VIEWED FROM THE SHOULDERS OF GOD:

THEMES IN SCIENCE AND THEOLOGY

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FOREWORD

One of the more fascinating traits of human beings is the way they reconcile paradoxes and live with irreconcilables. Many find it impossible to reconcile science and religion, natural and supernatural, immanence and transcendence. So they choose to live in two apparently irreconcilable worlds. They visit the doctor with an incurable disease while fervently praying to God to heal them; they study the weather chart, praying for rain counter to its prognosis. But many others make their peace with the out-and-out biological nature of life and accept their inevitable biological mortality. Yet others, while accepting their biological condition, continue to find religion meaningful and allow room for God.

Technoscience is manifestly putting pressure on religion. Religion is widely perceived as evolutionary scaffolding that propped up humankind in its childhood, but serves no further purpose now it has reached adulthood and must be demolished. We no longer need a projected father in heaven to see that justice prevails; we take responsibility for society ourselves. However, many believers disagree. Throwing religion out with the bathwater saps the verve of the human spirit. It strips life of aesthetics because its 'truth' is doubted. It reduces faith to this life only with no hope of anything beyond it.

Yet religion evolves from one generation to the next. Since the dawn of Christianity God was worshipped Sunday after Sunday, but the mode of worship changed radically over the ages. Our expectations of God, our self-image and worldview are totally different from those of first century Christians.

Religion can't be kept alive artificially. If the need for it is superseded by something else it will cease to exist. But that does not necessarily mean that we will live in a post-religious phase with no value systems, justice, humility or morality.
Hence the aim of the science-religion debate is not to 'rescue' religion from science. The gods don't need protection, they speak for themselves. A meaningful goal for the debate would be to clarify humankind's apparently incorrigible religiosity, and to reconcile the substance of faith and the concomitant expectations with our understanding of the physical functioning of our cosmos. To highlight the irrationality of religion – as scholars like Dawkins do – is easy. Pointing out misuses of religion is our duty; accepting religious 'malpractices' because they 'do no harm' is an insult to the human mind; hushing up scientific findings that appear to threaten religion is dishonest; denying the personal value that religion has for millions of human beings is a fallacy.

Where does that leave us? Christianity offers countless plausible ways to accommodate belief in a personal god and personal salvation within the parameters of present-day technoscience. The science-theology debate has helped it to do so: not to devise new proofs of God's existence; not to sacrifice honesty in order to preserve religion; but to uphold the meaning that religion offers in a proficient manner. Even those who operate without a religious framework must acknowledge that religion evolved to enable humankind to accomplish what has been accomplished. To claim that we can face up to the challenges of our time without the backing of an unshakable spirit is hubris. But the driving force of the human mind is not dependent on just a handful of religious interpretations. The mind is bigger than that and we must give it more leeway. To a great extent human spirituality has become secular, finding transcendence inter alia in immanence. The science-theology debate offers plenty of examples.

Thus the premise of this book is that we should have the guts to accept the multifaceted biological nature of existence without surrendering the values that are essential for the human spirit to survive. The angle of the book is basically Christian, with due regard to possible approaches from other religious traditions.

Chapter 1 is a thumbnail sketch of what the dialogue is about. It permits panoramic vistas from a pinnacle (like people standing on God's shoulders with a bird's eye-view). Naturally the validity of our pinnacle talk is tested when we have to pick our way through the labyrinth of realities on the ground, but what we bring with us from the tower top is the very values that are the hallmark of the human mind. That is the theme of chapter 2. Chapter 3 analyses six protological stories in Genesis 3-11 to find a perspective from a historical religious source that offers useful guidelines for interaction with our natural and technoscientific environment. Chapter 4 explores the ways in which religion and science approach their respective worlds (texts). For all the parallels, each has its peculiarities. Metaphor and narrative are singled out as seemingly the most effective approach available to theology, and to some extent to science as well. Chapter 5 takes the reader on a lightning tour of the worldviews that determine us. The dominant Western worldview has largely outgrown its Christian infancy and has to find new meaning in a technoscientific environment. In theology critical realism has contributed to a stance that continues to assign values a key role in a scientific context. Chapter 6 elaborates on the theme by examining how we map our complex world. Although our cartography (science) was honed to a fine art in the modernist framework, humankind needs more. The sciences remain a road map that directs us on our journey, but they remain a background to, and a preparation for, the journey: they are not what the journey is about. The way we understand things and the wherewithal at our disposal largely determine how we live, but they are not what life is about. We turn to Heidegger for examples of how to integrate scientific artefacts with our human nature to make life meaningful. The cartography of the human spirit as *imago Dei* is explored in order to fathom its underlying spirituality. Chapter 7 seeks to deconstruct one of the cardinal metaphors that shaped Western culture through the ages: the metaphor of *natural law* that was transposed from nature to philosophy, jurisprudence, physics and theology, with all its religious luggage. In time these disciplines came to realise that the application of the metaphor far exceeded its scope. If the concept of natural law is anachronistic, the sciences have to reappraise the basic metaphors that serve as their criteria. Chapter 8 endeavours to give science a human face by recognising the role of the human subject anew. This is done by way of post-epistemology in the form of an axiological epistemology that expands the requirements of good epistemology to include important human values. The foundation of Western epistemology – representation – is broadened to incorporate factors like language and tradition that feature in local contexts. By discussing the axiological dimension of knowledge systems we draw attention to the power factors at work in our epistemologies. Chapter 9 looks at the negative sentiments that accrued to the notion of natural theology in Western theology. This is done with reference to the work of Karl Barth, a leading figure in this regard. The aim is not to reinstate classical natural theology, but to work out a contemporary natural theology consonant with present-day interactions between science and theology. Barth's reaction should be seen in the context of his time. In that context he contributed significantly to the interpretation of biblical texts that deal with creation and with certain provisos, his views leave scope for natural theology. Chapter 10 examines developments in evolutionary biology that are particularly relevant if we want to retrieve the biological roots of rationality, epistemology and religion. Human organisational systems have their analogous origin in the operation of autopoietic cell systems. Chapter 11 offers a critical bird's eye-view of the work of a great pioneer in the science-theology debate: Arthur Peacocke. More radically than anyone before him, he proposed adapting Christian doctrine to demonstrate its compatibility with current scientific insight. Chapter 12 takes on the issue of evil in this world, together with the theodicy problem. This is probably one of the thorniest questions in Christian religion and has provoked a lot of criticism over the ages. The points of reference are the work of Hume and Voltaire, both pioneers in this field. Hume's critique of unwarranted causal inferences and Voltaire's satire of false interpretation of our lot can, if taken seriously, liberate religion. Chapter 13 tackles the age-old puzzle of the relation between brain and mind. Developments in cognitive science present religion with one of its most serious challenges by reducing religious experience to mere brain functions. Ignoring this research would isolate religion and negate the physiological basis of religious experience. Interaction with cognitive science remains a sine qua non for religion. Some important models are examined, the conclusion being that cognitive science can be taken seriously without limiting religion to mere brain functions. Chapter 14 comes to grips with one of the bugbears in the debate: the design principle. In response to proponents of the intelligent design thesis, it is argued that there is no provable architect of the universe and cosmos, life or design. There are also objections to the anthropic principle inasmuch as it seeks to function as a proof of God's existence. The role of information and evolution in the sense of cumulative development is considered. The book concludes by proposing critical wisdom as a response to our technoscientifically attenuated existence. The challenge facing us is to integrate our splintered sciences and existence in a meaningful whole.

