Essays on Science and Christianity

by

Christopher Downs

Introduction

I became a Christian at about the same time that I began a career working in science. Yet for many years I was left with the uneasy feeling that so much of what science stood for was apparently in conflict with my Christian beliefs. I came to see science as a powerful force shaping our society and shaping me and proclaiming itself as the supreme way forward. I was being exposed to two apparently different systems of thought and belief, not one. Two directions can mean disintegration, and I soon came to wonder whether I should leave science and follow some other career path that would be more in keeping with my Christian faith.

During 1995 and 1996 I spent time at Regent College, Vancouver, Canada where I had the opportunity to think through some of these issues. My time at Regent helped me to see that Christians are called to fully integrate all that we believe with all that we do, including our workplace and our careers. So by leaving science I would be missing an opportunity to integrate my faith with that science. These essays represent my journey so far toward integration. They are written from the perspective of someone who is setting out on a faith journey toward a destination - there is much that is still to be known.

In *Hostile Science,* I outline some of the factors which contributed to the disintegration I felt between my faith and science. In *Christian Thinking in Science,* I draw on the alternate paradigm of thinking formulated by Michael Polanyi as a way to reintegrate science and Christianity. *In Creative Science,* I introduce the concepts of co-creativity, dominion and stewardship as a framework within which to conduct creative and God-honouring science.
In the first essay below, *Seeing God Through Science and Creation*, I introduce the concept of whether science should merely be viewed as a job or whether science is a privileged opportunity to see God through Creation. Why is it that Christians and non-christians working in the same area of science can examine the same things and yet view them quite differently?

Biography

Chris Downs completed his PhD at Macquarie University, Sydney, Australia in 1991. He currently leads a team of researchers at a New Zealand Crown Research Institute. He is an elder at St Albans Presbyterian Church in Palmerston North and is an advisor for TCCF (Tertiary Students Christian Fellowship) at Massey University.

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Hostile Science

A wide range of scholars recognise that in history, Christianity in many ways inspired the birth of modern science by providing both the intellectual presuppositions and moral sanction required for such a development. It was in this Christian environment that science continued to flourish. How is it then, that today this close connection between Christianity and science has come to suffer such significant damage? In this essay, I will examine some of the factors from within the biological sciences which have contributed to the separation of science and Christianity.

The influence of biology has come relatively recently in the history of science. Initially the scientific revolution seemed to bypass biology and instead be confined to physics, mathematics and astronomy, and to the work of scientists such as Galileo, Copernicus and Newton. Our first glimpses of the biological revolution came with the "Ages of Exploration and Classification" when biologists began to travel the world in search of new species of plants and animals. In order to handle this influx of new information, biologists developed new classification systems with an emphasis on describing form and function largely based on the ideas of Aristotle. The biological revolution may have begun, but scientists such as the botanists John Ray and Carl Linnaeus and the zoologist Georges Cuvier all continued to integrate their science with their belief in God. There was a rich interaction between the study of theology and the study of living things. For Linnaeus, this meant that rational inquiry must inevitably lead to the acknowledgement of and respect for an omniscient and omnipotent Creator. However, in later "Ages" – the "Age of Evolution" and the "Age of DNA", the close interaction between science and Christianity has diminished. And in many ways, the negative impact of these scientific revolutions has mirrored the influences of earlier philosophical revolutions which have also promoted a conversion away from God.

Emerging Hostility

The Age of Evolution, beginning in the late nineteenth century, has become a rallying point for many who are opposed to Christianity and the Church. And today this hostility continues. Along with the evolutionary theory, features such as mechanistic biology also came to dominate this area of science. The mechanistic movement, made popular by the physical sciences, brought with it the assumption that life is reducible to the laws of chemistry and physics – that life could be explained in purely mechanical terms. Charles Darwin was firmly rooted in this mechanistic tradition and his theories were used to help promote this scientific world view. Darwin's theory of natural selection was an attempt to explain how the appearance of design might come from random changes – a situation where adaptation to the environment could take the place of purposive design (ie. God). Previously, biologists in the mould of Aristotle explained adaptation in terms of ultimate purpose. Then, Darwin argued that purpose itself was not real, rather it was a product of natural selection. Mechanistic forces were being promoted as the only causes admissible in science and competing theories soon came to be viewed as unscientific.

