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NAME OF AUTHOR:

Sarah Rose Floden

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ST. STEPHEN'S COLLEGE

THE HOLY SPIRIT IN THE NATURAL WORLD

by

Sarah Rose Floden

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ABSTRACT

The thesis has been written out of a concern for the lack of connection that exists, both in theology and the secular world, between the work of the Holy Spirit and Creation. Using the method of a literature survey, the thesis has identified those points in history where the link between the Holy Spirit and Creation has been lost. This thesis has been designed to connect the findings of modern day physics and cosmology to the characteristics of the work of the Holy Spirit in Creation. The thesis has reached the conclusion that theology, especially in the last five hundred [500] years, has largely deleted from its deliberations references to the Holy Spirit and the Holy Spirit's work in Creation and has identified those influences which caused that to happen. It has further shown that the findings of modern physics and cosmology have consonances with those things that characterize the work of the Holy Spirit in Creation. These conclusions point to a way in which the Holy Spirit and Creation can be re-connected and the sacramentalism of nature re-established.

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Introduction

Preamble

I am one of those fortunate people who grew up on an Alberta farm. As a child, I spent a good deal of time out-of-doors. Outside chores were a regular part of my day and much of our play-time was outside because our house was very small. As a result, I grew up with a strong connection to the natural world. It was this connection with nature that gave me a strong sense of God. My parents were both strongly opposed to religion and I grew up with no instruction about God. Questions about God were actively discouraged.

In spite of this, I remember being convinced that there was a God. I have a very clear memory of laying out in the yard on a warm evening in the dark looking up at the stars above me and knowing with a certainty that has never left me that something greater than myself had made the astonishing night sky above me. This sense that nature is one of God's books has never left me.

In my journeys through different denominations of the Christian church this connection with nature has never been addressed except for the most passing reference. The church is not the only institution to ignore our connection to the natural world. According to Thomas Berry, Western society has become autistic where the natural world is concerned.¹ As a society on the whole, we have lost our sense of connection with the natural world and our sense of the sacramental aspect of Creation. This alienation from the natural world has had serious consequences for the world, including climate change, species loss, and pollution of water, soil and air, and depredation of the natural landscape. Humans have fouled their own nest. How have we ended up with this lack of connection to the natural world?

¹ Thomas Berry, *The Dream of the Earth* [San Francisco: Sierra Book Clubs, 1988] 16

Not only have we lost our sacramental sense of nature, but we also have an underdeveloped understanding in the Christian faith of the work of the Holy Spirit in Creation. The focus in Christianity on the work of the Holy Spirit has been on the birth, life, death and resurrection of Jesus. Elizabeth Johnson says that until recently the Holy Spirit has never been a highly developed belief in the Western church. She says, “that theologians have described the Holy Spirit as ‘faceless,’ ‘shadowy,’ ‘ghostly,’ ‘anonymous,’ ‘forgotten’,’ poor relation,’ ‘homeless,’ ‘watered down’ and ‘the Cinderella of theology,’”² Has our underdeveloped understanding of the Holy Spirit contributed to our loss of a sense of connection with the natural world?

The Western world has also been plagued with the dualism of thought that has seen faith and reason separated. What are the roots of this separation? How did we arrive at a point where, as Wolfhart Pannenberg says, “God was cordially excused from the natural world when a mechanistic interpretation of natural...processes traced all evidence of force to bodies and their influence on one another? This conception excluded God from any interpretation of natural events.”³

Thesis Question - This thesis will ask if an understanding of the work of the Holy Spirit in Creation can be linked to the findings of physics and cosmology in such a way as to allow us to re-capture a sense of the place of the sacred in the natural world. Can we go further, and identify where in history the sense of this connection was lost?

² Elizabeth A. Johnson, *She Who Is: the Mystery of God in Feminist Theological Discourse* [New York: Crossroad, 1993] 131

³ Wolfhart Pannenberg, Niels Henrik Gregerson, ed. *The Historicity of Nature: Essays on Science and Theology* [Conshohocken, Pa.: Templeton Foundation Press, 2008] 35

This thesis is written from a Trinitarian, pantheistic and speculative point of view. Trinitarian belief refers to the three persons of the God-head, Father, Son and Holy Spirit. Trinitarian belief is a complex view of the Christian God that is based on the relationality within the Godhead.

The term, 'Holy Spirit', as the third person of the Trinity is understood to mean nothing less than God Him/Herself. Hans Kung says, "the Holy Spirit is God himself...the Holy Spirit is none other than God Himself."⁴ Throughout this paper the terms 'God' and 'Holy Spirit' are to be understood as referring to the same mystery.

Walter Kasper enlarges our understanding of the Holy Spirit when he says:

...the Holy Spirit must be God's love in person... the Spirit thus expresses the inner most nature of God-God as self-communicating love...The spirit as it were is the ecstasy of God. He is God as pure abundance, God as the overflowing of love and grace.⁵

Pantheism is understood as the possibility of perceiving God in all things and all things in God while realizing that God is more than both of these. It is grounded scripturally in Ephesians 4.4-6 which says, "there is one body and one spirit...who is above all and through all and in all." Speculation will be made about possible links of the Holy Spirit to the natural world through the findings of physics and cosmology.

The Approach

In Part One, the process of trying to arrive at the defining characteristics of the Holy Spirit will begin with an examination of scripture. This will be followed by an examination of what the Jewish faith has to say about the Holy Spirit's connection to nature. The work of a number of early church Fathers will be examined to see what

⁴ Hans Kung and Jurgen Moltmann, ed. *Conflicts About the Holy Spirit* [New York: Seabury Press, 1979] 115

⁵ Walter Kasper, *The God of Jesus Christ* [New York: Crossroad publishing Co., 1986] 225,226

tradition has to add to our understanding of the Holy Spirit. Our understanding of the Holy Spirit and its connection to nature will be followed through the Middle Ages, the Reformation, and the changes that came with the development of science and in the thought of modern theologians.

In Part Two, a more detailed examination of the history of science undertakes to follow more closely the disconnection of the Holy Spirit and the natural world. Particular attention will be paid to scientific findings of the twentieth century, since those findings can most fruitfully be explored as possible avenues of connection between the Holy Spirit and the natural world.

In Part Three, those characteristics of the Holy Spirit that relate to the natural world are compared with specific findings of physics and cosmology that point to a spiritual interpretation.

Part Four is the conclusion, where those points in history which saw the connection between the Holy Spirit and Creation lost will be summarized because it is easier to regain what we have lost if we know what caused the loss. The final arguments that some of the findings of science that are consonant with the concept of the Holy Spirit as active in the natural world, will be made.

Methodology

The methodology used was a literature review. This literature review traced the development of thought about the Holy Spirit in Creation. The relationship of science and religion and the flow of thought between the two, especially with regards to matter and spirit were examined. From this examination, it is seen that consonances between theologies of the Holy Spirit and scientific understandings of the natural world emerged.

Validity

The materials consulted in this project are readily available to anyone who wishes to check the facts presented. The interpretations of these facts are my own.

PART ONE

1. What Do the Hebrew Scriptures Say About Spirit and Creation?

The stories of Creation portrayed in the Biblical stories, primarily in the books of Genesis and Job, were not created in a cultural vacuum. Other civilizations of the Near East had their own creation stories. In the Babylonian creation story, male and female deities beget other deities who engage in battle with each other. The world is eventually created from the body of a slain god. In the Egyptian creation story, Atum - Re, who is produced from the waters of chaos, produced other gods, and humans came from the tears of Atum - Re. In Memphis, the god Ptah created all living things from what his heart thought and his tongue commanded. "In some cases the gods fashioned things from matter, in other cases they produced them from their own beings but they came from primordial matter."⁶

The Hebrew creation story is told from the need to set the one God, Yahweh, apart from the other creation stories of the cultures surrounding the Hebrews. The religions that surrounded the Hebrews were all nature- worshipping religions, to one degree or another. The Hebrew story of Creation, wherever it is told in the Bible, sets God apart from his Creation so that there is no doubt in Hebrew minds that nature is not to be worshipped. Nature is, in effect, de-sacralized but is still important to God. The Hebrew creation story is written from an anti-

⁶ Bernard M. Mathaler, executive ed. *The New Catholic Encyclopedia*; 2nd ed. [Detroit: Thompson Gale, 2003 vol. 4 336

pagan point of view.⁷ According to the *New Catholic Encyclopedia*, the Hebrew story of Creation “borrowed, purified, elevated and added to the Creation concepts of the Near East.”⁸

There are two stories of Creation told in the Book of Genesis. Biblical scholars say that the story that is told so evocatively in Genesis One is actually a later account than the story told in Genesis Two. It is estimated that Genesis One was written after the exile of the Hebrews to Babylonia. Genesis Two was written around 1000 B.C.E. Both of these stories demonstrate that questions that we are still wrestling with, where did Creation come from, why were humans created, and why is there something rather than nothing, were questions that early Hebrews were struggling with as well.

Jeremy Benstein, a Jewish writer, has a helpful way of contrasting these two stories of Creation. He says that the first story in Genesis One is a “top-down story”. Creation is planned and executed by God. Each of the parts of Creation is deemed good and the whole is “very good.” There are no negatives and everything goes according to plan. In the second account in Genesis Two, “God seems to be proceeding more by trial and error than by plan.” In this “bottom up” account God works with the soil of the earth to create Eve because it is “not good” that man does not have a partner. God has created something that is less than perfect.⁹ Benstein goes on to point out that in the first story of Creation, Creation is seen as coming about by separations and distinctions while in the second account Creation takes place by means of mergers and combinations.¹⁰ Benstein suggests that story two also contains the blessing that man should “subdue the earth”. It is common now to attach a very negative connotation to this blessing and to say that this command is a part of the reason for the depredation of the earth

⁷ Jeremy Benstein, *The Way Into Judaism and the Environment*. [Woodstock Vt: Jewish Lights Publishing; 2006] 26

⁸ Bernard M. Mathaler, [Ibid] 336

⁹ Jeremy Benstein, *Ibid* 9-40

¹⁰ Jeremy Benstein, *Ibid* 41

that is occurring now, but this is to take the statement completely out of its context of humans in a primitive world of rampant nature being reassured that they would be safe in the world.

What place does the Spirit play in Creation? The Spirit of God plays a central part in Creation, according to the Bible. The Spirit is introduced as the Hebrew word *ruach*. It literally means breath or the voice of God's breath. It is a wind - something in motion. The resulting relationship between God and his Creation is a dynamic moving one. It is not static and never changing. Bibles variously translate *ruach* as meaning breath, wind or hovering. Moltmann says that it can be translated as "hovering".¹¹ John Taylor says that it can be translated as "fluttering".¹² However *ruach* is translated, it is the action of Spirit that brings Creation into being out of primordial matter. The spirit creates order from chaos. The Spirit is also life-giving as it is the Spirit that breathes life into creatures. It is interesting to note that the Bible uses non-animate symbols for the Spirit such as wind, fire, water and light. This may be one of the reasons that the Spirit is seen as shadowy or amorphous.

What is the work of the Spirit? The first work of the Spirit, without which there would be no other work, is Creation itself. The Spirit is the originator of Creation. It is through an act of the will of the creator that the earth exists. As Jurgen Moltmann says, "the Holy Spirit appears as the well-spring of life- the origin of the torrent of energy that pours through Creation."¹³ The Spirit is not only the transcendent originator of the universe but is also present in the continuing Creation of the world. Terrence Fretheim puts it this way:

God created a reliable and trustworthy world and while God will be pervasively present, God lets the creature be what it was created to be, without micro-management, tight control or interference every time

¹¹Jurgen Moltmann, *The Spirit of Life: A Universal Affirmation* [Minneapolis: Fortress Press, 2001]

¹² John Taylor, *The Go-Between God* [St. Albans Place: SCM Press, 1972] 25

¹³ Jurgen Moltmann, *The Spirit of Life: A Universal Affirmation* [Ibid] 195

something goes wrong. ... God's continuing creative work is both preserving and innovative.¹⁴

There is another aspect to Creation - God's plan for the completion of Creation. Creation will be brought to the fulfillment of God's plan ["behold I make all things new!" Rev. 21:5] There is an eschatological aspect to Creation. The Spirit is always calling humans towards a vision of life that includes justice not only for humans but for all of Creation. All of Creation is called forward to the kingdom of God through the power of the Spirit. Another aspect of God's continuing, sustaining and creative presence is God's faithfulness to God's Creation. The covenants that God forms with Abraham and Noah are evidence of God's steadfast devotion to God's Creation.

What else can we gather from scripture about the Spirit and Creation? Because Creation has a point of origin, history becomes viewed as having directionality rather than having a cyclical character as it does in nature-worshipping religions. The Messianic bent of the Old Testament, as well as the idea of the kingdom of God that Jesus came to establish, both point to a direction in history. God is viewed as being fully present to his Creation and working in the history of the Hebrew people. Creation, which is historical in nature, is subject to change and open to newness, variety and endless possibility.[Jer 31.22] This speaks of the freedom which is an integral, and indeed, underpinning principle of Creation. A Creation that incorporates freedom has always included the risk of imperfection. The evil that is real in the world can be seen as a further consequence of freedom.

The Biblical story of Creation demonstrates that God has a deep affinity with the world and that God saw nature as good [Gen 2.4].The anthropomorphic image of God creating Adam from the dust of the earth with his hands is indicative of the value that God places on the

¹⁴ Terrence E. Fretheim, *God and the World in the Old Testament* [Nashville: Abingdon Press. 2005] 7

natural world. As Psalm 33.5 points out, “the earth is full of the steadfast love of the Lord.” God is involved with Adam in the naming of the creatures [Gen 2.19, 20]. This is an intimate act which shows God’s concern for the creatures of the earth.

God is the giver of life who through his Spirit breathes life into all living things. [Gen 2.6] The Spirit is the vivifying presence in Creation. We see this again in the story of the dry bones told in Ezekiel. The universe is totally dependent on God for its existence. [Ps 148.5]

We see in scripture that God, through the Spirit, is the ordering power of Creation. [Gen 1.3-27] It is this order in Creation that gives us a sense of the beauty, truth and goodness of Creation. The regularizing power of God is now understood to extend to the laws of the universe that God has used as the frame-work for Creation.

God can also be seen as a healing power in the world, which is a part of God’s commitment to sustain Creation. The Spirit of God also enters humankind and can give us a new heart. [Ez. 36.27]. God is also a guiding power as we see depicted in the lives of the prophets.

The Spirit in Creation is universal. God’s spirit is poured out on all flesh. [Joel 2.28] All of Creation has been imbued with the spirit of God. A feature of this universality of Spirit is the relationality that it demonstrates. Many of the metaphors used in the Bible to describe God’s relationship to the world are metaphors of relationship, for example, parent/ child. As Fretheim says:

Israel’s God is transcendent and in relationship...Israel’s God is a relational God who has created a world in which relatedness is basic to the nature of reality; this God establishes relationships of varying sorts with all creatures, including a special relationship with the people of Israel. Relationship, he says, is integral to the identity of God and he goes on to point out that God was in relationship with the world long before there was an Israel. ¹⁵

¹⁵ Terence E Fretheim, [Ibid] 16

This idea of relationship finds expression in the created world beyond humankind as we see the interrelatedness, unity and relationality present in the natural world. Implicit in the idea of relationality is both the transcendence and the immanence of God in the created world.

Another aspect of this relationality is that God expects humans to join God in the work of Creation. Humans are endowed with the capacity to understand, at least to a limited degree, their surroundings. They have the ability to understand the laws of the universe and to apply them in creative ways to the betterment of Creation. Humans seem also to have a strong drive to create that which they see as beautiful and expressive of deep truths. The simple act of planting and harvesting seeds enjoins us to become co-creators. Alas, the opposite is also true. Humans also have the capacity to be very destructive.

The authors of Hebrew scripture frequently turn to nature as a way of describing God's power and might. Nature is frequently used as a weapon of God's anger as we see in Amos 4.7 and Jer 5.22, as well as the story of the great flood. Nature can also be used as a means of salvation as we see in the story of the Israelites crossing the Red Sea.

The most important understanding about Spirit and Creation that we gain from scripture is, according to Walter Kasper, "the Holy Spirit must be God's love in person.... The Spirit thus expresses the inner-most nature of God - God as self-communicating love... The Spirit ...is the ecstasy of God, he is the God of pure abundance, God is the overflow of love and grace."¹⁶ Creation, which is the work of the Spirit, is an explosion into reality of the love of God. If God can love Creation so much as to call it into being surely we too have a duty to love [but not worship] that Creation. It is important not to equate this love with human love as that trivializes God's love which is 'far more powerful than we can think or imagine.'