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- Common ground in the science-theology relationship, *Journal of Theology for South Africa*, 1995, 2, 33-45.
- The dominating world-views of science and technology: responses from Christianity, *Scriptura* 1997, 61(2), 151-165.
- The contribution of Arthur Peacocke to the science-theology debate, *Skrif en Kerk* 1997, 18(1), 67-85.
- Evolutionary biology as a link between religion and knowledge, *HTS,* 2000, 56(2&3)*,* 506-526.
- The place of values in the science-religion dialogue: biology, human nature and the cultural environment. *JTSA* 2002, July 113, 75-96.
- The metaphysical mind in its physical environment: religious implications of neuroscience. *HTS* 2002 58(3),1011-1031.
- Design, designers and the designing God. A critical look at some models. *HTS* 2004, 60(4), 1287-1306.
- Wisdom lost and regained? The possibility of reintegrating a fractured techno-scientific culture. *Religion and Theology*, 2005, 12(2), 129-144.

1

NEW COSMOLOGY: A TOWER OF BABEL

New Cosmology invites us to ascend the tower of origins, the highest theoretical tower we have yet contemplated. The view from the top is spectacular, like standing on the shoulders of God. At these explanatory heights vertigo, hubris and awe become very real. What is at issue is God's existence and the future of religion; our worldview, ethics and anthropology; the future of humankind:

"Our particular cosmos emerged in the beginning equipped with three spatial dimensions, time and a particular form of matter governed at least by particular and contingent physical laws together with at least three fundamental constants whose numerical values seem to have been arbitrarily chosen. During the first few hours of its history, this original matter formed itself into atoms of hydrogen and helium, and this was all there was for a very long time thereafter. Much later the hydrogen and helium separated under gravity into large masses which became galaxies. Long after this birth of galaxies, stars were formed within them and the evolution of atoms began. In time all atoms beyond helium were formed in stars. Then much later, on our earth, nucleic acids and proteins were produced out of methane, ammonia, and water in its atmosphere. From these, living cells were constituted, and finally the human race was produced. But people die, the sun and the earth must finally die, and ultimately all atoms, galaxies, and the universe itself must die. Nothing – not even space, time, matter, or the laws of physics – is self-explanatory. This is the most radical contingency imaginable. Why and for what purpose was this particular cosmos brought into existence in the first place? What accounts for the fact that the design of its atoms and the laws governing their behaviour made it possible to finally produce the human being within it? The cosmos did not have to be at all, and it certainly did not have to be designed in such a way as to make humanity a possibility. Such questions have no answers in science, and their contemplation leads to some sort of theological inquiry" (WCC 1975)

FOUNDATION OF THE TOWER

From the very beginning of its history humankind was plagued by questions like "how do things originate?", "why is there something and not nothing?", "what is the purpose of it all?" and "how does it affect me?" Answers to these questions crystallised in disciplines like religion, philosophy, cosmology and astronomy. Science challenged existing worldviews and belief systems, reshaping them, providing certainty for some and challenging others. It came up with principles for understanding the world. For the Greeks it was God the immovable mover (geocentric worldview); Copernicus and Galileo found it in the order of the cosmos (heliocentric worldview), Newton in natural laws (mechanical universe). By this time the pace had quickened. Discoveries and inventions came thick and fast, revolutionising the medieval picture of the universe.

The scientific revolution (c. 1500-1700) is symbolised by the Copernican revolution, the first in a series that culminated in the most recent revolution in information technology. We give a thumbnail sketch of its historical development.

Copernicus (1473-1543)

The Copernican revolution transformed astronomy and laid the foundation for classical mechanics. It severed links with the powerful Aristotelian tradition, changed the perception of motion, replaced Ptolemy's 2nd century geocentric worldview with a heliocentric one, and triggered a process that was to secure the autonomy of the natural sciences and, in the end, separate science from religion. The Copernican revolution established, for the first time, a deterministic worldview that rejected the idea of freedom and purpose in nature.

In his *Amalgest* Claudius Ptolemy (90-168) had described the heavens as perfectly spherical. The planets rotated in a perfect circle (epicycle), whose centre revolved steadily around another perfect circle (the deferent), with non-rotating earth at the centre. This complicated system was too messy for Copernicus. Like Ptolemy, he assumed that the geometry of heavenly motion must be perfect circles. The circle was appropriate for the heavenly spheres, having neither beginning nor end. But he reduced the number of epicycles postulated by Ptolemy to accommodate all planets from 83 to 17.

Copernicus put the earth at the centre, not of the universe, but of the moon's orbit. The sun replaced earth as the centre of the universe. For Copernicus the sun was a far more worthy centre of a properly ordered cosmos than earth. In his *On the revolutions of the heavenly spheres* he used the image of the sun sitting upon a royal throne ruling over his children, the planets, which circled round him. All this was still in the realm of speculation. The transition to empirical observation came next.

Galileo (1564-1642)

In 1610 Galileo invented a 20-power telescope and discovered astronomical features that contradicted both Aristotelian physics and the Ptolemaic model of the cosmos. What had hitherto been purely theoretical became visible to the eye. The universe did not end with the firmament, as Ptolemy had suggested: it contained far more stars. Jupiter was observed to have moons, the moon to have craters and the sun to have sunspots. Venus went through changing phases, just like the moon. The premodern worldview was shattered. The sacred heavens of antiquity were as profane as earth; indeed, earth could be regarded as just another heavenly body. Galileo's *Dialogues* were studied all over Europe and his telescopes were in demand.

To placate the outraged church Galileo turned to biblical interpretation and hermeneutics – hitherto the prerogative of bishops and ecclesiastic councils. In a discussion with the clergy on Joshua 10:13 (where Joshua commanded the sun to stand still) he said that God did not stop the sun in its orbit round the earth, but made it look as if that was what happened. Galileo postulated the autonomy of science in his *Dialogue on the two great world systems* (1632). God is the author of the book of revelation – the Bible, which speaks metaphorically and figuratively – and the book of nature. In principle the two cannot contradict each other: religion and science represent two different approaches to the same reality. In Galileo's view physical science must be freed from the authority of Scripture. Thus, by confining its ambit to revelation theology, the church inadvertently relegated natural theology to the natural sciences.

Galileo was brought to trial in 1616 on charges of heresy. The substantive questions of the scientific truth of Copernicanism and the proper use of the Bible in relation to science did not arise at the trial itself, although they were the real issues behind it. The scandal of Galileo's trial severely embarrassed the Catholic Church. Copernicus's book remained on the Index of Prohibited Books until the early 19th century.

Galileo spent his last days under house arrest. He founded classical mechanics by adding to it an ontology of immaterial forces and 'ethers' acting on ordinary matter according to mathematically expressed laws. Along with Kepler, and later Newton, he laid the foundations for classical mathematical physics.

Kepler (1571-1630)

Kepler replaced traditional mathematical astronomy, based on Greek geometry, with his philosophy of nature, which held that mathematical harmonies governed the motions of heaven. He combined mathematical beauty with rigorous, exact observation. Building on the work of the leading astronomer of his time, Tycho Brahe, he formulated his laws. After a long struggle to harmonise Brahe's data with combinations of circular orbits he abandoned the idea of circular motion, discarding the circle, until then the epitome of heavenly perfection. His first law of planetary motion stated that the actual mathematical form of all planetary orbits is an ellipse with the sun as one focus.