The impact of this mechanistic tradition, with its appeal to reductionism, continues to be a dominant force in our current age – the Age of DNA. This period began in earnest with Watson and Crick's discovery of the double helical structure of DNA. Both Watson and Crick are strong adherents of a mechanistic view of biology in which scientists are committed to reducing life to a product of physical/chemical forces. In his autobiography *What Mad Pursuit*, Francis Crick tells of how he even switched his scientific studies from physics to biology because he was interested to find the molecular structure of genes. He also claims that he is an atheist who believes that biologists must constantly keep in mind that what they see is not designed, but rather evolved. That *life is mere chemistry* has now become the catch-cry of many of today's scientists who are strong adherents of the mechanistic view. This view also appears as a foundational principle in many school science departments and textbooks.

The science of today has also come to be characterised by another force which is best described by the words *objective* and *subjective*. These words, and the dichotomy which they represent, have become so integral to our ways of speaking about science that it is almost impossible to think in a way that is not controlled by them. We have become accustomed to the idea that claims about truth can be divided only into those which communicate objective knowledge and those which speak about subjective experiences. Descriptions of beauty and goodness are relegated to the subjective realm since they are only feelings, whereas the findings of science are offered as objective facts that are universally true. The full person, fully capable of two poles of knowing, both the subjective and the objective, has been removed from science. Our scientific literature today is rarely written in

the first person. It rarely indicates that a person has been directly involved in the work, and even more rarely do journal editors permit the scientific facts to be enriched with words such as amazing, beautiful or stunning - for that would be to allow personal feelings to influence the facts.

How then, should a Christian working in science respond? Two attempts at response have created confusion and disintegration: The Creation Science movement has attempted to use the opening chapters of Genesis as prescriptive filter for all science, and more generally, many Christians who pursue science have failed to think fully and Christianly about the work that do.

Failed Responses to Hostility

Creation Science:

Mark Noll, author of *The Scandal of the Evangelical Mind*, claims that any unity of thought that may once have existed between Christians and science has been further eroded during the twentieth century by Christian fundamentalism, and by the Creation Science movement in particular. Although largely centered in North America, the influence of Creation Science has stretched far beyond these shores. The positive influences of this movement have come from their critique of the contention that science itself is a better path toward ultimate truth than that offered by Christianity. There has also been a useful critique of how science has been funded, practised, preached and promoted in our societies. However, the science that this movement promotes appears not to be well grounded; for them a philosophy influences the interpretation of the facts. Creation Science's tenuous use of Scripture and their apparent limiting of science to only that which is found in the Bible often results in a rejection of the claims of this movement by others with an interest in science.

Creationism, when properly defined, means "all who discern a divine mind at work in, with or under the phenomena of the natural world" (Mark Noll). However, others have unfortunately narrowed this meaning to that which implies that God created the world 10,000 or fewer years ago, and in doing this they push the interactions between Christianity and science to, and beyond, the brink of battle. While it is clearly possible for an omnipotent God to have created the universe a very short time ago, if this is so, why would God leave many pieces of evidence which would suggest that the universe is considerably older? The tension built up around issues such as this, means that other critical issues at the interface of science and Christianity become hard to isolate and discuss. The roar of the battle drowns out more careful thinking and communication and as a result the Christian intellect within science has become severely restricted.