¹⁶ Walter Kasper, *The God of Jesus Christ* [New York: Crossroads Publishing. 1986] 226

It can be seen from the examples given that the Bible is rich source of commentary about the relationship of God and God's Creation. The Spirit is this God who has effected Creation. As we face a period in the history of the world where the seriousness of neglecting Creation becomes more and more evident to us, we could do worse than return to the treasure trove of scripture for a reminder of the importance that God places on the out-pouring of his love, which is Creation. We turn to a further examination of scripture by having a brief look at Jewish interpretations of the relationship between Spirit and Creation.

2. Jewish Interpretations of Creation and Spirit

Christianity is a derivative faith. It has developed from Jewish roots so it is not surprising that many of the observations in the preceding section also apply to a Jewish interpretation of the Creation accounts of the Bible. The Jewish faith would be in agreement that God works in history has an ordering and vivifying power, as well as a guiding and healing power.¹⁷

There are some distinctions that can be made between a Jewish interpretation and a Christian interpretation of Creation and Spirit. The term Holy Spirit is never used in the Hebrew Scriptures. The Spirit in Hebrew Scriptures never refers to Spirit as a person as does the Christian doctrine of the Trinity. The Spirit is represented by symbols from nature such as fire, wind and water. Spirit is never separate from God and is viewed as "the divine power capable of transforming the human being and the world."¹⁸ The Jewish faith derives its beliefs not only from scripture but also from Mishnah, Midrash and Rabbinical teachings. The Mishnah, according to Sisteri, speaks of the "spirit as something that can be attained by man

¹⁷ Lea Sesteri, *The Jewish Roots of the Holy Spirit* 2010 1

¹⁸ Lea Sesteri [Ibid] 1

through different spiritual stages.”¹⁹ Spirit can be equated to the Shekinah which is God’s presence on earth in the tabernacle.

According to Benstein, the “very strong emphasis placed on the spiritual with exclusive value placed on the study of the Torah as the key to eternal life make a deep relationship with nature seem inconsequential.”²⁰ With its desire to set the faith in Yahweh apart from pagan religions surrounding the Hebrews, the Jewish faith developed with a devalued view of the places of Creation, in spite of the many rich connections which scripture affords.

This view is somewhat mitigated by kabalistic teachings about divine sparks within the animate and inanimate world, according to Benstein. He also points out that the Lurianic kabala has suggested that the world could only come into being if God, whose presence was the totality of all being, “made room for Creation”.²¹ This idea of a self - limiting God which came from the 16th century kabbalist, Luria, is found in Moltmann and in the thinking of process theologians.

Another difference between Jewish and Christian interpretations of scripture concerns the matter from which Creation is made. Accounts in the Genesis myth clearly say that matter is created by bringing order to a pre-existent chaos [the deep]. Christian theologians interpreted this to mean Creation from nothing, *ex nihilo*. The idea of Creation from nothing is a late addition to the Old Testament and is found only once in 2 Maccabees, which was written around 170 B.C., much later than the other Creation accounts.

Another area of difference is the concept of blessing. The Jewish faith places an emphasis on the idea that the human is the center of Creation and that the statement from Genesis that mandates conquest and dominion is a blessing and is not permission to pillage the

¹⁹ Lea Sisiteri, [Ibid] 2

²⁰ Jeremy Benstein, [Ibid] 29

²¹ Jeremy Benstein, [Ibid] 58

earth. The Jewish faith also places high value on the idea of the covenant God has established with the tribes of Israel. The Christian faith recognizes both of these concepts but does not place such a high emphasis on them.

It is apparent that the early church adopted interpretations of scripture that differed from those of the Jewish faith from which the church had sprung. This will be demonstrated by an examination of what the early church taught about Creation and the Spirit.

3. The Spirit, Creation and the Early Church

The first followers of Jesus were Jews and they led Jewish lives. They considered Jesus as the Messiah, long promised in the Jewish faith. Later, Christian missionaries preached the gospel and awaited the return of Jesus, which they felt was imminent. Paul's letters were written in the 50s and 60s. They "show that Christians had already started to engage in a radically inventive exegesis of the Torah and Prophets to demonstrate that Jesus was the culmination of Jewish history."²² As time passed, more and more Gentiles began to be admitted to early churches and this certainly had an effect on the development of the church.

Because the New Testament, which was written by various writers during this period, did not espouse a unified point of view, it was subject to interpretation. Gentiles who joined the church brought with them their Greek education and philosophy. They brought these to bear on scripture. By the second century the church had separated from its Jewish roots. New converts like Justin Martyr [110 – 160] and Origen [185-254] took on the task of making sense of their new beliefs in terms of their understanding not just of Judaism and but also of Greek

²² Karen Armstrong, *The Case for God*, [New York: Alfred A. Knopf. 2009] 82

philosophy. Justin, for example, introduced the concept of Christ as Logos that had great influence on other early thinkers of the church.²³

The early church consisted of different factions developed, each with very different interpretations of scripture. The Gnostics, Marcions, Manicheans and later, the Pelagians, all advanced ideas that differed from those of the rest of the church. Early leaders of the church turned their minds to combating what they viewed as heresies. Many of the complex theological ideas of the church can be traced to early fathers of the church.

For the purposes of this paper only three of these thinkers will be examined. Irenaeus, Tertullian and Augustine all had something to say about Creation and Spirit that have had a lasting impact on the teachings of the church. These men were all well-educated, although they came from very different backgrounds and settings. All of these thinkers were concerned with questions about Creation.

Irenaeus [130- 220] was born in Asia Minor. As a young person he was a student of Polycarp who knew the apostle John. Irenaeus eventually became the Bishop of what is now Lyons in France. From there Irenaeus launched a vigorous attack on the teachings of Gnosticism. This sect taught that all matter is evil. The earth was created, according to Gnostic belief, not by God but by a lesser god, a demi-urge, who shaped a pre-existing matter into Creation. This original matter contained imperfections and was thus the cause of evil in the world. Irenaeus launched a vigorous attack on this belief. He proposed that Creation is not formed as God's molding or shaping of existing matter [chaos] but he proposed, as it says in 2 Maccabees, that God through the power of the Spirit, created the world from nothing. There is thus no material cause of the world; rather the cause of the world is God's will. Because it is God's will that brought matter into being, it is "naturally good in all its parts, material as well

²³ Karen Armstrong, [Ibid] 94

as spiritual...” Irenaeus went on to insist that all levels of created existence, material as well as spiritual, are subjects of divine redemption.²⁴ Irenaeus proposed that God’s Creation could draw close to God through the power of the Spirit. It was Irenaeus’ belief that rather than being created evil by virtue of their materiality, humankind was created in immaturity and that as humans mature they will draw closer to the divine.

Robert Grant quotes Irenaeus as saying “we have provided many proofs to show that the Word, which is the Son was always with the Father. But that wisdom which is the Spirit was with him before all Creation...”²⁵ The Son and the Spirit are, according to Irenaeus, the hands of God. Irenaeus is seen as the author of the doctrine of *creation ex nihilo* – the belief that God created the world from nothing more than an act of will. We see also in Irenaeus’ teachings an understanding of the goodness of Creation. As well, we see hints of the doctrine of the Trinity.

Tertullian [160-225] was born in Carthage, a North African Roman city. He is the first thinker in the church to write in Latin. Tertullian had a good deal to say about Creation. Like Irenaeus, Tertullian believed in *creation ex nihilo*. Tertullian believed that Christianity is a revealed faith. God’s revelation is known primarily through Christ but he says that the order and beauty of the cosmos are also sources of information about God. God, to Tertullian, is the “absolute Lord who by, his Word, summons the universe into existence when before it did not exist at all.”²⁶

Tertullian’s most important contribution to Christian theology was his development of thinking about the doctrine of the Trinity. He seems to have been the first person to use the

²⁴ Richard A. Norris, *God and the World in Early Christian Theology* [London: Adam and Charles Black, 1966] 73

²⁵ Robert M. Grant, *Irenaeus of Lyon* [London: Routledge 1997] 151

²⁶ Richard A. Norris, [Ibid] 90

term although the full development of the doctrine did not take place until later. [It became a doctrine of the church at the Council of Toledo in 645.]

The Son God, Tertullian explains, is God's Logos, that is...God's reason and God's Word. He is also the Wisdom of God which is mentioned in the Book of Proverbs and that Spirit of God which St. Paul says knows all the things of God. It is the Spirit says, Tertullian, which animates the world, just as it is Reason which puts the universe together out of diversity of elements.²⁷

Tertullian drew on nature for images to describe the relationship of Father, Son and Spirit.

He said that if the Father is the sun then, the Son is the sunlight and the Spirit is the warmth that we feel from the sun.

Tertullian also came up with an interesting suggestion about freedom, the influence of which we can see today in process theology. He says,

Therefore it follows that once God granted the man freedom, he must withdraw his own freedom, restraining within himself that foreknowledge and superior power by which he might have been able to intervene to prevent the man from presuming to use his freedom badly and so falling into peril.²⁸

This idea was used by the Jewish kabbalist, Luria, one thousand years later. Although

Tertullian was later ex-communicated from the church for adopting Montanist views, his legacy to Christian theology has stood the test of time.

The most influential of the early church theologians was Augustine of Hippo [354 – 430]. Augustine was born to a devout Christian mother and a Pagan father. He received an excellent education with special training in rhetoric. In his early adulthood he was a follower of Mani and during this period he was said to lead a hedonistic life. He later converted to Christianity and turned his stunning intellect to the development of Christian theology. He

²⁷ Richard A. Norris, [Ibid] 93

²⁸ R.H. Ayers, *Language, Logic and Reason in the Church Fathers* [Hildsheim: Georg Olms Verlage. 1979] 45

produced a vast commentary, some of which went on to become church doctrine that is still very much accepted by some churches.

Augustine's reflections on Creation were highly influential in the church. He clearly differentiated the emerging Christian view of Creation from those of his contemporary Greek thinkers. To Greek thinkers the world was viewed as eternal, with no beginning and no end. As Alister McGrath notes: "Augustine confirmed [the world] as a created entity."²⁹ Augustine went on to affirm Irenaeus's exposition of *creation ex nihilo*. McGrath states that in adopting the view of Creation out of nothing, Augustine adapted "a profoundly counter cultural position which differentiates him from the prevailing wisdom of contemporary classical science."³⁰ Augustine's [and to be fair, Irenaeus'] view of Creation as having a starting point remains the view of the Christian church.

Augustine also tackled the issue of time in Creation. If Creation is eternal, this is not an issue as time would be eternal too. He recognized that time does not exist in eternity and he theorized that God must have created time as a part of Creation. Augustine went on to assert that God exists outside of time. God, according to Augustine, saw the whole sweep of history at the moment of Creation.

Augustine claimed that Creation "bears witness to its creator and the human mind on account of its Trinitarian origins, has the capacity to reflect on and understand the Creation."³¹ This is an important idea since it created an intellectual framework for Christians which included the idea of exploring Creation from the base of reason. It also encompassed Augustine's contention that Creation itself is good. Augustine used his own power of reason to

²⁹ Alister E. McGrath, *A Fine Tuned Universe- The Quest for God in Science and Theology*. [Louisville, KY : Westminster John Knox Press. 2009] 99

³⁰ Alister E. McGrath, [Ibid] 99

³¹ Alister E McGrath, [Ibid] 101

come up with the image of the seed to suggest that the world was not created as a static entity but was created as something which holds within it the potentiality for change. God's providence would guide this change. This image of the seed is a remarkably far-sighted image since it contains within it at least a whiff of the theory of evolution.

It is also important to note that Augustine adopted a Trinitarian view of God by this time. M.C. Steenberg points out, "Marius Victorinus had earlier made a very vigorous statement of the Spirit as consubstantial with the Father and Son,"³² and this view gradually came to be prevalent. It was incorporated into the creed of the Nicean council in 325 and later expanded after the time of Augustine, as mentioned before.

In his *Confessions*, Augustine provided us with an image of God that still has relevance for us today. He wrote:

It was as though your being were the sea, infinite, immeasurable, everywhere yet still only a sea which had within it a huge sponge but nevertheless finite. This sponge would in all its parts be filled with the immeasurable sea. So I thought of your Creation as finite and filled utterly with you-the infinite and I said 'here is God and here is what God created and God is good and mighty and incomparably better than all these but being good, He created them good and behold how he surrounds and fills them.'³³

This is a highly creative depiction of the principle that God and God's Creation are separate but connected. Augustine has often been accused of being in opposition to matter because of his doctrine of original sin, but it can be seen here that this is not the case. It is clear that he regards God's Creation as good.

It can be seen from this brief examination of only three church fathers that questions of Creation and the triune nature of God were important to them. The early church developed an understanding of God as Trinity with Spirit assuming personhood and coming to be understood

³²M.C. Steenberg, *Of God and Man- Theology as Anthropology- From Irenaeus to Athanasius* [London; and t clark. 2009] 9

³³Mary T. Clark, trans. *Augustine of Hippo- Selected Writings* [New York: Paulist Press. 1984] 63

as synonymous with the Father and Son. In the Western Church the Holy Spirit came to be closely identified with the work of God in redemption, [although it was certainly recognized that without Creation there would be nothing to redeem!] It was less closely associated with Creation. The concept of Trinity is deeply puzzling to the rational mind and as Western society gradually placed more and more faith in reason, the doctrine of the Trinity slowly assumed less importance. It is, of course, meant to be puzzling since it is trying to express the deepest mystery; it points us in a figurative way to the deep mystery of God.

In the Eastern Orthodox Church, the doctrine of Trinity developed in a different way. Early Fathers of the Eastern Church [the Cappadocian Fathers 329-390] provided a more well thought out concept of the Trinity. These Cappadocian Fathers, Basil, Gregory and Gregory of Nazianus, conceived of the idea of Trinity as a way of “reminding people not to think about God as simple personality and that what we think about God cannot be reduced to rational analysis.”³⁴ This led them in their liturgies to make a strong connection between the material world and the spirit that did not happen in the Western church. Kirsteen Kim, writing about the Holy Spirit in the world, says “for the Orthodox, the mission of the Spirit is life-giving or the renewing of Creation.” Kim goes on to say that, “West and East have designated the spirit as ‘love’ and ‘life’, respectively.”³⁵ This is the first feature of the Holy Spirit.

As mentioned, Gregory of Nazianus had a well - developed theology of the Holy Spirit. Sigurd Bergman interprets Gregory’s understanding of the Holy Spirit as incorporating two major characteristics.³⁶ Gregory proposed the idea of a social God, a God who exists in community with God self. As such, God is completely relational and Gregory said that this

³⁴ Karen Armstrong, [Ibid] 115

³⁵ Kirsteen Kim, *The Holy Spirit in the World-A Global Conversation* [New York: Orbis Books. 2007] 46

³⁶ Sigurd Bergman, *Creation Set Free- the Spirit as Liberator of Nature* [Grand Rapids MI: William B. Erdmann’s Publishing Company, 2005] 71-167

relationality is mirrored in Creation. The second feature of the Holy Spirit is movement. Within the concept of movement Gregory included the idea of Creation moving towards consummation or fulfillment. In this movement God creates, orders, liberates and consummates all of life. Movement can also refer to movement towards God such as when order, harmony and peace are observed or away from God when disharmony, disorder and lack of peace are present. The Holy Spirit is the agent of movement but is not restricted to this world. As such, the Holy Spirit moves through the boundaries of Creation and Creator and is fully present in Creation. Gregory used the metaphor of the harp and the harpist to describe the movement of the Holy Spirit - Creation is the harp that is tuned and played by God through the Spirit.

The doctrine of Creation from nothing also came to be accepted during this period although it represented a break with both the bulk of Jewish tradition and the Greek understanding of the world. It is interesting to note that this question of the origin of the Earth is still the subject of debate, not only amongst theologians, but also among modern day scientists. Whatever else can be said of the Early Fathers of the church, it cannot be said that they did not address issues that were very central to the faith, and we owe an immeasurable debt to these leaders who are proof that revelation is ongoing.

The western church gradually became more 'spiritual' in its focus in a way that weakened the link which the early church Fathers had made with the Spirit and Creation. The exception to this is, of course, the Celtic Church, which had a spirituality that drew heavily upon connection with the earth. The Celtic Church, which is credited [perhaps a little too enthusiastically] with keeping alive the learning of the church during the period following the sack of Roman Empire, was able to remain independent of the Roman church during this period. It was later suppressed by the Roman church as political stability at least partially

returned to Europe. Another flowering of a similarly Creation centered spirituality occurred when St. Francis injected a breath of fresh air into the church.

4. Spirit and Creation in Changing Intellectual Climates

As political order was gradually re-established in Europe after the fall of Rome, under the leadership of men like Charlemagne, the intellectual climate in Europe also changed in small incremental steps. Learning that had been lost to Europe during the periods of political instability was re-introduced to Europe through the Arab conquest of Spain, Sardinia and for a short while, Italian states. This brought back to Europe, through Arab scholars, classical works of the Greeks that had been lost. This learning spread slowly over Europe and had a great influence on European philosophy and theology. The works of Aristotle became the focus of much study and attention. Concurrently with these developments, Europe saw the establishment and growth of universities.