To Kepler geometry and mathematics were part of the divine mind, which was transferred to humans along with the image of God. Philosophy was written in this grand book, the universe, which is continually open to our gaze. But to understand it one first has to learn the language and the alphabet in which it is composed. It is written in the language of mathematics.

Newton (1642-1727)

Newton's *Principia mathematica* (1687), the most famous and influential work in science, completed the synthesis of terrestrial mechanics and astronomy. Newton's laws portrayed the stars and planets as a reliable, self-sufficient clockwork, with God as the giant clockmaker who need not be on call all the time (deism). Science became a self-explanatory system with its own laws, methodology and language, not requiring spirits, mysticism or superstition to explain itself. The things we see and touch do not belong to different realms, governed by different rules. Matter – the uniform, invisible substance that underlies all appearances – is governed by a single set of rules. This mechanical worldview left no scope for purpose, quality or religion.

In book II of the *Principia* Newton revolutionised the Aristotelian concept of motion, cantring on a prime mover, into one of inherent, neutral and value-free movement. This took the ghost out of the machine and spirit out of matter. There was no longer any need for an animated world-soul to explain movement. Book III extended the laws of motion to the whole universe. Gravity seemed to be the very paradigm of an occult force reaching invisibly across space, relentlessly exerting itself on distant objects. Newton showed that gravity varied with distance and mass. The greater the mass, the greater the gravitational pull. An attractive force of gravity must balance the centrifugal force of a planet orbiting the sun.

In his private world, remarkably, Newton was an ardent believer and speculative natural philosopher. His religious manuscripts run to well over a million words. He accepted God's continuing influence on the universe and believed in millenarianism, anti-Trinitarianism and Arianism (Jesus was not God but God's adopted son). In his *Origins* he proposed a cyclic pattern of human history, in which the one true religion is continually perverted and God persistently sent prophets, including Jesus, to convert humankind from idolatry.

Einstein (1879-1955)

A rocket fired from a hurtling airplane doesn't travel faster than one fired from a stationary craft. The speed of light remains the same, irrespective of the mobility of the person measuring it. We don't directly experience our motion around the sun or that of a flying plane. To account for this Einstein had to abandon Newton's notion of absolute space and time. Any two observers in relative motion see time and space intervals differently. This led to Einstein's postulate on the equivalence of mass and energy, expressed as $E = mc^2$ (where c represents the speed of light). Energy is hidden in all matter. A kilogram of anything contains enough energy to destroy a city. His theory of general relativity (1916) offered a new explanation of the operation of gravity in the universe. Light is a form of energy and therefore possesses mass, which will be attracted gravitationally by other mass. A beam of starlight should bend slightly as it passes close to the sun. This theory was confirmed when such bending was observed during the solar eclipse of 1918.

From this cumulative paradigm shift New Cosmology was born.

IS GOD DISPENSABLE IN NEW COSMOLOGY?

New Cosmology does not favour belief in God, but at this stage it is not ruled out. The amenability of New Cosmology to religion depends on the position one adopts. It can certainly pose a serious threat to faith. Some may even see it as the final argument to dispose of God, heralding the end of religion and the triumph of secularism. On the other hand it can be interpreted as enriching religion and reinforcing belief in a creator God.

In New Cosmology the creator God can be superseded by God the physicist, or simply by a physical event. For some the always hypothetical God has been replaced by the laws of physics (Carrol 1988:64). For the first time since Aristotle we can reject the so-called Immovable Mover or First Cause with a reasonable degree of certitude: physical laws are now based on large numbers and average behaviour. God has been pushed to the sidelines. We have no need for a God of the gaps now that we can, at least theoretically, explain our origins. Indeed, we could claim that we have finally moved and removed the immovable mover!

DIFFERENT VISTAS FROM THE TOWER

We have never had an inclusive vista capable of accommodating all the different belief systems (Küng 1990:164). Can New Cosmology supply such an all-encompassing framework?

Attitudes towards New Cosmology range from theological scepticism to positive theology. We outline some of the better known positions.

Creationism

God is our creator the way we have always believed. Theology should disregard big bang theory and limit itself to traditional biblical creation stories and accepted creation doctrine: natural theology and general revelation may testify to God, but in themselves cannot inspire faith in him. Faith is a consequence of God’s grace, not of any proof of his existence. Creationists defend a literal, fundamentalist reading of the Bible, the final arbiter on all matters pertaining to cosmology irrespective of new evidence.

Deism

God might have been involved at the beginning, regulating the whole process, but then left it to evolve by itself. Or he is simply a spectator of a physical process that could have started without him. God exists, but he is not responsible for creating the universe.

God: a dispensable hypothesis

God may exist, but we have no definite proof of this. Tryon pointed out that the laws of physics are fully adequate to account for the origin of our universe (Carrol 1988:64). Sagan used Hawking's suggestion that reality might have no absolute beginning to infer that there is no need for a creator – hence a Godless universe. The truth of (and need for) religion lies only in its pastoral and socially beneficial effects.

Scientism

Scientism, on the other hand, operates with a closed, immanent worldview that hardly allows for transcendence in a religious sense. It is immaterial to scientists whether creation is clarified by big bang theory or not. Scientists should stick to their jobs and not worry about the influence their theories may have on people's beliefs. They must testify to reality as they understand it. If God is the creator, he may choose whatever process he sees fit to create, even if it takes 15 billion years. Our knowledge and theories are still inadequate and culturally bound. Humans will know and believe differently a millennium from now. We are not responsible for defending a God that may not exist. If God does not influence human life, he will fade away, no matter what cosmology we espouse.

Natural theology

To the Greeks the cosmos was a unifying concept. The world formed a single, integrated system governed by universal principles. All the post-Enlightenment dualisms and dichotomies that have separated humanity from nature, mind from matter, rationality from causality, were foreign to the thought of antiquity (Toulmin 1982:224). In post-Renaissance times scientists saw their task as augmenting true religion by revealing God's hand in the book of nature. They had to trace the details of his design, while the theologian was assigned the marginal role of teaching and interpreting the divine scheme in more general, pastoral terms (Toulmin 1982:231-2). Natural science and natural theology parted ways in the 19th century, since by 1860 the natural sciences had fragmented into various independent disciplines.

The anthropic principle

According to this principle chance has largely been ruled out as a possible cause of the evolution of our cosmos. It tries to show that the universe did not happen haphazardly or accidentally but testifies to an underlying design, pattern and planning. The symmetries and delicate balances we observe require extraordinary coherence of conditions and cooperation of laws and effects, suggestive of some sort of purposeful design. Thus they testify to intentionality (of a creator), realised both in the laws of physics and in the choice of boundary conditions for the universe (Ellis 1992:103). In this sense the anthropic principle corresponds to the teleological argument, which posits orderly development towards a gives end.[1]

MEANINGFUL COMMUNICATION OR BABEL TALK?