Vocational Science:

Our culture today exhibits an all-pervasive dichotomy between the public realm of facts where our allegiance is commanded, and a private realm of values, opinions and feelings where our expressions are clearly optional. In *Foolishness to the Greeks*, Lesslie Newbigin claims that the dual realms of life in modern Western culture are a further development of the Enlightenment's *conversion away from God* that saw new concepts of thought appear in science and philosophy. As a result, today the world is no longer explained by reference to a Divine purpose, rather reason is to be subject only to the facts – all knowledge is to be objective. This separation into private and public worlds is clearly seen in the Western education system, where every schoolchild is expected to know the facts about DNA, but not that humans are created in God's image and are intended to glorify God. This latter information is considered merely a religious expression that is values-based and therefore should be kept private. God has been omitted from the public realm of our world and Christians have too easily accepted this position. As a consequence, Christian thinking within the public sphere of life is being lost.

This dichotomy extends within the scientific community, where being a Christian working in science has been to hold a vocational rather than an intellectual position. For, if a scientist were to talk of God as the Bible does, as the Creator and Governor of all things, whose purpose is the requirement for everything human, in both the public and private sectors of life, there would inevitably be conflict. Christians in the sciences have therefore retreated, with their thoughts and beliefs, into a private silence. Consequently, Christians are missing an important opportunity to develop and communicate a Christian mind set about the world and the Creator. Christians may even be ignoring the scriptural mandate that calls us to be transformed by the renewing of our minds (Romans 12:1-2).

Time to Re-evaluate

A central premise of this essay has been that the deficient thinking of Christians working in science today needs correction. The need for correct thinking is seen in the pathologies of our actions – either we argue or battle from a flawed basis, as seen in the Creation Science movement, or we retreat with our thoughts and beliefs into a private realm. As Christians working in science, there is a need to come to terms with the cultural baggage that we carry. There is a need to re-evaluate the extent to which a purely objectivist or mechanistic world view has come to dominate our thinking, and ultimately our view of God.

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Christian Thinking in Science

For the scientist who has lived by his faith in the power of reason, the story ends like a bad dream. He has scaled the mountains of ignorance; he is about to conquer the highest peak; as he pulls himself over the rock, he is greeted by a band of theologians who have been sitting there for centuries. (Robert Jastrow, God and the Astronomers)

We are indebted to the scientist Michael Polanyi for formulating an alternative paradigm for knowledge from which much can be applied to the integration of science and Christianity. A strength of Polanyi's work is that it comes from within science itself. It was from here that he saw that the concept of scientific knowledge was being abused: "When any human thought can be discredited by branding it unscientific, inordinate power has passed over to science; hence science itself has become in its turn the greatest source of error". In response to this situation, Polanyi wrote the book *Personal Knowledge* so that science could again become attuned to the full range of human thought.

Revolutions in Thought

The history of science is a history of revolutions and new concepts of thought. In the sixteenth century Copernicus offered a new concept of the cosmos which went against the geocentrism of the day. Since then, Newtonian thought (the centreless universe), with its emphasis on observational objectivity and empirical knowledge, has come to dominate science. However, Polanyi sees that with Einstein's discovery of relativity there is hope for scientific thinking that is not grounded purely in the empirical and the objective. For Polanyi this discovery is evidence, and hope, that a new paradigm for thinking - a *personal* dimension - can be developed and accepted. A purely objective and empirical idea of knowledge can therefore be rejected.

The concept of complete objectivity and therefore complete detachment is in reality a false ideal. An example of a personal element in knowledge is seen in the personal responsibility felt by a doctor deciding on a diagnosis in a difficult case or a juryman bringing in a guilty verdict in dubious circumstances. For Polanyi, the concept of connoisseurship also demonstrates the existence of a personal dimension in knowledge, since, like a skill, it can only be communicated by example and not by precept. For example, the large amount of time spent by students of biology, physics and chemistry in their practical courses shows how greatly these sciences actually rely on the transmission of skills from master to apprentice. Clearly then, these skills are communicated through some process of non-propositional knowing. Polanyi terms this the *tacit dimension* of knowledge.