All of these threads had their influence on theological thought. The Middle Ages saw the growth of a movement called scholasticism. The most influential thinker of this school was Thomas Aquinas [1225 -1274]. Thomas was a member of the monastic community of Dominicans which had been formed as a teaching and preaching order. Thomas is often considered the greatest Catholic theologian and is considered a Doctor of the church. Thomas taught that faith and reason were the two tools needed to engage in theology. Thomas taught that as Being itself, God was the source of all that existed because all beings made in God's image could tell us something about God. As Min has written:

He had a profound confidence in the presence of grace in nature which enabled him to accept in a serene and joyful way, the fundamental goodness of all creatures each according its own nature and role in an ordered cosmos. "It was

Thomas' opinion that "divine revelation and law provide norms from above; reason and nature provide norms from below."³⁷

In other words, we can look for truths about God from nature and from revelation.

But there was another side to Thomas. He recognized that we can never fully know God and that anything that we say about God is a construct of the human mind. Thomas is famous for his five proofs of God which he approached from the perspective of what we cannot say about God – the *via negativa*. Bradley Holt says "his synthesis of reason and revelation, nature and grace was one of the great intellectual accomplishments of the Western Church."³⁸ What Thomas did in his sacramental view of nature is marry both Creation and Spirit.

Given the long - lasting influence that Thomas' thinking has had in the Catholic Church it is surprising to learn that his systematic theology was soon under attack. Theology began to turn in the direction of men like John Duns Scotus and William Ockham. These men, and others, claimed that "revelation no longer had an independent claim to truth but had to be submitted to the judgment of what was thought rational."³⁹ Study, reason and logic could be turned to any topic and this included God since they envisioned God as another kind of being. Scholastics were also deeply suspicious of mysticism. These theologians tackled such questions as how to mathematically measure free will and they tried to determine how many angels could sit on the head of a pin. Karen Armstrong claims that this was a pivotal period in the history of theological thought because it saw the split of theology and spirituality. This is a split which she says continues to this day.⁴⁰

³⁷ Anselm K. Min, *Paths to the Triune God- An Encounter Between Aquinas and Recent Theologies* [Notre Dame, Ind.: University of Notre Dame. 2005] 42

³⁸ Bradley Holt, *Thirsty for God-A Brief History of Christian Spirituality*[Minneapolis: Augsburg.1993] 84

³⁹ Bradley Holt,[*Ibid*] 84

⁴⁰ Karen Armstrong, [*Ibid*] 149

There was also a mysticism that flourished during this period, both individually and in communities like the Beguines, and it focused its attention on the third person of the Trinity, the Holy Spirit. But these mystics practiced a privatized spirituality that did not contribute to theological thought. Mystics like Julian of Norwich, Hildegard of Bingen, Catherine of Sienna, Teresa of Avila and John of the Cross drew on the natural world for images to describe their experiences of God, but Creation was not the focus of their attentions in a theologically reflective way.

Creation was important to rational Scholastics because they believed that, if they understood Creation, it would lead them to understand God. It is not surprising that in such an atmosphere a class of natural philosophers and theologians arose. Science became an interest of a few men like Roger Bacon who began systematic investigations of the world around them. Again, the third person of the Trinity was not a focus of their attention.

The trend towards the privatization of faith continued as theologians turned towards humanism as a means of replacing the spiritual aridity of the Scholastic movement which had never been understood by the vast majority of believers. These humanists turned to scriptures and the early church fathers for their inspiration as they focused on the central importance of humans in Creation that they saw in older traditions. They were encouraged in this by the artistic out-pouring that occurred during the Renaissance, which in their minds, demonstrated the heights to which humans could rise.

The Modern Period, which is generally understood to begin around 1500, ushered in a major change in world view. Bradley Holt points out that:

The modern period can be summarized by themes of autonomous reason, progress and anti-traditionalism, objectivity and fascination with science,

optimism, individualism and mechanism.... Religion was largely reduced to morality leaving little room for affective spirituality.⁴¹

This period also saw a change from the Ptolemaic position that held that the earth was the center of the universe. After the work of early astronomers [Copernicus, Kepler, Galileo] the earth was no longer seen as the universe but it was understood that the universe is heliocentric. This change in world-view came to be accepted very slowly.

These changes were, of course, felt in the church. They were to greater or lesser degrees contributing factors in the second great schism of the church, the Reformation. The Reformation had an impact on the natural theology of the day. Martin Luther "...did not imagine for one moment that the investigation of the cosmos or natural reasoning could bring us true knowledge of God. Luther apparently felt that speculation about 'God's inconceivable act in governing the universe could cause humans to fall into abject despair and terror'... this deliberate de - sacralizing of the cosmos was a secularizing idea that would encourage scientists to approach the world independently of the divine."⁴²In this way, the separation between Spirit and Creation that started with the Scholastics was given further impetus by the Reformation.

During the same period the approach to the Holy Spirit also underwent a change. As Protestants moved towards reliance on scripture as a basis for correct belief, the concept of the work of the Holy Spirit came to be seen as between the correctly believing individual and God. The concept of the Holy Spirit became privatized and focused on the action of the Holy Spirit in redemption. The natural world became a backdrop for the work of salvation.

The exception to this was the thought of John Calvin [1509-64]. Calvin was a Protestant Reformer who felt, in contrast to Luther, that "the orderliness of Creation; both the physical

⁴¹ Bradley Holt, [Ibid] 84

⁴² Karen Armstrong, [Ibid] 171

world and the human body testify to the wisdom of God.”⁴³ Calvin also argued against Biblical literalism. He pointed out “that the Bible is not an astronomical, geographical or biological textbook. When the Bible is interpreted, it must be borne in mind the God adjusts to the capacities of the human heart and mind. God brings revelation down to our level.”⁴⁴ These arguments were adopted to defend views like the heliocentric universe that seemed to contradict scripture.

The Catholic Church, suffering from the pressures of Reformation, also turned its focus away from the examination of nature as a way to prove the existence of God and put more emphasis on the necessity of participating in the ritual of the church and subscribing to dogmatic beliefs that were designed to eliminate doubt in the mind of the believer. The church started to stress the constancy of Catholic beliefs. The Holy Spirit came to be seen as attached to the magisterium of the church and only accessible through the church.

The Reformation had another effect on the concepts of Spirit and Creation. This centered around Reformers’ opinions of what should constitute proper worship. Men like Zwingli and Calvin held that material things like candles, lights, and paintings were not important and even detracted from worship. This led in extreme cases to the destruction of art work in churches and the removal of any material symbols from worship. Ultimately it led to a re-interpretation of the Eucharist. The end result of this was that the reformers created a strict separation of the material and the spiritual.

These approaches were departures from both scripture and tradition. Julian N. Hartt, writing a chapter on Creation in the book *Christian Theology*, makes the point that from the time of Origen to John Calvin, there was a remarkable unity in approaches to Creation. Hartt

⁴³ Alister E. McGrath, *Science and Religion* [Oxford: Blackwell Publishers Ltd., 1999] 10

⁴⁴ Alister E. McGrath, [Ibid] 10

refers to this as the consensus. There are some differences, but on the whole there was agreement about the following main points: Creation from nothing; the result of God's action is Creation; the world was created with order that indicated a hierarchy; since God created the world, it must be good and lack nothing it needed; concerns about the problem of evil in Creation; and the certainty that Creation includes an end - the fulfillment of Creation. This consensus gradually came to be questioned and eroded in the intellectual and political climate that was fostered by the Reformation and the growth of science.⁴⁵

The Reformation played a large part in causing a period of horrendous religious wars that swept through central Europe starting in 1630. The Thirty Years War saw up to thirty-five [35] percent of the populations of these regions killed during these wars. Understandably, it left many questioning the place of religion in society and led some to place their faith in reason rather than religion as a way to achieve peace in society.

The growth of the nation state during this period was also a contributing cause to these wars. Princes and kings in various states sought to concentrate political power in their own hands and wrest it from the church hierarchy. The schism of the church was helpful to these rulers who sought to consolidate, and in some cases, expand their territories. This move towards secularization would gain further impetus from the growth of science and the ensuing Industrial Revolution.

These secularizing forces, as well as the developing importance of rationalism as a philosophical point of view, were important influences in the development of science. The development of science was to play an important role in Christian theology. [The development of science is examined in more detail in Part Two]. Views of God, Creation and the Holy Spirit

⁴⁵ Julian N. Hartt, "Creation and Providence" in *Christian Theology- An Introduction to Its Traditions and Tasks*, ed. Peter C. Hodgson and Robert H. King, [Minneapolis: Fortress Press, 1994] 144

all changed as a result of exposure to the ideas of science. In the late Middle Ages and the early Modern Period there was no distinction between science and theology as men of science like Copernicus, Kepler, Galileo and later, Newton all regarded themselves as Christians. Under the influence of these men, the world-view changed from a geo-centric one to a helio-centric one. Men no longer saw the Earth as the centre of the universe, as Ptolemy had suggested.

By the time that Newton demonstrated that universal principles governed motion and mass, the idea of the world as a machine that had been designed and created by God, who then left the world and its occupants to their own devices, had come to be accepted. This Deistic view of God, as espoused by men like William Paley, [1743- 1805] came to be associated with a natural theology that suggested that knowledge about the world gleaned from science could add to our understanding of God. Deism gained in popularity during the sixteenth [16th] and seventeenth [17th] centuries and by the eighteenth century it was the prevailing theology. Deism was, by this time, the most successful alternative to the consensus view of Creation. Deism squeezed mystery [and with it an openness to the Holy Spirit] from the Christian faith, but it seemed to be a rational way of relating knowledge of God to findings of scientists.⁴⁶

Deism also led, according to Karen Armstrong, to some dualisms that we have carried with us to this day. She says that most people retained their traditional beliefs but did their best to purge them of mystery.⁴⁷ The God who cared for individuals became a supernatural God who was opposed to nature.

In the supernatural world, God remained a mysterious and loving Father active in the lives of worshippers. But in the natural world God had been forced to retreat- he created it, sustained it and established its laws –but after that the mechanism worked by itself and needed no further intervention.⁴⁸

⁴⁶ Julian N. Hartt, [Ibid] 144

⁴⁷ Karen Armstrong, [Ibid] 213

⁴⁸ Karen Armstrong, [Ibid] 213

The dualism of matter and mind was thus established in the western mind.

The rationalism that appealed to theologians did not hold appeal for many in the church. Waves of pietistic movements that spread through both Europe and America during the eighteenth [18th] and nineteenth [19th] centuries were a response to the rationalism of Deism.

The First Great Awakening in the United States is an example of such a reaction. John Wesley's Methodism is another example of a response to what was seen as the aridity of the church.

Still another response to the Deism of the age came from a surprising source – Romantic poetry. Romantic poets like Shelley [1792-1822] and Wordsworth [1770-1850] had a strong sense of Spirit as an unseen power that was integral to nature and which should be approached with reverence. The material world, as these poets saw it, was imbued with a spiritual power that we needed to pay attention to.⁴⁹

These Romantics had their influence on theology as can be seen in the work of German theologian Frederic Schleiermacher [1768-1834]. Schleiermacher re-introduced to theology the idea of personal religious experience. He also had a deep respect for the place of mystery in religion. Philosophers like Hegel [1770-1831] were also re-examining Deism. He maintained that Spirit was inextricably involved with the natural and human worlds.

Perhaps a natural result of Deism was the growth of Atheism, especially in the eighteenth [18th] and nineteenth [19th] centuries and, of course, continuing to the present day. Early scientists had regarded themselves as Christians, as has been mentioned. The Deists,

⁴⁹ Karen Armstrong, [Ibid] 229

however, had created a God who was remote from the natural world. Eliminating such a remote God seemed of little consequence. The physicist La Place [1749-1827] saw God as irrelevant to the study of physics. Philosophers followed in eliminating God. Feurbach [1804-1872] and Nietzsche [1844-1900] declared God dead. Marx assumed that God was irrelevant when he developed his philosophy. Atheism began to be widespread, especially in intellectual circles.

Deism was also seriously challenged during the late nineteenth [19th] century by the work of geologist Charles Lyell and biologist Charles Darwin. Lyell's work on the age of the Earth and explanations about the formation of valleys and mountains brought into question the Biblical accounts of the formation and age of the earth. "Darwinism challenged the traditional Christian idea that life owed its specific characteristics to individual acts of divine Creation."⁵⁰ The intellectual attack on the church was fed, not only by findings from science and philosophy, but also by questions about the Bible that arose as a result of the work of German theologians in the late nineteenth [19th] century who developed a form of Biblical enquiry called Higher Criticism. Higher Criticism raised questions about the historicity of Jesus and the Bible as a whole. The authorship of the Pentateuch, which had always been assumed to be Moses, was called into question. The cruelty and unpredictability of the God of the Hebrew Scriptures came under scrutiny. The nineteenth [19th] century was, consequently, one of the most difficult periods in the history of the organized church.⁵¹ According to Craig, Graham, Keegan, Ozment and Turner, many intellectuals left the church and secular liberal nation states attacked the political and social work of the church.

There were a number of responses to these pressures from inside and outside the church. Alister McGrath points out that from the late eighteenth [18th] century on, four main

⁵⁰ Alister McGrath, [*Science and Religion, Ibid*] 26

⁵¹ Albert M. Craig, William A. Graham, Donald Keegan, Steven Ozment, Frank M Turner. *The Heritage of World Civilizations*. [New York: MacMillan, 1986] 938

streams of thought developed within Christianity.⁵² Each of these streams of thought has approached questions of Creation and the Holy Spirit in different ways so it will be helpful to examine each of them briefly.

Liberalism developed from the time of Schleiermacher [1768-1834]. Based on his theories, "...liberalism was committed to bridging the gap between Christian faith and modern knowledge."⁵³ Liberals came to regard a number of Christian beliefs as out of line with cultural norms and therefore in need of revision. Creation needed to be rethought to reflect evolution. They questioned traditional Christian beliefs such as original sin and the divinity of Christ. Liberals were optimistic about humanity and saw life as steadily improving. They entertained a positive view of the findings of modern science and were prepared to adapt Christian traditions so that they could be more congruent with the findings of science. Paul Tillich, who felt that theology should establish a link between culture and faith, is a well-known example of a liberal theologian.

Modernism was second stream of thought. Modernist thought arose as a Catholic attempt to "integrate Christian thought with... the new understandings of history and natural sciences that were gaining ascendancy by the end of the nineteenth [19th] century."⁵⁴ Modernists strongly supported a Darwinian view of evolution which they invested with supernatural significance. They were more radical than liberals and had no difficulty eliminating those aspects of Christian thought that they found inconvenient. Alfred Loisey [1857-1940] and George Tyrell [1861-1909] was representative of this group of thinkers.

A response to both liberalism and modernism is found in the writings of neo-orthodox Christians who wrote after the First World War. This school of thought was founded by Karl

⁵² Alister McGrath, [*Science and Religion, Ibid*] 35

⁵³ Alister McGrath, [*Science and Religion Ibid.*] 32

⁵⁴ Alister McGrath, [*Science and Religion, Ibid*] 37

Barth. Hartt suggests that neo-orthodoxy was an attempt to recapture the consensus that had been lost.⁵⁵ It was an approach that stressed the ‘otherness’ of God. Theology, in this approach, is a response to the word of God. “God is to be regarded as radically distinct from the world and methods used to study the world are inappropriate for the study of God.”⁵⁶ Clearly, neo-orthodox theologians would reject attempts made by liberals and modernists to relate the findings of science to Christian beliefs. Their primary focus would be redemption rather than Creation.

Evangelism is the fourth school of Christian thought that developed in the late nineteenth [19th] century. It is a trans-denominational trend in theology and spirituality which puts emphasis upon the authority of scripture, uniqueness of redemption through Christ on the cross, the need for conversion, and the urgency to evangelize. McGrath points out that it is not to be confused with fundamentalism.⁵⁷ Fundamentalism demanded a literal interpretation of scripture but that is not always the case with Evangelicals. Evangelicals were opposed to Deism but were nonetheless attracted to a theory of Intelligent Design which still holds sway with some Evangelical Christians. Belief for Evangelicals became a matter of intellectual conviction and perpetuated the separation of the natural and supernatural.