New Cosmology sparked off the long overdue science-theology debate – although some maintain that we must discover why things are the way they are without reference to religion (Van den Beukel 1990:35). Science and theology are closely linked in New Cosmology. It does not mean that scientists must become

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[1] Criticism has been levelled against the anthropic principle. Drees (1990:78-79) dismisses it as essentially trivial anthropic coincidences. It rests on metaphysical presuppositions which, once accepted, imply certain views of the universe. The world adapts extremely well to the models we construct of it: they fit reality. Was reality planned to fit our mathematical explanations? We develop models and construct science to fit reality, just as religious beliefs fit their interpretation of reality.

priests of a new religion or theologians must become quasi-physicists. Sciences cannot operate separately from each other as they did in the past. Isolating them can lead to exclusively materialistic explanations. Scientific reductionism simply limits the scientist's scope.

It is difficult to tell whether we have made any progress in the science-religion debate. Both domains are diversified and neither can speak on behalf of the other. Science and religion cannot be united or separated, nor can one be subordinated to the other. Interaction is necessary in view of the boundaries between them (Bergold 1988:8-11).

We know that both science and religion grapple with reality, albeit in different ways. One cannot say that one picture of reality is more real or legitimate than the other. Reality is multidimensional. Religious reality can be more real than any scientific fact and many scientific theories are metaphysically determined. Reality has different faces; science and religion are two of them, which science and religion deal with in their own distinctive ways.

Neither science nor religion is free from paradoxes. Both work with models and metaphors. Both have their fair share of metaphysics. Underlying the physical aspect of the world is a metaphysical structure. Metaphysically we ponder issues like the following: Why does anything – matter, the universe – exist at all (the Parmenides question)? What underlies physical laws? Why are there laws in the first place? Why are they mathematical? In what way is their operation mandatory in reality? We do not really understand these things. Physics is in effect simply a form of naming or labelling what we understand to happen. We comment, but we do not know why these laws exist or where they come from. These questions transcend the physical realm and are answered on metaphysical, theological and other levels (Ellis 1992:106-107). Scientific theories and models cannot be taken as literal descriptions of atomic reality. They may be seen as symbolic attempts to represent the natural structures responsible for particular observable phenomena (Barbour 1990:121).

But how do theologians see it? Being a textual science, theology has in a sense become a closed science. By domesticating the biblical text theologians have deprived it of its transcendent referent, limiting its reference to the intra-textual dimension. Much of the wonder and awe expressed in the Bible are lost to us: cultural distance and differing worldviews blur the original writers' vision. In modern-day cultures New Cosmology may contribute to a worldview that permits new appreciation of God's otherness, so awe and wonder can become part of Christian experience again.

Theology's function is not to provide science with a God hypothesis. Neither does it seek to filter scientific findings or tell scientists what may and what may not be said. It is not called to supplement or censor science but to stimulate awareness of broader needs that have to be considered. Scientists, on the other hand, are not always aware of developments in the theological debate, which cannot simply be dismissed as 'church talk' on scientifically pertinent issues. Theology takes account of questions like the context in which Scripture speaks, the nature of theological language, the use of models and metaphors in theological thinking, the limitations of metaphysics, the cultural framework of our thinking, the existential and pastoral facets of truth, and the importance of presuppositions in our thinking.

THE BIBLE VIEWED FROM THE TOWER TOP

Creation stories in all religions are anthropocentric: humans are assigned a dominant position in the world. The Bible does not say exactly how it all began or how it is put together, at least not in a frame of reference that corresponds with modern cosmological models. Biblical accounts of creation are confined to the relation between humankind and God. Creation is the stage for the enactment of God's covenant with the human race, the latter being the inner drive of creation. If God did not make a covenant, the earth would not exist. From this well-known Barthian formulation it follows that, according to this theology, the history of the cosmos is part of salvation history: salvation history presupposes the existence of the cosmos.

In the Bible the creation of heaven and earth functions as a point of reference and orientation. Creation was a fixed point, the gods were variable. To ascribe creation to God served to explain God, not creation. Creation, awe-inspiring and wonderful as it was, was given, visible, there. It explained the invisible God and was an attribute of God.

The biblical view of creation stresses the following aspects.

- Creation as doxology (Gn 1).
- God can be known universally through his creation – supports the givenness of creation (Wis of Solomon 13:1-9; Rm 1:18-25).
- The power and mysteriousness of God (Job 38:1-35, 42:1-3).
- Wisdom as God's co-worker in creation (Pr 8:22-31).
- The creator God is the God of history (Is 40:12-15, 22-31).
- The creator God creates a new covenant (Jr 31:31-37).
- God created heaven and earth and is in control of creation.
- Humans, made in God's image, are created as God's representatives, responsible for his creation.
- God's glory is illustrated in creation (Ps 104).
- God's creation comforts us in affliction and uncertainty.
- Christ as mediator of creation and salvation (Jn 1:1-14; Col 1:12-20)
- The new creation through Jesus Christ (2 Cor 5:14-21; Rv 21:1-12)

The first creation story culminates in celebration of God's work on the seventh day. His triumph over chaos reaches its climax in the self-awareness achieved in the creation of humankind. It is this principle of self-reflection, symbolised by the Möbius strip,[2] that makes the difference between humankind and the rest of creation. It accounts for consciousness, self-reflection, self-correction, morals and responsibility – for religion, history and science (see Davies 1983:95-97).

The triumph over elemental chaos recorded in the first creation story would not have been known had there not been a knowing subject: a free, self-reflective human being. Humankind acknowledges the creator, sees that his work is good and praises him. In this sense the sabbath day is the festive acknowledgement of God's goodness, power and love. It celebrates humankind as that part of nature that has become conscious of self and can acknowledge a maker. It acknowledges humans as the culmination of God's work. Sabbath theology's aim to praise God can be enriched by New Cosmology.

Copernicus relativised the earth's importance in the geocentric worldview. Today the Copernican revolution itself has been revolutionised: the earth is indeed the centre of everything, insofar as this planet – and especially life on earth – is the culmination of a grand process.

If we are the mirror of creation, our cosmology should influence our view of ourselves. The history of what has been happening since the beginning of time lies hidden inside us. But we can differ on the underlying purpose. In the 'open universe' model it is accepted that all life will eventually be extinguished as the cosmos grows old and the stars burn out. This can induce severe pessimism. We must have the courage to face up to our being in all its dimensions. "The effort to understand the universe is one of the very few things that lifts human life a little above the level of farce, and gives it some of the grace of trag-

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2 The Möbius strip is a twisted band. As the eye follows the line of the band, the top side becomes the bottom side, and the inside the outside. It is also the mathematical symbol for infinity (∞), the symbol of ultimate paradox. It represents human self-consciousness as it depicts self-reflection.

edy" (Drees 1990:195). Religion offers a response to this tragedy.

Kant was uncommonly fascinated by the stars above him and the moral law within himself. In a way these two dimensions are inseparable: both make a tremendous impact on human beings, as they influence their identity, place in the universe and how they make sense of things by adopting a certain lifestyle. While the stars reduce us to our ephemeral existence, moral law demands that we act.

Ellis (1992:117,131) contends that ethical understanding – a fundamental sense of right and wrong – is built into the structure of the universe. What we know affects us and we don't experience this knowledge as neutral. It plays a part in our cultural fabrication. The underlying order of the universe is broader than that described by physics alone: it relates to the full depth of human experience, in particular providing a foundation for morality and meaning.

Metz (1981:35) speaks of an anthropology of domination: our knowledge has become knowledge via domination and our praxis one of exerting power over nature. As a result non-dominating human virtues recede into the background.

Let us descend the winding stairway from the tower top and enter the maze of conundrums awaiting us in the real world below.