The Tacit Dimension

Tacit knowing is the unaccountable, inarticulate component of knowledge where we always seem to know more than we can tell. It enables us to recognise the face of a loved one in a crowd without being able to describe why. It enables a child of ten to ride a bicycle without being able to state the rules governing turning, balance, speed and the angle of disequilibrium. Tacit knowing is the fundamental power of the mind which creates explicit knowing; it lends meaning to explicit knowing and therefore controls our use of explicit knowing. Put another way, the explicit formulations of a scientist rely upon a vast area of tacit knowledge which is shared to a greater or lesser degree with all human beings. It should be noted however, that any emphasis on the personal participation of the knower does not entail a retreat into irrational subjectivity. Rather, Polanyi's proposition is that all knowledge is to do with orientation. The tacit dimension, and therefore personal knowledge, have a "from - to" orientation – from the tacit to the explicit, from me to outside of me (to the world).

For the Christian working in science, Polanyi's concept of personal knowledge, in which the personal and the objective are fused together, provides clear evidence that spiritual and scientific elements can also be fused together. The same "from - to" orientation applies – from the tacit to the explicit, from that which is relied upon to that which is attended to, from the spiritual to the scientific. Polanyi's reconstruction of the basis for knowledge in science has also created a path of knowledge which leads us toward God.

The Tacit Dimension: New Meaning in a Many-Levelled World

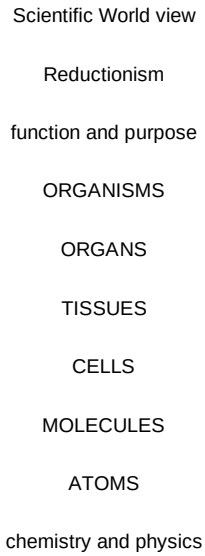
We live in an age where we have a dominant scientific world view, where nature is thought to exist merely as some closed mechanical system. This is a concept of our world where the vital experiences of *mind,*

purpose and *meaning* are missing. Polanyi attacks this mechanistic approach, and its reductionism into mere chemistry and physics, and instead claims that what makes life distinctive are the principles by which those chemicals are put together in living organisms. He uses the example of a machine to emphasise his point here. An analysis of a machine as an object, by chemistry and physics, will tell us much about the machine's molecular structure, but will leave us in complete ignorance as to what the machine actually is or does – this type of analysis will tell us nothing about the machine's function. Polanyi claims that "the more detailed knowledge we acquire of such a thing, the more our attention is distracted from seeing what it really is". True meaning, true understanding cannot therefore be found in a downward spiral into reductionism.

When applied to the biological sciences, Polanyi's argument allows us to view the DNA molecule in a different way. Watson and Crick's discovery of DNA and the subsequent analysis of its molecular structure has shown that DNA is composed of bases, sugars and phosphates. All these components are ordinary chemicals and all are reacting according to the laws of chemistry and physics. But these chemical laws are insufficient to explain the *sequence* of bases within DNA which spell out the genetic code. Clearly then, the code is independent of the physical and chemical forces within the DNA molecule itself, and it is precisely this indeterminacy that gives the DNA molecule the flexibility to appear in a huge variety of sequences, just like words on a page. Here again, physics and chemistry are insufficient to answer the question of how the rich information content of DNA arose. A central issue in biology today therefore is the question on the *origins* of complex organisation. Where are the other examples of information-rich structures being created by natural processes? Creationists may therefore say that DNA contains the marks of intelligent workmanship because reductionism has not provided the answers.

