. The dissertation is also **hermeneutical** in that it interprets and explains the studies found in Catholic Christian theology and in natural cosmology regarding theories of beginning. Finally, the dissertation is **analytical**, analysing the conclusions of Catholic Christian theology with those of natural cosmology, and using the results obtained to identify similarities which support a dialogical approach between the considerations of the two methodologies regarding the beginning of existence.

1.7. Chapter outline

This chapter has presented the general framework this dissertation will employ in its research method. In exploring the cosmological method, chapter 2 demonstrates that natural science alone falls short in its explanations of the nature of existence when considering the biological, geological and cosmological theories of beginning. In exploring the method of theology, chapter 3 demonstrates that the Catholic Theology of Creation is a theological theory of a God created universe. Though this method attempts to be scientific through natural theology, it is still theoretical and highly speculative because of its reliance on divine revelation. Chapter 4 presents a comparative analysis between the previous two chapters, looking critically at the methodology and conclusions of the two theories and proposing a relationship of dialogue between them to break their individually limited worldviews and take scientific knowledge forward. Finally, chapter 5 concludes the research, presenting the conclusions of the preceding chapters and recommending the dialogical approach to the relationship between natural science and theology in order to encourage a better outlook on reality.

Chapter Two:
**INITIAL SINGULARITY THEORY: THE EVOLUTIONARY NARRATIVE OF THE
NATURAL SCIENTIFIC THEORY OF BEGINNING**

2.1. Introduction

The previous chapter delineated the general analysis of comparison between the Catholic theological and the natural cosmological theory of the beginning of existence. This included a presentation of the thesis, objective and method of the dissertation by way of introduction.

This chapter is a particular analysis of the aforementioned comparison through an exposition of the natural cosmological theory of beginning called the “Initial Singularity theory”. The chapter first presents a methodological analysis and clarification of terms in order to clarify some ambiguous concepts and to set the tone for the rest of the chapter. It takes the meaning of “beginning” whenever the term “origin” is referred and distinguishes “beginning” from “evolution”. The chapter then presents the beginning of existence using a three-dimensional evolutionary synthesis in the biological, geological and cosmological sciences. The chapter subsequently explores some contemporary cosmological concerns and summarizes the natural cosmological debate with the promotion of the Initial Singularity theory as the widely accepted and most plausible cosmological theory which explains how the universe began.

2.2. Methodological analysis and clarification of terms

“Astronomy” is a science that uses the conclusions of physics, chemistry and even mathematics in order “*to explain the [beginning] and evolution of celestial phenomena*” (Breen, 2018:110).²⁰ It is the study of the macrocosm of planets, stars, galaxies and the

²⁰ “Even mathematics” refers to the fact that mathematics is a *formal science* whose considerations are theoretical, rational and often hypothetical while astronomy is a *natural science* whose considerations do not focus on theology, pure reason and speculation (Ellis, 2008:71).

universe in an attempt to formulate responses to some of the most fundamental questions facing humankind, such as: what lies beyond the sky? (Breen, 2018:111). In its turn, “cosmology” is a particular branch of astronomy that “*involves the [beginning] and evolution of the universe*” (2018:111), formulating responses to the beginning of existence as a whole, such as: is this universe all there is or are there many universes; how did it/they come to be? Thus cosmology can be viewed as a scientific study of the large scale properties of existence as a whole, focusing its scientific endeavour on the questions regarding the universe(s) (2018:111).

As a science concerning the beginning and evolution of the universe(s), cosmology is very diverse, incorporating both theological and natural considerations (2018:111). This chapter is an exploration of the natural considerations of cosmology (in Initial Singularity theory). In order to get a good understanding of these natural considerations among a diversity of methodologies, the chapter situates cosmology within a particular context of natural sciences which explore the beginning of existence. Among the many extant natural sciences, this chapter further situates our explorations to an ascending three-dimensional approach of biological, geological and cosmological sciences. This approach answers three fundamental concerns pertinent in unravelling the beginning of existence:

- (1). “how did life begin”? (Biological),
- (2). “how did the Earth begin”? (Geological), and
- (3). “how did the universe(s) begin”? (Cosmological).

Each dimension explains a key aspect of the natural theory of the beginning of existence, and at the same time each dimension comes forth from the other, that is, biological from geological, geological from cosmological (Agazzi, 2011:14). This three-dimensional approach is adopted in order to trace theories of the beginning of existence in a systematic way. The approach is also employed in order to demonstrate potential connections and similarities between cosmology and theology (2011:13-14).

The theory of many universes (i.e. the multiverse) was introduced in 1952 by Erwin Schrödinger as a hypothetical group which comprises everything that exists (Ellis, 2008:204). The physical laws and constants which describe the universe such as space,

time, matter, are contained in the theory of the multiverse (Ellis, 2008:205).²¹ The theory was rejected for its hypothetical nature. In fact, Schrödinger himself used the concept jokingly and the theory only gained popularity because of its use in explaining how our universe appears to be fine-tuned for conscious life (Ellis, 2008:205). This research shall, henceforth, use the singular (universe) as it is the more broadly accepted concept in cosmology.

Explaining the key aspects of the natural theory of the beginning of existence can be a daunting task, especially since “beginning” is distinct from the term “origin”. The term “origin” is a contentious term in natural science. The contention stems from the fact that the term has theological underpinnings as it comes from the Latin *origo*, which means the “beginning”, the “source”, or the “birth” of something (Herbermann, 1913:296). Perhaps this is why natural scientists, like Evandro Agazzi, prefer the former meaning – “beginning” – because it is less ambiguous than terms like “source” or “birth” (2011:14). Terms such as “source” or “birth” are ambiguous because they “*require some kind of agent’s activity as implicit in the theological meaning*” (2011:14).

Natural science focuses on the physical dimensions of the “beginning” of existence rather than on hypotheses of a theological agent responsible for existences’ “origin” (2011:14). For example, Georges Lemaître, in his theory of the primeval atom, explained that “*we could conceive the **beginning** of the universe in the form of a unique atom... We may speak of this event as of a **beginning**, I do not say **creation***” (1931:98).²² Even the great evolutionary biologist, Charles Darwin, found the term “origin” to be too mysterious, “*the mystery of the origin of all things is insoluble by us, and I for one must be content to remain an agnostic*” (1859:118). Thus the majority of natural scientists speak about “beginning” and not “origin”, about “evolution” and not “creation” (discussed below). Thus this chapter on the natural cosmological theory of beginning as found in the Initial Singularity theory employs the meaning of “beginning” each time the term “origin” is referenced (Agazzi, 2011:14).

²¹ The “multiverse” is also called “parallel universe”, “other universes”, “alternate universes” or “alterverses” (Ellis, 2008:205).

²² The emphasis is the authors insert.

The term “evolution” has a complex meaning with regards to existence, and when applied to natural cosmology, it can be very easily confused with a similar yet different term: creation (2011:14). The term “creation” comes from the fourteenth century Latin verb *creare* (to create) (2011:15). It means the action of creating or of causing to exist associated with the “origin” of existence and the creative action of God: “*that which God has created, the universe, the world and all in it*” (2011:15). The term “evolution” comes from the Darwinian theory that supports the gradual development of species and things as “*the process by which different kinds of living organisms developed from earlier more simpler forms during the history of existence*” (2011:15). While both “creation” and “evolution” involves existence, their focus is different: the former focuses on the “origin” of existence while the latter focuses on the “beginning” and development of it (2011:15).

While clarifying terms, it would be good at this point to make a distinction between “beginning” and “evolution”. The term “beginning” concerns the starting point of things and events whilst “evolution” refers to how things and events change and develop over time (Ellis, 2008:52). Unlike “creation”, “beginning” does not necessarily imply any agent since things can begin from random, unreasonable and sporadic occurrences (i.e. mutation) (2008:55). This distinction comes as a result of the fact that things and events must have a starting point (i.e. must begin) before they can change and develop (or evolve) (Agazzi, 2011:98). The former stresses the *being* and the latter stresses the *doing*, both of which must subsist simultaneously in all entities (2011:98). Thus the two terms, though distinct, are interconnected. For example, in the biotic sphere, the driving force behind the “beginning” **and** “evolution” of organisms involves natural selection and mutation, whereby natural selection maintains that dominant and resilient characteristics reproduce themselves for the adaptation and survival of individual species while mutation entails the sporadic reproduction of completely new species (Ellis, 2008:53). In the abiotic sphere, the driving force involves the endothermic and exothermic thermodynamics and mechanics whereby the interaction between matter, force and energy gradually produces development in all entities (2008:91).

“Evolution” concerns how things and events change, and broadly speaking it refers to the aggregate of changes that take place in all things, which includes the macro (includes

galaxies and planets), as well as micro (includes species of animals and plants) economy (2008:90). In this sense, “evolution” refers mostly to changes that take place in groups, as well as to changes that accumulate over time (i.e. natural selection) and even sporadically (i.e. mutation) (2008:91). The changes that take place in individuals are more sporadic as a result of genetic restructuring, and like the change in DNA which mutation presents, genetic restructuring can either lead to deficiencies (such as disease) or surplus (i.e. new species) (2008:91). Yet for all these changes – *doing* – to take place, organisms first had to have begun – *being*.

In a narrow sense, the “evolution” of the universe can also be defined within the confines of natural science, within the dimensions of biology, geology and cosmology since each dimension deals with a specific aspect of the universe’s existence. In the biological sciences, “evolution” refers to the theory that biotic organisms come from the same ancestor and have “descended with modification” from these ancestors (Darwin, 1859:114). In the geological sciences, concern is placed upon the “evolution” of our own planet: how it began, its composition and cumulative development through time (Ellis, 2008:75). In the cosmological sciences, “evolution” involves the physical scientific principles of chemistry, such as contraction and expansion, hot and cold, thermodynamics, sedimentation and erosion (Agazzi, 2011:107). All these dimensions focus on evolution (i.e. on the doing) and neglect the beginning (or being) implicitly present in everything. This is why this chapter now turns to focusing on the “evolution” of these three dimensions in order to get a better understanding of how the universe evolved over time.

2.3. Cosmological beginning in three-dimensions.

With the study of the beginning of existence in three dimensions (i.e. biological, geological and cosmological) it becomes possible to trace how the universe evolved in a systematic fashion: how life began, how the world began, and how the universe began. The study of evolution plays a vital role in this tracing since evolution involves how things develop over time, and by tracing this development, it becomes possible to postulate a beginning since the two are intricately connected: everything that evolves has a beginning (Agazzi, 2011:98).

2.3.1. Biological evolution

The beginning and evolution of life on planet Earth is referred to as “biological evolution”, or “abiogenesis” (Ellis, 2008:25). In the time of the ancient Greeks right through to the early nineteenth century, biological scientists believed that living things possessed a vital spirit which separates them from dead or non-living compounds such as water (2008:25). In the nineteenth century these scientists were known as “vitalist biologists”, and they held that processes of life cannot be reduced to mechanistic explanations alone (Stefanatos, 1997:187). The theory was inspired by the creationist theologies presented by the early civilizations which depicted a deity or eternal force as having created the universe (1997:187).

The inspiration was carried through in the works of Henri Bergson, by his theory of the *élan vital* (Stumpf & Fieser, 2007:153). This theory held that life emanates from the self-organisation and spontaneous morphogenesis of organisms in an increasingly complex manner (Guerlac, 2006:14). Vitalism and the concept of the *élan vital* were gradually abandoned in the biological sciences of the late nineteenth and early twentieth centuries when further research regarding the constitution and function of living things failed to establish the existence of a vital spirit (Godfrey & Petto, 2008:206). The rejection was further emphasised with the hypothesis that it was possible for organic compounds to be produced from inorganic chemicals (2008:206). For this reason, other theories were proposed regarding how life began and evolved.

In 1794, physician Erasmus Darwin, the grandfather of Charles Darwin, proposed that all living things have a common beginning, and that a living filament caused all living things (1794:214). He believed that this living filament – or great first cause – granted living things the ability to regenerate and improve themselves over time (1794:230). Although his theory gave credence to vitalism, it was largely theoretical in that it did not explain the nature of this great first cause or how it came about (1794:230).

In 1809, biologist Jean-Baptiste Lamarck proposed the spontaneous and continuous generation of living organisms (Bowler, 1989:207). He rejected the idea that living organisms have a first cause or share a common ancestor, but rather proposed that the

increasing complexity of organisms over time is the result of an acquired inheritance (1989:210). Acquired inheritance proposes that organisms make changes in themselves and pass these changes to their offspring (1989:210). Thus in harsh environments, organisms forced themselves to survive by overcoming their limitations through their will to survive (1989:210). It is through their will that organisms changed over time, evolving into advanced species which were better suited for survival (1989:210). In this sense, organisms change rather than become extinct (1989:210).

In 1859, Charles Darwin refuted Lamarck when he hypothesized that the change in species was not due to an organism's ability to change itself, but rather on the pre-existing variation within populations (1859:74). Certain variations which pre-exist made certain organisms better suited to their environment than others (1859:74). Organisms pre-existing which are poorly suited cannot force themselves to change, but compete for resources (1859:74). Darwin affirmed the common descent of organisms and explained that biological evolution has everything to do with this natural process of selection through competition (1859:108) Through this natural process, the poorly suited organisms are overcome by the better suited ones (1859:108). Thus only those organisms which survive reproduce and pass the better suited trait to their offspring (1859:108). In this sense, organisms do not change but rather become extinct (1859:108).

Darwin further explained that natural selection affects living things in a variety of ways, from the way they are built to the things that they do, from how they behaviour to where they live (1859:108). Natural selection is not only about how organisms compete for survival, but is a complex random process of continuous change which takes place over many years (1859:108). Lamarck held that biological evolution involves a process of change in organisms, this view he shared with Darwin (1859:108). Lamarck differs regarding which process of change organisms underwent, as he did not hold the view that change is a random process of natural selection (Bowler, 1989:212). Instead, Lamarck held that even though the change was spontaneously and environmentally challenged, it was not random as it depended on the organism's will to overcome and change itself, passing these acquired changes to its offspring (1989:212). In this sense, change is not random but predetermined in an organisms will (1989:212).

Lamarck's theory of acquired inheritance lost momentum because of the lack of observational evidence in support of it (1989:202). Biologists questioned that if organisms can pass on traits they have acquired, then why does this passing of traits not apply to all acquired traits such as physical fitness and injury? (1989:240). Furthermore, when an independent study by Alfred Russel Wallace confirmed the process of natural selection through the discovery of genetics, it became clearer that an organisms genetic make-up was predetermined and permanent, changing only through reproduction (1989:241). Thus the Darwinian theory of natural selection became the driving force behind biological evolution and was widely accepted and studied by biological scientists (1989:255). The theory lays emphasis on how life evolved and not on how it began.

Darwin's evolutionary theory – also known as Darwinism and Neo-Darwinism – became the widely accepted explanation for biological evolution. And though the Lamarkian theory was rejected, other alternative theories did emerge, which include vitalism orthogenesis, mutationism, catastrophism, structuralism and evolutionary creationism.

For example, in 1868, biologist Louis Pasteur conducted several experiments regarding abiogenesis (Bowler, 1989:256). His experiments involved replicating the conditions in which non-living matter formed living matter in order to verify the theory that inorganic chemicals can be used to produce organic compounds, but the results were negative (1989:256). He concluded that "*fermentation was a vital action*" (Pasteur in Bowler, 1989:256). His view revived the early vitalistic theory that non-living matter contains a non-physical element which sparked life, but the theory was abandoned for lack of evidence (Bowler, 1989:256). However, the fact that organic matter could not be synthesised in the laboratory did not mean a vital action or non-physical element must therefore exist (1989:256).

In 1893, zoologist Wilhelm Haacke proposed an orthogenetic approach to biological evolution: all organisms possess a desire from within to grow towards basic goals (Bowler, 1989:254). Although the theory was rejected due to its teleological nature, it did popularise the notion that evolution represents progress (1989:255). Extreme progress came with the introduction of mutationism, which is a more aggressive approach holding

that change comes through large mutations rather than the gradual notion of natural selection (1989:255). Mutationism was an extreme alternative which was purely theoretical, lacking in practical observation and verification, with all observational data pointing to the gradual process of natural selection (1989:255).

In 1913, palaeontologist Georges Cuvier proposed catastrophism in which the evolution of organisms is largely viewed as the result of basic extinction patterns caused by large-scale natural catastrophes (Bowler, 1989:255). Modern fossil and stratigraphic records affirm catastrophism, as for when “*a large extinction at the end of the Cretaceous period led to [the evolution of] 70 % of all species*” (1989:255). Neo-Darwinism does not exclude the geological and environmental pressures and influences upon organismic development which catastrophism proposes, rather it focuses on biological development (1989:255). In 1944, biologist Etienne Geoffrey proposed a more structured view of evolution (Bowler, 1989:256). Adding to catastrophism, he argued that evolution should not be reduced to natural selection alone, but that important roles are played by other mechanisms that contribute to the overall development of the process of becoming (1989:256). Neo-Darwinism includes structuralism and all mechanisms of development, but natural selection is considered to be the most dominant mechanism of becoming as presently imagined (1989:256).