Difficult times for Christianity were to persist from the nineteenth [19th] century through the twentieth [20th] century and into the twenty-first [21st] century. Two World Wars, the Holocaust, the Great Depression, nuclear warfare, genocide, exploding population numbers, climate changes, environmental depredation as well as globalization have all left their marks on the Christian church and theology. The nineteen sixties [1960s] saw the beginning of a decline in church attendance in the Western world that continues to the present. Some surveys suggest,

⁵⁵ Julian N. Hartt, [Ibid] 157

⁵⁶ Alister McGrath, [*Science and Religion, Ibid*] 40

⁵⁷ Alister McGrath, [*Science and Religion, Ibid*] 41

for example, that only six per cent [6%] of the population of England regularly attend mainline church services.

This overview of Creation and its relationship to the Holy Spirit demonstrates that there really was no separation of Holy Spirit and Creation in either scripture or the traditions of the faith until the early Medieval period. The growth of scholasticism with its emphasis on rationalism was, as Karen Armstrong theorizes, “the thin edge of the wedge” that began the slow but thorough separation of the Holy Spirit and Creation.⁵⁸ The Holy Spirit slowly becomes privatized as we see with the mystics of the Medieval period. This trend was accelerated by the Reformation which continues to place an emphasis on the work of the Holy Spirit as a private matter focused on the work of redemption. Combined with the Reformer’s tendency to separate material objects from spiritual overtones, a strong tendency to separate Creation and the Holy Spirit was in place by the late fourteenth [14th] and early fifteenth [15th] centuries.

The growth of rational philosophy and the growth of science continued this trend towards a separation of the Holy Spirit and Creation. The final separation occurred as theologians adopted a natural theology which stressed the importance of learning about God from Creation but relied solely on a rationalism which did not allow for the presence of the Holy Spirit. By the late eighteenth [18th] century mystery was largely gone from theology as theologians attempted to reconcile the findings of science with their faith. The findings of science undermined this approach in the late nineteenth [19th] century. Christian thought splintered into a number of schools during this period but the Holy Spirit was not connected to Creation in a serious way in any of these schools of thought in spite of the efforts of liberals and modernists to incorporate the teachings of science. Elizabeth Johnson claims that “...for

⁵⁸ Karen Armstrong, [Ibid] 150

the last five hundred years the religious value of the Earth has not been a subject of theology, preaching or religious education. Creation, she says, got lost in Christian reflection.”⁵⁹ The Holy Spirit finds expression in the various pietistic movements and new churches and in the lives of individual Christians, but these movements are centered on redemption rather than Creation.

Questions about the place of the Holy Spirit in Creation are questions that are so very relevant in today’s Post-Modern period [1970’s to the present]. How can Christianity address problems of exploding population numbers, climate changes, and environmental depredation, with all of their accompanying effects on our lives if we do not understand that the Holy Spirit is deeply embedded in Creation? It is vital to re-establish the connection of the Holy Spirit and Creation if Christianity is to speak with authority on these issues.

The loss of a sense of the value of Creation that has been present in Christianity has been blamed for a number of the ills of the world. Historian Lynn White Jr. writing in 1967 says that “... Christianity made it possible to exploit nature in a mood of indifference to the feelings of natural objects....The spirits in natural objects, which formerly had protected nature from man, evaporated.”⁶⁰ More importantly, he says:

Our science and technology have grown out of Christian attitudes towards man’s relation to nature which are almost universally held not only by Christians and neo-Christians but also by those who fondly regard themselves as post-Christian. ...Despite Darwin, we are not in our hearts a part of the natural processes. We are superior to nature, contemptuous of it, willing to use it for our slightest whim.⁶¹

The loss of our sense of connection between the Holy Spirit and Creation, in other words, has led us to our present state of environmental crisis. These are strong words, but they at least

⁵⁹ Elizabeth A. Johnson, “Losing and Finding Creation in the Christian Tradition” in *Christianity and Ecology: Seeking the Wellbeing of Earth and Humans*. Harvard University Center for World Religions Conference, 2000 3-21

⁶⁰ Lynn White Jr., “The Historic Roots of Our Ecological Crisis,” *Science* 155 [March 10, 1967] 1203-7

⁶¹ Lynn White Jr., [Ibid] 1203-7

cause us to reflect on the seriousness of losing the connection between the Holy Spirit and the natural world.

Feminist theologians point to a further consequence of our exploitation of nature. Writers like Elizabeth Johnson, Sallie McFague and Rosemary Radford Ruether claim that the same patriarchal attitudes that led to the exploitation of the natural world are the same attitudes that have led to the world-wide oppression of women and children. Privatized ownership of land has led humans to believe that we have free reign to do as we wish with “our” land. Because women have been [and still are in some parts of the world] viewed as property, it is easy to see how attitudes towards the land can be extended to women.

A re-connection between the Holy Spirit and Creation is a necessary fore-runner of justice for the natural world and for women and children. We really must return, as our scripture and traditions teach us, to a view of Creation that includes God’s love for Creation and treat it accordingly. Fortunately, theologians are turning their minds to ways of thinking about God that do not separate the Holy Spirit from Creation. This is a development that has been around since the late nineteenth [19th] century but it has only been during the last fifty years that it has begun to be of real influence. There is no unified approach to the topic of the Holy Spirit and Creation so it will be useful to examine the most prominent schools of thought and the work of individual theologians that point in the direction of unifying Spirit and Creation. A discussion of Creation and spirit must also include the relationship between theology and science since it is science that has revealed to us the world in all its dynamism, complexity, interconnectedness and wonder.

5. New Directions for Spirit and Creation

As we approach the twenty first [21st] century, it can be seen that there is a renewed effort to connect the Holy Spirit and Creation. This effort comes from theologians and from scientists who are also theologians, as well as some scientists. In the last twenty to thirty years there has been an explosion of books about science and religion. These developments do auger well for an attempt to connect Holy Spirit and Creation. Some of the more promising schools of thought such as panentheism and process theology will be examined to see what they have to say about the connection of spirit and Creation. A number of individual theologians are also developing these ideas; their thoughts will be briefly considered. These include Teilhard de Chardin, [1881-1995] Jurgen Moltmann, and John Polkinghorne.

A theological approach that tries to find a middle ground between pantheism [the view that God and the world are one and the same] and classical theism is called panentheism. The Oxford dictionary defines panentheism as “the belief that the being of God includes and penetrates the whole universe so that every part of it exists in Him but [as against pantheism] that His being is more than that and is not exhausted by the universe.” It draws its scriptural base from Acts 17.28 –“In him we live and move and have our being” and also Ephesians 4.4-6 “there is one body and one Spirit...who is above all and through all and in all.” It is a definition that has been around since the early nineteenth [19th] century when it was coined by German idealist philosopher Karl Christian Frederick Krause. It was first used as a term of derision by traditionalists who directed it at those who questioned the prevailing Deism.

Panentheism currently has a large following of theologians. A partial list includes Charles Hartshorne, John Cobb Jr., John Robinson, John MacQuarrie, Anna Case-Winters, Leonardo Boff, Marcus Borg, Phillip Clayton, Matthew Fox, Sallie McFague, Jurgen Moltmann and Arthur Peacocke. Dietrich Bonhoffer, Martin Buber, Rudolf Bultmann, Martin

Heidigger, Rosemary Radford Ruether, Alfred North Whitehead and Teilhard de Chardin have been identified as panentheists.⁶²

There are different interpretations of panentheism. An example of a particular type of panentheism is Sallie McFague's metaphor for the world as God's body⁶³. Panentheism can also be described as a sacramental explanation of Creation. Brierly suggests that a

Sacrament is a physical thing under, in and through which God comes. The whole cosmos for panentheism is sacramental for it is something under, in and through which God comes.... Specific sacraments are simple particular intensifications of the general sacramental principle ...Everything has the potential to become a full vehicle of the divine.⁶⁴

This particular definition of panentheism lends itself to consonance with findings of science, as will be explored later. Sacramental theism is deeply relational. It assumes that Creation is shot through with God. In this sense it mirrors the deeply relational Trinitarian God of mutual relationships. In panentheistic thought a unity of Spirit and Creation is very evident.

Process theology is a particular kind of panentheism. Christian process thought was developed by Charles Hartshorne, John Cobb Jr. and David Griffen and is based on the philosophy of Alfred North Whitehead. Donald Viney says that in process theology "reality is to be viewed not as material substances, but rather as serially ordered events which have a physical and mental aspect."⁶⁵ God plays a role in each of these events but not a determining role. God does not use coercion, but uses the power of persuasion to bring about events. In process theology, God chooses to be self-limiting and allows freedom a very important role.

⁶² Michael W. Brierly, "Naming a Quiet Revolution: The Panentheistic Turn in Modern Theology" *In Whom we Live and Move and Have Our Being-Panentheistic Reflections on God's Presence in a Scientific World*. Phillip Clayton and Arthur Peacocke ed. [Grand Rapids, MI: William B Erdmann's Publishing, 2004] 8

⁶³ Sallie McFague, *A New Climate for Theology: God the World and Global Warming* [Minneapolis: Fortress Press, 2008] 72

⁶⁴ Michael W. Brierly, [Ibid] 8

⁶⁵ Donald Viney, 2 "Process Theism" [<http://plato.stanford.edu/entries/process-theism>] Stanford Encyclopedia of Philosophy; retrieved 09/11 2010/ 1:09pm

In process theology, God is also seen as the initiator of new possibilities and as such has to be considered as the author of all that is new in Creation. Process theologians suggest that God is also influenced by the events of the world and is thus to some degree, contingent on events in the world. God is considered to have a dipolar aspect; that is, God has a changing or variable aspect which reacts to events in the world but at the same time has an unchanging or constant aspect. This unchanging aspect of God includes things like God's goodness, faithfulness, wisdom and love. It can be seen that process theology accepts the idea of a God who self-limits in order to accomplish the goals of human freedom. This also allows for the workings of the laws of nature and allows humans the opportunity for moral growth. Ian Barbour suggests that the idea of the Holy Spirit is consistent with process theology.⁶⁶ Barbour sees the Holy Spirit as God's presence in the events of the world.

Particular individuals were [and in some cases still are] very influential in bringing together the ideas of Spirit and Creation. The first person in the twentieth [20th] century to really pursue this idea was Pierre Teilhard de Chardin [1881-1955]. De Chardin was a highly educated French Jesuit who was a noted paleontologist and geologist. He is also recognized for his mysticism. He was a prolific writer but the Vatican banned him from publishing his theological reflections because of his unorthodox views. His writings had been left to a friend who arranged for their publication after his death in 1955.

Early in his career de Chardin had become fascinated by evolution and in his writings he struggled to unify his understanding of evolution, not only as a biological process, but also a religious concept and process. De Chardin came to believe that, "Christians... must learn to perceive and revere the sacredness of matter and the cosmos; the experience of the cosmos is a

⁶⁶ Ian Barbour, *Religion in the Age of Science* [San Francisco: Harper and Row; 1990] 230

necessary dimension of human experience that must be integrated into the Christian faith.”⁶⁷

De Chardin’s experience as stretcher bearer, often at the front lines, during the four years of the First World War, led to his belief that humanity formed a web of reality that existed above the biological reality. He named this web the noosphere. Participation in this noosphere gives value to each person as an individual.

De Chardin viewed evolution as “the power of love moving through matter and creating the bonds that bind the particles to make the atoms, the atoms to make the molecules, the molecules to make the cells, cells to make the organs and then whole bodies.”⁶⁸ This power of love leads eventually to the cerebralization of humankind which in turn leads to the noosphere. The whole process is drawn forward by the power of the Spirit towards unity with the Omega point which is the Cosmic Christ. De Chardin’s understanding of evolution is one that “affirms the extraordinary inter-relationships and inter-connectedness of the whole universe.”⁶⁹ His work as a scientist led him to see the relationality that runs deeply in the universe and then to connect this insight to his Christian faith. As De Chardin says, “Without any doubt there is something which links matter energy and spiritual energy and makes them a continuity. In the last resort there must be a single energy active in the world.”⁷⁰

De Chardin’s work was a profound break with earlier theologies and needs to be recognized as such. In the context of nearly five hundred [500] years of theology that saw the separation of Spirit and Creation de Chardin manages to reunify both Spirit and Creation and do so in a way that restores a great sense of mystery and awe to theology. His work is currently criticized for placing too much emphasis on the importance of humanity in Creation and for the

⁶⁷ James W. Skehan, “Exploring Teilhard’s ‘New Mysticism’: Building the Cosmos” in *Pierre Teilhard de Chardin on People and Planet*. Celia Deane-Drummond, ed. [London: Equinox Press, 2006] 20

⁶⁸ Diarmuid O’Murchu, “Teilhard: A Mystical Survivor”, Celia Drummond ed. [Ibid]101

⁶⁹John A. Grim and Mary Evelyn Tucker, “An Overview of Teilhard’s Commitment to ‘Seeing’ as Expressed in his Phenomenology”, *Metaphysics and Mysticism*, Celia Drummond ed [Ibid] 68

⁷⁰ Pierre Teilhard de Chardin, *The Hymn of the Universe* [New York: Harper and Row, 1961] 87

globalizing tendencies in his concept of the noosphere. These criticisms fail to recognize what a radical work he had done in his efforts to unite science and theology, spirit and matter-ideas that had largely been lost to Christian thought. A deep debt is owed to De Chardin for his very original thinking in the areas of science and faith.

Teilhard de Chardin laid the ground work for a discussion of the place that spirit plays in the natural world that would influence many who followed him. Theologians like Wolfhart Pannenberg, Jurgen Moltmann and Hans Kung began to explore their Christian faith in the light of science. Others who followed in de Chardin's spirit were scientists like physicist Ian Barbour, bio-chemist Arthur Peacocke and physicist John Polkinghorne. Peacocke and Polkinghorne are both theologians, in addition to being scientists, so they bring a good deal of expertise to their deliberations about Spirit and Creation.

John Polkinghorne [1930-] is a theoretical physicist who turned to a second career, first as an Anglican priest, and later as instructor in theology at Cambridge University. He has been knighted for his contributions to the dialogue between science and religion. As part of his work of introducing Christians to the findings of physics, he addresses the question of how Spirit is related to the natural order. Polkinghorne turns to the beautiful order of the natural world as an expression of the mind of the creator. He sees also the fruitfulness of the natural world as a reflection of purpose and meaning in Creation. A Trinitarian, Polkinghorne believes that the deep seated relationships evident in the natural order are mirrors of the divine unity of the Trinity.

“The Spirit,” according to Polkinghorne, “is the hidden God working from within; he is the divine presence ever active in the unfolding process of the created world and never wholly

disentangle from that process.”⁷¹ Polkinghorne maintains that the Spirit is not the possession of any one group seeking truth and can be available to anyone seeking truth, including scientists. In spite of his declarations about the deep entanglement of Creation and Spirit, Polkinghorne maintains that he is not a panentheist. In his view, the separation between Creation and creator must be maintained. “The Spirit is not incarnated in the cosmos.” Rather confusingly he also says ⁷² “...cosmic history... on its inside is the action and passion of the personal Spirit”⁷³ This seems to be the statement of a panentheist who would maintain that while God is present in all things, God is also more than Creation. Perhaps Polkinghorne is trying to distinguish between the sacredness of Creation [pantheism] and the sacramental nature of Creation that is part of panentheism. Whether or not he is a panentheist, Polkinghorne places a good deal of importance on the connection between Spirit and Creation.

Jurgen Moltmann is one of the most prominent theologians currently at work. He is a German theologian who set out to develop a systematic theory of theology which he called the theology of hope. More recently he has turned his attention to the Holy Spirit and written at least two books exploring the third person of the Trinity. Included in this exploration is his interpretation of the role of Spirit in Creation.

Moltmann writes from a strongly Trinitarian point of view, which is based on his understanding “...that to be alive means existing in relationship with other people and things. Life is communication in communion.”⁷⁴ This relationship, which is at the heart of life, is mirrored in the persons of the Trinity, Father, Son and Spirit. Moltmann recognizes that Christian theology has placed more emphasis on redemption than on Creation. Moltmann seeks

⁷¹ John Polkinghorne, *The Faith of a Physicist* [Minneapolis: Fortress Press, 1996] 147

⁷² John Polkinghorne, [Ibid] 151

⁷³ John Polkinghorne, [Ibid] 151.

⁷⁴ Jurgen Moltmann, *God in Creation* [Minneapolis: Fortress Press, 1993] 3

to redress this imbalance by drawing attention to the work of the Spirit in Creation. He says Creation is “a fabric woven by the Spirit and a reality to which Spirit gives form.”⁷⁵ He unites the ideas of Creation and redemption by stating that Spirit is involved in Creation through the Father and in redemption through Christ.

To Moltmann, God both transcends from Creation and is deeply immanent in Creation. Moltmann uses the Jewish concept of Shekinah [God separating from God’s self and dwelling with God’s people in the tabernacle] to explain this transcendence and immanence. “The Spirit is also the principle of creativity...He creates new possibilities and in these anticipates the new designs and blueprints for material and living organisms. In this sense the Spirit is the principle of evolution.”⁷⁶ Here we see Moltmann’s openness to including findings from science in his theology.