Polanyi proposes an alternative way for science to describe the natural world – as a hierarchy of levels (see Figure 1). When pictured like this, and when the tacit dimension is incorporated into our knowing, Polanyi demonstrates that we can fully know something at a lower level only by the tacit information that we already carry from the other, higher levels. True knowing therefore comes when our focal awareness at any level is integrated with our subsidiary awareness of the higher levels. When examined in this way, the higher level of organisation imposes conditions on the lower level particulars. For example, the function of cells are only properly understood when they are examined with reference to the tissues and organs in which they arise, and DNA molecules can only be understood by the genes that they encode and the function of these genes in the cells in which they are contained. And therefore, the genetic code can only be understood as coming from intelligent design – under the influence of God, at the top of the hierarchy.

Figure 1: Polanyi's Rejection of Reductionism



Tacit Dimension: Personal Knowledge

Since Polanyi was not a Christian when he wrote *Personal Knowledge* it is unlikely that his intention in reconstructing the scientific basis of knowledge was to create a path of knowledge leading toward God, but with the direction of his arguments, exactly this has occurred. Another writer, T.F. Torrance, claims that Polanyi has helped to "restore science to its true purpose, where man's natural knowledge expands continually into the knowledge of the supernatural". It is perhaps significant to note that Polanyi came to profess Christianity later in his life.

We live in a world where the purely objective and detached analysis of science has failed to provide answers for our ultimate questions. However, by apprehending Polanyi's concept of personal knowledge, our investigations can lead us in the direction of answers about function and purpose. By acknowledging the operation of the tacit dimension, when our focal attention is directed toward science, we are also carrying with us a subsidiary awareness of the higher levels – of who we are as persons, living in the natural world that God has created. Only with the objective and the personal fused together can we understand the true function of science, and our true function and purpose as persons (see Figure 2). The study of science and theology can again become integrated – both part of the same continuum of knowing.

The Tacit Dimension: Scientists as Full Persons

A complete chemical and physical topography of a human being, or even the complete sequence of every gene in the human genome will tell us nothing about what it is to be a person – the fullness of personhood is missing and instead we are merely considered to be *things*. This example describes the inadequacy of the mode of analysis of our science today, however the disease of objectivist science also extends to those practising science – since it renders persons to an existence as subpersons. Polanyi claims that "the rules of scientific detachment require that we limit ourselves only to physical and chemical observations, however in doing this we remain unaware of the true and complete nature of living things and their achievements".

Figure 2: Science and Personal Knowledge

Scientific World view

Reductionism

function and purpose

CREATOR

CREATION

SCIENTIST

SCIENCE

chemistry and physics

Personal Knowledge

Tacit Dimension

By adopting a purely objectivist position we are not able to participate *personally* in science. It is to right a wrong such as this that Polanyi's concept of personal knowledge has come to be viewed as so important. Polanyi saw that any scientific research pursued in a detached, impersonal, materialistic way isolates itself from a human's higher faculties and thereby restricts its power of discernment and understanding. However, a science which incorporates a personal component, which encourages a focal awareness on science while allowing for subsidiary clues coming from the higher levels of creation and Creator (Figure 2), will be able to overcome what Polanyi saw as a damaging split between: subject and object, mind and matter, thought and experience, and therefore, ultimately also the split between faith and reason, and between personhood and thinghood. Since we are human persons, made in the image of God, we should no longer be merely described as things or objects which are the result of molecular interactions. Without an integrative way of thinking, where the personal component is absent, Christians in science will never be able to recover the natural unity between knowing and being, and will therefore also never be able to operate as full persons.

A crucial first step for the Christian in science is to realise that objectivist science always leaves out a complete set of categories of knowledge, and therefore this mode of science should not be viewed as the only way ahead. Polanyi's critique of thinking in science has shown that there is also an essential *personal* component in scientific thought. This alternative mode of thinking provides fertile grounds for Christians, for not only does personal knowledge enable a Christian in science to operate as a full person; there is also a new way for science to proceed. The integration of a personal component into science will again enable us to see the image of God in this world, and in doing this, Polanyi claims that we will "restore science to the great family of human aspirations, by which men hope to fulfil the purpose of their existence as thinking beings".