Finally, evolutionary creationism recognises a deity or eternal force as being directly involved in the evolutionary process (Bowler, 1989:270). The earliest forms present themselves in the form of cosmogonies, “*attempts to understand how the world and the universe came into existence*”, the first of which originated in Ancient Egypt and Mesopotamia (1989:270). From the ancient through to the early modern era, the Judeo-Christian theory of creation was the dominant view (1989:270). From the book of Genesis, the Judeo-Christian view held that “*in the beginning God created heaven and earth*” (Gen 1:1). After the Scientific Revolution, scientists abandoned this view for Darwinism and Neo-Darwinism because of the lack of physical evidence and the rejection of theological hypotheses (Bowler, 1989:270).

Thus the Neo-Darwinian hypothesis stands, and it holds that all life on Earth is the development of ribonucleic acid (RNA) (Campbell & Williamson, 2006:32). Organisms are assembled by the direction of enzymes such as protein, which are constructed under the direction of RNA (2006:32). Since RNA is single stranded and capable of its own replication, it precedes and even develops deoxyribonucleic acid (DNA), the building block of all life forms (2006:32). All living organisms possess either RNA or its subsequent (DNA), the earliest forms of which are said to have appeared between 3.5 and 4.3 billion years ago in hydrothermal vent precipitates (2006:92).

The theory further asserts that life began from organisms which were simple and single-celled as a result of the assemblage of RNA and DNA into organic molecules, that is, organic amino acids (RNA/DNA) synthesising organic compounds (simple single-celled organisms). How these organic amino acids became organic is unclear as biologists are still challenged to laboratorically replicate the transition even when the exact conditions are present (Bowler, 1989:256). After the existence of these single-celled organisms came the rapid process of *complexification* where more complicated living things started to appear as well as many variations of these complicated things to what is in existence today (Campbell & Williamson, 2006:173). Like natural selection, “complexification” involves the forceful diversification of organisms within an environment for adaptive purposes (McShea, 2000:652). It is a natural process which is not limited to organisms but affects all natural systems:

The vast majority of studies investigating evolvability of complex systems ignore the fact that all natural complex systems undergo complexification, either through the addition of new components or an increase in system connectivity, at different points during their evolutionary history (McShea, 2000:655).

Other theories include the extra-terrestrial beginning of life, claiming that life was introduced into Earth’s atmosphere from meteorites or comets which contained carbon and hydrocarbons, the burning of which – as they entered Earth’s atmosphere – generated organic amino acids (Campbell & Williamson, 2006:173). Meteorites containing trapped gasses found in Antarctica support this theory, particularly since they are said to have come from Mars as the gases were identical to the Martian atmospheric

composition (2006:173). This theory is not widely accepted though, as it is a speculative alternative account of the beginning of life.²³ Finally, the aquatic theory proposes that life originated within pools of water from inter-tidal environments (2006:173). The theory holds that through the clay minerals abundant in primitive oceans, life may have developed as these minerals served as protection from the ultraviolet radiation for the organic amino acids (2006:173). Yet, the theory is highly speculative and theoretical, in that it asserts, where, and not, how, life came about.

The above theories of the beginning of life indicate that much progress has been made regarding how organic matter is formed and how it developed into organisms, as well as the favourable conditions wherein life could have sprung forth (Ward & Kirschvink, 2015:40). The exact processes which brought about the organic phase, however, remain ambiguous (2015:40). This ambiguity of the beginning of life is, thus, a perennial biological concern which leaves biologists hard-pressed to define, using the natural worldview alone, such pertinent questions as how exactly life came to be? The uncertainty of this exact process has spiralled into a variety of related biological concerns, such as defining what constitutes a living thing. Contemporary biology proposes many characteristics of a living organism, which include nutrition, respiration, excretion, growth, reproduction, and sensitivity (2015:41).²⁴ Nevertheless, biologists have not yet agreed upon which characteristic(s) constitutes the essence of life, i.e. whether it is the combination of characteristics or just one of them, and if a combination how they would constitute the essence (2015:41).²⁵

Furthermore, biological scientists have begun backing the assertion that the change from non-life to life “*was not a single event but a gradual process of increasing complexity that involved molecular self-replication, self-assembly, autocatalysis and the emergence of cell membranes*” (Ellis, 2008:91). This gradual process fails to attend to the concern of

²³ Even though this theory proposes that life originates outside planet Earth, it does not negate the fact that there must be a causal account for life.

²⁴ Nutrition – the process of consuming energy in digestion; respiration – the process of releasing energy within cells; movement – change in position; excretion – removal of toxic materials; growth – the permanent increase in cell number and size; reproduction – the act of producing babies; and sensitivity – the ability to be open to external stimuli (Ward & Kirschvink, 2015:41)

²⁵ An essence constitutes the most basic and fundamental aspect of an entity which by definition should consist of a single thing (2015:41).

the beginning of life but rather replaces it with the circular Darwinian argument that “*life emerges from life*” (Darwin, 1859:74; Ward & Kirschvink, 2015:40). The reality is that “*although biology has achieved great success in recent years, we have not got a clear idea of what life is*” (Ellis. 2008:91).

While the question of the beginning of life remains ambiguous, what is definitive is that life exists, and that planet Earth developed the necessary conditions for its existence. Next we shall contemplate how Earth came about and what made life spring forth.

2.3.2. Geological evolution

The beginning and evolution of planet Earth is commonly referred to as “geological evolution”, where insights obtained serve to, among others, assist on how to foresee certain disasters, assist in distributing the resources of the Earth more effectively, as well as assist in predicting uncertain changes in processes which are climatically and geologically natured (Day, 1984:113). Geologist William Day explains that planet Earth, and all planets, came about around 4.54 billion years ago when a nebulae consisting of interstellar debris collapsed as a result of a supernova shockwave (1984:113).²⁶ The nebulae collapsed from the inside out, and when the central regions got hotter and more dense, they were squeezed by the pressure of the falling material (Huggett, 2017:105). As the temperature increased, the electrons were ripped out from the atoms and the bare nuclei began to move freely through a wave of electrons (2017:105). No longer protected by any shell, the nuclei could approach each other, smash into each other, and fuse to form hydrogen, helium, and other elements (2017:106).

The fusion of hydrogen and helium was first initiated as these form the core which powers every planet (2017:120). The fusion occurs since the helium weighs slightly less than the combined hydrogen, and it is this missing mass which is converted into energy (2017:120). The core attracts debris and other materials by accretion, and this forms the surface and intermediary layers of the planet (2017:120). The energy in the core produces an outward pressure (radiation) on the surface which, from a distance, appears as a light

²⁶ Scientists use radiometric dating to determine Earth’s age since the radioactive elements decay at a stable rate (Day, 1984:82).

in the night sky (2017:125). The brightness of a planet depends on its mass, the more mass the higher the temperature, the higher the temperature consequently the higher the fusion rate and the brighter the luminosity (2017:125). The outward pressure produced by the core is matched by the inward force of gravity which keeps the planet in equilibrium and eliminates collapse (2017:125).

This equilibrium is dynamic since a planet is not a truly stable object and survives only as long as it can maintain equilibrium (2017:125). Equilibrium is maintained only insofar as the core consumes fuel, thus the fuel sustains the pressure that eliminates collapse (2017:125). When the core runs out of fuel, it contracts and heats up, which forces the surface to expand and become bright red (2017:125). The contraction and expansion continues until the helium ignites and the planet burns up both at the core and at the surface (2017:126). The planet eventually settles at the core, forming a white dwarf, it then finally cools off to form a black dwarf (2017:126).

This date of the interstellar cloud which formed the planets (± 4.54 billion years ago) was achieved by use of radiometric dating of radioactive elemental debris of the asteroids which occasionally collided with Earth at the proto stage of its development (Day, 1984:113).²⁷ At this proto-phase Earth was molten, composed of gases such as sulphur dioxide, nitrous oxide, methane and ammonia (1984:113). The Earth was also bombarded frequently by planetary debris such as asteroids and comets (1984:113). Earth was of an extreme temperature because of the heat caused by accretion as well as because of the decay of radioactive elements trapped inside, and as it started to cool it formed dense compounds which sank to the core, while the less dense formed the crust, with the mantle between them (1984:113). This happened during the initial stage of the Earth's development (first 500 million years or the Hadean Eon) which includes the formation of the moon as well as the emergence of the first forms of life (1984:113).²⁸

²⁷ Because all asteroids formed at approximately the same time as all planets (± 4.54 billion years ago), radiometric dating of their radioactive elemental debris may be used to determine the age of planets (Day, 1984:113).

²⁸ The moon was formed when a large asteroid struck proto-Earth and released a huge amount of debris into space, the debris gradually coalesced to form the moon (Day, 1984:113).

Two theories stand out which attempt to explain how the Earth's atmosphere became hospitable for life (Allgre & Scheinder, 2005:12). The first holds that inorganic geochemical processes led to hospitable for life (2005:12). As the gasses emitted warmed the atmosphere, water evaporation increased and triggered the hydrological cycle (2005:13). As a result, precipitation allowed these gasses to mix with rainwater and be reduced from the atmosphere (2005:13). With less gas in the atmosphere, the atmosphere cooled and increased hospitable for life (2005:13). The second asserts that through the process of photosynthesising microorganisms, hospitable for life occurred (2005:13). Since the major gas responsible for warming the atmosphere was carbon dioxide, the removal of this gas – by microorganisms capable of photosynthesising carbon dioxide – meant the reduction of the gas in the atmosphere and gradual cooling (2005:13). Phytoplankton is one such microorganism which converts carbon dioxide into calcium carbonate sediments (2005:13).

After the emergence of life came the rapid complexification of living organisms, and as this happened oxygen levels within the Earth's atmosphere drastically increased, generating a protective layer which reduced the sun's Ultra Violet radiation and enabled more complex forms of life to evolve: fish, amphibians, insects and reptiles, dinosaurs and mammals (Day, 1984:82). After this multiplication period, or Proterozoic Eon (\pm 428 million years ago), came the Carboniferous Eon whereby a steady drift from tectonic plates produced the force behind natural disasters including volcanic eruptions, mountain formation and earthquakes (1984:100). Some geologists, like James Walker, propose that it was these natural disasters which made the dinosaurs to become extinct (1977:28). It was because of their extinction that grass could emerge, and with it herbivorous animals which dominated the novel ecosystem and triggering the evolution of humans (Day, 1984:100).²⁹

While the formation of the Earth as well as the conditions which make it hospitable for life is relatively clear, the absolute ages of planetary development, the duration of the periods,

²⁹ It is not clear what led to the extinction of the dinosaurs as geologists postulate different hypothesis; some confirm a large meteorite impact killed them while others say they were killed by the release of large amounts of toxic gasses and dust into the Earth's atmosphere by prolonged and catastrophic volcanic eruptions (Day, 1984:109).

and the absolute certainty of the phases of history cannot really be known to an absolutely determinable chronology (Day, 1984:88). This is why there are many approximations (\pm) with regards to dates and even events. The existence of the interstellar cloud and supernova – at the beginning point of cosmic development, which resulted in both biological and geological beginnings – however, require causal account within the broad narrative of evolution that is herein being traced.³⁰ This forms the topic of the next subsection.

2.3.3. *Cosmological evolution*

The beginning and evolution of the universe is referred to as “cosmological evolution”, and while evidence for the universe’s evolution is present in all evolving entities, the way it began is highly speculative as evidence rests mainly on mathematical probabilities and theoretical hypotheses (Penrose, 2004:42). As a result, cosmology is a field of astronomical science which studies how the universe is evolving, and from this insight proposes a variety of hypothetical theories regarding how the universe began (2004:42).³¹ Dominating among them are the theories that either the universe has no beginning or end (Steady State theory) or that the universe began at a certain point in time (Initial Singularity theory) (2004:42,78). Proponents of the Steady State theory, such as Fred Hoyle, ascertained that the universe had existed in an eternity of time and will continue to exist eternally (1948:52). While this theory circularly answers the problem of the existence of the universe, it does not give a tangible, rational explanation for the changes which characterises the universe. Some of the most evident changes include, among others, the expansion of the universe (discovered by Russian physicist Alexander Friedmann in 1922), as well as the background radiation filling it (discovered by Arno Penzias and Robert Wilson in 1964) (Penrose, 2004:101).

Initial Singularity theory not only proposes the linear beginning of the universe from a highly dense and hot analogical cosmic egg, but also explains that the expansion of this

³⁰ By “beginning” I mean both a beginning in time and a beginning of time.

³¹ Inflation is a singularity explanation of the existence of the nature of space which ascertains that during the early universe, space extended at an enormous rate as a result of an inflation field (Penrose, 2004:42).

cosmic egg can conversely be decreased to a beginning (Kragh, 1996:109).³² Further, the theory models the background radiation as the remnant of condensed elementary particles which filled with freely moving atoms after the cooling of the hot universe at the initial phase of expansion (1996:109). In giving explanations for these and other evident changes in the universe, Initial Singularity theory dominated the cosmological science of the 1960s onwards, and today it is considered the most plausible cosmological hypothesis which explains the beginning of existence. This chapter will thus omit other cosmological models and focus on the beginning and development of this widely accepted cosmological theory in the subsection that follows.

2.3.3.1. *Initial Singularity theory*

The cosmological theory of Initial Singularity proposes that the universe began with the expansion of a hot and dense cosmic egg 13.73±0.12 billion years ago (Planck Collaboration [PC], §15). The cosmic egg gave rise to an expanding universe, and if projected backward in time, suggests that the expanding universe can be contracted to an initial singular point (or cosmic egg) at some time in the past (PC, §18). Physicists, like Lemaître, confirm that all the mass and energy of the universe was concentrated in this cosmic egg (PC, §18).³³ These chronological projections were observed at Cosmic Microwave Background investigations and they reveal that the expansion of this cosmic egg means its thinning out and cooling off gave rise to space (Westfall, 2007:36). The thinning out produced every material thing in existence (since matter is not created), and the cooling off produced all transformations of energy in existence (since energy is not created) (PC, §38).³⁴ Thus all space (the universe) comprises matter and energy (PC, §38).

³² The concept of a cosmic egg originates in the concept of a unique atom proposed by Lemaître, “[w]e could conceive the beginning of the universe in the form of a unique atom” (1931:98). The term cosmic egg is analogical in that it likens the early character of the universe to that of an egg.

³³ If the cosmic egg indeed gave rise to the entire universe, it follows that “*the atomic weight of [the cosmic egg] is the total mass of the universe*” (Lemaître, 1931:98).

³⁴ With the universe being a closed system, the law of conservation of matter dictates that matter cannot be created nor destroyed, but can only be transformed (PC, §38). Similarly the first law of thermodynamics dictates that energy is only transformed and never created nor destroyed (PC, §38).

Much of the ancient and medieval cosmological theories of beginning were dominated by Aristotelean physics (Barnes, 1984:294). In his *De Caelo*, Aristotle held a fluid model of the universe, holding that it was spatially finite but temporally infinite (Aristotle in Barnes, 1984:360). For him, the universe was eternal, uncreated and indestructible: “*the heavens as a whole neither came into being nor admits of destruction... but is one and eternal, with no beginning or end*” (Aristotle in Barnes, 1984:360). His cosmological view is similar to the Steady State theory, which also held an eternal, uncreated and indestructible universe which has no beginning or end (Hoyle, 1948:118). After the Scientific Revolution, Aristotelean physics was discredited when scientists of the revolution – Galileo Galilei and Sir Isaac Newton – set out to disprove it with contradictory experiments in order to pave the way for experimental science and its natural laws of force and motion (Westfall, 2007:108). For example, Aristotle held that objects naturally want to come to rest relative to the surface of the Earth (2007:108). Galilei explained that it is not the nature of the object to want to come to rest as if by some will or eternal force, but rather for the fact that external forces work against motion with constant velocity that any moving object will come to rest (2007:108). This explains the object’s inclination to the surface of the Earth when acted upon by another force (2007:108). Galilei’s explanation formed the essence of Newton’s first law of motion (2007:108).

In 1858, physicist Johannes Mulder objected to the Aristotelean concept of an infinite universe, proposing that “*if the universe was infinite... the accumulated starlight in circulation should make the sky at night as bright as on a sunny day*” (Mulder in Ihde, 1957:423). The fact that night falls is an indication that the stars had not always existed and that the universe is finite (Ihde, 1957:423). Newton observed this relation between matter and energy (light), concluding that all matter contains energy and cannot exist on its own (pure matter) (Westfall, 2007:108). Thus, matter and energy are interconnected (2007:108). Observing this interconnection Newton formulated three laws of motion: “*objects in motion stay in motion and objects at rest stay at rest unless acted upon by an unbalanced force... force equals mass times acceleration... [and] for every action there is an equal and opposite reaction*” (Westfall, 2007:108).

As the second law dictates, Newton's expression for the force between two objects depends on the masses and on the speed of the distance separating the bodies (Westfall, 2007:110). The equation did not consider time; thus in this instance, if a force moves an object, other objects effected – either by the force or the object in motion – move instantaneously (2007:110). It was Albert Einstein, in his Theory of Relativity, who corrected the relation of Newton by adding time in his cosmological field equations (Westfall, 2007:110).³⁵ Einstein also proposed that the universe was finite with no boundaries and therefore contains a finite amount of stars (2007:110). Einstein's theory of relativity revolutionised cosmological thought and laid a good foundation for modern cosmology (Westfall, 2007:110).³⁶

In 1922, Friedmann experimented with these field equations and discovered that these equations displayed an expanding universe, and that this is suggestive of a point in time where the universe actually had a beginning, "*the time since the creation of the world is a time which has passed from the moment at which space was a point to the present stage*" (Friedmann, 1922:381). Yet it was priest, astrophysicist and cosmologist Monsignor Georges Lemaître, who boldly publicised the practical hypothesis of what this beginning would look like: "*we could conceive the beginning of the universe in the form of a unique atom, the atomic weight of which is the total mass of the universe*" (1931:706).