2

VALUES IN THE SCIENCE-RELIGION DIALOGUE: BIOLOGICAL ROOTS OF HUMAN NATURE AND INTERACTION WITH CULTURAL ENVIRONMENT

THE VALUE PERSPECTIVE

The focus in the science and religion debate has, to some extent, shifted from physics to evolutionary biology. Developments in sociobiology, neuroscience and cognitive science are especially important and have far-reaching implications for religion and ethics. Completion of the mapping of the human genome[1] will shed new light on illnesses and behaviour and will boost gene technology. There is a growing realisation that human rationality, ethics, thought and consciousness – in fact, all of human nature – must relate to their biological roots. Studies have appeared that link rationality to its biological roots (Wuketits, Van Huyssteen), to language and cognitive science (Lakoff, Johnson) and to neuroscience (Happel, Arbib). These developments usher in a new phase of post-Cartesian mind-body dualism. New challenges are posed – especially to Christian ethics – to interact with and integrate these ideas. Shared values that may advance interdisciplinary research are the common denominator in the process.

We experience the world through the language we speak, the metaphors we use and the models we employ to interpret things. The world we see is more than the physical reality around us. It is a world (cultural environment) constructed by human interpretation, co-determined by our specific culture, re-

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1 The human genome is the biological instruction for the formation of the individual and the functioning of body cells. It is contained in coiled double helixes of DNA. The identification of genes that play a role in human disorders opens up the way to manipulating, correcting or replacing these genes. A rough draft of the human genome was completed on 26 June 2000.

ligion and society. This world is value-laden. The replacement of the geocentric worldview by a heliocentric one started a process that increasingly relativised the place of humankind in the cosmos. In the 20th century this culminated in New Cosmology, which stresses the insignificance of our planet in the universe. The relativity of human life is offset by its position at the pinnacle of evolution that, after billions of years, produced conscious life. The meaning of human life crystallises in the values people hold, the commitments they make and the belief systems they live by. The emphasis on humans as moral beings restores their place and dignity in the universe. From a human point of view the physical universe on its own is incomplete. It cannot explain itself. Human beings are built into the scheme of things in a very basic way.

Values are the underlying link in the science-religion dialogue[2] and the importance of shared values in the two fields must be recognised. They include crucial epistemic values and value judgments that shape the way rationality functions in science and religion (Van Huyssteen 1999:120). When considering these values the role of ethics in the respective fields must be examined, as it links the cultural to the natural sphere.

The acclaimed structure, beauty and fine-tuning of our physical universe and the findings of evolutionary biology evoke similar feelings of wonder and awe for both natural scientists and theologians, which can be expressed in shared values. Developments in new physics and especially quantum mechanics are

[2] In referring to dialogue we recognise that it is simplistic to talk about 'the' dialogue between 'theology' and 'science', since all these terms have been pluralised (Van Huyssteen 1999:54). There is no unanimity on method and constraints in the dialogue. The models discussed in the work compiled by Van Huyssteen & Gregersen (1998) are distinguishable from one another, but overlap in many areas. (They are: post-foundationalism, critical realism, naturalism, pragmatism, complementarism, and contextual coherentism.) The dialogue goes beyond the simplified options of conflict, independence and unconvincing harmonisation (see Barbour 1997:77-106). It may be seen as part of the great challenge of consilience of the sciences (the attempt to bring the different sciences closer together), advocated by Wilson (1998). The science-religion dialogue can be conducted on many levels and from different angles. One approach is to consider the values of importance in both fields.

said to express the spiritual potential of the universe.[3] For some scholars notions like quantum indeterminacy, autopoietic systems and the anthropic principle[4] (the idea that the universe possesses a priori properties to make human life possible) leave scope for an intervening God.[5]

New Cosmology not only evokes dormant human values; it also displays a value agenda of its own. If physical processes are sufficiently 'open' to accommodate a divine agent, it follows that they will also display human and divine values. The universe not only harbours a hidden code that can be deciphered through ingenious investigation, it also conceals an inherent value-laden structure which can be read from finely balanced physical processes. Once it is seen as a moral universe, it becomes possible to explain further cosmological features that other (non-theistic) accounts of anthropic features fail to explain: why is there a universe at all and why is it law-like? (Murphy & Ellis 1996:203). The value-laden structure of the universe is said to have a very special message for humans. This sentiment, however, is not universal. Some regard religion only as an anachronistic artefact of human culture and tolerate it as a necessary scaffold for human feelings of uncertainty, which does not really influence scientific and technological decisions.[6] Christianity, it is argued, cannot continue to cling to values which were formed in a bygone era and are part of a defunct worldview.

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3 Murphy & Ellis (1996:203) mention that in biology the suffering of non-human life can be seen as a 'non-moral harbinger' of conscious self-sacrifice. In physics a theory of non-coercive divine action can be harmonised with quantum theory, the indeterminacy of quantum events providing an analogy with human freedom.

4 Murphy & Ellis (1996:59) identify three key issues in the anthropic principle: selection, pure chance and purposeful design.

5 The effort to find spaces for divine intervention is controversial. Although the examples mentioned may offer scope for God to act, this cannot be proven. Drees (1996:xi), for example, appreciates the place and role of religion in our lives, but he does not see religiously relevant gaps in the natural and human world where the divine could interfere with natural reality.

6 Wilson expresses this sentiment when he says (1999:270, 285): "It would be a sorry day if we abandon our venerated sacral traditions … People need a sacred narrative. They must have a sense of larger purpose, in one form or another. They will refuse to yield to the despair of animal mortality."

THE WORLD OF VALUES

Values are human constructs,[7] functioning as value judgments that predetermine the way we see the world in which we live. The values we adhere to explain the commitments we make. They are based on specific viewpoints, theories, doctrines and experiences. While people may value things or identify value in things, it remains a quality imposed by humans. Although something may have inherent value or display a structure that humans value, that value is always linked to humans and what they consider valuable. People can only perceive things in a human way and any reality they perceive must of necessity be human-like (Ashbrook & Albright 1997:44).

The world of values is pervasive and complex. Values may be as personal as one's fingerprints or musical tastes, but may also be shared by many people. They may change, grow, be rejected and reinterpreted over time, but no era is imaginable without values. Values are all-pervasive and influence our beliefs, decisions and feelings, directly or indirectly. They concern our subjective inner world but are also linked to reality 'outside' us.[8]

Although some may regard values as existing in their own metaphysical sphere independently of us, they are generally recognised to be a human concern. Reality (ontology) is linked

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7 For Rolston (1999:50, 360-361) valuing is primarily an activity preformed by human choosers. In the genetic world, for example, value-based vocabulary is more accurately descriptive than morally derived vocabulary. The category of values can, however, be extended beyond the human world to that of nature. Sentient animals may value, using teeth and claws, or maybe plants value as they, unconsciously, defend their lives with thorns and propagate their kind with seeds. But in an evolutionary account the value story becomes systematic, more holistic, ecological, global. Earth is a value-generating system, value-genic, valuable, value-able – that is, able to generate values that are widely 'distributed', 'dispersed', 'allocated', 'proliferated', 'divided', 'multiplied', 'transmitted', 'recycled', and 'shared' over the face of the earth. Earth can display what is to be valued and evaluated.