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Creative Science

We used to think our future was in the stars. Now we know it's in our genes. (James Watson, *The Double Helix*)

A "new" biology, often called the "Age of DNA" has come to dominate our world of the late twentieth century. In 1866, the monk Johannes Gregor Mendel first speculated about the germ of inheritance as a result of work in pea breeding. Then, less than 100 year later, the dominant Age of DNA began in earnest with Watson and Crick's discovery of the double helical structure of DNA. Since this discovery in 1953, gene-biotechnology has developed with breathtaking and, for some, ominous speed. By 1973, scientists were able to develop techniques for gene manipulation and genetic engineering. And today, this field of science has gone on to produce the enormous Human Genome Project – the attempt to map and sequence every gene in the human body. The information generated is predicted to become the source book for biomedical research well into the twenty-first century. Today also, many plant and animal species have been genetically modified and some are being commercialised. Analysts confidently predict that gene-biotechnology, which is already big business, will soon exceed such fields a heavy industry, electronics and computers.

As potential for commercial gain increases, so also do our fears of potential unknown dangers to health and to the environment. Countering this however, are the feelings of triumph and exhilaration that come with being able to gain new knowledge about the world and the organisms living in it. The Age of DNA is therefore asking the Christian many new and urgent questions, and consequently there needs to be an effective Christian mind in these areas of the "new" biology. The founding Director of the Human Genome Project, DNA's co-discoverer James Watson, claims that our present technology is powerful, but it will pale in comparison with that of the future. How then, should a Christian working in gene-biotechnology, or any other field of science, react to this powerful technology? In this essay, I examine gene-biotechnology from a biblical perspective, using concepts such as dominion, stewardship and co-creativity. My intention here is not to produce a prescriptive list of "do's and don'ts", rather I aim to outline some of the principles which might serve as a guide for the researcher.

Co-creativity

God's original covenant mandate, described in the opening chapters of Genesis, consists of three essential components: communion with God, community building and co-creativity with God. However, the fullness of our participation in these covenant activities has been destroyed by the Fall. The new covenant in Jesus Christ has the aim of restoring and redeeming people to the fullness of life and work that existed before the Fall. In Jesus Christ a position of wholesome co-creativity is therefore possible again.

Co-creativity speaks of our *relationship* with God. It tells us that we are not divine, but rather we are in fellowship with the Divine One. In this privileged relationship our work here on earth is to bear the stamp of God's creativity – we are called to be co-creative! This co-creativity should therefore be the dynamic heart of our living and working. In the Hebrew of the Bible, several words are used to describe the creating and working activities of both humans and God:

Yasar is used of both God and humans to suggest forming and fashioning, just as a potter fashions clay (Genesis 2:7-8, Isaiah 64:8)

Malaka speaks of God's craftsmanship (Genesis 2:1-2) and of human craftsmanship (Exodus 31:3)

Bara is used only of God, as a designation of God's creative work, indicating the initiation of something new (Genesis 1:1,21; Isaiah 41:20; Isaiah 48:6-7; Jeremiah 31:22; Psalm 51:10).

The philosophy underlying much of science today is that science holds the exclusive, or most reliable path to knowledge and truth. This is a philosophy which encourages the belief that the scientific abilities of humans occupy the spiritual centre of the universe. Opposing positions are often not tolerated. However, the concept that the work of the scientist, or more particularly the gene-biotechnologist, is co-creative (as in *yasar* and *malaka*), rather than creative in the ultimate sense (as in *bara*), shows a crucial distinction. Christians are in a relationship with the Creator and therefore redeemed science can be an expression of our co-creativity – our relationship. Creativity in the sciences is not therefore a mandate for doing away with God. Rather, science, and indeed all

authentic work, if it both unfolds and heals creation, engages with God's revelation through creation. Joe Holland, in his book *Creative Communion: Toward a Spirituality of Work* suggests that by understanding co-creativity we become explicitly conscious of the spiritual meaning of our work, of who we are and the things that we are meant to do.