Physicists and cosmologists George Gamow, Ralph Alpher and Robert Herman popularised Lemaître's hypothesis – amidst its critiques – when they published the famous Alpher-Bethe-Gamow paper (1948:128). The paper explained Nucleosynthesis as an affirmation of the Initial Singularity theory (1948:128). The paper inferred that there was an initial beginning which consisted of a hot and dense inferno of radiation hot enough to later cool into nuclear particles that could interact to first form lighter elements (such as hydrogen and helium), then later heavier elements which coalesced into planetary bodies (such as suns and planets) (Gamow, Alpher & Herman, 1948:128).

³⁵Einstein's field equations – $R_{\mu} - \frac{1}{2}Rg_{\mu\nu} = 8\pi GT_{\mu\nu}$ – tells how the curvature of space-time reacts to the presence of energy, thus expressing how the presence of energy source curves space-time (Westfall, 2007:110).

³⁶ Einstein's field equations presuppose a singularity (Westfall, 2007:110). Contemporary cosmology represent the dominant cosmological models, and these rely on singularity (Penrose, 2004:118),

Initial Singularity theory and the assertion of a finite universe gained momentum in relation to rival theories like the popular theory of an infinite universe (Gamow, Alpher & Herman, 1948:128). To this effect, modern cosmological investigation centres on the hypothesis that the universe as a whole is a uniform and spatially closed system in accordance with a positive curvature of space which necessitates an initial singular point (Hawking & Penrose, 1970:539). Initial Singularity theory dates the finite nature of the universe to a definite singularity or age as 13.73 ± 0.12 billion years (PC, §15). The proofs which demonstrate such a finite aged universe are diverse, yet three stand out as dominant: Cosmic Microwave Background Radiation (CMWBR), Inflation, and Nucleosynthesis (PC, §15).

Early cosmological investigations revealed the existence of CMWBR, i.e. electromagnetic radiation (Breen, 2018:112). This radiation is the remains from a prior phase of existence (2018:112). Investigations also revealed that while the space between planets is completely dark, there is a distinct yet weak radiation whose glow fluctuates at certain regions of the radio spectrum (2018:112). The inference made from the evidence – according to this theory – is that the cosmic egg was dense and hot and glowing, and as the egg inflated, the density, heat and glow thinned out and spread throughout the universe (2018:112). This means that:

Although many different processes might produce the general glow of the dark body spectrum between the stars, no model other than the Big Bang has yet explained the fluctuations. As a result, most cosmologists consider the Big Bang model of the universe to be the best explanation for the CMWBR (2018:112).³⁷

Further investigation on the existence of CMWBR and the nature of the Initial Singularity theory which it supports revealed an inflationary epoch that lasted from between 10^{-36} to 10^{-32} seconds (2018:113). This epoch explains why the universe is so big and so evenly

³⁷ The Initial Singularity theory being discussed serves to be synonymous to the “Big Bang theory” being referenced by Breen (2018). It is a more modest description of the beginning of the universe than the more descriptive “Big Bang”, which was initially said jokingly by Fred Hoyle in an attempt to discredit singularity (Gamow, Ralph & Herman, 1948:172).

distributed in all directions with CMBR (2018:113). It also explains “*why the universe is flat; and why no magnetic monopoles have been observed*” (2018:113). Thus in effect:

The basic inflationary epoch is accepted by most physicists even as a number of inflation model predictions have been confirmed by observation, and that a detailed particle physics mechanism responsible for inflation is still contentious. Nevertheless, there is a hypothetical field theory thought to be responsible for inflation called the inflaton (2018:113).

Nucleosynthesis is another theory in support of an initial singularity which proposes that the nature and density of some elements, i.e. protons and neutrons, necessitates a time when the atmosphere was dense and hot enough to facilitate their synthesis (Gamow, Ralph & Herman, 1948:207). Such a hot and dense atmosphere points to a hot beginning. The theory involves the creation of new light atoms from old heavy ones through the existence of protons and neutrons, the first atoms of which were created moments after the cosmic egg inflated (Breen, 2018:113). The rationale affirms that some elements could not have been created in the density and temperature of the current universe. Rather, they must have been created at a time when the universe was a hot and dense inferno of 10 billion degrees Kelvin containing neutrons, protons, electrons and positrons, photons and neutrinos which cooled off and formed light and heavy elements by nuclear fusion (2018:113). Nuclear fusion is the process responsible for the growing abundance of elements in the universe, occurring at extreme temperatures:

As has been pointed out, the temperature during the capture process must have been of the order of 10^5 eV \approx 10^9 K. the density of the radiation at such a temperature is of the order of 1 gm/cm^3 (Gamow, Ralph & Herman, 1948:207).

Recent research surrounding the nature of the universe proposes that it contains three major components: dark energy, cold dark matter, and ordinary matter (Breen, 2018:113). The dark energy is known to accelerate the expansion of the universe, permeating the whole of space; cold dark matter constitutes 85% of the universe and is relatively unknown; and ordinary matter is the remaining 15% which this chapter has researched (Breen, 2018:113). This recent research is known as the Lambda-CDM model and it serves as the current standard model of Initial Singularity theory, which is presently the

acceptable model giving a clear account for the observations and measure contained within the science of cosmology (2018:113).

2.3.3.2. Contemporary Cosmology

While Initial Singularity theory remains the dominant model in contemporary cosmology, physicists and cosmologists continue to explore new avenues regarding the beginning and development of the universe. While the Steady State theory no longer rivals Initial Singularity theory, String theory and Quantum Loop Gravity (QLG) do serve as formidable contemporary alternatives.

In the late 1960s and early 1970s String theory was developed as a theory of mesons possessing a strong interaction (Thiemann, 2007:206). Thomas Thiemann saw that scholars of the theory, like Geoffrey Chew and Steven Frautschi, “*discovered that mesons make families called Regge trajectories with masses related to spins in a way that was understood as the relationship expected from rotating string*” (Thiemann, 2007:220). The theory begins with molecular attraction (quantum field) and adds gravity, and it asserts that “*point-like particles can be replaced by one-dimensional objects [rotating strings] which propagate through space and interact with each other*” (2007:220).

Quantum Loop Gravity (QLG) is a cosmological theory which attempts to merge quantum mechanics and general relativity in a quantum gravitational hypothesis that begins with quantum relativity and adds the quantum field (2007:258). It was introduced in 1986, when physicist Abhay Ashtekar rewrote Einstein’s field equation as a non-perturbative and background-independent quantum theory of gravity in terms of intercepting loop solutions, ignoring the chronological projections observed at CMWBR (Thiemann, 2007:258). While Einstein’s equations displayed gravity as a property of space-time, Ashtekar variables took gravity as a force in an attempt to develop a quantum theory of gravity based directly on geometric formulations (2007:260).

Thanu Padmanabhan is a contemporary scholar of the cosmological theories of beginning. He explored both String theory and Quantum Loop Gravity and saw that both are developed models of the Steady State theory in that they assume the eternal

existence of the universe (2015:180). He saw that String theory differs from QLG in that it does not reject the initial singular point of Initial Singularity theory: “*from the eternally existing pre-universe our universe emerged when the density reached the maximum value in a big crunch, or big bang*” (2015:189). String theory holds that nothing existed before the “big bang”, and that the universe is infinite, only becoming finite after singularity (2015:189).³⁸ Unlike String theory, QLG rejects the initial singular point of Initial Singularity theory with its negation of supersymmetry (2015:190).

Padmanabhan identifies that both theories are detrimental when applied to the universe, especially when the nature of a ‘pre-universe’ or infinite universe is undefined (2015:190). Here, Padmanabhan concludes by determining a boundary to natural science: pre-singularity indeed falls outside the ambit of physics and cosmology and fits better into philosophical debate: “[W]hat happened before the big bang? We really have no idea. String theory offers no insight; the implications of loop quantum gravity on quantum cosmology are too disastrous” (2015:199).

Regardless, Neil Bostrom persists with the Steady State model of the universe, insisting that while all the proofs for singularity indeed dates the universe back to 13.73 ± 0.12 billion years ago, they do not necessarily claim that the universe has a beginning (2002:197). He explains that singularity exposes how the universe developed (*doing*), but not necessarily how it began (*being*):

All cosmological models describe a finite old universe but not, when physics is added to the mathematics, a universe starting point... This can be done by replacing the ordinary parameter t by a new one Θ which is logarithmically related to t time. On this new concept of time, singularity did not occur at $t = 0$ but at $\Theta = -\infty$ (minus infinity), which means that it has a point of singularity but it never *began*. Thus the numerical finiteness of the age of the universe by no means precludes its conceptual infiniteness (2002:208).

³⁸ In String theory, ‘nothing’ and ‘infinity’ necessarily exclude space and time and are unlimited (Herbermann, 1913:284). ‘Thingness’ and ‘finitude’ necessarily include space and time and are limited by it. Thus the limiting factor is space and time, and can be analogously replaced by matter (space) and energy (time) (Herbermann, 1913:284).

The distinction between the numerical finiteness (13.73 ± 0.12 billion years) and conceptual infiniteness (minus infinity) is an attempt to reconcile the two independent methods of natural science and theology respectively (Padmanabhan, 2015:199). However, the assumption that finitude and starting point can be logarithmically separated is logically, cosmologically, philosophically – and even theologically – unsound for the relation between the two is reasonable (2015:199). The distinction and separation is a consequence of coupling mathematics to physics since for the former everything that ends does not necessarily have to begin while for the latter everything that ends must by necessity have a beginning (2015:199).³⁹

2.4. Conclusion

This chapter has exposed the natural cosmological theory of beginning. Its approach was an ascending three-dimensional synthesis of the beginning of life, of the Earth, and of the universe respectively. It also explored some contemporary cosmological arguments and proposed that the cosmological theory of beginning has much room for development and perhaps might be better displaced if its view considered some important theological considerations.

With regards to scientific knowledge, it can be said that “*our knowledge of the universe has an edge*” (Barrow, 2005:252). In this light, our attempt to understand its beginning in a three-dimensional approach, has led to some striking considerations regarding the method of natural science:

- While it is clear where organic matter emerges from and how it developed into organisms, the exact processes which brought about the organic phase remains unresolved. This ambiguity of the beginning of life remains a biological concern, and biologists are hard-pressed to define problems, as to how life began, using the natural worldview alone.

³⁹ Mathematics is an abstract science which can incorporate infinite concepts into its calculations, this mathematics shares with theology (Padmanabhan, 2015:199). Physics is a practical science which can only incorporate measurable concepts in its considerations (2015:199). Physical considerations which cannot be measurable are the result of mathematics within physics, infinity being one such example (2015:199).

- The evolution of the planet is largely an estimated event, the absolute ages of planetary development, the length of time between different phases, and the phases as they occurred in the past cannot really be known with precise dates. There is a certain level of speculation and of reflection which bridges the gap between the past and history.
- With regards to the emergence of the cosmos itself, and the dominance of an initial singularity as broadly accepted, CMWBR, Inflation and Nucleosynthesis forms the basis upon which singularity rests, with the cosmological field equations which supports it relying mainly on mathematical probabilities and theoretical hypotheses.

These conclusions demonstrate that the explanatory ability of the natural worldview has limits. Further, they demonstrate that even though natural science does not employ theology, there is much room for the theological worldview with regard to the narrative of cosmological and biotic origins, in particular in terms of each sphere's point of beginning, and the causal action thereof.

Chapter Three:
**CATHOLIC THEOLOGY OF CREATION: THE CATHOLIC THEOLOGICAL THEORY
OF BEGINNINGS**

3.1. Introduction

After having delineated the general analysis of this dissertation in chapter one, chapter two began a particular analysis of cosmological theories of beginnings as found in the Initial Singularity theory.

This chapter continues this particular analysis by looking at the theological theories of beginning as found in the Catholic tradition. It is a form of “creationism” that this dissertation labels as the Catholic Theology of Creation (CTC).⁴⁰ The chapter achieves this particular analysis by critically defining what the CTC is, then by explaining it regarding the theory of beginning from the point of view of Scripture, Augustine and Aquinas, and contemporary theologians. The chapter then enters into a Catholic controversy regarding the CTC, identifying natural theology and theistic evolution as competing theories to the traditional doctrine of creation (*creatio ex nihilo*).

3.2. Different forms of creationism

Broadly construed, “creationism” is the theory that the universe is the result of the creative action of a deity or deities (Luminet, 2008:109). The first of such theories came in the form of myths which “*generally express the idea of the creation and defence of an ordered cosmos from out of primordial chaos*” (2008:120).

The *Enuma Elish* of ancient Mesopotamia is one such myth which depicts Marduk’s (young god) struggle against Apsu (primordial chaos) and Tiamat (Apsu’s wife) (2008:120). Marduk defeats Tiamat and creates the heavens and the Earth from her body

⁴⁰ I am not advocating for the common understanding of creationism as a literal interpretation of scripture, but rather take a dynamic interpretation which deeply engages natural science.

(2008:125). Marduk also defeats Kingu, Tiamat's champion, and creates human beings from Kingu's blood (2008:125). The story reveals an existential reality which intrigued scientists of antiquity: humankind is not the apex of creation but a consequence of a greater struggle within the cosmos (2008:125). This existential reality explains humankind's limited existence in such a majestic and ancient universe.

In the ancient Greco-Roman creation myth, Gaia (Earth) and Uranos (Heaven) are born out of Chaos (primordial abyss) (2008:125). There is a generational struggle between the gods and titans which culminates in Zeus (god of lightning) defeating the titan Chronus (Zeus's father) and bringing peace between the gods and the titans (2008:125). Thereafter, the titan Prometheus and his brother Epimetheus created human beings and animals (2008:125). Again the story reveals humankind's limited existence as being created by superior beings.

In these ancient narratives, scientific investigation was limited such that observational and experimental instruments were theoretical rather than practical (2008:320). These creation narratives attempt to make theoretical sense of the existence of humanity, the nature of existence, as well as assist in comprehending the moral purpose of the power of nature (2008:320). They assisted in providing reflective solutions to the complex questions baffling humankind at the initial stages of inquiry (2008:320). They reveal that humankind was created by superior beings much more powerful than themselves, and that while they are made supreme among other created things because of their reasoning abilities, they are, like the plants and animals, thrown into an existence they had no hand in creating (2008:320). The narratives themselves are not factually true, for they are mythological; nevertheless the reflections they provide instil a sense of meaning and purpose to a people making sense of the laws of nature and their place as humans in it (2008:320). The Genesis creation narrative (discussed below) shares similar features with these ancient creation narratives, such as that a deity created humankind, that chaos existed in the very beginning, and that a superior being brought order from it (2008:320).

The Genesis narrative influenced the creation narratives of subsequent generations, some of which include Initial Chaos theory⁴¹, Young Earth Scientific Creationism theory⁴², Theistic Big Bang theory⁴³, Old Earth Creationism theory⁴⁴, Gap theory⁴⁵, and Historical Land Creationism theory⁴⁶.

Each creation theory attempts to explain how heaven and Earth came to be. The Genesis creation narrative takes its bases from the ancient myths of antiquity, and subsequent theories of creation take their basis from Genesis. Though each subsequent theory interprets the Genesis narrative differently, their interpretations attempt to understand the existence of a universe in which humankind finds itself.

⁴¹ Initial Chaos theory holds that only God existed before all things and that He created everything (Gen 1:1). God created an unformed chaos, and turned it into the cosmos in six days, shaping the heavens and the Earth (Gen 1:1–2).

⁴² Young Earth Scientific Creationism theory holds that all of creation occurred within six consecutive days (Gen 1:2-16). It takes its foundation from the Book of Exodus, which held that “*God created the world, the universe, and everything in them in six ordinary, twenty-four hour days*” (Ex 20:11). It was one of the first attempts to chronologically situate creation in history with the view that:

God created all space (heavens), all time (beginning), and all matter (earth), and this *ex nihilo* creation of the universe by God was on the first day. Then on day four God placed these ‘lights’: sun, moon, and galaxies of stars . . . being made of the same ‘earth’ that had been created on Day One (Luminet, 2011:15).

⁴³ Theistic Big Bang theory (or Theistic evolutionism) holds that the big bang which occurred 13.73±0.12 billion years ago was the creative action of God (Luminet, 2011:15). Before the cosmic egg, and its subsequent explosion, only God existed (2011:15). Thus the developments in cosmology and theology regarding how existence came to be corroborate: “*science, through its progressively improved understanding of the world, has come to agree with theology*” (2011:18). This theory became popular among Catholic theologians who saw contemporary evolutionary discoveries as complementing theology, and it shall be discussed later (2011:15).

⁴⁴ Old Earth Creationism theory holds that in the beginning God created heaven and earth by the big-bang from nothing (Luminet, 2011:18). Earth was uninhabitable at this point and by divine command God made earth habitable and then progressively created life (2011:18).

⁴⁵ Gap theory holds that God created heaven and Earth from nothing in the beginning and during a gap of time created life (Luminet, 2011:18). Life died, and God created life again in six days, creating a new Earth in which light separated day from night (2011:19).