The suffering that is so apparent in the created world is something that Moltmann addresses. He does not have a romantic view of nature which overlooks suffering. He sees the Spirit as suffering [groaning and sighing] with Creation and drawing it to the wholeness which God intends for Creation. “Through the Son, God creates, reconciles and redeems the Creation. God accompanies a suffering Creation through the process of kenosis, of emptying Himself/Herself and also self-limiting Himself/Herself. In the power of the Spirit God creates, reconciles and redeems the Creation.”⁷⁷ This gives Moltmann’s theology an eschatological flavor.

Moltmann places a good deal of emphasis on liberation. He says that Creation is longing for liberation from agents of destruction within it and from the destruction heaped on it by humans. He draws hope from the fact that all living creatures live in the direction of our

⁷⁵ Jurgen Moltmann, [Ibid] 99

⁷⁶ Jurgen Moltmann, [Ibid] 100

⁷⁷ Jurgen Moltmann, [Ibid] 15

futures. He believes that we must return to a more integrated view of Spirit and Creation. We must give up the views that caused us to separate ourselves from nature. These views have led to destructive domination of nature.[He goes on to say that these same views that caused the depredation of the natural world have been instrumental in the oppression of women who have largely been regarded as property.] “The earth is not unclaimed property and nature is not ownerless. It is God’s beloved Creation.”⁷⁸

The connection between the Holy Spirit and Creation is being re-discovered and given new voice by proponents of panentheism and process theology as well as the particular theologians mentioned. A growing group of writers, some theologians like Wolfhart Pannenberg, Hans Kung and Thomas Torrance, some scientists like Ian Barbour and Paul Davies and Francis Collins, some scientist theologians like Polkinghorne, Alister McGrath, and Arthur Peacocke, are drawing attention to the connection between God and the natural world. In spite of this, there is wide division between theology and the world of science which studies the natural world. Since science and theology are both studying reality, it would be logical that there should be some areas of common interest.

In order to understand the division between science and theology and therefore the Holy Spirit and Creation, it is helpful to have a better understanding of the history of science. This has been alluded to but will be examined in more depth in Part Two of this paper. Particular attention will be paid to those points at which science and theology diverge. It is in some ways ironic to address the division of science and theology since science has its roots in religion. This fact is not often recognized by current scientists who are currently very vocal in their criticisms of religion. Arthur Peacocke states this in a colourful way when he writes:

The received wisdom is that the stream of scientific development,

⁷⁸ Jurgen Moltmann, *The Spirit of Life- A Universal Affirmation* [Minneapolis: Fortress Press, 2001] 171

rising from muddy and doubtful sources, has clarified itself of all pollutions and diversions, and now flows clear and direct on into that wide ocean of yet undiscovered truth, on whose shores the great Newton conceived of himself as playing like a boy diverting himself ‘in now and then finding a smoother pebble and prettier shell than ordinary’; whereas, although the springs of religion may, some concede, have begun pure its course was soon diverted in a confusion worse than that of the Nile delta – its ultimate destination in a stagnant pool! Historical studies suggest otherwise.⁷⁹

The ‘muddy and doubtful sources’ of science will be outlined with attention being paid primarily to the physical sciences.

Part Two

1. The History of Science

The Oxford dictionary defines science as “a branch of knowledge conducted on objective principles involving the systematized observation of and experiment with phenomena, especially concerned with the material and functions of the physical universe.”

The word science was not introduced until 1833, when it was proposed at a meeting of what is now the British Association for the Advancement of Science as a word that would cover all of the endeavors of their membership. It was slow to be accepted and was not in common use until the beginning of the twentieth [20th] century. Up until then scientists were referred to as natural philosophers.⁸⁰

1.1 Science in the Ancient World

Science is as old as recorded history. The Babylonians developed mathematical, astronomical, and medical expertise approximately five thousand [5000] years ago. The development of an agricultural rather than nomadic society created a need for writing but also a

⁷⁹ Arthur Peacocke, *Creation and the World of Science* [Oxford: Clarendon Press, 1979] 8

⁸⁰ Patricia Fara, *Science – A Four Thousand Year History* [Oxford: Oxford University Press, 2009] 191

need for a means to keep track of land, animals and the production of the land. Babylonians developed a number system which was the first abstraction on the road to scientific thinking. They developed a numerical system based on 60 which is still evident today. [We still use 60 seconds to the minute and 60 minutes to the hour]⁸¹ The Babylonians kept detailed and accurate records of the movements of heavenly bodies. The movements of the stars were thought to influence events here on earth and the Babylonians worked out complex mathematical ways of using their astronomical observations to predict the future. These predictions often served religious purposes such as determining auspicious dates for holding religious festivals.

Egyptians later adopted and expanded on Babylonian astronomy, mathematics and medicine. This knowledge was assumed by the Greeks when the Greek empire extended to include Egypt and the area that had been Babylonia. The Egyptian priesthood controlled scientific information and put it to their own uses. Their legacy includes the three hundred and sixty five day year.

In Greek society the investigation of the natural world was the work of philosophers. The classical period of Greek philosophy is considered to be the 6th century BCE to the 1st century BCE. These philosophers included metaphysical questions like ‘how did matter come into being’ to be a part of their domain. Out of the efforts of many philosophers, came a geometrical way of looking at the world. The astronomical measurements that came to them from the Babylonians and the Egyptians continued to be associated with prophecy, rites and music and magic. Thales, Anaxamander, Heraclites, Pythagorus, Socrates, Plato, Hippocrates, Aristotle, Euclid, Ptolemy and Archimedes established the basis of astronomy, geology,

⁸¹ Byron Wall, *Glimpses of Reality- Episodes in the History of Science* [Toronto: Wall and Emerson, 2003] 70

geography, physics and medicine. Rather astonishingly, the findings of Greek philosophy predominated in the world of ideas until the seventeenth [17th] century.

Among the Greek philosophers, Aristotle and Euclid are generally regarded as having the most influence on science. Aristotle outlined the basic methodology for the study of nature. He advocated the formation of explanations and the construction of coherent descriptions of what could be observed. His method may have been sound but his conclusions were often wrong.⁸² Aristotle was committed to continuity in both the physical and living world. He concluded that the world must exist as it does for a reason. Aristotle adopted a teleological approach that was based on believing the world had a purpose. Such was Aristotle's reputation that his conclusions were not challenged for hundreds of years.

Euclid built upon the work of Pythagoras and put together a firm foundation for mathematical knowledge. Just as importantly, Euclid put in place a method of developing a complex mode of knowledge. Mathematics would later undergo many revisions such as algebra and calculus, but Euclid laid the foundation for later innovations.

When Rome fell in 476, the ancient era drew to a close. Western Europe entered a phase which saw almost no growth in original scholarship. Even more importantly much of the knowledge that the Greeks, Egyptians and Babylonians had fostered was lost to the Western world for a considerable period of time. The Muslims conquered the Middle East, Spain and parts of Italy after the fall of Rome. It was this Arab presence that slowly re-introduced the learning of the ancient world to Western Europe. Not only did the Arabs pass on ancient knowledge, but Arab scholars advanced learning, particularly in the fields of mathematics [they introduced algebra], astronomy, alchemy and optics.

⁸² Byron Wall, *Ibid*, 79

1.2 Science in Medieval Europe

By the end of the twelfth century Western Europe had become a thriving trading zone where education flourished. The monastic movement was in full flower during this period and learning was centered in monasteries. Many of the works of ancient philosophers were translated into Latin during this period. Monks continued the Roman practice of writing encyclopedias.⁸³ This period also saw the establishment of universities. By 1200 there were three universities – Paris, Oxford and Bologna. By 1500 there were seventy more universities. These centres of learning maintained a closed connection with the church. Subjects studied were logic, natural philosophy, geometry, music, astronomy and theology. From these universities there developed a class of natural philosophers who were convinced that the study of the natural world was a legitimate concern of theology. These natural philosophers were to be very important to the field of science.

Also important to laying the ground for scientific enquiry was the growth of practical inventions. Harness for horses, ploughs, crop rotation and irrigation systems were among some of the practical ways in which knowledge was put to use. During this period a new way of telling time was introduced in monasteries. Clocks were invented that called communities to prayer and these slowly replaced the practice of ordering life on the basis of daylight hours.

Alchemy, which was the forerunner of modern chemistry, was introduced to Europe in the Middle Ages. While it is popularly associated with the attempt to change base metals into gold, it was far broader in scope in that alchemists were interested in all change in the natural world. They addressed questions such as why iron rusts and why seeds grow into trees. Alchemists were ardent in their search to find God in these processes. The field grew rapidly

⁸³ Patricia Fara, [Ibid] 69

because it appeared to be based on reason even though it often incorporated magic.⁸⁴

Alchemists, who were often well educated, were often very innovative in the apparatuses they invented, and this approach became important to the later growth of science which often depended on the refinement of instruments.

Another basis for modern science is to be found in the work of astrologers. Astrology had been developed during Babylonian times and was based on actual movement and measurement of heavenly bodies which were thought to influence events on earth. Astrologers were often expert mathematicians. It gradually became compatible with the church by separating those who made individual predictions and who came to be regarded as tricksters from those who made large scale predictions and were often attached to European courts. Johannes Kepler, who later became known for his laws of motion, earned his living as a court astrologer.

Another factor which became important in the growth of science was the invention of the printing press during the Middle Ages. This was eventually to transform the way knowledge could be disseminated and scientists came to rely on the printed word, not only as a means of spreading their ideas, but also for gathering support for their work.

1.3 Science in an Age of Certainty [1500-1905]

The sixteenth [16th] century in Europe is usually referred to as the High Renaissance. The Renaissance was a movement that began in Italy and saw a widespread revival of learning in many areas, particularly the arts. It was also a period when natural philosophy and an interest in humanism flourished. Scholars studied the works of ancient philosophers, especially

⁸⁴ Patricia Fara, [Ibid] 84

Aristotle and Euclid, but they slowly began to question some of the teachings of these philosophers.

New methods of approaching the study of the natural world began to be evident. The work of William Gilbert [1544-1603] is an example of this new approach. Gilbert did careful experimental work in the field of magnetism. Of particular importance was his clear way of writing about his findings that formed the basis of later scientific reporting. Roger Bacon [1561-1626] is often referred to as the Father of Empiricism. Empiricism assumed that all knowledge could be derived from our senses. Bacon emphasized the importance making careful observations with an open mind and then carefully recording what was observed.

It was in the field of astronomy that the break with ancient scholarship became most evident. Copernicus, who felt that understanding the mysteries of nature would lead us to understand God, published his view of a sun-centered universe in 1543. It was a view that challenged the church view of heaven above and hell below and at first it had little impact, but it came to the attention of other astronomers who began to take it seriously. One of these was Tycho Brahe who was very interested in building a more powerful telescope that would allow more accurate measurements of the heavens. His measurements would eventually be placed in the hands of Johannes Kepler, who was not only an astrologer but a gifted mathematician. Kepler not only confirmed the work of Copernicus, but he expanded upon it to produce three laws of planetary motion.

The Copernican view of a helio-centric world was confirmed by Galileo who based his findings on observations he made with a much improved telescope which he had built. Galileo is now most famous, not for this finding, but for the reaction of the church to the publication of his findings in 1616. Galileo was placed under house arrest for his views, which differed from the views of Aristotle and scripture. Galileo has his modern-day fame from his dispute with the

church, but this is not the area where he had the most influence on the development of science. While he was under house arrest he conducted a series of careful experiments which he recorded and translated into mathematical language. Galileo felt that his task was to understand the natural world but not to try to answer how it came to be the way it is. Galileo separated science from philosophy for the first time.⁸⁵

Rene Descartes needs to be mentioned for his influence on the development of science. Descartes was a contemporary of Kepler and Galileo. His aim was to reform philosophy with a special view towards building a new philosophical system which would incorporate metaphysical questions but would also embrace the findings of natural philosophers. His view of the world as lifeless and mechanical would have a great influence not only on the future of science but on the relationship of science and theology. He also introduced the idea of the dualism of the mind and body.⁸⁶

During the sixteenth [16th] century, mathematics was introduced as a way of expressing experimental results. Although Galileo used mathematics to express his findings, mathematics was far from fully developed in Galileo's time. Geometry had come from the Greeks and algebra had been introduced by the Arabs. The symbols + and – were introduced in 1540. Multiplication and division functions were added in 1659. Logarithms were not introduced until the early seventeenth [17th] century. Descartes added Cartesian coordinates to the body of mathematical knowledge and thus transformed mathematics by making geometry analyzable

⁸⁵ John Langone, Bruce Stutz, Andrea Gianopolus eds., *Theories for Everything* [Washington, D.C.: National Geographic Press, 2006] 32

⁸⁶ Byron Wall, [Ibid] 227

using algebra. Newton and Leibniz developed calculus. Mathematics was to become the language for the expression of the findings of scientists about nature.⁸⁷

All of the natural philosophers mentioned to this point were practicing Christians. In spite of Galileo's falling out with the church, it is safe to say that they were all searching for order in the world that would reveal God. Their lives illustrate that there was no defining moment when science began as an entity separate from theology. It was a time of change when careful experimentation could be advocated by men like Kepler and Galileo who were practicing astrologists. Astrology and alchemy continued to be taken seriously for some time.

During the seventeenth [17th] century science emerged as an approach to a problem that differed from both philosophical and theological approaches that tried to incorporate 'why' questions. From the early experimental work of Bacon, Gilbert and especially Galileo, the scientific approach slowly emerged. This approach involved isolating a question, gathering facts using accurate measurements from carefully made instruments and then expressing the findings mathematically. This approach grew and flourished in religious institutions, courts and individual homes and was carried out by men who were believers in God. The roots of the scientific approach are definitely in religion.

During the seventeenth [17th], eighteenth [18th], and the early half of the nineteenth [19th] century, science was carried out by individuals, often working in a single room at a university or in private homes. It was often the work of wealthy individuals who were educated and had the means to support their experiments. Societies of these individuals began to slowly form across Europe [the Royal Society was formed in England in 1662] and began to disseminate scientific ideas. They were aided greatly in this dissemination by the growing

⁸⁷ John Gribben, *The Scientists- A History of Science Told Through the Lives of its Greatest Inventors*. [New York: Random House, 2002] 107

availability of the printed word. Although the word 'science' was not used at this time to describe this way of approaching the natural world, its approach was becoming more widespread. This was particularly true of the Industrial Revolution of the eighteenth [18th] century when experimental work began to be put to practical use in society.

There was certainly no separation of science from religion during this period because the major practitioners were all Christians. What did change very gradually was the Christian adaptation of theology to include ideas like those of Descartes, which stressed the mechanical view of the natural world. As has been mentioned, it was envisaged that God was a transcendent God who created the world and set it in motion and then withdrew from it. This Deistic view became the predominant view.

This view became much more pronounced after the work of Isaac Newton [1642-1727]. Newton was a complex individual who practiced alchemy and spent a good deal of time studying theology. He wrote, "This most beautiful system of the sun, planets and comets could only proceed from the counsel and dominion of an intelligent and powerful Being."⁸⁸ His many scientific interests included optics, astronomy and mathematics. He was the contemporary of a group of others like Edward Halley, Christopher Wren and Robert Hooke who were experts in their own areas of interest and did much to stimulate Newton's thinking. In 1687, he published *The Principia*, which outlined a new physics of motion and introduced the concept of gravity. His laws of motion, which are still held to be valid at a particular level, incorporated the work of Kepler and Galileo. In the course of trying to explain his findings, Newton developed calculus. [It was concurrently developed by Leibniz.] Newton's work laid the foundation for science and particularly physics, by proving that the universe was governed by universal laws that could be discovered by man.

⁸⁸ Byron Wall, [Ibid] 270

Newton's work was one of the cornerstones of the period of history known as the Enlightenment. During the eighteenth [18th] century the intellectually elite became enthused with the idea that mankind could eventually come to understand the whole of nature, using the power of reason. Coupled with the Industrial Revolution, which created a demand for technological applications of the findings of natural philosophers, the Enlightenment saw experimental work being carried out in many different areas. This century is now known as the Age of Classification during which a dedicated group of amateurs worked to classify insects, plants, animals and all aspects of the natural world. Newton and Robert Hooke made advances in the field of optics. Chemistry was established as a legitimate field of enquiry separate from alchemy, thanks to the work of Robert Boyle, Henry Cavendish and Antoine Lavoisier.⁸⁹ Improvements were made in the instruments of science, like the use of larger telescopes and the invention of the microscope. Electricity and thermodynamics became a field of study. Gases were studied extensively by Cavendish.