Dominion

Dominion speaks of the role given to humans by God. Ultimately, God has sovereign dominion over all creation, but by His grace He has granted us sub-sovereignty. Psalm 8 shows well the position and the role of humankind in dominion. Humans are lower than God (8:4-5);

"What is man that you are mindful of him, the son of man that you care for him? You made him a little *lower* than the heavenly beings and crowned him with glory and honour".

The dominion role is delegated from God (8:6-8);

"*You made* him ruler over the work of your hands; *you put* everything under his feet: all flocks and herds, and the beasts of the field, the birds of the air, and the fish of the sea, all that swim the paths of the seas".

Another aspect of dominion comes from the special place that humans occupy in creation by virtue of being made in the *image of God* (Genesis 1:26). In *Earthkeeping in the 90s: Stewardship of Creation*, Loren Wilkinson suggests that this image of God characteristic is something that we do – it is relational, it describes our unique calling to be in a responsible relationship with God, with each other and with the rest of creation. In God's image therefore, humans are installed as God's managers of all creation with power to control and regulate it, and the power to harness its potential. What a concentration of power in human hands!

In the hands of the scientist there is the potential to manipulate the plant genome so as to produce plants with many new and different characteristics. There is the opportunity to regulate the course of nature, to the bane or blessing of the world. What guidance then, does the biblical view of our dominion role give for opportunities such as these? Any action focussed entirely upon a misreading of the *subdue and rule* of Genesis 1:28 will likely result in a forceful dominion over creation – an attitude that some Christians have quite rightly been criticised for in the past. However, a more balanced reading of Scripture will also recognise God's instruction in Genesis 2:15 to *work and take care of* the garden. The Hebrew use of these words suggests working and serving, keeping watch and preserving creation. Therefore, they describe actions not undertaken primarily for the sake of the *doer*, but for the sake of the *object* of the action. For the scientist then, proper dominion represents a role of service to the earth, and to humanity, for its preservation.

Stewardship

Stewardship speaks of our *responsibility* to God. As stewards, humans are responsible to God for the way in which the earth is treated and the ends for which it is used. Two concepts of stewardship appear in the Old Testament. Firstly, there is the close identification of the steward with their master – the steward is considered as the representative of the employer, master or lord. Secondly, there is the insistence that the steward is not, after all, the owner or master. Clearly then, the steward is strictly accountable to another. In New Testament Greek, the word stewardship or oikonomia means management of a household. Many New Testament references support the concept that the steward is a manager of something or someone not belonging to themself (Matthew 20:8; Luke 8:3; John 2:8). A good steward is described as being watchful, trustworthy and blameless.

Loren Wilkinson claims that the responsibility of stewardship is the distinctive characteristic of our dominion and our humanity. Therefore, the responsibility of stewardship also speaks of our freedom and independence to act the way we wish. Scientists have the ability to manipulate the natural world, to name and to celebrate creation, to be rational and to have knowledge about it. For if scientists, or any other human being, did not have the freedom to act independently, we could not be held accountable, since our actions would be beyond our control. The industrial revolution and today's highly technological society are ample evidence of the creative, and in some cases not so creative, ways in which humans have exercised their freedom in the use of science and technology. Issues such as deforestation, pollution, overcrowding and dwindling biodiversity indicate that humans can either use or abuse their freedom. By making humans stewards, God has not issued exact rules on how we are to

manage creation, instead He has set general guidelines, and within those guidelines He holds us accountable for our decisions.

A Response

Human beings have been created with abilities of intellect, creativity and technique which can be expressed for good or bad. Today, with the Age of DNA upon us, scientists have been given the opportunity and freedom to focus their abilities on understanding and modifying the genetic code underlying life itself. However, as a redeemed person, the Christian working as a scientist in this area is called to fully use their abilities for the wise and loving management of creation and to assist in the development of the full potential of everything in creation, including human beings, and for the praise and glory of God.