⁴⁶ “In the beginning”, according to Hebrew tradition, always means a time period (2011:19). The Historical Land Creationism theory held that in that beginning time period (Gen 1:1), God created the heavens and the Earth—including Earth’s seas and land along with a multiplicity of life—all in this beginning (2011:19). Eden was synonymous to Earth, and was depicted as an uninhabitable wilderness empty of life (2011:19). Thus in six days (Gen 1:2–31), God prepared Eden (the future Promised Land of the Hebrews) making it habitable for the first humans (2011:19). The theory held that:

The recipients of Genesis, Israel at Mount Sinai, would know who their God is, the Creator of all things; and the importance of the Land as the place to re-establish a covenant relationship according to the Sinai Covenant with their Creator as in Eden/Promised Land (2011:21).

Specifically, the Catholic Theology of Creation is a theological interpretation of the beginning of existence. Similar to the other mentioned theories, it uses the Genesis creation narrative to explain why all of existence came to be.

3.3. The Catholic Theology of Creation as a theological interpretation of the beginning of existence.

In order to be in a good position to explain how the CTC investigates the question of the beginning of existence, it is fitting to define it within a broad framework for clarity.

In terms of the etymology of “*science*”, the word comes from the Latin *scientia* (knowledge) whose root word is *sciens* (knowing) (Ruskin, 1872:12). This makes science the art of knowing and the skill of the intellect which distinguishes the sentient from the non-sentient in that “*in science [one] must not talk before one knows... this forms the basis upon which sentience rests*” (1872:12). In this general sense CTC is a science.

A more recent definition of science holds that it is “*about the structure and behaviour of the natural and physical world, based on facts that you can prove*” (Agazzi, 2011:271). This definition is distinct from the general sense in that it lays stress on natural science with its use of facts and evidence (2011:271). Theological inquiry, with its focus on a supernatural world known not by proven facts but by rational reflection (abstraction), is not included in this definition (2011:271). Yet theology is a science since it is a study that focuses on the systematic, pastoral and dogmatic elements of the divine. This is why the recent definition is a particular definition which distinguishes a natural perspective (facts and proof) from a theological perspective (abstraction) (2011:271). This dissertation, however, uses the general sense of “science” as it is a more inclusive definition which incorporates both a theological (abstraction) and natural (facts and proof) perspective.⁴⁷

⁴⁷ The general definition of science as the art of knowing and the skill of the intellect does not only incorporate a theological dimension but is open to multiple forms of knowledge acquisition which is not limited to facts that can be proven (Agazzi, 2011:271). The usage of this general definition of science in this particular occasion incorporates theology – and CTC in particular – as science.

The term “*theology*” comes from the Latin *theos* (God) and *logos* (word\study), and thus theology can be viewed as “*the study of the nature of God and religious beliefs*” (2011:119). CTC is theology.

CTC is also “Catholic”, a term which comes from the Greek “*καθόλου*”(universal) and has been used “*to denote the name of the largest Christian communion, the Catholic Church*” (2011:121).

Considering these definitions, CTC can come to be viewed as the science about the creative action of God according to the Catholic tradition, done in order to produce knowledge about the beginning of existence (2011:118).

3.4. The threefold approach

The CTC constitutes a unique theory of creation in that it investigates the beginning of existence in a threefold approach. It takes its foundations from Scripture, and includes the views of Saints Augustine and Aquinas, as well as of contemporary theological perspectives.

3.4.1. CTC from Sacred Scripture

The Dogmatic Constitution on Sacred Scripture, *Dei Verbum* (DV), declares that God freely chose to inspire specific people to write and convey His Word through specific texts that the Catholic Church confirms as Scripture (§2).⁴⁸ This is why Scripture needs to be read and understood within a broad context which considers the author, recipient, intent, situation and time of each specific text or literary genre (§2). This is a comprehensive way of interpreting not only Scripture, but all theological texts wherein reading is done in an analytical and reflective way so that it becomes possible to extrapolate not only the theology behind the text, but also the spirituality within the text (DV, §2; Pontifical Biblical Commission (PBC), §20).⁴⁹ Thus in order to avoid the danger of fundamentalism and

⁴⁸ “*God chose to reveal Himself and to make known to us the hidden purpose of His will*” (DV, §2).

⁴⁹ Hermeneutics is “*the area of study which explains and analyses written texts*” (Speake, 1979:108). Within each text there exists a specific style of writing in order to explain a specific reality. For example, poetry is used to express desire and romance. The study of hermeneutics allows one to differentiate different writing styles in order to explain better the reality. Thus the metaphors expressed in poetry will reveal a romantic and not a literal reality (1979:108).

other erroneous interpretations of Scripture, as well as to understand more clearly the message communicated within the text in context, *Dei Verbum* advises:

Since God speaks in Sacred Scripture through men in human fashion, the interpretation of scripture, in order to see clearly what God wanted to communicate to us, should carefully investigate what meaning the sacred writers really intended, and what God wanted to manifest by means of their words (§12).⁵⁰

This means that reading and understanding Scripture is a process, and keeping this reality of Scripture in mind, it becomes possible for us to decipher meaningfully what was meant when Scripture says:

In the beginning... there was a great darkness, with the spirit of God hovering over the waters. God said, 'let there be light' (Gen 1:1a, 2a).

This text is fundamental to the study of the Catholic Theology of Creation, for it sheds light upon what happened in the beginning of existence as well as how existence was set in motion. These two points i.e. beginning and motion form the foundation upon which the theory of beginning according to the CTC is based.

Marybeth Lorbiecki explains the meaning of this sentence of Scripture, indicating that it demonstrates two important points regarding *existence* and *creation* (2014:41). First, that there was 'no thing' of significance in *existence* before God's intervention (darkness), and second, that God's significant intervention of *creation* brought forth into *existence* all significant things (light) (2014:41). The emphasis is on God's presence and activity, or lack hereof, and these are stressed in order to reveal elements of God's nature: that He is both passive and still, as well as active and moving (2014:41). In this light, it can be said that the whole of Scripture is an attempt to reveal God's nature in order that humanity learn and imitate Him (2014:48). Lorbiecki further explains that the sentence reveals an uncreated, always existing (eternal), all-powerful and ever-living (immortal) God who creates by divine command (2014:49).⁵¹ Thus, in the beginning, God was amidst the

⁵⁰ Fundamentalism is the inadvertent belief that everything written in Scripture is literally true and should be taken as true without any interpretation (Speake, 1979:72).

⁵¹ Other passages of Scripture reveal God to be intelligent, loving, and personal; to be distinct from His creation (Ps 90:2); to be personally active in His handiwork (Is 34:9); and to uphold, sustain, and preserve creation (Neh 9:6).

nothingness (darkness) which pervaded infinity, and out of love set into motion the thingness (light) which we call finite reality by His divine command (2014:48). Put in another way, everything that exists is finite and was created by an infinite God, out of nothingness, by divine command (2014:49).

The Jesuit theologian, Benjamin Fiore, follows on Lorbiecki's logic when he explains that God existed before all things, having Himself no beginning or end (infinite) (2017:64). Fiore further acknowledges that while describing and defining something infinite is theologically comprehensible, it is empirically incomprehensible, and that it is only by use of analogy that anyone can actually say anything finite (natural) about the infinite (theological) (2017:64). Similarly, through the revelation of Scripture as revealed in the text in question, finite humankind can come to know, by analogy, many of the incomprehensible things about this infinite God (2017:64).⁵² Continuing the study of the scriptural text in question, Fiore makes mention of the fact that it is because of the infinite and incomprehensible nature of God that He can be associated – only by analogy – to theological probabilities such as the spiritual: "... *the spirit of God hovering over the waters*" (2017:64; Gen 1:1b).

The concept of "*spirit*" comes from the Latin *spirare* (to breathe) which came to mean a theological and animating breath distinct from the soul (*anima*): "*and the Lord God formed man of the dust of the ground and breathed into his nostrils the breath of life, and man became a living being*" (Fiore, 2017:64; Gen 2:7). St Thomas Aquinas explained that it is through this breath of life that humankind's intelligence finds animation, and that this intelligence likens us, and draws us, to God (*Summa Theologica* [ST] I, q.66. a.4). The spirit animates, and in a theological sense can be associated with the spiritual part of the person which includes the mind, feelings and character over and above the physical elements of brain, heart and body (Smeenk, 2011:171).

⁵² An analogy involves exacting an understanding of one thing by using another thing of similar features (Speake, 1979:207), Thus it involves using limited human language – and imagination – to explain an unlimited God. This limits God to human language and forces scholars, hermeneutically, to transcend written texts about God in an attempt to comprehend the incomprehensible (Fiore, 2017:65).

Being theological carries other significant aspects of God, for it allows Him to be associated with absolute probabilities such as omniscience (all-knowing) and omnipotence (all-powerful), which explains how He could, through divine command, bring everything into existence without pre-existing matter (Fiore, 2017:64). This also explains why theological reasons are the only reasons which can adequately explain why God creates: reasons such as “*that God creates by wisdom out of love*” (Fiore, 2017:65; *The Catechism of the Catholic Church (CCC)*, §65).⁵³ This explains why accumulation and dominion over the material objects He created cannot explain why God created them.⁵⁴

The act of creation was a cooperative work of a benevolent Trinitarian God, who in Catholic theology exists as Father, Son and Holy Spirit:

God is one, yet He exists in three persons: God the Father who created heaven and earth, God the Son through whom and in whom the Father created, and God the Holy Spirit who proceeds from the Father and the Son (Fiore, 2017:65).

This theological theory of creation is known as *creatio ex nihilo* (2017:65).⁵⁵ The theory explains how an all-powerful God created everything and how this all powerful God defeats any assumptions that something existed before Him (2017:65).⁵⁶ It explains the infinite nature of God and His theological role in creation (2017:65). In this light, Fiore warns that there is a problem which has ensued for finite humanity to accept a theory which is grounded on an infinite being, especially in a natural science dominated society (2017:65). Such acceptance can only be made possible through the use of analogy, and

⁵³ God created the universe in order to allow His creation to share in His love, in His wisdom and in His infinite goodness: “*for you created all things, and by your will they existed and were created*” (Rev 4:11).

⁵⁴ Reasons such as the fact that God created existence in order to accumulate resources or even that He wished to exercise dominion over what He created are not theological and thus cannot serve as reasons as to why God created the universe.

⁵⁵ “*The doctrine of creatio ex nihilo (creation out of nothing) proclaims the unconditional nature of the act of creation and specifies God’s omnipotence as its ground (Gen 1:1). Together with the corresponding idea of the unconditioned freedom and contingency of God’s creative work expressed throughout Scripture, creatio ex nihilo possesses constructive meaning for the Christian understanding of creation*” (May, 2004:18).

⁵⁶ Since God is infinite, without beginning or end, the fact that He created the universe means that nothing existed before Him (Fiore, 2017:65). Thus God did not begin but set beginning into motion through creation (2017:65)

analogy does not dominate the natural sciences since it requires more abstraction than experience (2017:65).⁵⁷

Fiore explains that modern consciousness rejects the theological arguments which maintain that the sacredness of Scripture is reasonable grounds to affirm the content of Scripture, especially when the content contradicts empirical scientific facts (2017:65). It is an understandable rejection since sacredness is a theological reality which cannot be explained adequately in the natural sciences (2017:65). Thus Catholic, and Protestant theologians – such as Alister McGrath (2010) – use scientific observations to complement theology, this in order to be more accurate and relevant to modern consciousness (2017:65).⁵⁸ McGrath – for example – argued that the teleological argument is an authentic scientific theory (2010:185).⁵⁹ McGrath argues that if empirical verifiability be the only criterion for authentic scientific inquiry, then it follows that scientific propositions which are synthetically and not sense-experimentally verifiable do not form part of authentic science (2010:185).⁶⁰

McGrath argues that the teleological argument uses rational inference to explain where being comes from, and that since no contrary inference has yet disproven it, the proposition should be held as true on rational grounds and on these grounds expanded as a generality (2010:185). His comparison between the teleological argument and the proposition stand in need of revision, since the teleological argument requires a number

⁵⁷ Since there is a certain degree of abstraction in natural science, it follows that analogy is also an experimental tool in use for empirical science (Kragh, 1996:20). For example, the accepted cosmological definition that the universe began as a hot and dense “cosmic egg” uses the concept of “egg” to explain by analogy what the starting point of existence looked like (1996:20).

⁵⁸ Being a Catholic representation of creation, the support of Protestant scholars regarding the Catholic Theology of Creation, like McGrath (2010), shows that the theory is not dogmatic but interdenominational and inclusive.

⁵⁹ Because all of creation displays a common nature of having purpose or goal (*telos*), it follows from rational necessity that all of creation was created with a specific purpose or goal and that such a goal oriented creation cannot come into existence by some random event but must have been purposefully created by something or someone prior to existence, which had this purpose or goal in mind. This purposive creator is called God (Aquinas, ST I, q. 66. a. 5).

⁶⁰ The shortest distance between two points being a straight line is an example of a synthetically verified proposition (McGrath, 2010:185). Synthetic verification occurs as a result of the fact that while no scientist can examine the distance between every two points to experimentally verify it, after a number of successful experiments, the proposition is held to be true on rational grounds and on these grounds expanded as a generality (2010:185). If science can use this proposition and conclude it as authentically scientific, then it does not rely solely on empirical verifiability but also on rational inference (2010:185).

of successful experiments in order for it to be synthetically verified. McGrath did succeed, however, in exposing the fact that empirical verifiability is not the only criterion for authentic scientific inquiry with his exposition of the reality that rational inference has always been a part of natural science (2010:190). Exposing this connection bridges the gap between natural science and theology since rational inference (abstraction) forms a substantial part of the latter (2010:190). McGrath's insights also show that the Catholic Theology of Creation, as explained in *creatio ex nihilo*, is more than a dogmatic exposition exclusive to the Catholic faith.

The theory of an infinite God who created the universe out of nothing by divine command relies heavily – though – on rational inference and not so much on empirical verifiability. Yet with the existence of God slowly coming into the purview of our research, it must be emphasised that Augustine and Aquinas had to, therefore, further develop the Catholic tradition and the CTC to be relevant.

3.4.2. Augustine and Aquinas

Both Augustine and Aquinas upheld the teachings which had been handed down regarding Catholic principles and practices (PBC, §4).⁶¹ They explained, in more detail, the theory of creation elaborated upon in Scripture, taking their starting point from it (Scripture) as an exposition of a God created universe from nothing – *ex nihilo* – out of love (PBC, §4). Scripture reveals this theological reality not only for the reasons given above (i.e. to understand the existence of a universe in which humankind finds itself), but also as a way of preserving creation by presenting it as dignified (CCC, §65). Augustine and Aquinas attempted to explain what Scripture means amidst the challenges which such a theological theory faced in a scientific oriented society (PBC, §4).⁶² They were

⁶¹ St Augustine of Hippo (AD 354 – 430) is one of the Neoplatonic fathers of the Catholic tradition whose apologetic writings (including the *City of God*, *De doctrina Christiana* and *Confessions*) influenced the development of the Catholic tradition and earned him a place among the saints in the Catholic faith (Brown, 1967:221). St Thomas Aquinas (AD 1225 – 1274) was an Italian Dominican Friar who wrote in the scholastic era in defence of rationalizing and making knowable the Catholic faith. Influential among his many works include his nine volume *Summa Theologiae* (a compendium of all the main theological teachings of the Catholic faith) and three volume *Summa contra Gentiles* (an apologetic aid to missionaries in defending the Catholic faith against other religions) (May, 2004:18).

⁶² Social influence from the late middle ages onwards saw an emancipation of human rationality and a rejection of theological hypotheses (Stumpf & Fieser, 2008:192).

forced to clarify, using hermeneutical tools, some of the seeming contradictions which appeared.

In the time of Augustine, apart from the believers of the Catholic faith, there were few who could accept such a theoretical hypothesis within the Genesis creation narrative of an infinite and all-powerful God who created the universe out of nothing in six days (May, 2004:18). In theological circles, some believers, like the Manicheans, disputed the Genesis narrative by studying and identifying discrepancies in the scriptural text itself, basing their arguments upon the two separate accounts of creation that are recorded side by side and concluding that they contradict each other (Martos, 2001:206). They were certain that a contradiction exists between Gen 1:1 and Gen 1:2 in which creation both takes place at once (Gen 1:1) and over six days (Gen 1:2ff) (2001:206).⁶³

Augustine defended the Catholic scriptural position against the Manicheans (2001:206). He distinguished creation in the beginning from creation out of chaos, whereby God first created the infinite formless void (creation out of chaos), then from this void shaped the heavens and the earth and all finite creation (creation in the beginning) (Brown, 1967:217). Thus, while Lorbiecki explained that God was amidst the nothingness (darkness) which pervaded infinity, and out of love set into motion finite reality, Augustine was sure to mention that God was not just amidst this infinity, but that He created it (Brown, 1967:217).

Augustine further addresses the Manichaean critique by making a distinction between an ontological and a chronological act of creation (1967:220). This explains why even though creation may be seen to have taken place at the same time, there is a distinct order in which this very happening occurred (1967:220). Thus, while God ontologically created the heavens and the Earth, the sun and moon, day and night, plants and animals, and humans together, Augustine explains that there is an order in which this creation chronologically took shape (1967:221). This is why Earth is prior to day and night, day

⁶³ "... [T]o the dilemma in the first chapter of the Book of Genesis where creation is seen to have taken place both at once (Gen, 1:1) and over six days (Gen, 1:2ff)" (Manicheans in Martos, 2001:206).

and night to plants and animals, and so forth, as narrated in Genesis (1967:221).⁶⁴ This ontological order of reality and chronological order of time is what often appears contradictory both within the Genesis narrative, as well as between physical (finite) and theological (infinite) theories of cosmology (Padmanabhan 2015:199).⁶⁵

Finally, Augustine explains that the ontological and chronological distinction does not in any way diminish the reality that God is creator, but explains that God created in stages that account for the seeming contradictions which appear:

We must not suppose that unformed matter is prior in time to things that are formed; both the thing made and the matter from which it was made were created together. A voice is the matter from which words are fashioned... [b]ut the speaker does not first utter a formless sound... and later gather it together and shape it into words. Similarly, God the Creator did not first make unformed matter and later, as if after further reflection, form it according to the series of works he produced... [T]he material out of which something is made, though not prior by time, is in a sense by its origin prior to the object produced (Augustine, 1994:229).