8 Nikolai Hartmann saw values as incorporating a world of their own, which could exist ideally. The idea behind this is that even if values are not realised by people, they still exist. This is a metaphysical view of values, which leads to separation of values from reality. Windelband tried to restore unity and overcome Hartmann's dualism. He stresses the value-laden nature of being (*die Wertfülle des Daseins*) (see Hessen 1950:45).

to both logic and axiology (value theory). Hence values and reality are interdependent. Values "want to be" realised, actualised and personalised. They determine our identity and our identity impacts on them. Things have value, but humans have worth. That worth is realised by personally embodying values like freedom, justice and goodness. Values are positively charged physical needs and desires that are directly embodied in personal identity and social relations (see Chidester 1987:15-16). They depend on people, institutions and ideas to embody them in a certain time and space. They may differ in character, depending on their specific host.

Most values are transparent to us, unconsciously influencing our ideas and emotions.[9] They operate intuitively and take on an emotional character (Hessen 1950:82). Values cannot be proven. Value judgments are based on value experiences, are often not logically explicable but are self-evident to those who hold them (Hessen 1950:88-89).

Values are not innocent. They involve power, determine conduct, manipulate attitudes and direct policies. In the process some values contest opposing values and may take precedence over values lower down the hierarchical scale. Values are not neutral but are historically linked, contingent and contextual. They are imbedded in worldviews, linked to ideologies and motivate religious wars. Any evaluation of a value system is itself value-laden. There seems to be no way out of this vicious circle of applying values to judge values. Consequently one cannot invoke a higher, final or ultimate norm, which means that each and everyone has a right to her basic value premises. Criticism of value abuse does not mean that we can do without values. We need them as we need similarly complex value-laden criteria like truth, justice and freedom.

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[9] "*Werke werden von uns in unmittelbarer, direkter Weise erfasst. Das Werterkenne ist kein mittelbares, diskursives*" (Hessen 1950:81).

VALUES IN THEOLOGY AND IN THE NATURAL SCIENCES

It is difficult to know to what extent something has objective value (a property *sui generis*) and to what extent value is subjectively ascribed to it (personal opinion). Max Scheler and Nicolai Hartman tried to counter the subjectivisation of values by proposing an objective, material theory of values – a view that was rejected (Schmidt, Jüngel& Scheltz 1979:30-32).

Belief in progress (science) and the materialism and individualism it engenders are perhaps the strongest values influencing us today. The Western belief in progress acquired religious dimensions (Appleyard 1992:228). It was logically linked with the belief that the West attained its position of power and affluence through advances in industry, technology, education and medicine.

Scientific values relate primarily to scientific method, but they include extra-empirical influences like the epistemic values of predictive accuracy, coherence and simplicity, as well as a host of non-epistemic values that scientists adopt, like naturalism, various forms of empiricism, pragmatism and feminism (Van Huyssteen 1998:25; 1999:141). We know that data are theory-laden and theories are paradigm-laden, culture-laden and value-laden – all going beyond strict empirical values (Barbour 1997:144). The role of value judgments in rational reflection indicates that theory appraisal, and ultimately theory choice, in science entail a complex, sophisticated form of value judgment (Van Huyssteen 1999:142).

Once the value-ladenness of science is accepted the way is open to take science to task on an ethical level. Murphy and Ellis (1996:86-87) consider applied and social sciences to be incomplete without ethics. The social sciences cannot provide full understanding of their subject matter without invoking concepts of goals, values and ultimate worth. They introduce ethics as the top rung of the hierarchy of goals. The human sciences cannot explain why something ought to be pursued. Ethics and morality[10] need a metaphysical (preferably theological) theory to turn 'is' into 'ought' (Murphy & Ellis 1996:106ff, 202ff). The hard core of Murphy and Ellis's theological programme is a 'kenotic ethic', which they consider compatible with scientific findings (Van Huyssteen 1999:103).

CONVERGENCE OF VALUES IN SCIENCE AND RELIGION: THE POSSIBILITY OF CONSILIENCE[11]

More than ever before, it seems imperative for the human and natural sciences to pursue integration or consilience. The reason is not so much a self-confident belief in a super-scientific meta-narrative, but rather developments in different disciplines that necessitate interdisciplinary work. Although the advantages of interdisciplinary integration have long been recognised, not much has come of it. Two reasons for this state of affairs are the complexity and extent of the ideal and the danger of oversimplification and reductionism. It is also questionable whether the proliferation of disparate scientific methods, models, terminologies and aims can be harmonised in a super-science incorporating this diversity.[12]

Although values are decisive in both science and religion, the two spheres hold radically different values (see Wilson 1998:230).[13] Scientific values pertain to scientific integrity,

10 Values are the bedrock of morality. Morals are always linked to one or more supportive values. They are more susceptible to cultural change than the underlying value system.

11 Concerning the unification of the sciences, Wilson (1998:58) says that the explanations of different phenomena which are most likely to survive are those that can be connected and proved consistent with one another.

12 Positivism and pragmatism tried to realise the dream of objective truth. Logical positivism tried to define the essence of scientific statements by means of logic and linguistic analysis. Denotative statements based on established facts had to replace metaphysical speculation. The project was thwarted, because agreement could not be reached on the distinctions between fact and concept, empirical generalisation and mathematical truth, theory and speculation, and scientific and nonscientific statements (Wilson 1998:67-69).

13 For Mooney (1991:310, 327) the epistemology of science differs from that of theology, but he finds a common sociology of knowledge arising from the dynamics of history and culture. Thought processes in the two fields have undergone a remarkably similar development in recent decades. Their epistemologies may differ because

which includes method, model and paradigm. These values were formed over many years of scientific experience and experimentation and are critically tested by the scientific community. Although they consist of a rather fixed core, in which they acquired a quasi universal character, they are in principle open to falsification and change. Theological (theistic) values, on the other hand, are much older than scientific values, are determined by alleged divine revelation and tradition, are in principle universal and consequently not open to modification (unless they are proven to contradict Scripture and tradition).

Rationality seems to be a fundamental value shared by science and religion. According to Van Huyssteen (1999: 202) the fact that theology and the sciences have different epistemic ranges, experiential resources and heuristic structures does not mean that they also have different rationalities. Van Huyssteen (1998:23-29; 1999:108) sees post-foundationalism as a middle way between the objectivism of foundationalism and the extreme relativism of most forms of non-foundationalism. Post-foundationalism acknowledges contextuality, the role culture plays in thought, interpreted experience, interdisciplinary dialogue and the biological roots of human rationality. Van Huyssteen sees no sharp dividing line between scientific and other forms of rationality. This doesn't mean that rationality as a common factor can serve as an overarching universal norm. Theology and the sciences must each identify the rational integrity of their own discipline by subjecting it to critique, articulation and justification. Neither theology nor the sciences require universal epistemological guarantees any longer (Van Huyssteen 1999:116-117). Recognition of the role played by information in evolutionary biology indicates that human rationality has a biological base. For Van Huyssteen (1998:152) the importance of evolutionary epistemology lies in its ability to break down the modernist subject-object polarisation, which emphasises that cognition is a function of active systems interacting with their environment. But this does not explain in what sense recogni-

of the different types of human experience they investigate, but there is a common sociology of knowledge available to both.

tion of the biological roots of human nature, and thus of rationality, gets us any further. The data-laden structure of genes can be seen as a precursor of rationality (Rolston 1999:63). Seemingly we cannot proceed beyond the point of simply acknowledging that we are rational beings and that different forms of rationality characterise different disciplines. Evolutionary epistemology as a meta-theory explains the development of ideas, scientific theories and theological models, but doesn't help us to overcome disciplinary differences, which pertain to the specific history and identity of the discipline and may be surmounted by radical paradigm changes. Recognition and accommodation of evolutionary epistemology (as well as neuro- and cognitive science) may radically change the social sciences and theology.