By the beginning of the nineteenth [19th] century, the work of natural philosophers was becoming more closely allied with states and with industry. In France, for example, Napoleon funded a large laboratory for LaPlace. A group of researchers gathered around La Place and they worked hard "to establish a mathematically based physics and they quantified science by making mathematics central to physics and chemistry....This approach was adopted by British and German physicists during the nineteenth [19th] century and is still the approach of science."⁹⁰

Scientists during the nineteenth [19th] century struggled to establish their discipline. Scientists presented themselves as spokespersons of reason because they recorded the world as

⁸⁹ Patricia Fara, [Ibid] 177

⁹⁰ Patricia Fara, [Ibid] 186

objective observers. “They gradually established themselves as experts wrestling authority from religious leaders to create a new scientific priesthood,” according to Patricia Fara.⁹¹ Scientists adopted a number of ways of promoting science. They began to slowly marginalize those who did not have educational credentials. They moved for the first time to make a sharp distinction between science and religion. In doing so, Victorian scientists were not necessarily attempting to attack religion but merely to exclude anyone who based their hypothesis on religious arguments. At the same time, it became more common to hear public attacks on religion based on scientific reasoning such as those made by Thomas Huxley. By the turn of the twentieth [20th] century science became a commonly used word and becoming a scientist was viewed as a profession. It is estimated that in 1766 there were three hundred [300] scientists at work and that by 1900 there were one hundred thousand [100,000] scientists⁹².

It should be noted that not everyone agreed with the objective approach of scientists. A group of philosophers in nineteenth century [19th] Germany developed an approach which they called *naturalphilosophen*. These natural philosophers questioned whether the objectivity that scientists took pride in was actually possible. These philosophers stressed that the world should be approached as a unified whole with humans integrated within the natural world. They believed that science, with its stress on objectivity was headed in the wrong direction. *Naturalphilosophen* was surpassed by science and its goal of objectivity. It is interesting to note that with the advent of quantum mechanics in the field of physics, scientists recognized that their presence has an impact on measurement and that true objectivity is not possible.

During the nineteenth [19th] century there still continued to be theological discussion of the findings of science. The findings of men like geologist Charles Lyell had direct theological

⁹¹ Patricia Fara, [Ibid] 197

⁹² John Gribben, [Ibid] 359

implications as they seemed to contradict Biblical teachings about the age of the earth. The same was true of Darwin's proposal that natural selection explained evolution. The work of these two men suggested that Creation was not in the static state that the church to this point had assumed that it was. Creation, it seemed, was dynamic, changing and constantly in flux. Theologians either rejected this outright, or struggled to re-interpret their beliefs in the light of these findings. In their struggles to use the same tool of reason that was used by scientists, theologians largely left out of their discussions any sense of mystery. When a sense of the mystery of God is deleted from the faith, then the importance of the Holy Spirit in Creation has to be by-passed because it is not seen as reasonable. By the early twentieth [20th] century, attempts to address the natural world had largely been abandoned by theologians as they turned away from the book of the natural world to the Book of Revelation. Science and theology were viewed as separate fields of endeavor by many.

During the nineteenth [19th] century science in Britain was clearly allied with commercial interest. Germany took a different approach. German universities started to build laboratories supervised by a dominant professor. By the 1870's Germany dominated scientific knowledge. In North America graduate schools for scientific study started at the end of the nineteenth [19th] century and The United States became a major scientific power. By the end of the Victorian period science was enmeshed in all aspects of society.⁹³ It became a part of government, educational, economic structures and warfare and so it remains to this day.

The nineteenth [19th] century also saw the findings of science grow in a large way. There were significant advances in many areas. A partial list of accomplishments must include James Maxwell's unification of electricity and magnetism into a theory of electromagnetism. The work of Lord Kelvin on friction and motion with heat as the result led to the field of

⁹³ Patricia Fara, [Ibid] 242

thermo-dynamics. Joule's work on energy led him to believe that all forms of energy were one and the same and could be connected. The discovery of cathode rays and x-rays caused excitement at the turn of the twentieth century [20th]. The Curies subsequently explored the whole subject of radioactivity. The theory that matter was composed of atoms was proposed at the beginning of the nineteenth century [19th] by Dalton and electrons and a nucleus were identified by J.J.Thompson in the early twentieth century [20th]. The periodic table of elements was introduced to the field of chemistry in 1871 by Mendeleev. The discovery of radio waves transformed communication. There were many and varied advances in medicine with vaccinations being a major breakthrough. The field of astronomy was transformed by the building of huge telescopes and the introduction of photography that showed the vastness of space. With these tools astronomers were able to determine the composition of stars. The life sciences incorporated the work of Darwin and Lyell.

When we look back on this period it can be seen that science, and physics in particular, was moving towards a greater generality and deeper unity in its understanding of the concepts of the natural world. For example, Newton had identified two variables in nature- matter and motion. In the nineteenth [19th] century these were generalized to mass and energy which included motion. Magnetism and electricity were collapsed into a theory of electromagnetism. But science was about to undergo a profound change from the mechanistic world that Newton had demonstrated. The certainty that characterized Newtonian, or classical science, was about to give way to uncertainty about the natural world. The beginning of the twentieth [20th] century saw one major issue in science that was still unresolved –was light a particle as Newtonian physics had suggested or was it a wave? It was around this issue that a whole new way of scientific thinking developed in the early twentieth [20th] century.

2.4 Science in An Age of Uncertainty [1905-]

Science until the end of the nineteenth [19th] century was based on a mechanistic materialism, according to Paul Davies and John Gribben.⁹⁴ They characterize this as the belief that "...the physical universe is nothing but a collection of material particles in interaction, a giant purposeless machine in which the human body and brain are unimportant and insignificant parts."⁹⁵ "Gone", say Davies and Gribben, "were the ancient notions of the cosmos as a living organism imbued with mystical purpose."⁹⁶ A sense of the Holy Spirit had no place in this deterministic view of the world. But science was about to undergo a major change and this change would create room for the Holy Spirit.

The first major breakthrough of the twentieth [20th] century was undoubtedly Einstein's proposal of first the theory of special relativity and later the general theory of relativity. Einstein's theory of relativity continued the trend of moving towards an understanding of the more general and deeper unity in nature. Mass and energy were no longer seen to be separate entities but were equivalent to each other. [It seems that naturalphilosophen was right!] His theory related light and gravity, time and energy.⁹⁷ Einstein's mathematical formula, which was later demonstrated experimentally, marks a time when physics moved from a world that could be touched and seen to the use of mathematical formulas to explain the unseen atomic and sub-atomic world. Physics also began to move from a rigid view of the laws of the universe to the realization that the universe was flexible and dynamic.

It was in the field of energy and matter on the atomic and sub-atomic levels that science made great progress and yet created great confusion in the early twentieth [20th] century.

Thompson had demonstrated that atoms were divisible and that they had electrons. Rutherford

⁹⁴ Paul Davies and John Gribben, *The Matter Myth* [New York: Simon and Schuster Paperbacks, 1992] 8

⁹⁵ Paul Davies and John Gribben, [Ibid] 12

⁹⁶ Paul Davies and John Gribben, [Ibid] 12

⁹⁷ John Longone, Brian Stutz, Andrea Gianopolus, [Ibid] p.218

went on to show that atoms also have a nucleus surrounded by a cloud of electrons and that atoms are mostly empty space. Niels Bohr imposed order on these electrons by suggesting that each electron occupies its own orbit. The structure of the atom revealed more and more particles during the twentieth century. Studying the structure of the atom required expensive equipment like cloud chambers and particle accelerators. Physicists have finally arrived at the Standard Model for particles that identifies two kinds of particles - quarks and leptons. "Quarks are the constituents of protons and neutrons and others. Lepton refers to all particles that are not quarks, like electrons and neutrinos. In all there are twelve kinds of particles, held together by four forces - gravity, electromagnetism strong and weak nuclear forces"⁹⁸

The development of quantum physics in the 1920s saw further radical ways in which the world was viewed. Quantum physics described the sub-atomic world in ways that did not relate to our experiences of reality and called ideas of rationalism and determinism into question. They were such a departure from commonly held beliefs that Einstein refused to accept some of their premises. Quantum theory was postulated by Max Planck in 1900. It was refined by others like de Broglie, Heisenberg and Schrodinger into what came to be known as quantum mechanics. This is a mathematical means of describing that the motion and interaction of particles can also be described as waves. Heisenberg introduced the idea that there is uncertainty at the sub-atomic level. We cannot measure the momentum of a particle if we know its position. The two cannot be determined at the same time. Non-locality is another feature of quantum mechanics that is counter-intuitive. It suggests that if particles have interacted with each other, they will still be affected by each other, no matter what their location. Quantum theory has been integrated with the theory of relativity and has proven to be true in numerous practical applications, but it has not yet been related to gravity. A reporter attending a major

⁹⁸ Lee Smolin, *The Trouble with Physics*. [Boston: Houghton Mifflin Company, 2006] 12

conference in 1925 where many of these ideas were presented had this to say about quantum theory;

The layman, without knowledge of higher mathematics, listening to Dr. Heisenberg and those who discussed his conclusions would have decided that this particular section of the British Association is composed of quiet, and polite but determined lunatics, who have created a wholly illusory mathematical world of their own.⁹⁹

Physicist Lee Smolin points out that there are unresolved problems with both the theory of relativity and quantum mechanics. “The mind calls out for a third theory to unify all of physics, and for a simple reason. Nature is in an obvious sense ‘unified’. The universe we find ourselves in is interconnected, in that everything interacts with everything else.”¹⁰⁰ A solution to this problem was proposed with the formulation of string theory which was thought to unify all the particles and forces in nature.

String theory was proposed in 1970s by Leonard Susskind. It has since become far more complex and seems to involve more than one theory. String theory suggests that at the heart of all matter are infinitesimally small vibrating strings. Particular particles are composed of strings that have distinctive vibrations. Strings at very low energy would form matter. The theory suggests that these strings vibrate in ten dimensions. Other peculiarities of string theory are landscapes, branes as well as multiple universes and super symmetry. “Branes,” according to physicist Lisa Randall “are membrane-like objects in higher dimensional space that can carry particles [strings] and confine particles and forces.”¹⁰¹ String theory also suggests that there are multiple universes and that there could be parallel universes. Our universe could exist in much larger universe or could be a holographic image of another universe. To add to this mix

⁹⁹ Byron Wall, [Ibid] 355

¹⁰⁰ Lee Smolin, [Ibid] 4

¹⁰¹ Lisa Randall, *Warped Passages: Unraveling the mysteries of the Universe* [New York: Harper Collins, 2005] 460

Leonard Susskind has added the concept of landscapes. What does he mean by this? He says a landscape “denotes a mathematical space representing all the possible environments the theory allows.” Susskind points out that while landscape is a mathematical construct only, it allows for a seemingly limitless list of possible environments.¹⁰² String theory involves complex mathematical computations which puts it in the reach of only a limited number of experts. It has not yet been proven experimentally, although a good deal of hope is being placed on the Large Hadron Collider to do just that. String theory is not the only attempt at a unified theory. Gravitational Loop Theory has also been proposed as a unifying theory.

This move towards unity in an understanding of the world is a thread that has been seen throughout the development of science. Newton’s work included the work of Galileo and Kepler. Maxwell’s work united electricity and magnetism. Chemistry was unified by the introduction of the periodic table. Einstein’s work united energy and matter. Quantum mechanics united electromagnetism and atomic theory. Special relativity and quantum mechanics have been united and so have electromagnetism and weak nuclear theory. All of these are important accomplishments but scientists have not yet given the world one unified theory.

Not only has the twentieth [20th] century seen changes to existing branches of science but it has also seen the growth of new fields of endeavor. Such a field is cosmology, which grew out of astronomy and physics. Cosmologists are concerned with origin and overall evolution of the universe. It is a field that flew in the face of conventional scientific wisdom that said that earth had no beginning. The Catholic priest, Georges LeMaitre [1984-1966], developed an idea that he called the Primeval Atom or Cosmic Egg. He suggested that all

¹⁰² Leonard Susskind, *The Cosmic Landscape- String Theory and the Illusion of Intelligent Design* [New York: Little, Brown and Co., 2006] 129

matter in the universe was initially in one lump, like a super-atomic nucleus, which exploded and fragmented. This theory was derided by many and derisively referred to as the 'Big Bang'. That changed after 1965 with the discovery of background radiation which confirmed the theory. The term has come to describe the moment when the expansion began or it can be used to refer to the expansion which is still taking place. It is said that the universe began from a singularity, a gathering of everything in the universe to a point so small that it had no dimensions. "In a single blinding pulse, a moment of glory much too swift and expansive for any form of words, the singularity assumes heavenly dimensions, space beyond conception."¹⁰³ In the first few minutes after the expansion of the singularity, all matter, the forces of nature, space and time as well as the laws of physics themselves were produced. Cosmologists do not know what caused the singularity in the first place but this is a hotly pursued question. Some scientists, like Stephen Hawking, are trying to argue that the world did not have a beginning, but it is now a generally accepted theory.

One of the interesting effects of the 'Big Bang' is that it resulted in producing conditions that are just right for life to exist. It is a principle that says that "the universe is a fine-tuned thing."¹⁰⁴ There are twenty [20] constants in nature that have been identified as being necessary for the universe to exist. These constants are referred to as the Anthropic principle. Some examples of the Anthropic principle are, if gravity was just a tiny fraction stronger or weaker, stable elements may never have formed or the universe may have collapsed in on itself. If the expansion had been too rapid, the material of the universe would never have coalesced into stars and planets. Carbon, oxygen and other elements were there in 'just right'

¹⁰³ Bill Bryson, *A Short History of Nearly Everything* [Canada: Random House, 2003] 10

¹⁰⁴ Leonard Susskind, *The Cosmic Landscape- String Theory and Illusion of Intelligent Design*. [New York: Little and Brown, 2006] 129.

proportions for life to develop. It is fair to note that many physicists do not like this theory and resort to the multiverse, or many worlds, theory as a way of explaining these constants.

Cosmology is not the only new field of study in the sciences. A new field of study has developed around the whole area of complex systems. Computer modeling has permitted the study of complex systems and this has led to the realization that systems often behave in ways that are more than the sum of their parts. There seems to be a drive in nature towards ever increasing complexity in systems that points the way towards holism. Polkinghorne points out “that at the macroscopic level systems display astonishing and wholly unexpected powers of self-organization spontaneously generating remarkable holistic patterns of long- range dynamical behavior.”¹⁰⁵

Related to the study of complex systems is the field of chaos theory. The Oxford dictionary defines chaos theory as “the mathematical study of complex systems whose development is highly sensitive to small changes in conditions, so that slight changes can give rise to strikingly great consequences.” Examples of chaos theory can be found in weather systems where the presence of chaos makes the effects of these systems very hard to predict. Chaotic systems display a kind of ordered disorder that is not yet well understood. There may laws governing complex systems but these are not yet known.

In the past few years physicists have proposed another theory, called information theory, which promises to have long-range effects on the study of physics. The Oxford dictionary defines information theory as “the mathematical study of the coding and transmission of information in the form of sequences of symbols.” Some physicists, John Wheeler and Gerald Schroeder for example, suggest that things, such as matter and radiation, should be viewed as manifestations of something more basic. Information - where a particle is,

¹⁰⁵ John Polkinghorne, *Theology in the Context of Science* [New Haven: Yale University Press, 2009] 119

whether it is spinning one way or the other and so on -forms an irreducible kernel at the heart of reality, according to these physicists.¹⁰⁶ Gerald Schroeder goes as far as to say, “Every particle, every being from atom to human, appears to have within it a level of information, of conscious wisdom.”¹⁰⁷ Some physicists are predicting that the sciences of complexity, chaos and information will create the next revolution in science.

Information theory has been the key in the development of computer sciences. Computer scientists are extending their knowledge to encompass the whole universe. Seth Lloyd has made the statement that the whole universe is a computer and he makes it clear that he does not mean this in a metaphorical sense. He suggests that since the time of the Big Bang particles have been colliding with each and taking bits of information from each other and in a sense, computing.¹⁰⁸ The developing fields of complexity, chaos, and information theory have been accompanied by a shifting away from a model of reductionism that has characterized physics to a more holistic model. This model is called emergence.

Paul Davies and John Gribben make the interesting suggestion that another radical idea has been introduced to physics with the collapse of Newtonian linearity. They say that the whole idea of what constitutes matter has radically changed and that we now have “come to the point where matter has been reduced from its central role to be replaced by concepts such as organization, complexity and information.”¹⁰⁹ Another major change has come to physics with the advance of String theory. String theory is a very elaborate mathematical construct that has not yet been proven experimentally. String theorists continue to follow the mathematics, in spite of the lack of proof for their theories. They put their faith in the belief that mathematics

¹⁰⁶ Brian Greene, *The Hidden Reality* [New York: Alfred A. Knopf, 2011] 239

¹⁰⁷ Gerald Schroeder, *The Hidden Face of God* [New York: Simon and Schuster, 2001] xi

¹⁰⁸ Seth Lloyd, “The Computational Universe” in *Information and the Nature of Reality*, ed. Paul Davies and Niels Henrik Gregerson [Cambridge: Cambridge University Press, 2010] 103

¹⁰⁹ Paul Davies and John Gribben, [Ibid] 15

not only describes reality, but is the reality. In the course of doing this they have moved science to the realm of metaphysics where they meet their cousins, the theologians.