The ontological and chronological distinction reveals the fact that the act of creation, though explainable, remains in many respects mysterious (1994:301). Augustine believed that it was such a powerful act that creation itself cannot help but naturally reflect its creator, “[it] ought in principle to be possible for a person to look upon a tree, [and] infer from the tree the existence of God” (1994:301). The inference demonstrates a reasonable way of understanding the nature and existence of God by rationally inferring from nature alone, so forming the basis of natural theology (discussed below) (1994:301).

Augustine’s responses to the Manicheans and eloquent defence of the tradition of the Church found favour in Catholicism and were later adopted by the Fourth Lateran Council. The council held that:

⁶⁴ St Augustine limited his creation theology to the scriptural narration (*creatio ex nihilo*), yet theologians after him expanded his chronology to include the natural observations explained in physical cosmological models (McGrath, 2010:189).

⁶⁵ Adding mathematics to physics allows physics to consider unmeasurable characteristics such as infinity which contributes to apparent contradiction of the Genesis narrative (Padmanabhan, 2015:199).

God... by His own almighty power at once (simul) from the beginning of time made each creature from nothing (Fourth Lateran Council in DV, §80).

Aquinas also contributed towards the development of the Catholic theological tradition on creation. He elaborated on the declarations on the Fourth Lateran Council regarding the creation doctrine, holding that God both created the boundless infinity out of nothing, as well as set forth into motion all finite things at the beginning of time (ST I, q. 66, a. 4). Aquinas endorsed the ontological and chronological ordering of creation, explaining that it is this distinction of creation in time and creation through time which was a novel way in which Scripture presented creation:

Creatures came into existence when the key of love opened his hand and... this one, true God, of his own goodness and almighty power, not for increasing his own beatitude, nor for attaining perfection, but in order to manifest this perfection through the benefits which he bestows on creatures, with absolute freedom of counsel and from the beginning of time, made out of nothing both orders of creatures, the spiritual and the corporeal (I, q. 66. a. 4).

Aquinas further maintained that God's creative act of love displays His benevolence, for as an infinite omnipotent entity without limitation, there was nothing other than His intrinsic nature of benevolence which sparked such an ordered and self-giving act of love (I, q. 69. a. 4). This is why it follows by necessity that, being created by a loving God, all of creation is good, is driven by an innate desire to do good, and finds its ultimate end in goodness (I, q. 70. a. 4).⁶⁶ This is a powerful reason why Scripture reveals this theological account of creation, and it is the abuse of the gift of free will in all creatures which often hinders them from attaining this goodness (I, q. 70. a. 4).

As a result of God's absolute benevolence, certain truths about His nature can be revealed purely by the use of reason (*Summa Contra Gentiles* [SCG], 1.3.2). This use of reason exists only for the rational creatures which share in God's likeness (humankind).

⁶⁶ "For it is clear that the absolutely last end of creatures, whose existence, nature and every action are practically due to the efficient activity of God, the First Cause of all things, must be identical with His finis operantis, that is, His infinite goodness, which consequently must be considered to be the sole sufficient reason of the creative act and at the same time the unique ultimate end or final cause of everything finite" (Aquinas, ST I, q.70.a.4).

This ability points to the inevitable reality that not only did God want to be known by His creatures, but that He wanted them to share in a relationship with Him:

There are some truths about which the natural reason is able to reach. Such are that God exists... such truths have been proven demonstratively by philosophers (SCG, 1.3.2).

In this light, the scriptural and traditional teachings of the CTC maintain that “*through God all things were made; without him nothing was made that has been made*” (John 1:3). Augustine and Aquinas affirm the infinite and divine nature of God and His active role in creation, as well as maintain the finite nature of the universe: “*what has not begun yet which exists may have no end [infinite], just as everything that has begun which exists has an end [finite]*” (I, q. 69. a. 4). These two states of being, finite and infinite reality, though they are mutually exclusive as a result of the natural and theological dichotomy, do corroborate in their attempt to explain the beginning of existence in some contemporary theological arguments (Kelly, 1997:290).

3.4.3. CTC from contemporary theologians

As a complete revision of the customs and traditions of the Church, Vatican II made great strides in consolidating the teachings of the previous councils and in forming a more definitive and descriptive Catholic Theology of Creation (CTC) (Sullivan, 2002:18). The Council’s Constitution on Divine Revelation affirmed this interpretation amidst the many theories which developed regarding creation (DV, §16). These theories included Pantheism (everything is God), Gnosticism (the physical world is evil), Deism (God made and abandoned creation), and Materialism (of scientific influence, rejects any transcendent origin for the world) (Cohan, Curd & Reeve, 1995:74).

While Augustine and Aquinas took the existence of God for granted, the introduction of materialism contributed to God’s existence now being called into question. It was thus up to licensed theologians, as part of the formal teaching office of the Catholic Church (*magisterium*), to further interpret the doctrines of Vatican II (Sullivan, 2002:18).⁶⁷ The

⁶⁷ The *magisterium* of the Catholic Church is the authority or office responsive to give authentic interpretation of the deposit of faith (Sullivan, 2008:18). This can be solemnly through the Pope when he declares *ex cathedra*; ordinarily in statements by cardinals and bishops in episcopal conferences through

CTC encountered much criticism and rejection within the ever growing dominance of scientific materialism and empirical verification (*Fides et Ratio* (FR), §38). The doctrines were clear, but the explanations were out of reach for the ordinary faithful who began to rely more on their senses and less on their reason (§38). Thus, even though there may be many reasons to believe in God, the fact that God is not visible to the senses causes people to question and even reject His existence.

The CTC holds that God created the universe without pre-existing materials by divine command, out of love, as recorded in the Genesis creation narrative (CCC, §65). It holds that even though a literal interpretation of the Genesis narrative is discouraged (PBC, §20), the narrative does explain a non-contradictory theological reality (DV, §18). *Dei Verbum* clarifies this link between Scripture and theology when it maintains that:

Sacred theology rests on the written word of God, together with sacred tradition, as its primary and perpetual foundation. By scrutinizing in the light of faith all truth stored up in the mystery of Christ, theology is most powerfully strengthened and constantly rejuvenated by the word. For the Sacred Scriptures contain the word of God and since they are inspired, really are the word of God; and so the study of the sacred passage is, as it were, the soul of theology (§24).

While this link formed a satisfactory interpretation of how the CTC – as a scripturally founded theology – embraced *creatio ex nihilo*, some contemporary theologians saw a need to evaluate and re-evaluate this scriptural interpretation in order to further develop a theology of creation which best explains the reality of the beginning of existence (Hoopes, 2018:37; Kelly, 1997:78). They were inspired to consider inclusive language in a society which rejects the rational inference of the existence of God (Hoopes, 2018:37; Kelly, 1997:78). They challenged themselves not only to develop more convincing arguments in order to stay relevant, but more importantly to prove the existence of God. The challenge led to developments in the Cosmological and Teleological arguments.

written documents, encyclicals, pastoral letters and homilies; and sub-ordinarily through clergy and theologians who lead a life of integrity, and who solemnly swear under oath to uphold the deposit of faith and submit to solemn and ordinary declarations (2008:18).

The cosmological argument comes from the first three ways of demonstrating the existence of God by Aquinas in his *Summa Theologica* (ST): from motion, efficient cause and necessary being. They all begin with an observed fact in the natural world and trace this fact back to its original source, “*it is clear that the chain of links cannot go back to an infinity past; thus there must be an initiator to the chain of connections, which we call God*” (ST I q. 34. a.1). The cosmological argument stresses the third way, which points out that everything is contingent (finite) (ST I q. 34. a.1). Since contingent beings come to an end, there must have been a time when nothing existed (ST I q. 34. a.1). But things exist, and because *ex nihilo nihil fit* (i.e. nothing can come from nothing), there must exist an uncaused necessary (infinite) being which caused and sustains all contingent beings (ST I q. 34. a.1).

Gerry Hughes redefines the cosmological argument when he compares it to scientific unobservable entities:

[W]e have what amounts to a sufficient proof of the existence of unobservable entities – quarks – that it would be unreasonable to deny they exist... The implications for the Cosmological Argument are obvious: God is an unobservable entity concerning whose existence it would be unreasonable to deny (2005:12).

Hughes is of the view that proof should include the idea of overwhelming probability (2005:18). Thus though certain entities are unobservable, their existence may be overwhelmingly probable such that they become unreasonable to deny (2005:18). For example, quarks form an essential part of natural science such that particle physics does not make sense without them (2005:18). They are unobservable, yet their existence is overwhelmingly probable and denying their existence is unreasonable (2005:18). Similarly, from the viewpoint of theological discourse, God forms an essential part of understanding why and how the universe began such that denying His existence becomes unreasonable insofar as conclusive explanations for its existence by natural science is still lacking (2005:18).⁶⁸

⁶⁸ Natural science has consistently denied any theological explanation of existence insofar as science came up with satisfactory explanation to existence. This leaves theology in a disadvantaged position of filling up the places where natural science is lacking, a theory called “the God of the gaps” (Hughes, 2005:18).

Anthony Kenny argues that it is not necessarily God who explains why the universe began, but that the matter making up the universe may itself be necessary to explain why the universe began (1969:108). The Cosmological Argument is inductive and based on probability (1969:108). While Kenny does see the importance of a 'Necessity' to cause contingent existence, he does not agree that this 'necessity' be necessarily attributed to a supreme being(s) (1969:108). Kenny further agrees with Aquinas that attributing 'necessity' to a plurality of divine beings renders existence inexplicable, yet he does not agree that it is necessarily any one divine being (1969:108). Thus, for Kenny, the probability of whether a necessary existent being (God) or a necessary existent entity (matter) caused existence carry equal weight regarding the Cosmological Argument, with the latter proving the most probable option for natural scientists due to its tangibility (1969:108). Yet Kenny's argument is circular in that it perpetuates the infamous "God of the gaps" theory.

The teleological argument comes from the last two ways of Aquinas, particularly the proof for God based on the order we see in the world (ST I q. 34. a.1). All things behave in an orderly manner, even unintelligent objects which cannot carry out functions unless directed by something intelligent (ST I q. 34. a.1). Thus Aquinas concludes that "*some intelligent being exists by whom all natural things are directed to their end*" (ST I q. 34. a.1). William Paley saw that natural objects show evidence of a creator because of their purpose or *telos* (2009:240). Since the universe exhibits the same purpose, he concluded that it is likely that the universe was created (2009:240).

McGrath had used the teleological argument above because it remained a very influential theological argument not only throughout the Renaissance and Enlightenment, but even today (2010:206). Theologian, Richard Gula, maintains that the teleological argument plays an important role in the creation narrative by inspiring meaning and purpose in all created things (1994:148). Like orthogenesis, teleology maintains the creation of existence from a benevolent agent for a benevolent purpose, with humankind taking a special role because of the likeness it shares with its creator through intelligence (1994:148). While natural scientists dispute this purpose-driven understanding of existence by attempting to show that existence emerged because of structures and

mechanisms, Gula argues that for as long as these structures and mechanisms fail to demonstrate the genesis of being (i.e. biological, geological and cosmological beginnings), their dispute is not convincing (1994:150). Gula held that:

The 1964 discovery of cosmic microwave background supported the big bang theory and thereby confirmed that the universe is historical albeit 13.7 billion years old rather than eternal. Thus, arguments about the inevitable emergence of life based on probabilities that rely on an infinite amount of time suddenly looked unlikely, i.e., as life no longer had an infinite amount of time to emerge because the clock was running. Teleological arguments based on cosmology, astrobiology, and astronomy lent credence to the “anthropic principle” which contended that the universe is fine-tuned to evolve human life (1994:150).

Paleontologist Simon Morris does not share the teleological view (Morris in Bowler, 1989:310). Although Morris saw the gap in structures and mechanisms to adequately explain emergence, instead of advocating a goal oriented universe he prefers a different approach that relies on frequent mutations or convergences (1989:310). He argues that living organisms are filled with examples of independent evolutionary paths as a result of frequent mutations, and he uses the intelligence found in crows, dolphins, and great apes to explain it (1989:310). Nevertheless, as an alternative Darwinian and neo-Darwinian approach to biological evolution, convergence is not a favourable theory among biologists because of its purely theoretical basis and the fact that natural selection is the accepted evolutionary model (1989:310).

As a theological reality inspired by Scripture, the issues surrounding a goal-oriented universe have much to do with the theology contained in the Catholic approach. For example, Gula held that the issue surrounding teleology has less to do with the specific conclusions of research and more to do with the implications of a purposeless existence for humankind (1994:155). How we view creation is directly proportional to how we treat it (1994:155). Joseph Martos, on the other hand, believes that while purpose is important, fidelity to reason, objectivity and critical inquiry is more so, even if such fidelity excludes teleology (2001:249). This could lead to a unique type of theology: a theology that is natural.

3.5. A Catholic evolutionary controversy

The aforementioned threefold approach encompasses the traditional Catholic approach to creation, an approach that we have deemed the Catholic Theology of Creation (CTC). The Pontifical Biblical Commission and its active interpretation of Scripture maintain a careful reflection of the Genesis creation narrative when explaining the beginning of existence. Even the Constitution on Divine Revelation points out that God's own actions and teachings as recorded in Scripture are the ultimate proof of His existence: "*God has revealed himself to man by gradually communicating his own mystery in deeds and in words*" (DV, §16). Nevertheless, some theologians advocate for an incorporation of contemporary scientific views with these traditional views, in order to gain access to a deeper understanding of the beginning of existence. These theologians caused some controversy around the issue of what constitutes the Catholic interpretation of the beginning of existence, an interpretation which the CTC seeks to evaluate.

3.5.1. Natural theology and evolution

Natural theology is a type of theology which attempts to prove and explain divine entities strictly by what the natural world reveals about them (Paley, 2009:241). Paley uses the example of a watch and a rock to explain that, through our reason, we can come to know how things came to be:

[S]uppose I crossed paths with a rock and wondered how it came to be there, for all I know it may have lain there forever... suppose I crossed paths with a watch, the same reason for its being there cannot apply (2009:270).

He uses the intricate details making up the watch to conclude that it must have had a maker who put the detail together for a specific purpose, it could not have lain there forever (2009:270). He applies this purpose-driven detail to natural existence and proposes that his former answer to the existence of the rock may itself be incorrect, and that it – too – may have a maker given the intricate detail constituting it (2009:270).

Thus, theologian Herbert Vorgrimler held that natural theology is not restricted to Christian theology, but theology in general (1992:125). Natural theology is not like Pantheism or Stoicism which hold that God is in everything, but rather holds that reflecting upon anything can reveal the existence of God (1992:125). Furthermore, Stoicism and Pantheism found no need to prove the existence of God since a theological beginning of the universe was taken for granted, this is not so for natural theologians (1992:125). Augustine believed that one can infer the existence of God by reflecting on nature, and Aquinas affirmed that natural reason can bring us knowledge about God (Augustine, 1994:301; cf Aquinas, ST I. q.66. a.4). Both laid a foundation upon which natural theology can flourish within the Catholic tradition and the CTC.

The Catholic tradition – as well as the CTC – promote the traditional views of creation as held in *creatio ex nihilo*; they also accept the revelations contained in natural theology as endorsed by Augustine and Aquinas. The official Church documents, like *The Catechism of the Catholic Church* (CCC), state that: “*God, who creates and conserves all things by his [sic] Word, provides men with constant evidence of himself in created realities*” (CCC, §58). This, Vorgrimler argues, can be interpreted in the manner that the “*created realities*” could include evidence from the natural world (1992:130). The implication is that we can come to know God by studying His created realities, and this is what natural theology is all about. Thus the CTC holds that while Scripture is the ultimate proof for God’s existence, evidence from the natural world can supplement these proofs.

Vorgrimler believes that if we prove God’s existence from a theological **and** natural point of view, it would not hinder but help our understanding of God (1992:297). He saw that the apprehension about the importance of natural theology by some theologians (cf, Weist & Smith [2012]) came as a result of an understanding of natural theology that attempts to “*demonstrate the existence and determine the character of God without recourse to divine revelation*” (1992:197). This would constitute a form of heresy known as Pantheism in which God is reduced to everything (1992:197). While divine revelation remains a theological imperative, Vorgrimler argued that there is room for natural revelation to supplement it not in order to replace it (1992:131). This supplement is done to better explain and prove objectively realities very difficult to rationalise (1992:131). The

Catechism agrees, saying that no harm can come from any naturally revealed truth about God for God is truth, and truth cannot deny truth:

[T]he humble and persevering investigator of the secrets of nature is being led, as it were, by the hand of God in spite of himself, for it is God, the conserver of all things, who made them what they are (CCC, §159).⁶⁹

Some theologians reject any rational approach to understanding the beginning of existence (Martos, 2001:249). Martos held that natural revelation and divine revelation are irreconcilable (2001:249). Swiss Reformed theologian, Karl Barth, agrees with Martos, viewing natural theology as an unfair way of looking at revelation, and he asks “*why should we rely on natural revelation in dealing with creation and not when dealing with other articles of faith?*” (1990:310). Natural theology does not appeal to natural revelation or the natural world for the doctrine of the Trinity, so why should it do so in order to work out whether the world was created by God or not:

[I]t is not the existence of the world in its manifoldness, from which we are to read off the fact that God is its Creator. The world with its sorrow and its happiness will always be a dark mirror to us, about which we may have optimistic or pessimistic thoughts; but it gives us no information about God as the Creator. But always, when man has tried to read the truth from sun, moon and stars or from himself, the result has been an idol (1990:310).