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Seeing God Through Science and Creation

For since the creation of the world God's invisible qualities – His eternal power and divine nature – have been clearly seen, being understood from what has been made, so that men are without excuse (Romans 1:20)

Those of us who work as scientists are all too familiar with the nature of the work. The days in the library reading journals, the theories and the questions, the hypotheses and then the experiments. The days in the laboratory, the low drone of equipment, the smell of chemicals, the focus on your work – failure again and starting over. Then, as tension builds, new discoveries create pauses and moments of exhilaration – the electron micrograph showing the lunar-like landscape of a new species of pollen, the complex biochemistry of senescence yielding yet another clue or the DNA sequencing gel finally analysed and the gene sequence revealed. For the Christian, these can be God-moments, but what do others see? Is there any inkling at all that there is something bigger going on? Is there a sense that this new discovery is something other than just a successful experiment?

God is Revealed in Creation

God's revelation is God's deliberate self-disclosure to humans. This single divine activity occurs in two different ways, expressed in theological terms as general and special revelation. Special revelation is the revelation of God in Jesus Christ and is the knowledge of God which is necessary for salvation, whereas, general revelation is a revelation of God as creator which is given to all people through their own self-awareness and knowledge of the world. While carrying no redemptive power, general revelation clearly mediates the conviction that God exists. What then does the Bible teach about God's revelation through creation?

Psalm 19 shows that God reveals Himself through a two volume book; of creation (Psalm 19:1-6) and of the law (Psalm 19:7-13). This psalm begins with, "the heavens declare the glory of God, the skies proclaim the work of His hands". This revelation is described as being continuous ("day after day", Psalm 19:2), abundant ("it pours forth", literally gushes Psalm 19:3) and universal ("all the earth", Psalm 19:4). Here, the psalm is showing that creation reveals the divine glory and is therefore an external manifestation of God's inner being and attributes. Elsewhere, the book of Job (36:24 - 37:24) describes a situation where natural phenomena such as rain, thunderstorms, snow, ice and the clouds are all attesting to the power, majesty and goodness of the Creator. Job 36:25 says that "all mankind has seen" this revelation.

Perhaps the clearest indication that all people have a rudimentary knowledge of God comes from the teaching and writings of Paul. In Acts, Paul is pictured as addressing the Athenians (Acts 17:24-31), and as a point of contact with these non-believers, Paul refers to their knowledge of God by virtue of God's universal self-disclosure in both nature and history. In Romans (1:18-21), the teaching also shows that all people have a rudimentary knowledge of God as Creator. Here, Paul argues that through the revelation in nature, God is known, clearly seen and understood, and therefore "men are without excuse". The readers are also told that this type of revelation in nature dates from "the creation of the world".

It seems then, that all scientists, indeed all people, are exposed to this same revelation from God. It comes to us from the created world and resides in our consciences. It is a knowledge that is ours, by our free choice to either accept or reject. The non-believer represses this knowledge, whereas the Christian, who in the words of John Calvin "sees through the glasses of faith", has been given the capacity to have a God-moment, to appropriate this knowledge and to be transformed by it. Therefore, the non-believer working in science is a person with a sight problem. No electron microscope, computer analysis package or laboratory technique will help to reveal the ultimate truth about the part of the world under study. God is revealed to all people equally, but sin dims and alters this sight. The revelation is still given from God, and inklings of it still get through, but only when the *glasses of faith* are worn is God's revelation seen distinctly and fully.

Recommended Reading

Berkouwer, G. *General Revelation* (Eerdmans, Grand Rapids MI, 1955)

Henry, C. *Revelation and the Bible* (Baker Book House, Grand Rapids MI, 1958)

Packer, J. *God Has Spoken* (Baker Book House, Grand Rapids MI, 1979)