The many accomplishments of science during the twentieth [20th] century have been marred by the use to which its findings have been put. John Gribben says that science is essentially impersonal and it involves the search for absolute, objective truths.¹¹⁰ This may be true in theory, but when the findings of science become the hand-maidens of politics and large industry and are further separated from any sense of the sacramental nature of Creation, as has happened in the twentieth [20th] century, then there is enormous potential for harm.

Unfortunately a good deal of this potential for harm has been realized in the last century. Chemical knowledge has been used to produce poisonous gases and harmful pesticides. Atomic theory has made possible the destructive force of atomic and nuclear bombs. Science has devised many practical applications that have wrought environmental destruction. All of these examples of the harm that has come from science must, of course, be weighed against the good that has come from advances in areas like medicine. Nevertheless the optimism about the future that characterized the nineteenth [19th] century and was buoyed by scientific discoveries has largely disappeared. Science is not as impersonal as it first appears. It is legitimate to speculate whether the loss of a sense of the sacramental aspect of nature that accompanies the loss of connection between the Holy Spirit and the natural world, has robbed science of its moral and ethical base.

Only a small sampling of the great discoveries of science have been mentioned, but it can be seen from those that are mentioned that science is without doubt one of humankind's great achievements. The attempts of science to describe reality have benefited all of us. But is there another way to describe reality? Christian theology also claims to describe reality and we

¹¹⁰ John Gribben, [Ibid] 614

would expect that if there is truth in both the scientific and theological descriptions of reality then we should find that they will not be mutually exclusive, but that at some deep level they point to each other. In Part three, the ways in which science and religion can relate to each other will be explored. Part three will also take a more detailed look at some of the findings of science that might relate to Christian theology, and in particular the Holy Spirit. The question is, do the findings of science exclude the Holy Spirit or do they make room for it?

Part Three

1. How Science and Religion Relate to Each Other

There have been a number of theories advanced as to how theology and science might relate to each other. They are pertinent to our efforts to relate the Holy Spirit to the natural world, so several will be examined.

Scientist Ian Barbour has identified four ways in which science and theology can relate.¹¹¹ The first way is conflict. This theme did not become apparent until after the work of Charles Darwin, and then not immediately so. Many theologians supported the work of Darwin, but the revival of Biblical literalism set those who believed in a literal reading of scripture against the findings of biologists and geologists. This dispute continues in some quarters. Lee Smolin gives an extreme example of this conflict when he recounts meeting a group of students from a Bible college when they were returning from Africa where they had been searching for the dinosaurs they claim are still alive and living in caves in Africa. In their eyes, fossil remnants are much more recent.¹¹² At the other extreme of this conflict are scientists, like Steven Weinberg, who says, “The more the universe seems comprehensible

¹¹¹ Ian Barbour, *When Science Meets Religion - Enemies or Strangers or Partners?* [New York: Harper Collins, 2000] 10

¹¹² Lee Smolin, [Ibid] 25

the more it seems pointless.”¹¹³ Other examples of this point of view are readily available in the scientific community. They include biologist Jacques Monod and cosmologist Carl Sagan. Essentially those in these two camps are claiming that they are describing two different realities.

The independence of science and theology is another way that Barbour suggests. While those in this group would not be in conflict with each other, they see science and theology as operating in two separate domains. In this group would be those who say science and theology are two separate languages which perform two separate functions. Scientific language is used for control and prediction and theological language is used to recommend a way of life. Karl Barth and Langdon Gilkey are two theologians who would support this view.

Dialogue is the third way that Barbour suggests that science and theology relate to each other. Proponents of this approach think that science and theology would be describing the same reality. According to Barbour, those who hold this position emphasize similarities in “presuppositions, methods and concepts.”¹¹⁴ The presuppositions would include recognition of the role of Christianity in the development of science and also boundary questions that propose questions that science cannot answer. It would include parallels in methods such as the use of models. The place that creative intuition plays in science, which many scientists report as being part of their major discoveries, is another possible place of dialogue between the two.

A fourth way is the view of integration. Those who follow this way claim that there is only one reality and that each discipline deals with different aspects of the same reality. Since

¹¹³ Paul Davies, *The Mind of God* [New York: Simon and Schuster, 1992] 194

¹¹⁴ Ian Barbour, [Ibid] 6

what they say has to be measured against the same reality, then there should be a measure of possible understanding between the two. According to Barbour, although the main sources of theology lie outside of science, the findings of science might strongly affect the reformulation of doctrine, as has been the case with the theory of evolution and the Big Bang theory. How the church has viewed the doctrine of creation has been changed by the Big Bang theory and the theory of evolution.

Perhaps the best known advocate of this position from a theological point of view is Wolfhart Pannenberg who holds the view "... that if God is the all-determining reality, then all of reality ought to contain a further and theologically relevant dimension and theology should be able to lay theological claim to the investigations of all the sciences."¹¹⁵ At the extreme end of this group would be physicist Frank Tipler who feels that theology ought to be a branch of physics.

Physicist and theologian John Polkinghorne proposes a simple categorization of the ways that science and theology could interact which he calls consonance and assimilation. If consonance exists, then science and theology retain their autonomies in their own domains but are capable of appropriate reconciliation with each other where their domains overlap. In assimilation, a maximum possible conceptual merging takes place.¹¹⁶

Philosopher Ken Wilber proposes yet another categorization of the ways in which science and theology can interact. He proposes five categories the first of which is science denies theology. This is a very commonly heard stance today and we hear it espoused by Richard Dawkins, Steven Weinberg, and Francis Crick, among others. Theology and religion are presented as harmful relics of a superstitious past. In the second category theology denies

¹¹⁵ Carol Rausch Albright, and Joel Haugen, ed. *Beginning With the End/ God, Science and Wolfhart Pannenberg* [Chicago: Open Court, 1997] 1

¹¹⁶ John Polkinghorne, *Science and Theology* [Minneapolis, Minn.: Fortress Press, 1998] 22

the findings of science. A third category suggests that science and theology deal with different realms of being and can co-exist peacefully. Science deals with lower realms of matter and body and theology deals with higher realms such as soul and spirit. They are both part of the big picture of reality. A fourth category takes a different approach; it says that science offers arguments for Spirit's existence. An example would be citing the Big Bang as needing a creator. It is a theology of nature which claims that a revealed spirit is used to interpret the findings of science. Wilber's fifth category says that science is only one way of knowing the world, and is no more valid than poetry or art.¹¹⁷

The approach taken in this paper will be Wilber's category that suggests that a revealed spirit can be used to interpret the findings of science. The ways that the Holy Spirit has been revealed in scripture, tradition and the newer theologies have been examined and some major findings of science, particularly in the last one hundred years, have been explored. It remains to be seen if what we know of the Holy Spirit can be related to the findings of science in a way that will demonstrate that the natural world and the Holy Spirit are interwoven. Understanding that a relationship exists between some of the findings of science and the work of the Holy Spirit will help to regain a sense of the sacramental nature of Creation and is a means of connecting the Holy Spirit with Creation.

2. Connecting the Holy Spirit and Scientific Findings

2.1 The beginning of Creation

A number of things characterize the work of the Holy Spirit at the beginning of Creation. These include Creation *ex nihilo*, relationality, love, kenosis, universality, freedom, life giving and Creation as an expression of the will [mind] of God. Each of these will be examined in turn, together with those findings of science that may be related.

¹¹⁷ Ken Wilber, *A Theory of Everything* [Boston: Shambala, 2000] 60-62

Central to this discussion is the question of whether Creation had a beginning. Christian tradition says that Creation does have a distinct beginning although it is generally understood that the idea of beginning cannot be applied to the Holy Spirit since God exists outside of time. In science, it has generally become the accepted theory that the Universe had a distinct beginning in the Big Bang. At the time of the Big Bang, all the basic elements of Creation came into being: time, space, matter, energy, the four gravitational forces, the laws of physics and mathematics. All of this occurred from a singularity which physicist Paul Davies describes as “the nearest thing science has found to a supernatural agent.”¹¹⁸ Christians would say that the supernatural agent is of course, God. Christianity developed the idea of Creation from nothing, *ex nihilo*, which suggests that a material universe came into being as an act of the will of God through the work of the Holy Spirit. In this view, God exists apart from Creation but is not excluded from acting within Creation. Some congruity can be seen between the Big Bang theory and the Christian view of Creation.

Christianity, particularly in its articulation of the triune Godhead, says that relationality is built into the fabric of the universe. Quantum mechanics, with its theory of non-locality, [the Einstein – Podolsky - Rosen effect] says that particles that have interacted with each other will continue to do so regardless of the space that separates them. This clearly demonstrates that relationality is built into the fabric of the universe, from a scientific point of view. John Polkinghorne says that, “Science has discovered remarkable degrees of relationality present in the physical world at all levels from subatomic to cosmological.”¹¹⁹ Paul Davies claims that, “the world is not a collection of separate, but coupled things, rather

¹¹⁸ Paul Davies, *God and the New Physics* [New York: Simon and Schuster, 1983] 55

¹¹⁹ John Polkinghorne, *Theology in the Context of Science* [New Haven: Yale University Press, 2009] xxii

it is network of relations.”¹²⁰ Quantum theory has been extended to quantum field theory which suggests there is a mathematical framework for the particles of nature and the forces of nature. This framework describes a world of shadowy particles in a teeming vacuum. According to Davies, “it creates an image of a universe crisscrossed by a net-work of interaction that weaves the cosmos into a unity.”¹²¹ There is a good deal of consonance between the findings of science and the relational aspect of the Christian faith.

Christians subscribe to the revelation of scripture that God is love. It can be imagined that the Big Bang is an outpouring of God’s love that resulted in the spirit/matter of the universe. One of the consequences of love is the freedom of the beloved. Tracings of freedom are to be seen in the world revealed by science. The quantum world is a sharp break with the deterministic findings of Newtonian science. Uncertainty is one of the principles of quantum theory. Heisenberg proposed that atoms can behave as both wave and particle, but not at the same time. He further suggested that if you know the position of a particle you cannot know its speed and vice versa. Quantum physicist Paul Dirac went on to propose that until an observer tries to measure the position or speed of a particle, the particle is a ‘ghost.’ Paul Davies puts it this way:

The old physics linked all events in a tight chain of cause and effect. But on the atomic level the linkage turns out to be loose and imprecise. Events occur without well-defined causes. Matter and motion become fuzzy and indistinct spontaneous random fluctuations in the structure of matter and even spacetime inevitably occur.¹²²

It can be seen that both the uncertainty principle and the need for an observer introduce the possibility that freedom for the Holy Spirit to maneuver exists in the quantum world.

¹²⁰ Paul Davies, *God and the New Physics* [New York: Simon and Schuster, 1983] 112

¹²¹ Paul Davies and John Gribben, *The Matter Myth* [New York: Simon and Schuster Paperbacks, 1992] 235

¹²² Paul Davies and John Gribben [Ibid] 5

Another consequence of love is introduced in the idea of kenosis introduced by process theologians and also Jurgen Moltmann. Kenosis suggests a God who self-limits in order to allow the world maximum freedom to develop in its own way. It gives God's freedom, through the Holy Spirit, a place to act in the processes of the world although it recognizes that God is not in control of all of the processes of the world. Polkinghorne sums this up by saying, "God allows the whole universe to be itself. Each created entity is allowed to behave in accordance with its nature, including the due regularities which may be part of that nature."¹²³ Kenosis as a descriptor of the Holy Spirit can also be related to natural selection which seems to proceed randomly but may do so as a result of the self-limiting of God.

The universality of the Holy Spirit is a characteristic that is accepted by Christians as a part of revelation. There are certain universals also present in the findings of science. The laws of physics are a universal accepted by science but science has not answered the question of the origin of these laws. Indeed, it seems beyond the scope of science to answer questions about the origins of the laws of physics. Davies describes the laws of physics as absolute, universal, depending on nothing else, eternal and omnipotent.¹²⁴ It is interesting that these are also descriptions that we attribute to God. Many scientists, however, accept the presence of laws as a brute fact and accept that they came into being with the Big Bang.

The scientist expresses these laws of the universe mathematically. Mathematics is a language that is universal but where did mathematics come from? Does it exist independently

¹²³ John Polkinghorne, *The Faith of a Physicist* [Minneapolis, Minn. Fortress Press, 1996] 81

¹²⁴ Paul Davies, *The Mind of God* [Ibid] 84

of mathematicians who discover it or does the mathematician discover it? Mathematician

Roger Penrose says,

There often does appear to be some profound reality about mathematical concepts, going quite beyond the deliberations of any particular mathematician. It is as though human thought is being guided by some eternal truth ...¹²⁵

It is quite legitimate to ask the question, as some have done, is God a mathematician?

Stephen Hawking asks a further question when he says, “what is it that breathes fire into the equations”?¹²⁶ Christians would answer that it is the Holy Spirit who breathes fire into the equations which express the laws of nature.

A further characteristic of the work of the Holy Spirit that was present at the beginning of Creation is that Creation is seen as a result of an act of the will of God. God chose, through the work of the Holy Spirit, to make this world and not another one. It is a deliberate act coming from the mind of God that resulted in a rational world. Does science point to evidence of mind? The laws of physics and the mathematics that describes these laws would lead one to conclude that Creation had been rather well thought out but that is not the only evidence of mind in Creation. The Anthropic principle which details the constants of nature, as mentioned in the previous section, also points to the evidence of mind. Physicists who do not like the Anthropic principle have adopted a many worlds theory to explain the almost too good to be true coincidences of the Anthropic principle. Many worlds theory is currently just as beyond proof as is the suggestion that the Anthropic principle points to the mind of God.

It has been noted that the universe seems to operate on quantum principles. One of the principles of quantum theory is that the presence of an observer is necessary if the mysteries

¹²⁵ Paul Davies, [Ibid] 142

¹²⁶ Stephen Hawking, *A Brief History of Time* [New York: A Bantam Book, 1988] 174

of the sub-atomic world are to reveal themselves. This leads to the question of whether or not the universe itself needs an observer to come into existence. Could this observer be the Holy Spirit, the active force of the mind of God?

A fruitful suggestion of the presence of mind in the universe comes from information theory. Beneath the smallest particles, energies and forces of the universe seems to lay the concept of information. John Polkinghorne posits:

...a physical world within whose open grain it would be fully conceivable that the God who is the world's creator is providentially at work through the input of active information into its unfolding history in a manner that operates non-interventionally within the grain of nature rather than intervening against it.¹²⁷

If Polkinghorne is correct, information is an avenue where the Holy Spirit could work in the natural world. He is not alone in this view. Jewish Physicist and biologist Gerald Schroeder states it bluntly when he writes, "Wisdom, information, an idea, is the link between the metaphysical creator and the physical Creation. It is the hidden face of God."¹²⁸ This interpretation of information is further supported by physicist Freeman Dyson who says:

Atoms are weird stuff, behaving like active agents rather than inert substances. They make unpredictable choices between alternate possibilities, according to the laws of quantum mechanics. It appears that mind, as manifested by the capacity to make choices, is to some extent inherent in every atom. The universe is also weird, with its laws of nature that makes it hospitable to the growth of mind. I do not make any distinction between God and mind. God is what mind becomes when it has passed beyond our scale of comprehension.¹²⁹

Paul Davies supports these ideas when he says, "...the entire physical universe may be the medium of expression of the mind of a natural God."¹³⁰ These physicists certainly seem to

¹²⁷ John Polkinghorne, *Exploring Reality- The Intertwining of Science and Religion* [New Haven: Yale University Press, 2005] 36

¹²⁸ Gerald Schroeder, *The Hidden Face of God* [New York: Simon and Schuster, 2001] 49

¹²⁹ Gerald Schroeder, [Ibid] 7

¹³⁰ Paul Davies, *God and the New Physics*, [Ibid] 223

support the concept that the mind of God is closely knit into the fabric of Creation. If this is true, then another avenue for the maneuvering presence of the Holy Spirit in Creation is open.

Some scientists have proposed that the universe is a giant computer. If this theory holds, then another possible application of the concept of information as a building block of the universe is open to us. Information lies at the heart of computers. Does it also suggest the need for a programmer, at early stages of the development of the universe? The concept of information clearly has rich metaphysical implications.