Barth discourages a naturally revealed hypothesis because of the limitations of humanity in seeing past the self (Vorgrimler, 1992:131). Vorgrimler argues that this may be so for a natural scientist, but never for a natural theologian who considers existence as a gift from an almighty Creator (1992:131).

3.5.2. The rise of natural theology

The CTC is cautious when discussing natural theology because of the danger of some theologians to render it a purely and exclusively natural attempt to prove God as creator (Barth, 1990:310). But this should not be the case. Natural theology should be used as a mechanism which strengthens and supplements the doctrines of divine revelation

⁶⁹ “[E]ver since the creation of the world, the invisible existence of God and his everlasting power have been clearly seen by the mind’s understanding of created things” (Rom 1:20).

(1990:310). It should serve as a means of explaining how God created the world in ways that theologians and natural scientists can understand (1990:310). This method of explanation is necessary in a world which relies heavily on empirical verification over and above rational inference, and perhaps can serve not only as a means of explaining how God created the world, but in support of other articles of faith (1990:310).

The reliance on empirical verification which natural theology brings to theology depends on the interpretation of natural theology as supplementing divine revelation (Vorgrimler, 1992:87). Yet according to theologians Walter Weist and Elwyn Smith, this supplementary form is not enough (2012:47). Weist and Smith are of the view that a natural theology that depends on theology is not natural but theological (2012:47). Martos shares their view, holding that were reason, objectivity and critical inquiry to lead a natural theologian away from divine revelation, the theologian would choose the latter (2001:135). Thus can Weist and Smith conclude that this interpretation is not a form of natural theology, but a form of theology, since fidelity to reason, objectivity and critical enquiry is not absolute (2012:48).

Theologian Thomas O'Meara saw no tension in supplementing divine with natural revelation as they analyse two distinct aspects of a dynamic reality (2012:260). Divine revelation focuses on the theological aspect while natural revelation focuses on the natural aspect of reality (2012:260). Reason, objectivity and critical inquiry cannot lead a natural theologian away from divine revelation because he/she is investigating two aspects of one reality, each aspect independently (2012:260). The only reason that a natural theologian may stray from being objective would be the personal bias of the fact that he/she is primarily a theologian, a bias which holds true for almost all scientists in their particular fields of study (2012:261).

This aforementioned debate between natural (reason) and divine (faith) revelation taints the importance of natural theology (2012:55). The CTC does not support the debate which holds one as superior to the other, but rather it holds both in high esteem (2012:55). Nevertheless, concern is shown for the implications of a natural theory of beginning which relies exclusively on natural revelation (2012:55). Natural theologians seek an understanding of creation as found both in Scripture (*creatio ex nihilo*) as well as in the cosmological and teleological arguments (2012:57). They argue that while evolving from

structural and mechanical processes, creation is a purposeful and loving act, is driven by an innate desire to do good, and finds its ultimate end in goodness (Aquinas, ST I, q. 66.a. 4). They seek not to deny the structural and mechanical processes which our sense experience reveals to reason, but to ground these processes in the certainty of revelation (Weist & Smith, 2012:57).

The Catholic tradition and the CTC teach that God is and does good, and that God created humankind in God's image and likeness for a reason (Gn 1:27-29). This means that humankind not only has a 'why' to live, but also a 'how', which is why the "Constitution on the Church in the Modern World", *Gaudium et Spes* (GS), maintains – anthropocentrically – that humankind is "*the only creature on earth that God has wanted for its own sake*" (§24). Thus the CTC forms the foundation upon which the dignity of creation, and human dignity in particular, is built: "*God created man in the image of himself, in the image of God he created him, male and female he created them*" (Gen 1:27).

According to natural theology, while human beings are biological organisms, they are also capable of spiritual experiences (GS, §24). As such they cannot be treated as means to an end because they are ends in themselves. Weist and Smith propose that:

The human individual cannot be subordinated as a pure means or a pure instrument, either to the species or to society; he has value per se. He is a person, with intellect and will, capable of forming a relationship of communion, solidarity and self-giving with peers. His likeness to God resides especially in his speculative intellect, for his relationship with the object of knowledge resembles God's relationship with what he has created. But even more, man is called to enter into a relationship of knowledge and love with God, a relationship which will find its complete fulfilment beyond time, in eternity (2012:82).

3.5.3. Theistic evolution

The relationship between the biological and spiritual which natural theologians seek to collaborate is also emphasized by theistic evolutionists. Theologian Michael Chaberek held that theistic evolution takes the natural approach to theology. It holds "*God-guided evolutionary views that regard religious teachings about God as comparable with modern scientific understandings about biological evolution*" (2015:124). There are many Catholic

sources which support a theistic evolutionary approach to the subject of creation, for instance, *The Catechism of the Catholic Church*, which holds the inseparability of faith (spiritual) and reason (biological):

There can never be any real discrepancy between faith and reason. Since the same God who reveals mysteries and infuses faith has bestowed the light of reason on the human mind, God cannot deny himself, nor can truth ever contradict truth. Consequently, methodical research in all branches of knowledge, provided it is carried out in a truly scientific manner and does not override moral and natural laws, can never conflict with the faith, because the things of the world and the things of faith derive from the same God (CCC, §159).

When Pope John Paul II touched on the Catholic approach to evolution during the 1996 Pontifical Academy of Sciences, he seemed to tend towards theistic evolution as well: “*Today, almost half a century after the publication of the encyclical [Humani Generis], new knowledge has led to the recognition of the theory of evolution as more than a hypothesis*” (John Paul II in Chaberek, 2015:231). According to Chaberek, the Pope wanted to update the biblical theory of creation (*creatio ex nihilo*) and to supplement the theory with scientific certainty, but what he said was not taken positively by some scholars and journalists (2015:231).

Cardinal Joseph Ratzinger resumed the issue of evolution when he gave a few comprehensive lectures and wrote articles on the topic (1995:56). Incorporating the views of theistic evolution, Ratzinger held that:

We must have the audacity to say that the great projects of the living creation are not the products of chance and error. Nor are they the product of a selective process to which divine predicates can be attributed in illogical, unscientific, and even mythic fashion (1995:56).

Pope Francis also commented on evolution as he wrote the most recent pronouncements on the topic at a 2014 gathering in the Pontifical Academy of Sciences (Chaberek, 2015:296). Also leaning towards theistic evolution, Pope Francis:

[W]arns that when reading the Genesis account of creation one may ‘imagine that God was a magician, with such a magic wand as

to be able to do everything... [I]t was not like that. God created beings and left them to develop according to the internal laws that He gave each one, so that they would develop, and reach their fullness' (in Chaberek, 2015:296).

The CTC holds that Catholics should avoid fundamentalism and not take literally the words of Genesis, even if the written historical narrative – as history – must be preserved (2015:201). Chaberek promotes divine revelation over natural revelation, and thus downplays the Pope's remarks by stating that the Pope did not define his terms (2015:201). Chaberek is of the view that Pope Francis is not a theistic evolutionist, and that a clarification of statements against the backdrop of *creatio ex nihilo* will reveal exactly this (2015:201). Yet because of the focus on observation and natural experiment, there is the possibility that theistic evolution could gain momentum against the traditional Catholic interpretation, and this is explicit in the Popes remark (2015:202). Chaberek does not choose one over the other, but holds that both theistic evolution and the Catholic tradition should find common ground (2015:22). His concern is that more should be done in the study of evolution in order to take into account both traditional view points and modern theistic evolutionism. Such a study should form one Catholic stance in which the traditional and contemporary theologies of creation merge, and this is what the Catholic Theology of Creation is attempting to demonstrate:

Rapid developments in biochemistry are raising many obstacles to the common evolutionary scenario, and theologians now face the need to reinvestigate the original doctrine of the Church and explore whether theistic evolution is in fact compatible with the Christian view of creation (2015:4).

3.6. Conclusion

This chapter has continued the particular analysis of the theories of beginnings by looking at the theological theory of beginning as found in the CTC. It achieved this by critically defining what the CTC stands for amidst the different forms of creationism which exist, then by explaining CTC regarding the theory of beginning from a three-pronged approach (Scripture, Augustine and Aquinas, and contemporary theologians). The chapter also entered into a Catholic controversy regarding the CTC, identifying natural theology and theistic evolution as competing theories to the traditional doctrine of creation (*creatio ex*

nihilo) held by the CTC. The chapter finally recognises that more research needs to be done in order to develop a Catholic Theology of Creation which is unified and complete.

Humankind has discovered much through the persistent employment of reason, objectivity and critical inquiry. This means that there is much our reason can continue to discover in upcoming generations. However, like all finite things, if left unchecked, the employment of an exclusive method (be it natural or theological) could be detrimental to the same humankind it seeks to empower. Some caution and restraint need to be employed in order to direct reasonable inquiry into progress.

Chapter Four:
ENCOURAGING DIALOGUE BETWEEN INITIAL SINGULARITY THEORY AND THE
CATHOLIC THEOLOGY OF CREATION: SCIENCE AND THEOLOGY IN
COMPLEMENT

4.1. Introduction

Chapter one was a general delineation of the methodology of the dissertation, with chapters two and three being a particular analysis of cosmology (Initial Singularity theory) and theology (Catholic Theology of Creation) respectively.

This chapter analyses the possibility of a relationship of complement between the last two chapters by way of presenting a dialogical approach towards viewing cosmology and theology. It achieves this by presenting the conclusions of the last two chapters, then by presenting ways in which cosmology relates to theology. Afterwards it presents transformed reason as the method of dialogue and explains how such dialogue takes effect in cosmology and theology. Finally it presents some theories which supplement dialogue between cosmology and theology.

Can cosmology and theology, under the guise of Initial Singularity theory and the Catholic Theology of Creation, be viewed as two aspects of one reality? This chapter argues that this can be so as this one reality is dynamic, presenting both cosmological (Initial Singularity theory) and theological (Catholic Theology of Creation) nuances. We begin deciphering these nuances by taking a brief look at the conclusions of the Initial Singularity theory and the Catholic Theology of Creation.

4.2. A précis look at the conclusions of the two theories of beginning

Before we can begin to identify and argue for the dialogical approach that sets cosmology in conversation with theology, it is fitting, by way of introduction, that we summarise the

conclusion of the two theories of beginning as they presented themselves in the previous two chapters.

4.2.1. Initial Singularity theory

Our investigation of the cosmological theory of beginning has concluded that the theory of Initial Singularity had much potential for development because of its limitations (Barrow, 2005:252). It is limited because of the reality that “*our knowledge of the universe has an edge*” (2005:252). The attempt to understand the beginning of the universe in a three-dimensional approach revealed certain conclusions regarding the limited method of cosmology – and of natural science in general. Before critically evaluating what the conclusions mean and how they assist this dissertation in its endeavour to complement cosmology with theology through dialogue, it is good that we enlist the conclusions as they appeared in chapter two.

Firstly, biological evolution demonstrated that while it is clear where organic matter emerges from and how it developed into organisms, the exact processes which brought about the organic phase remains unresolved (Ward & Kirschvink, 2015:40). This ambiguity of how life began remains a biological concern, and biologists are hard-pressed to define problems – using the natural worldview alone – as to how life began (2015:40).

Secondly, geological evolution proposes that the evolution of the planet is largely an estimated event, the absolute ages of planetary development, the length of time between different phases, and the phases as they occurred in the past cannot really be known with absolute certainty (Day, 1984:88). There is a certain level of speculation and of reflection which bridges the gap between the past and history (1984:88). How things actually happened, and how they are recorded to have happened, form two separate realities ⁷⁰

Finally, cosmological evolution theorises that the beginning of the universe in the form of Initial Singularity theory confirms that Cosmic Microwave Background Radiation (CMWBR), Inflation and Nucleosynthesis form the bases upon which any cosmological theory of beginning rests (Breen, 2018:113). The cosmological field equations supporting

⁷⁰ The theological worldview separates reality into two: the corporeal and the spiritual.

the theory rely mainly on mathematical probabilities and theoretical hypothesis (2018:113). Alternative cosmological theories such as String theory and Quantum Loop Gravity (QLG) exist, though they are mainly developed models of the Steady State theory, in that they assume the eternal existence of the universe (Padmanabhan, 2015:180). The eternity of the universe, nevertheless, falls outside the ambit of natural science and cosmology and into a philosophical debate (2015:199).⁷¹

Barrow's statement regarding knowledge rings particularly true when considering the limitations of the natural cosmological theories of beginning as they were explained in chapter two. While we do wish to know all that there is to know about the universe, various physiological, psychological and biological conditions prevent us from attaining an absolute account of it (the universe). In short, in presenting limited accounts of the theories of beginning, the natural scientific worldview showed itself to be limited.

4.2.2. The Catholic Theology of Creation

The theological theory of cosmology in the form of the Catholic Theology of Creation (CTC) demonstrates that a benevolent infinite God created the universe from love out of nothing in accordance with the divine revelation of Sacred Scripture (Lorbiecki, 2014:49). It revealed that though the beginning of the universe takes its basis from divine revelation, it can be supplemented by a practical and scientifically informed form of theology called natural theology which allows for fidelity to reason, objectivity and critical scientific inquiry (Vorgrimler, 1992:124).

Tautologically, natural theology is a theological attempt to dialogue with natural science (1992:124). Natural theology is itself a limited approach which holds divine revelation in high esteem. The CTC – as a theological endeavour – is rejected by natural science for this theological link (Kelly, 1997:27). This theological link indeed limits the endeavours of the CTC by including propositions which go beyond the scientific worldview (or beyond sense experience) (Kelly, 1997:114). But, through fidelity to reason and the attempts at objectivity and critical scientific inquiry of natural theology, this form of theology is brought

⁷¹ “[W]hat happened before the big bang? We really have no idea. String theory offers no insight; the implications of loop quantum gravity on quantum cosmology are too disastrous” (Padmanabhan, 2015:199).

closer to the scientific worldview (i.e. sense experience) (Vorgrimler, 1992:130). It sometimes even uses data obtained from natural science and is able to dialogue with natural science by means of this data (1992:130).

The requirement which fidelity to reason, objectivity and critical scientific inquiry brings to theology exists as a result of natural revelation, and natural revelation exists as supplement to divine revelation (1992:201). CTC is not in opposition to natural revelation. Furthermore, it does not support the debate which holds divine revelation as superior to natural revelation, or vice versa, but rather it holds both in high esteem (Weist & Smith, 2012:55). The CTC simply cautions against the exclusive use of natural revelation out of concern for the implications of an exclusively natural theory of beginning (2012:55). It argues that while evolving from structural and mechanical processes, creation is a purposeful and loving act, which is driven by an innate desire to do good, and which finds its ultimate end in goodness (Aquinas, ST I. q. 66.a. 4).

The CTC embraces a natural theological approach to the theory of beginning, yet it holds divine revelation as its primary source. Weist and Smith identify this as a key limit in the method of the CTC (2012:47). They assert that if reason, objectivity and critical scientific inquiry went against divine revelation, natural theology would choose divine revelation, and science cannot prove the existence of the divine (2012:47). Even though Thomas O'Meara confirms that such a dilemma would not be possible since the two are distinct and independent aspects of reality, the method of theology is limited because of its reliance on the unmeasurable (2012:261).

Despite both Initial Singularity theory (cosmology) and the Catholic Theology of Creation (theology) being limited, they can overcome their limitations by relating to each other, so learning from one another. Below are a variety of ways in which natural science can relate to theology.

4.3. Ways of relating natural science with theology

Initial Singularity theory and the CTC follow independent worldviews, natural science and theology, respectively. Through the worldview of natural science, the theory of the beginning of existence has led to the Initial Singularity theory, and through the worldview of theology, the theory of the beginning of existence has led to the CTC. Though it has not yet been possible for these two worldviews to become one, there are a variety of ways in which both worldviews can be viewed. Ian Barbour and Ashley Montagu propose four ways in which these worldviews relate (2000:154). They view both worldviews as being in a relationship, and they place these relationships under the general umbrella of “science and religion” (Barbour, 2000:154; Montagu, 1984:52).⁷² Barbour and Montagu propose a fourfold relationship (or typology), and these form the basis upon which other typologies regarding the relationship between science and religion ought to be viewed (Barbour, 2000:154; Montagu, 1984:52). I argue it is basic because it is encompassing, and for us to better appreciate how encompassing the Barbour-Montagu typology is, the variety of typologies shall be discussed first.

Robert John Russell offers a brief characterization of the way in which the relationship between science and religion could be viewed (Murphy, Russell & Stoeger, 2008:117). Rather than naming them he describes the relationships as follows:

In some cases, these ways are meant as mutually exclusive, such as ‘conflict’ versus ‘two worlds’; in other cases, one way might lead to and become incorporated within another, such as ‘dialogue’ and ‘integration’. In some cases, each way is meant as a characterization of the relation between science per se and religion per se; in other cases, they only apply to specific topics in science and in religion (2008:117).