Wilson regards evolutionary biology as the common denominator to unify the sciences. He believes the commonality of human nature to be a product of the interaction of biology and culture across all societies and considers it sufficient ground to seek consilience of the sciences (Wilson 1998:137). Scholars like Condorcet, Bacon, Schelling, Polanyi and others already envisaged methodological harmony over the whole range of knowledge, which will promote rationality and universal intent (see Wilson 1998:15-48, Barbour 1997:94). Wilson (1998:208-209, 224) sees the connection between the social and natural sciences as associated with their respective temporo-spatial scales. This gives evolutionary biology an unprecedented and unrealistic advantage, although he is gracious enough to single out cognitive neuroscience, behavioural genetics and the environmental sciences for special privilege. Murphy and Ellis (1996) put ethics at the top of their scientific hierarchy. No artificial construct, top-down or bottom-up approach, hierarchic selection or dominant model or method will succeed in unifying the sciences. That can only come through dynamic cross-fertilisation.[14]

[14] From a postmodern point of view (which Wilson 1999: 47, 233 strongly rejects) science as such no longer exists; instead all we have is a plurality of sciences playing their own games and generating their own local rules for what they do. Postmodernism is more than rampant relativism and loss of all objectivity and reality (Van Huyssteen 1999:31, 37, 42).

BIOLOGICAL ROOTS OF LIFE-SUPPORTING VALUES

Many human values can be linked to so-called biological values.[15] Human values are the source for explaining biological values, which are metaphoric. They are the tip of the iceberg, supported by a substructure of biological values. Biological values have often been typified as wild, savage drives which must be tamed by human culture. However, in their tamed form they are 'positively' applied to fit a specific cultural mould. Nevertheless there is a radical break between inherent biological values and the appearance and appreciation of values on a conscious level.

Biological values inherent in the processes and development of life are attributes we impose on these phenomena. The organism is not a sentient or conscious valuer. Humans can identify life-sustaining and life-promoting values in organisms and in themselves. Although human genes can be interpreted to be the loci of intrinsic values, they are not conscious carriers of value. On the genetic level we find activities reminiscent of a conscious valuer – actions like selection and even choice. These 'evaluations' are on the level of chance rather than that of intelligent decision. Although genes, cells, organs and organelles represent values, it is not possible to make this a moral issue. Biological values are not directly or literally commensurable with cultural values. The 'selfish' gene cannot literally be compared to human selfishness. There is no such thing as a 'selfish' or an altruistic gene. It is a metaphor, as is the idea that DNA contains or transmits information or that the brain processes formal representations. These metaphors do not describe how such systems actually operate (see Lakoff & Johnson 1999:561).

Biological values that display a metaphoric nature include selfishness and altruism, self-preservation and self-perpetuation

15 Rolston (1999:50) distinguishes between three kinds of biologically based values: intrinsic values pertaining to the cell, organisms, preservation and replication; instrumental values regarding organisms' interdependence in the food chain and the welfare of offspring; and systemic values pertaining to the broader ecological system.

(autopoietic values), dynamic interaction with the environment, survival of the fittest, mutations and adaptability (interplay of chance and necessity), determinism and behaviourism, genetic coding, freedom and responsibility. Information may be considered the basic biological value.

INFORMATION AS A DETERMINING VALUE IN THE ORIGIN OF LIFE

Life can be viewed as a chemical phenomenon, but its distinctiveness lies not in its chemistry as such but in its informational properties. A living organism is a complex information processing system (Davies 1999:19). Information has a long evolutionary history. As the supreme biological value responsible for all other identified biological values it also determines human cultural values, although on a different level.

Information does not come easily. It requires a protracted evolution of gaining knowledge through information processing that increases an organism's fitness (Van Huyssteen 1998:148). Although the evolutionary process of acquiring cognition entails a laborious spiral of trial and error, it leads to the emergence of new and qualitatively different forms of order.

The source of information in the natural world can only be the organism's environment, which begs the question how the information got into that environment in the first place. Although information was present from the very start of creation, we know that the universe started out with very little information. For someone like Davies (1999:60ff) the salient question is not where matter came from, but where information came from.

Information and matter can be distinguished but not separated. Only the combination of matter-energy and information can explain life. Matter and energy are prerequisites for informational possibilities to emerge (see Rolston 1999:356). The ex nihilo formation of matter and energy is explained by gravitational processes, which opened up an entropy gap between actual and maximum entropy in the universe. The reason the universe can have zero energy and still contain 10^{50} tons of matter is that its gravitational field has negative entropy. All sources of free energy, including the chemical and thermal energy inside the earth, can be attributed to that gap. With matter-energy comes information. The ultimate source of biological information and order, therefore, is gravitation (Davies 1999:61, 64), but it does not explain the ex nihilo appearance of information and life.

Life can originate only in an acceptable environment with sufficient matter-energy and information input. Life on our planet began when the three great domains of archaea (the oldest form of life, which underwent very little genetic change), bacteria (as early as 3.9-4 billion years ago) and eucarya arose. The lowest and shortest branches of the tree are dominated by thermophiles and hyperthermophiles – organisms that cluster around the thermal ocean vents and inhabit the hot subsurface rocks (well above 100ºC), exploiting the thermodynamic abundance of energy. Davies (1999:173, 175, 177ff, 184) considers these heat-loving microbes to most closely resemble the universal ancestral organism. This is not to say that life necessarily began hot and deep – only that life on earth had to pass through a temperature 'bottleneck' created by the meteoric barrage. The violence of the meteoric barrage would have sterilised earth's surface repeatedly. Around 3.8 billion years ago the first evolutionary fork was reached, when a group of microbes was cut off from the thermodynamic heat by some geological upheaval. Some mutants with flexible membranes survived and multiplied, and eventually had to switch from chemicals to light as a source of energy (Davies 1999:185). These primordial developments would have been impossible without information.

To explain the emergence of life is much more difficult than to explain its evolutionary development. Life is a dynamic state of matter organised by information. The mysterious emergence of meaningful information seems to be related to the origin of complexity, the interplay of chance and necessity,[16] and infor-

[16] Chance and necessity do not rule out 'purposefulness', but we do not mean purpose in the usual teleological sense of the word. This can be seen in random mutations

mation flowing from the environment. Kaufmann (see Barbour 1997:184) indicated that order emerges spontaneously in complex systems, especially on the border between order and chaos. Too much order makes change impossible and too much chaos makes continuation impossible. Complicated patterns which appear to be chaotic can often be expressed by a comparatively short algorithm. Algorithmic[17] randomness is a law of nature describing complicated behaviour. 'Genetic' algorithms involve combining and recombining partial solutions to a problem in order to generate improved solutions (Rolston 1999: 35). If genomes are information-rich, as is necessary for their biological function, then they have to display a high level of randomness. Chance in the guise of mutations and law in the guise of selection from just the right combination of randomness and order are needed to create the 'impossible object' of life (see Davies 1999:116-120).