The Holy Spirit is also characterized at the beginning of Creation as life-giving. Since this paper has been confined to the physical sciences, exploration of the life-giving consonances between life sciences and theology will not be addressed. Consonances between those things that characterize the Holy Spirit at the beginning of Creation and the findings of science have been identified. But what about the characteristics of the Holy Spirit in ongoing Creation? Do these also have parallels in the findings of science?

2.2 Ongoing Creation

The Holy Spirit has been identified as working in particular ways in ongoing Creation. It used to be felt that that Creation was a one-time only event that was unchanging and static. Primarily from the influences of the understandings brought to theology from the findings of science, it is now recognized that Creation is ongoing. It is therefore logical to conclude, unless one is a Deist, that the Holy Spirit will continue to be present in nature. Naturally all of those markings of the Holy Spirit that were present at the beginning of Creation, continue to be present, but other characteristics can be added. These include the ordering of Creation, the preserving of Creation, as initiator of the new in Creation, the healing power of the Holy Spirit, the dynamism of the Holy Spirit and the activity of the Holy Spirit in the processes of nature. Each of these can be linked to the findings of science.

For many people, one of the main proofs of the existence of God is the wonderful order and diversity of the natural world. As St. Paul says, “Ever since the Creation of the whole world, God’s invisible nature, namely his power and deity, has been clearly perceived in the things that have been made.”[Rom1.20] The whole development of science has rested on the assumption of the orderliness of the natural world. Orderliness has been shown to be something that is emergent in the universe. There is a regularity and ordered hierarchy in the natural world that is partly the result of the constraints of the laws of physics, but is also a reflection of complexity theory. There seems to be a consistent emergence of order that is more than the sum of the parts from which it spontaneously emerged. This emergence is something that is not predictable on the basis of the laws of physics. It appears to point towards a drive for holism in the universe. In this orderliness and drive for holism can be detected arenas where the Holy Spirit may be at work.

It has been identified that the Holy Spirit has been spoken of as the initiator of the new and novel in Creation. Science has demonstrated in a number of ways that we live in a world that is truly becoming. Certainly the theory of evolution points in this direction. Chaos theories, together with complexity theory, provide other examples of ways in which novelty enters Creation. Polkinghorne says, “Together they provide an interlacing of order and disorder that is precisely what seems to be needed for the creative emergence of novelty.”¹³¹ God’s human Creations have joined in the work of creating the new and novel and seem to have been singularly equipped to do so. The fields of art, literature and music are testimony to this creativity, as is the work of science.

The Holy Spirit has a preserving function in the natural world. The preservation of the world can be seen as an expression of God’s interest in the world. God’s faithfulness to the

¹³¹John Polkinghorne, *Exploring Reality-The Intertwining of Theology and Science* [Ibid] 27

world can be seen in the Noahic covenant. Preservation can be seen in the laws that govern the natural world and in the constants of nature, without which the world would not have survived. Left to itself, there is a balance in nature that seems to preserve it.

The Holy Spirit is portrayed as dynamic movement and this is evident in the natural order where we see the development of the new and novel. Dynamism is a concept introduced to science when Einstein proposed his theories of general and special relativity. Relativity suggests that the affairs of matter cannot be separated from time and space. The rigidity of space and time were abandoned in favor of a flexible, dynamic view of the space-time continuum. Dynamism is also seen in complex systems where there is a spontaneous emergence of more complex hierarchies. The existence of constrained chaos also is a demonstration of the dynamic flow that seems to be inherent in nature. The energy that flows so freely throughout the universe is another example of dynamism in nature that can be compared to the dynamic action of the Holy Spirit.

Scripture and tradition claim a healing power in the Holy Spirit. It is made clear that this healing will be applied to the natural world. The redemption that Christ promises extends to the universe. Because there is so much suffering in the natural world, the promise of this healing is important. It can be observed that the world seems to hold within itself great powers of healing. A recent television program showed the seemingly miraculous healing that had taken place on Mount St. Helens since the volcanic eruption a number of years ago. New growth is healing the damage done by the volcano. It is not illogical to see the work of Holy Spirit in this healing, perhaps working at the level of information.

Process theology is based upon the understanding that God is deeply involved in the processes of the world in a self-limiting way. The information theories, complexity and chaos theories as well as the indeterminacy that is a feature of quantum mechanics, can all be

viewed as examples of how the Holy Spirit might be involved in the processes of the natural world.

2.3 The Impact of String Theory

Attention is turned to String theory which was described in Part Two. String theory has some interesting parallels with Christian faith as a whole, and the Holy Spirit in particular. Since String theory has yet to be proven, these parallels may well fall by the wayside [it is one of the perils and a very real one of trying to relate the findings of science and theology.]

The question of how the Holy Spirit might interface with matter is central to our exploration of a possible relationship between the Holy Spirit and the natural world. If matter in its smallest form is vibrating strings of energy, then it is not difficult to imagine that the source of the movement might be the Holy Spirit. Gregory's image of the Holy Spirit as the harpist and Creation as the harp is a helpful way to think of matter and Spirit interface. Teilhard de Chardin guessed that when he said, "Without any doubt there is something which links matter and spiritual energy and makes them a continuity."¹³² String theory provides an explanation of what de Chardin had guessed. Here we have a theory that provides a seamless transition from spirit to matter. Matter and spirit are fully interpenetrated in string theory. We have a basis in string theory for using the term spiritmatter and an avenue for the Holy Spirit to be fully present in the natural world.

Questions of whether God is immanent or transcendent or some combination of both, have occupied theologians from the earliest days of the Christian faith. String theory provides a mechanism whereby both are equally valid. A hint of how God can be both transcendent and immanent is seen in the theory of branes and strings. Surely a brane gives us a way to speak of God as a part of the web of existence that supports everything and in strings God,

¹³² Teilhard de Chardin, [Ibid] 87

through the power of the Holy Spirit, becomes a part of all reality, including ourselves. String theory allows us a holistic concept of God - a concept of a God who is present to the universe in the widest possible sense but also present in the processes of nature in a very real and intimate way.

Christians believe that God is not only present in the world but also is a God who loves and cares for what has been created. Love has always been a puzzle. If God is the source of love, indeed, we believe that God is love, how does love become active in the world? Where did the idea that God should be equated with love originate? Is it, in fact a particular harmonic of the Holy Spirit that lies at the heart of matter? Do particular vibrations of the strings that constitute matter produce love? Is the opposite true as well? Is the source of evil vibrations of discord caused by an over-riding of the Holy Spirit which will always be possible because God is committed to freedom in Creation? If it can be imagined that particular vibrations of the strings that constitute matter produce love, then it doesn't require much further imagination to postulate that other ideals of the Christian faith like justice, equality, inclusiveness, peace and grace to name a few, might also be the result of the Holy Spirit acting upon the strings to produce a particular vibration.

Christians have been admonished by Jesus that prayer is important, but again it seems like a mysterious thing. Why should we do it and does it have a result? Marcus Borg says that prayer is concentrating God. In traditional terms this makes little sense, but if we view prayer in the light of string theory we see another way to look at prayer. When we pray are we affecting the Holy Spirit's interactions with vibrating strings? The Christian faith puts a good deal of emphasis on the importance of community. Is prayer more effective when two or more are gathered to pray because two or more have an increasing effect on the Holy Spirit?

Mysticism, the idea that some people are able to achieve union with God in this life, is another area of Christian belief and practice that doesn't seem so mysterious when we look at it from the point of view of string theory. Do some people [or perhaps all people] have an ability to attune the vibrations that are part of their being to the vibrations of the Holy Spirit? Are mystics more able to become aware of the "cosmic symphony," as string theorist Brian Greene refers to the universe?¹³³

Miracles form a significant part of Christian scripture. A huge amount of time and energy has been spent in trying to explain away miracles, or redefine them in terms of our rationalistic expectations. The miracles of scripture seem positively pedestrian when read in the light of string theory, information theory and quantum mechanics. Can resurrection and transfiguration be understood as the work of the Holy Spirit involving different dimensions? Can death, which plays such an important role in evolution, be understood in terms of transitioning to different dimensions or parallel universes?

Does string theory explain what St. Paul meant when he said that God is the "ground of our being?" Could this be true in a literal sense? Does the inter-connectedness of both quantum mechanics and string theory underlie the intrinsic relationality of the universe? Is the human need to form community a reflection of this inter-connectedness? Do human rituals set up vibrations that bring us into closer connection with Holy Spirit? Does the sacramental use of the material in worship [bread, wine, water,] better attune us to vibrations of the Holy Spirit? Do some locations on earth hold patterns of vibration that cause us to think that we are in the presence of the divine?

These questions cannot be answered by either science or theology, but they are worth raising because they give us new ways to think about the connection of the Holy Spirit and

¹³³ Video; *The Elegant Universe*; David Hickman, Director

the natural world. They give us a rich ground where the connection between science and theology can be explored. String theory, which is currently a metaphysical concept supported by mathematics but not experimental proof, is a way to think about the action of the Holy Spirit in the processes of the world.

2.4 The Fulfillment of Creation

The Christian faith is a faith built on hope. In no small measure, this hope is based on the eschatological nature of the faith. Christians believe that all of Creation will be redeemed from its travails at some point. We believe that the Holy Spirit is calling the universe towards the establishment of the kingdom of God. It must be admitted that science holds out no such hope for the future for the universe. Scientists currently see the future of our inflationary [expanding] universe as one that will see the death of our sun and the obliteration of the Earth. Other scientists predict that, at some point, the second law of entropy will come into play resulting in the death of the universe.

In spite of these predictions there are still some signs in science of the universe coming to a purposed end. The Anthropic principle would suggest that there is meaning and purpose in the natural world. This view is further supported by the concept of the arrow of time which suggests that the universe is constantly moving towards a more complex and diverse future. The openness of Creation to novelty and newness that is evidenced in quantum mechanics, information theory and string theory all suggest a meaning and purpose in Creation. The fruitfulness of the universe can be viewed as an expression of meaning in the universe.

Physicists have been searching for a theory that unifies all of the laws of the universe for a long time. They are searching for a Grand Unifying Theory [GUT] or a Theory of Everything [TOE] as it is sometimes called. They have had some success in doing this, as string theory has demonstrated. The fact that scientists themselves believe in the deep unity

of the universe, whether they believe in God or not, can be interpreted as a reflection of divine purpose in the universe. The way that scientific theory is developing in an ever more metaphysical way can be seen as a reflection of divine action deeply hidden in the mathematical processes of the natural world.

Part Four

1. Conclusions

At the beginning of this paper it was proposed that finding where in history the disconnection between the Holy Spirit and the natural world occurred, is a necessary step towards healing that disconnection. It has been shown that this occurred very gradually, over a long period of time. Both scripture and the early traditions of the church saw a deep connection between Creation and the Holy Spirit. The High Middle Ages began to see this connection fracture when the rationalism of Scholasticism gained a foothold in theology. This trend was further exacerbated by the Reformation and growth of Newtonian science. A review of the history of science has shown that, while science flourished in the intellectual background created by the church, science eventually separated from theology. This happened in spite of the fact that scientists themselves were often believers in the Christian faith. The growth of Deism that accompanied that drive towards rationalism and reason, spelled the diminishment of mystery in the faith as theologians began to accommodate their faiths to include the findings of science. By the end of the nineteenth [19th] century the break between the Holy Spirit and Creation was pronounced.

There is a certain irony in discovering that the break between the Holy Spirit and the natural world occurred largely because of human efforts to apply reason to their natural surroundings. This application of reason led to the development of science, which in its

efforts to maintain an identity separate from theology, indirectly led theologians to mimic the methods and conclusions of science. The result of these efforts was to delete mystery, and particularly, the Holy Spirit, from their deliberations. There are dangers in trying to connect theology with the natural world, as history has demonstrated.

The other, and related, task of this paper has been to explore what scripture, tradition and newer theologies have to say about the work of the Holy Spirit in Creation. This led to the identification of those things that ear-mark the work of the Holy Spirit. The major developments of science that pointed to the presence of spirit in the natural world had been identified in the section on the history of science. The characteristics of the Holy Spirit that had been identified were then compared with those findings of science that offered consonances between the two. In other words, what had been shown by revelation, tradition and some of the newer theologies about the Holy Spirit, and what science had shown about the natural world, were used to connect each other.

Some of the findings of science that were used as examples have not been proven and this leaves these interpretations open to reinterpretation at a future date. This paper has tried to avoid the error of leaving mystery out of our faith. Both science and theology deal, ultimately, with mystery and any interpretation of theology that leaves out mystery, in the cause of rationalism, has to be seriously questioned. St. Paul admonishes us in I Cor 4.1, to be “stewards of the mysteries of God.”

It has been shown, using the auspices of science, that the Holy Spirit and the natural world are very tightly interwoven. They are a piece of whole cloth. If this is truly the case, then we would expect this to be reflected by those who are not necessarily scientists and theologians. Artists have found ways of expressing the unity, beauty, simplicity and symmetry that exists at the heart of the universe. Poets, for example, have long known about

the connection of spirit and the natural world and have written movingly about this connection. Two examples will suffice to make this point. William Wordsworth wrote about the connection of earth and spirit in *Lines Composed Above Tintern Abbey*

A presence that disturbs me with the joy
Of elevated thoughts; a sense sublime
Of something far more deeply interfused
Whose dwelling is the light of setting suns,
And the round ocean and the living air,
And the blue sky, and the mind of man:
A motion and a spirit, that impels
All thinking things, all objects of all thought
And rolls through all things.¹³⁴

Another example is provided by Gerard Manley Hopkins who wrote:

The world is charged with grandeur of God.
It will flame out like shining from shook foil;
It gathers to a greatness, like the ooze of oil
Crushed. Why then do not men reckon his rod?
Generations have trod, have trod, have trod;
And all is seared with trade; bleared, smeared with toil;
And wears mans' smudge and shares man's smell: the soil
Is bare now, nor can foot feel, being shod.

And for all this, nature is never spent;
There lives the dearest freshness deep down things;
And though the last lights off the black west went
Oh morning, at the brown brink eastward, springs-
Because the Holy Ghost over the bent
World broods with warm breast and with ah! bright wings.¹³⁵

The world is at a point where the disconnection between the Holy Spirit and the natural world is having the most serious of consequences. We urgently need to rediscover the deep unity that lies within the world. This deep unity is revealed in a Trinitarian theology of relationship that can be viewed, from one perspective, as the ultimate Theory of Everything.

¹³⁴ William Wordsworth, in *The Norton Anthology of English Literature*, ed. M.H. Abrams and Others [New York: W.W. Norton, 1979] lines 94-102, 155

¹³⁵ Gerard Manley Hopkins in [Ibid] 1785

By going back in our tradition and history and linking these things to the findings of science, the unity of The Holy Spirit and the natural world has been demonstrated. This Creation matters to God, as evidenced by God's deep involvement in the processes of nature.

2. For Further Consideration

The ideas presented in this paper would no doubt have been strengthened by including parallels from the life sciences. The thoughts presented would have been enhanced by including a survey of philosophical thought alongside the information that has been given. It would be very interesting to take one feature of the Holy Spirit, perhaps relationality, and develop that more fully. It would also be interesting to draw parallels between the works of the Holy Spirit in Creation with the work of Logos in Creation.

It is fair to ask whether or not there is any real purpose in re-establishing the connection between the Holy Spirit and the natural world. A view of the world that connects the Holy Spirit and the natural world has ethical considerations for us as Christians. We need to ask ourselves what are our duties towards Creation that God has made through the power of the Holy Spirit? We are in the phase of geological history that geologists are starting to refer to as the Anthropocene Era. The last two hundred years have seen such an impact on the geography of the earth by humans that scientists are starting to recognize this as a specialized age. Huge movements of earth, such as are going on the Athabasca Tar sands and the enormous dams in China along with the release of carbon dioxide into the air as the result of the use fossil fuels are having an impact on the geology of the earth. As well, we are seeing climate change, extinction of species, and a change in the chemical composition of the ocean to mention only a few characteristics of the Anthropocene Era. All of these things raise ethical issues for people of faith. A re-enchantment of the Earth, which is the result of establishing the connection between the Holy Spirit and the natural world, will have an

impact on our ethical behavior towards the Earth. By taking seriously the contention that the Earth is the bearer of God's presence, we will be required to act towards the Earth in a way that reflects the importance that we place on the natural world. It is not enough to have our faith lived around spiritual concerns - we must also be concerned about our physical home.

There is another aspect to this. When we live in an autistic relationship with the natural world as Thomas Berry says, we have cut ourselves off from one of the ways in which we can know God. If there is a relationship between the Holy Spirit and the natural world as this thesis contends, then when we cut ourselves off from that natural world and do not realize that it is a bearer of God then we further distance ourselves from the God we each yearn to know more intimately. As followers of an organized religion, we need to remember that there is another route to God and that is the natural world. As persons committed to justice, we need to remember that the natural world needs to be treated justly.

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