Later on, Russell revised his relationships and produced a fourfold typology (2008:120). His topology mirrored that of Barbour, with the exception of “reflection” instead of “integration” (2008:120). While he does acknowledge that both worldviews are different independent aspects, it is clear that Russell believed that both science and religion could be integrated into one (2008:120). His fourfold typology includes:

⁷² While Barbour spoke of science and religion, I replaced religion with theology since in the Christian context it is theology which studies matters pertaining to religious belief.

- the traditional conflict between them.,
- the mutual independence they both share,
- the dialogue they can render each other, and
- the reflection of both methods in a new method brought about by integrating them (2008:120).

Nancey Murphy proposed a fivefold typology of relations between Christianity and culture in which they:

- concede,
- cement,
- carry (assist),
- celebrate, and
- complement each other (Murphy, Russell & Stoeger, 2008:197).

Being of the view that Christianity can be imbibed in every culture in its theological form, Murphy saw it as a means of transforming the cultural worldview of society, "*Christianity, as a theology, can be used as a means to see past the obsolete doctrines imposed by culture to society*" (2008:198). She later applied her theory to science (culture) and religion (Christianity) in general, placing optimism in religion as having a transforming element necessary for all social norms, including science (2008:200). She applied it because she was of the view that religion "*could be a transformer not only of culture in particular but even of science in general*" (2008:200). Religion, she held, is a science of the divine; most, if not, all societies, believe in a spiritual reality of something great: beyond human science (2008:200). Through their spiritual beliefs they can be able to analyse and abandon norms and practices of no value for society through a developed and transformed religion (2008:200). Thus, while she did not propose any formal typology suggestive of how science and religion relate, her view that both could be transformed and be "integrated" through religion was clear (2008:200).⁷³

Both Russell and Murphy propose the integration of science with religion. Though they do not indicate as to how such integration should take place. They were convinced of the transforming nature of both science and religion as a combined method. Russell saw a

⁷³ Murphy only made a typology for Christianity and culture not of science and religion. She only applied her typology to science and religion because of her optimistic view of Christianity.

possibility to dialogue and integrate religion and science, and Murphy saw religion as being the key for such dialogue and integration to take place not only in science, but in all sphere of social life. For her, religion is the key to transforming what it means to be a human being in relation to other human beings, for it has the ability to change each individual from the inside out (2008:200). The problem comes when demonstrating how such transformation can take place, or even explaining how it would look like. This is why Barbour and Montagu respectfully propose such integration as ideal.

John Haught proposed a theory which consisted in a fourfold typology that also mirrored Barbour's typology with the exception of the fourth: "confirmation" instead of "integration" (1995:54). Haught saw that while science conflicts, separates, and dialogues with religion, they also confirm each other as separate disciplines in a quest for knowledge (1995:54). Haught lay greater stress on the scientific world as he perceived it as an infinite wellspring which cannot be fully known (1995:54). Thus, he explains that in this type of relationship between science and religion, there is the tacit belief that:

[T]here is a real world, intelligibly structured; that the human mind is able to understand at least some of the intelligibility of the world; that no matter how much people explore they will find more and more comprehensibility to decipher; and that without this kind of faith there could be no incentive for scientific research (1995:55).

Haught saw knowledge as dependent upon the perceiving subject, and he held the view that all encounters the perceiving subject has with the perceived world is not only primarily intelligible, but is also held as a real encounter about the natural world in faith (1995:55). Thus, though many may argue that there is no faith in science, Haught was of the view that a scientist must have faith that his/her interaction with the perceived world produces something real about the perceived world (i.e. the objective natural world) (2005:120). Haught separates reality into the perceiving and the perceived, and in this sense makes scientific endeavours mirror theological reflection (so separating reality into two). The separation of reality into two by Haught was introduced by earlier scholars such as Francis Bacon and Saint John Henry Newman.⁷⁴

⁷⁴ Bacon and Newman shall be discussed below

Mikael Stenmark produced an analytical representation in which he replaced Barbour's notion of "conflict" with that of "irreconcilability" (1995:224). Stenmark also combined two of Barbour's categories—"dialogue" and "integration"—with "reconciliation" (1995:224). Thus, Stenmark held the irreconcilability of science and religion in the first instance, their reconcilability in the last instance, with their independence between them (2005:124). The two opposing views at opposite ends of his representation make Stenmark's "theory" untenable. He did not propose it as a typology but more as a critique to Barbour's fourfold typology, which explains why the contradiction exists.

Stenmark believed in the independence of science and religion, and saw this independence as advantageous to understanding two different aspects of the same reality, science for the natural, religion for the theological. He also saw them as having the possibility of being reconciled, and like Barbour's conflict and integration, places this reality at the opposite extreme. But unlike Barbour, Stenmark's choice of terminology is faulty as he places two opposing ideas in the same analysis, and they contradict and thus cancel each other out: irreconcilability and reconciliation. For Barbour, "conflict" and "integrate" are different but not opposite, and as independently different terms they do not contradict or cancel each other out. Thus, Stenmark's analytical representation falls short from ideal.

The above typologies share the salient features to the fourfold typology of Barbour and Montagu (Barbour, 2000:120). It is as though Barbour and Montagu have assimilated the above typologies and found the common features present in all. While some have replaced certain aspects such as Russell or combined certain aspects like Stenmark, they are still predominantly similar to the fourfold typology of Barbour and Montagu. Barbour and Montagu hold that science and religion cannot yet be integrated as one since a practical method of such integration has not yet been proposed (2000:151). They seek a relationship which is not only applicable but also practical and this is why their typology arguably forms a benchmark which all the preceding typologies mirror (2000:151). Thus, their fourfold typology can be argued to form the ideal identification in which the relationship between science and religion can be identified.

This is why this chapter not only focuses on this typology, but saves it for last. Barbour and Montagu's typology includes:

- Conflict,
- Independence,
- Dialogue, and
- Integration (Barbour, 2000:154; Montagu, 1984:52).

Each relationship proposes a unique way in which science and religion communicate and thus adds significant insight into the way considerations in religion can collaborate with those in science (Barbour, 2000:154; Montagu, 1984:52). While some relationships are discouraged, like that of conflict, Barbour encourages the employment of other methods because of the corroboration and progress they promote (2000:154).

Barbour explains that in a relationship of conflict, science and religion are rivals who make different and opposing statements about the same reality (2000:155). In such a relationship, one can only chose between the two points of view since one view is necessarily opposed to the other (2000:157). Each method is in conflict with the other. Thus, while science will appeal to experience, religion will appeal to faith, such that society will be forced to choose between the two (2000:157). This is the traditional way in which science and religion were viewed whereby religious statements dominated before the Scientific Revolution, and scientific statements dominated after it (2000:157). In a relationship of conflict, the two form mutually exclusive points of view, with each focusing on a unique aspect of reality. In such a relationship, the conclusions of one cannot assist those of the other and often the pursuit of truth is hampered by the desire to be right (2000:157).

Montagu makes a distinction between conflict and mutual independence whereby, for the latter, even though science and religion are not headstrong in being right one over the other (as in conflict), they are kept in two separate compartments and taken as mutually exclusive (1984:55). They are exclusive according to the questions they ask, the domain they refer to and the method they employ (1984:55). This means that views may conflict or even complement each other unintentionally, since each focuses on its own domain and holds no interest in the domain of the other (1984:60). Being independent, each

domain is selective and has limits, and these limits are motivated by the desire to be faithful to the exclusivity of questions and direction of focus in specific aspects of life and thought (1984:60). In such a relationship, the conclusions of one may assist those of the other, though in a limited and often unintentional capacity (1984:60).

In a relationship of conflict, no assistance is possible; in a relationship of mutual independence, minimum assistance is possible. In a relationship of dialogue, maximum assistance is possible, in which a more constructive relationship between science and religion emerges (Barbour, 2000:169). A relationship of dialogue emphasizes similarities in presupposition, method and concept, and exploits these in order to gain access to a greater degree of knowledge (2000:169). Both methods are enriched, reaching amicable consensus and making inclusive far-seeing conclusions (2000:169). They are, nevertheless, still very much independent, dialoguing in order to pursue their own individual ends (2000:170). The assistance adds only to broaden their individual horizons, helping them to see past their individually limited methods (2000:170). Though independent, such dialogue may be enough for gradual consistent growth.

Finally, Barbour makes mention of an ideal relationship of integration between the scientific and religious perspectives (2000:184). Integration is an extensive and systematic relationship between science and religion in which unification of scientific and religious propositions leads to a completely new and advanced method (2000:184). There is no assistance. It is ideal because of its desire to create this completely new method from the ones already in existence, thus eliminating the perennial competition between the two, which inadvertently always limits their perspectives and output (2000:184). While ideas and conclusions are often modified during dialogue, they still serve to perpetuate a specific agenda and for this reason do not unite into something new, which is why Russell and Murphy encouraged integration (2000:184). Yet Barbour and Montagu hold that such integration is not possible at present (Barbour, 2000:154; Montagu, 1984:52). Perhaps such a completely novel unity may become possible in the future through consistent dialogue, yet Barbour and Montagu hold the idea to be premature, falling short of content and method as was the case with Russell and Murphy (Barbour, 2000:185). The current

practical and working model is when science and religion remain independent methods attempting to explain different aspects of reality.

Barbour and Montagu discourage the conflict relationship, citing it to be biased and closed-minded toward the detriment of the knowledge it seeks to attain (1984:81; 2000:185). They accept certain positions of mutual independence as valid, as for when they complement the overall understanding of reality (Montagu, 1984:81; Barbour, 2000:185). They endorse the method of dialogue as a fruitful way in which science and religion relate, viewing reality as a coin in which the two individual aspects (sides) analogically represent science and religion (Montagu, 1984:81; Barbour, 2000:185). Science and religion may be independent, yet they both add something significant to the overall view of reality through dialogue (1984:81; 2000:185).

Dialogue serves knowledge in general in the interchange of methods for a broadening of perspectives, and pushes knowledge forward (Barbour, 2000:187). Since knowledge is the information, understanding and skill that is gained through experience, the interchange which dialogue stresses enhances this experience through the sharing of information which seeks to enrich all parties concerned (2000:187). This is particularly true since dialogue emphasizes similarities in presupposition, method and concept, and the experience gained in this dialogue is exploited in order to gain access to a greater degree of knowledge (2000:69). The give-and-take which interchange brings represents advancement in knowledge, and this is achieved through consistent dialogue (2000:187). Thus where there is more dialogue, there is more knowledge.

Finally, Barbour and Montagu assess the advocates of integration with a tinge of scepticism (Barbour, 2000:185). Even though they believe the relationship to be ideal, they are of the view that it cannot yet be convincingly achieved since a model for the practical implementation of integration is yet to be proposed (Barbour, 2000:154; Montagu, 1984:112). Furthermore, when viewing the attributes of the doctrine of creation, or the complexities of human nature, environmental ethics and process philosophy, integration is found to be lacking (Barbour, 2000:185). If anything, the doctrine of creation – as shown by the individual theories of beginning above – revealed how much more

research needs to go into dialogue between the sciences in order to break limits (2000:185).

4.4. A method for dialogue: “transformed reason”

Dialogue involves a method of communicating, a method of interacting, which allows theology and cosmology to grow and become better and more complete (Young, 1995:341). The method of dialogue is an intrinsic ingredient for growth as it involves constructive criticism and challenge. Constructive criticism involves identifying the shortcomings of the other and communicating these to the other in order that it can learn from these shortcomings in the future (1995:341). This is done in a positive and cautious manner in order to avoid unnecessary conflict. Conflict can arise in constructive criticism if it is not done in this cautious manner since criticism, regardless of how constructive, is often difficult to accept. Challenge involves confronting the point of view of the other and opening them up for discussion and review. It should also be done with caution since it involves fundamental viewpoints which are difficult to reject (1995:341).

Any amount of criticism and challenge will not be received if there is no trust (1995:135). Theology and cosmology have to demonstrate that they have the interest of the other at heart in order to demonstrate trust. Such demonstration of trust is made possible by acts of consistency and transparency. Consistency involves having a particular set of beliefs and standing by them while transparency involves being open and honest about one’s particular belief system (1995:135). Once trust is earned, it becomes possible for theology and cosmology to challenge each other in ways that are beneficial for both parties. Both are opened up and challenged by the possibilities of the other, and this is achieved by tools such as consistency and transparency (1995:135).

Theology challenges cosmology to experiment with immaterial probabilities and see past the immediate material existence around us (Numbers, 1992:458).⁷⁵ Natural theology has shown that there are immaterial probabilities which our natural reason can fathom. Such

⁷⁵ Thought experiments, for example, allows natural science to see past the immediate existence (Young, 1995:350). They are common in late twentieth century Analytical Philosophy and could be reintroduced “as a new interdisciplinary field [of experimentation] that uses methods normally associated with reflection and psychology to investigate questions of science” (Young, 1995:350).

knowledge criticises constructively the emphasis of cosmology on material existence alone as biological, geological and cosmological evolution depicted (1992:458). Cosmology, for its part, challenges theology to trust sense experience and the natural world. Since there are divine realities which can be revealed through natural reason, cosmology criticises theology for depending on divine revelation over and above natural reason. Such an overemphasis divides existence into a spiritual and corporeal reality (1992:458). Reality, for cosmology, is one, and cosmology challenges theology to understand this and find a way to incorporate the spiritual into the corporeal.⁷⁶ Once this is achieved, theology will be in a good position to dialogue with cosmology (1992:458). Theology holds that it does not divide reality into two, but simply identifies two distinct aspects of the one reality, a distinction some natural scientists have also made (Bacon [2004], Newman [1974], Haught [1995]). The aforementioned challenges and constructive criticisms lead to a transformation of reason, and bring progress to science.

Reason involves a general perception of things, and this general perception constitutes the worldview in which we live (Numbers, 1992:458). In a cosmological sense, this worldview involves external perception (i.e. of the corporeal), whereas in a theological sense this worldview involves an interaction between the internal perception (i.e. of the spiritual) and of the external perception (1992:458). These worldviews of reality – as purely external (cosmology) or as consisting in an external and internal dimension (theology) – constitutes our general perception or how things are rationalised (1992:458). If we are able to transform our reasoning into something different, into something better, our perception of things – our worldview – should also change since:

For a scientist, to acquire the mysterious meanings of things through the eyes of a transformed reason means to experience a genuine epistemological transfiguration: the scientist who carries out his research through the eyes of *transformed rationality* may discover a reality he has never seen before through the eyes of natural rationality; namely, he may discover the profound divine meaning of the investigated world (1992:458).⁷⁷

⁷⁶ Platonic dualism is an example in which theology separates the spiritual from the corporeal.

⁷⁷ The emphasis is the author's insert.

Through the interchange of ideas which dialogue proposes, “transformed reason” takes effect whereby natural scientists and theologians view their respective worldviews differently (1992:458).⁷⁸ Such a “transformed reason” is limited insofar as the dialogue is limited, i.e. inasmuch as the worldviews remain exclusively independent (1992:458).

“Transformed reason” expects theologians to change the way they view reality, seeing the natural world (natural theology) as an essential part of the supernatural world (theology). This means that the theologian should also study what is revealed through observation and experimentation, considering the results of scientific evidence in its pursuit into understanding the nature of existence. The Catholic theological theory of beginning (the CTC) incorporates the existence of a God created universe (theology) with that of evolution (natural science), thus leaving room for theology (CTC) to dialogue with natural science (Initial Singularity theory). “Transformed reason” means that the theologian becomes a natural theologian whose study of unobserved phenomena incorporates those of observed phenomena.

“Transformed reason” also expects natural scientists to change the way they view reality, seeing it as both having sense experiential and perceptible realities (1992:458). This means that:

[T]he scientific [reality] is not altered, weakened or relativized by its unification (unblended and undivided) with the revealed [realities], but is consolidated and enriched, acquiring a deepness that otherwise would not be accessible (1992:458).

Using this kind of knowledge, the scientist does not turn into a natural theologian but has his/her reasoning and worldview transformed into something better by exposure to natural theology (1992:458). This does not mean that the scientist is no longer doing science since he/she will still be a scientist carrying out research, thus dialogue could take place without a “transformed reason”, though in a minimum capacity. Rather, it means that the

⁷⁸ By this we mean theologians in particular and metaphysicians in general.

science which the scientist (with “transformed reason”) presents can go beyond the experiential world to conceptual realities.⁷⁹

Natural science in itself touches upon conceptual realities particularly with regards to mathematical phenomena. As a science of numbers and shapes, mathematics can be both rationalised and actualised, yet it is the rationalisation of realities which makes mathematics touch conceptual realities since rationalising is a purely abstract endeavour. “Transformed reason” means that such a methodology is reinforced in order to balance the empirical emphasis on observable and tangible realities with conceptual realities for the natural scientist. The natural scientist is thus challenged not only to observe but also to conceive as a method of inquiry, leading to a more inclusive research methodology. Observation has limits (is finite), as the evolutionary narrative of the natural scientific theory of beginning explained, yet conception, as a process of formulating an idea, does not (is infinite).

The effects of such an inclusive method of research proves itself beneficial when natural science finds itself within the realm of the unobservable. Even though some realities cannot be observed, their existence can still be explained insofar as it is mathematically sound, as can be seen with regards to quarks in particle physics. “Transformed reason” proposes that the same principle applies when natural science dialogues with theological science whereby the natural scientist becomes a scientist who probes beyond the natural world of facts and proof and into a conceptual world of abstraction and mathematics. This does not mean that the unobservable realm of theology and the unobservable entities of particle physics are of the same reality, for they are not. It does, however, mean that the different unobservable realities of being can dialogue for a better understanding of existence as a result of a “transformed reason”.

4.5. How dialogue takes effect in cosmology and theology

Cosmology is probably the most ancient body of knowledge, dating from as far back as the predictions of seasons by early civilizations (Montgomery, 2012:302). It is a science

⁷⁹ Experimentation is tangible and focuses on observable realities, conceiving is abstract and focuses on unobservable realities.

that regards entire galaxies as being small objects of observation which are fundamental to the human condition (2012:302). Cosmology has its own limitations, and it is through dialoguing with other methods that the opportunity to observe and overcome cosmological limitations presents themselves. Thus the effect of dialogue in cosmology involves the transformation of the limitations demonstrated by the cosmological (i.e. biology, geology and cosmology) and theological (i.e. the Catholic Theology of Creation) limits.

There are a variety of scientists, also, who acknowledge the limits of science, who are aware of the fact that there are things which science is not aware of. John Barrow, for example, explains that:

[T]here are demarcated boundaries beyond which it appears we cannot probe and questions that we cannot answer. Some of these limits are purely based on the physical size and shape of our body, and the limits of our sense organs. Others seem to be cosmological or quantum boundaries, while still others seem to be inherent Escher-like contradictions in our formal systems of defining reality (Barrow 2005:128).

Even the great Sir Francis Bacon acknowledged the limit of the science he so ardently promoted. In a dialogue he said that “*science is but an image of the [reality]*” (Bacon in Rees & Wakely, 2004:207). The length and breadth of this image depends on how well each scientist uses the tools of science: observation and experimentation; reason and experience (Rees & Wakely, 2004:227). Thus the science which the perceiving scientist does to the perceived reality is but an image of the perceived reality. There is still much that the perceiving scientist can learn from perceived reality through perception, thus the perception of the scientist is a limit to science (2004:227).

With regards to the emergence of the cosmos itself, and the dominance of the Initial Singularity theory, the reliance of the cosmological field equations on mathematical probabilities and theoretical hypotheses shows the limitation of the empirical method. But the natural theological theory that this one reality consists of two distinct aspects urges natural science to probe beyond its cosmological limits and to question the very foundations upon which natural science rests. Such an inquiry can be done with a

“transformed reason”, i.e. with a development of fundamental worldviews that transcend the methodological limits of any particular independent science.

Now that we have explained the method of dialogue and how it assists both cosmology and theology to move past their limitations and go beyond them through a transformed reason, we shall present a few theories which supplement this dialogical theory of relation.

4.6. Theories which supplement dialogue

The Oratorian Theologian, Saint John Henry Newman, can be seen as a precursor to Montagu and Barbour’s position of non-conflict and non-integration. He saw the relationship between the two to be independent, yet connected. He was of the view that “[reality] *is ultimately one, even if it is known through different modalities*” (Newman, 1974:431). Thus, perceptions about the objective reality which we seek to know is in itself one, even as it can be known to the thinking subject as a perceived reality in a diversity of aspects. His view adds to the significance of dialogue between science and theology since these distinct methods can be the different aspects to the one reality (1995:55). As distinct methods, science and theology had a way of relating to each other, and Newman saw that:

Theology is the philosophy of the [spiritual] world and science the philosophy of the natural. Theology and Science, whether in their respective ideas, or again in their own actual fields, on the whole, are incommunicable, incapable of collision, and needing, at most to be connected, never to be reconciled (1974:431).

The most this chapter sought to do was to connect cosmology with theology through dialogue: so conceived, each remains connected yet unreconciled. Any reconciliation or integration which may appear between theology and cosmology is not yet to be found – as Barbour eluded (2000:125). The Catechism of the Catholic Church highlights this point when it says:

[T]he great interest accorded to these [theological] studies is strongly stimulated by a question of another order, which goes beyond the proper domain of the natural sciences. It is not only a

question of knowing when and how the universe arose physically, or when man appeared, but rather of discovering the meaning of such an origin: is the universe governed by chance, blind fate, anonymous necessity, or by a transcendent, intelligent and good Being called “God”? And if the world does come from God’s wisdom and goodness, why is there evil? Where does it come from? Who is responsible for it? Is there any liberation from it? (CCC, §416).

The aforementioned are all theological (and not scientific) concerns which fall at the heart of natural theology, a theology which goes beyond science in that it incorporates scientific and theological discoveries. The investigations of natural theology prove unlimited, and its limit comes when such incorporation exists only insofar as natural theology deviates from divine revelation, which it does not (CCC, §416). Conversely, cosmology cannot go beyond the material existence, and this is where cosmology and theology complement each other through dialogue (CCC, §416).

Another theory of relation which supplements the dialogical approach comes in the form of Jesuit theologian, Robert Doran. Doran expresses the relationship between science and theology analogously as a political form of the state (science) and the Church (theology) (2011:760). Doran explains how they are by nature unique aspects of reality: *“although the Church and the political community both manifest themselves in visible organizational structures, they are by nature different because of their configuration and because of the ends they pursue”* (2011:760).⁸⁰ This is why there is a place for an interchange of ideas, a place for dialogue between them because of their difference. Science and theology show themselves as unique aspects to one reality, aspects which add essential insight into the considerations of the other.

The Encyclical Epistle of the Council of Bishops Abroad (EECBA) of 1933 taught that both the state and the Church were autonomous institutions which had influence over the

⁸⁰ Although the state and the Church are different to natural science and theology as political and not scientific institutions, their inextricable link towards practical and theoretical ends allows them to seek different methodological approaches to achieve similar ends (Schillebeeckx, 2007:58). It is these different methods of natural science and theology which make their ends similar to the state and the Church and for them to be spoken of in a like manner (2007:58).

society. The council saw the necessity of keeping the two as independent aspects of the human society, holding:

[W]hile the Church exists on earth, it remains closely bound to the fates of human society and cannot be viewed as being outside of space and time. Nevertheless, it is possible for it to exist apart from it" (EECBA, §2).

I am not seeking to argue against the independence of the worldviews of natural science and theology, for all aforementioned supplementing theories of relation have shown how both play pivotal contributory roles in society (Barbour, 2000:187). On the contrary, I propose that dialogue between them benefits knowledge in general in the interchange of ideas for a broadening of perspectives (2000:187). Further, it pushes scientific knowledge forwards in as long as this dialogue does not disintegrate into mutual independence or even conflict (2000:187). As different worldviews seeking to understand the nature of existence, both cosmology (natural science) and theology gain something new in dialoguing with each other: namely "transformed reason" (2000:187). While Newman sees science and theology as two distinct aspects of the same reality, he also sees them as two distinct aspects within the human person, with natural science satisfying the body and theology satisfying the soul (Newman, 1974:491). Both aspects can subsist independently, even as they can dialogue and learn from each other:

And why is this? It is, in a word, because the soul was made for religious employment and pleasures; and hence, that no temporal blessings, however exalted or refined, can satisfy it. As well might we attempt to satisfy the body on chaff, as to feed and nourish the immortal soul with the pleasures and occupations of the world (1974:491).

4.7. Conclusion

This chapter was an analysis of the possibility of a relationship of complementarity between cosmology and theology by way of presenting a dialogical approach towards viewing them. It showed that cosmology and theology can be viewed analogically as two sides of one coin, i.e. as two aspects of one reality, and that they can collaborate – albeit

independently – in revealing a broader view of reality. They can talk to each other through dialogue; they can interchange ideas and share views, even though they remain methodologically exclusively independent worldviews.

The dialogical approach between cosmology and theology was not proposed in order to hamper the progress of either, for progress in these distinct aspects of reality is sorely needed. It is, rather, to give a sense of direction to that progress. Through the breaking of limits which the dialogue proposes, cosmology and theology are transformed by each other, both serving as the two wings of a bird, directing it forward in gentle collaboration (FR, §34).

Chapter Five:

CONCLUSION

5.1. Introduction

In this dissertation I have argued that cosmology, in the form of the Initial Singularity theory, is limited in its approach to understanding reality. I also argued that theology, in the form of the Catholic Theology of Creation, also has a limited view of reality. I thus proposed a relationship of dialogue between the two approaches in order to broaden their limited horizons and take scientific knowledge forward.

This chapter concludes the entire comparative study between the two theories of beginning and their distinct methodologies. The main concern of the chapter is to identify the value this research has for philosophy as well as to identify areas of development in order to present recommendations. The chapter also gives an overview of the preceding chapters, as well as summarises the key ideas and themes presented in each chapter.

5.2. The value of this research to philosophy

I aimed at encouraging dialogue between cosmology and theology through the understanding of Initial Singularity theory and the Catholic Theology of Creation. I showed the importance of theological considerations as an aspect of reality which broadens scientific knowledge. When society had become caught up in the superstition of theology, Bacon and other scientists of the revolution rescued scientific knowledge (Rees & Wakely, 2004:145). As society is becoming caught up in the materialism and consumerism of natural science, Vorgrimler and other theologians attempt to return the favour (Vorgrimler, 1992:124).

The balance which is sought comes as a result of the fact that natural science has limitations inasmuch as theology does. In order to strike this balance, I have sought a

dialogue between the two in order to develop a more comprehensive view of reality rather than the perceived conflict. The conflict emerges as a result of the rejection of theology by natural science by its undervaluing the importance of theological considerations because of its scepticism and susceptibility to err (Rees & Wakely, 2004:135).

Since natural science itself has the same susceptibility to limitations, the normative argument has been made that science should not exaggerate the limitations of other sciences but rather expose the strengths through dialogue in order to break its own limitations.

I have also exposed the importance of theological considerations in its investigation of the theological theory of beginnings. The theory, which I have deemed as the “Catholic Theology of Creation”, saw that a purely material and natural understanding of the beginning of existence poses a limited view for understanding creation. Through dialogue, I argue that natural science and theology can transform one another through “transformed reason”.

Science seeks constructive and dialogical ways of better understanding the universe we live in. While there is much that we have discovered, there is still a world waiting to be discovered. Through the dialogue of all sciences, we take a step closer to discovering the cosmos, and this is what I sought to achieve. The old cliché rings true where it is written “*united we stand, divided we fall*” (Barrow, 2005:90). As a unified dialoguing body of knowledge eager in individual quests for truth, science stands a better chance at uncovering the nature of the universe.⁸¹

The lines which blur the reality from appearance can break down in dialogue as scientists, theologians and all researchers put their heads together and unravel the mystery which is our cosmos. With an end to the conflict which blinds all researchers and hinders the progress of science, science becomes not only a source of knowledge on which we can rely, but a wellspring of hope in which we can depend.

⁸¹ Because the complex being of objective reality – the cosmos – cries out to the thinking subject for recognition, the subject must use a suitably complex yet unified strata of epistemic tools to adequately grasp and express this singular reality.

5.3. Recommendations

5.3.1. Theological doctrine

I have looked at theology through the eyes of Catholic doctrine. Theology is much broader than this, as it encompasses the doctrines of every religious ideology. Thus being theological, a better approach towards looking at theology as a theoretical endeavour would be to include as many religions as possible. Within itself, Catholicism broke into a diversity of denominations as distinct from Catholicism (Bouyer, 2011:48).⁸²

The theological doctrine I adopted forms a fraction of Christian denominational theology (2018:95).⁸³ Thus to form a theological doctrine which is all encompassing, I recommend that one consider the views and doctrines of all Christian religions, which is lacking in this dissertation. This is a task which can bring significant insight into the nature of theological doctrine as relevant to natural science.

5.3.2. Initial Singularity theory

While cosmological evolution demonstrates that the beginning of the universe in the form of Initial Singularity theory rests on Cosmic Microwave Background Radiation (CMWBR), Inflation and Nucleosynthesis, there are a variety of mathematical probabilities which also assist in proving this theory (Padmanabhan, 2016:55). I recommend that anyone investigating the beginning of existence consider a wider variety of probabilities from different sciences.

⁸² The English word “*denomination*” comes from the Latin word “*denominare*”, which means “to name” (Bouyer, 2011:48). There are a variety of denominations with distinct beliefs and practices (2011:48). In a simplistic sense, a denomination is “*an association or fellowship of congregations within a religion that have the same beliefs or creed, engage in similar practices, and cooperate with each other to develop and maintain shared enterprises*” (2011:48).

⁸³ The word Christian meant “*those belonging to Christ, Christ-ones, or even Christ-people*” (2011:55). While the Catholic Church sees itself as containing the fullness of Christ, it does acknowledge that there are elements of Christ in other churches as well, particularly in those churches which broke away from the Catholic church in protest (Protestant churches) (LG, §16). Protestantism came about at around the sixteenth century and is based on the Christian faith and practice (Goode, 2018:91). The term “to protest” is from a Latin word “*protestari*”, which means “to testify on behalf of something” (2018:95). Protestantism began as a means to reform the Catholic Church, and constitute between 800 million and 1 billion people (as of AD 2010) (2018:91).

Initial Singularity theory does not rest solely on mathematics. There are a variety of other sciences, such as anthropology, sociology and non-Christian theologies, which need to be considered in identifying why the universe must have a beginning (Breen, 2018:113). The dichotomy between having a beginning and being neither created nor destroyed needs to be thoroughly investigated as it presents an interplay of permanence and contingency within the same reality (the universe) (Padmanabhan, 2016:55). Such interplay poses questions towards the nature of existence as finite yet comprising infinite materials, and this suggest that while there is change in all things, there is also permanence. A thorough investigation into the nature of the universe is recommended in order to better understand the interplay between finality and infinite reality.

Finally, I recommend a relationship of dialogue between cosmology and theology. Dialogue serves knowledge in general in the interchange of ideas for a broadening of perspectives. Dialogue emphasizes similarities in presupposition, method and concept, and exposes these in order to gain access to a greater degree of certitude. In dialogue, independence is preserved as both methods are enriched to reach amicable consensus and make inclusive far-seeing conclusions. Dialogue seeks to broaden the individually limited horizons of cosmology and theology, to assist them in seeing past their individual limits to horizons unknown.

5.4. Summary of themes emerging out of the research

This dissertation was primarily a comparative study of theological and cosmological (natural science) scientific methodologies (Mill, 1865:129). The comparison was made possible by the differentiation of the natural scientific method from other methods, which occurred in order to gain access to “foundational knowledge” about reality (Stumpf & Fieser, 2008:192). The comparison was motivated by the negativity with which some scholars – as representative of the different methodologies – view each other, in particular, the worldview of natural science to theology (cf. Dawkins, 1997:108,110).

These worldviews gave rise to two different methodologies rather than two complementary methods (1997:108,110).⁸⁴

The comparison between the two different methods revealed that in an attempt to understand the Initial Singularity theory in a three-dimensional approach, natural science has limitations. The limits include,

1. the fact that while it is clear as to where organic matter came from and how it developed into organisms, the exact processes which brought about the organic phase remains unresolved;
2. that the evolution of planet Earth is still a largely estimated event; and
3. that CMWBR, Inflation and Nucleosynthesis form the basis upon which the Initial Singularity theory rests, with the cosmological field equations which support them relying mainly on mathematical probabilities and theoretical hypothesis.

The comparison also revealed that the Catholic Theology of Creation – in its three dimensional approach – attempts to embrace both the theological theory of a God-created universe, as well as embraces natural science through natural theology. Natural theology gives rise to natural revelation about the natural world, and these are inferred through the application of reasoning about the existence of God from the natural world. This inclusive approach to the Catholic Theology of Creation, however, falls short in that precedence is always given to divine revelation and – like theology – aspects of divine revelation (Gen 1:1-31) are highly theoretical and cannot be empirically verified.

The comparison which I undertook was aimed at encouraging dialogue between natural science and theology through the particular disciplines of cosmology and theology (especially through theoretical branches of those disciplines, i.e. Initial Singularity theory and the Catholic Theology of Creation). The dialogue emerges as a result of the fact that natural science, in the form of biological, geological and cosmological theories of beginning, has limitations inasmuch as theology does. In order to achieve dialogue, the

⁸⁴ The main similarities and/or commonalities within both methods is the fact that they investigate the same problem (the beginning of existence), and that they are limited views of reality since they fall short in giving an accurate representation of reality.

dissertation sought to compare cosmology with theology in order to identify and assimilate similarities between them. These similarities reveal a more comprehensive view of reality rather than the partial view which the individual different views reveal as a result of conflict. A comprehensive view considers both natural science and theology as two aspects of the same reality. The conflict exists because of the rejection of theology by natural science. Theology can become detached from reality because of its theoretical focus and cosmology can assist theology to avoid this. Natural science, for its part, can become too rigid because of its overreliance on sense experience, and theology can assist natural science to get back in touch with intuition in order to decrease its rigidity. This is how they can complement each other as well as transform their individual worldviews.

5.5. In closing

This dissertation has presented the limitations within the methods of natural science (Initial Singularity theory) and theology (the Catholic Theology of Creation) in order to demonstrate the diversity of existence as well as the similarities of both methods because of their limitations in making attempts to understand being. It argued that both cosmology and theology have limited views of existence and that a more comprehensive view of existence would be to complement the two epistemic methodologies through dialogue.

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