Entropy, indicating the irreversible change from order to disorder along the directionality of time, affects life. Davies (1999:57) believes that life avoids decay via the second law of thermodynamics[18] by importing information from the environment. The environment (including the ecological and, later, the cultural environment) in which life originates is as important as matter and information. Information has downward causative power, emanating from the environment which makes the interplay between chance and necessity possible (Jacques Monod). Although it may vary over time, environmental information is a seemingly infinite source to tap. Values, which are a condensed form of

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and natural selection, which eventually proceed on a course that can be seen, retrospectively, as beneficial for the organism.

17 An 'algorithm' is a set of instructions or rules that is repeated to solve a problem.

18 The second law of thermodynamics specifies that in a closed system the total entropy cannot decrease, nor will it continue to rise indefinitely. There will be a state of maximum entropy or maximum disorder, which is thermodynamic equilibrium. Applied to biological evolution it means the constant flow of energy and information. The general struggle for life is for entropy to become available through the transition from the hot sun to the cold earth. This is the only source. Life is always on the lookout for meta-stable sources of free energy to exploit. Life utilises its sources to make resources from them. Animals burn organic material. Organisms control the release of energy through chemical reactions. On the level of information the appearance of a new species marks an increase in order. The price paid for this gain is thousands of unsuccessful mutants (see Davies 1999:50-55; Rolston 1999:41).

information, can be considered a negative form of entropy. They are comparable to symbols which encapsulate meaning and have a wide range of applicability.

CROSS-COMMUNICATION OF GENETIC AND ENVIRONMENTAL VALUES

The flow of information, vital to any evolutionary development is a highly complex and interactive process, involving all possible role players on the stage of life. In the drama of life there is no script (blueprint) indicating how the play is to proceed. There is only movement (dance) and interaction. There is no progress in evolution, only change. Although changes occur randomly, they are determined by successful or better adaptation to changing environments. Information from environmental circumstances must be communicated to the organism, which eventually stores new information genetically. Less successful changes lead to maladaptive species, which die out. Genes can be understood as the phenomenon of searching, using variations generated in the organism's encounter with changing environments to accomplish this end (Rolston 1999:24). The norm or value to be inferred from the evolutionary process is that whatever benefits an organism or species, whatever aids the preservation and multiplication of either of these two, is good. These beneficial 'values' are genetically encoded and transferred for the well-being of the specific life form. If the genes supply intelligence in sufficient amounts, they need not themselves be closely tuned to directing behaviour that can track environmental changes; they turn this over to the general intelligence they have created. This general intelligence feeds back to the genes (Rolston 1999:118).

Genetic identity is closely linked to the immediate environment in which the cell and organism find themselves. The environmental niche of the organism determines what genotype, what biochemistry is selected and maintained. Of importance is that the information at molecular level is 'communicated' to the higher, macroscopic level and the organism's confrontations in its community life there. On this level value is assessed, as is the case with humans (Rolston 1999:66).

In the case of humans the upward movement from genes to the cultural environment fails to explain the rapid advance of culture. The pace of cultural change is much faster than that of genetic evolution. The evolution of ideas outstrips the evolution of genes. Human behaviour is elliptic with two foci, one genetic and one cultural.[19] What genes do to culture by way of epigenesis is only half the story. The other half is what culture does to genes (Wilson 1998:179). However, it takes a very long time for information from the cultural environment to be genetically encoded. The rapid advance of human culture must be explained as culture taking on a life and evolutionary history of its own (presupposing the advent of the human mind). This means that the bottom-up process merges with a top-down movement. The two foci must always be seen together but should not be reduced to each other, since the system of inheritance of ideas seems to be independent of the system of genetic inheritance (Rolston 1999:136).

EVOLUTION FROM NATURAL TO CULTURAL ENVIRONMENT

The most important evolutionary change in the history of humankind was the switch of environments. Nature was gradually 'replaced' by the cultural environment as a dominant superstructure built on the substructure of nature. The creation of a cultural environment presupposes the emergence of the human brain with its neocortex, which was anatomically fully developed at least 100 000 years ago. The human brain made possible the storage of information in language and tradition outside the human genome. Memory, language and tradition are cultural DNA.

[19] Wuketits (quoted by Van Huyssteen 1998:144) maintains that environmental change by itself does not suffice as an 'evolutionary pressure'. Organic evolution exhibits patterns of its own dynamics that effectively surmount environmental constraints. Evolution is influenced by structures and functions of the organism itself.

The human brain also introduced the novelty of temporal and spatial experience. This raised the question of the fate of individuals and of humankind, which invited the introduction of a transcendent reality. The gradual dominance of the cultural over the natural environment was accompanied by a transition from implicit, biologically centred values to culturally determined morals. From the outset morals were associated with gods. In southern Europe religious rituals were already an essential part of people's lives some 20 000 years ago (Wilson 1998:145). Ayala (quoted by Rolston 1999:262) sees ethics as a by-product of selection for the sake of intelligence in the hominoid line. Increasing intelligence reaching the potential of the large brains of Homo sapiens made it possible to anticipate the consequences of one's actions, make value judgments and choose between alternative courses of action.

Culture, expressed in language and transmitted by tradition, became an inalienable part of humanity, as securely linked to humans as their genes. Wherever there are humans, there we find culture (*ubi homo ibi cultura*). As human culture developed, it gradually superseded nature as an interactive environment. Although the natural and cultural environments coexisted, nature became 'less' important as humans learned to control and manipulate it. From making fire to cultivating soil, culture supported and improved human chances of survival. A 'divide' between nature and culture was gradually introduced and humans came to see themselves independently of nature. Nature became the object of human actions, of science and technology.[20]

By virtue of living in a human universe humans experience both the realism of participating in the natural order and the meaningfulness of being separate from it (Ashbrook & Albright 1997:32). Humans are often more threatened and influenced by cultural revolutions than by natural catastrophes. The real world in

[20] Natural objects become invested with cultural meaning. They 'appeal' to us in this cultural mode. This is expressed by the term '*Aufforderungscharakter*' (invitation character), when the things we experience tell us what to do with them. Affordances in the environment are offered by things like surfaces to stand upon, places that offer opportunities, etc (Sanders 1999:129).

which they live is the world of the inner mind and interactive minds, which is regulated by the cultural environment. Although the cultural environment is linked to, and to some extent inhibited by, the natural environment (e.g. genetic and hereditary determination), it came to dominate the human mind. Cultural environment displays a freedom and potential which exceed that of the natural environment. Our cultural history testifies not only to the dawn of religion, the creation of ideology, and the invention of science and technology, but also to the extent to which humans have fallen victim to their own creations.

Something radically different occurs when culture, rather than genes, becomes the principal means of transmitting the past to the future and when conscious choice alters that future (Barbour 1997:61). Cultural evolution proceeded according to different rules than biological evolution. Culture has the potential and creativity to develop beyond anything we can imagine (Ashbrook & Albright 1997:32). Culturegens have the advantage of adapting rapidly to new and different environments, thus speeding up cultural evolutionary processes. Human culture, however, is predominantly conservative. When significant cultural change takes place it is experienced as revolutionary.

Culture implies people who value (see Rolston 1999:333-334, 281). Values are no longer primarily defended on the level of natural selection. The valuing activity shifts to a conscious level where it is culturally experienced and transmitted. The cultural self comes to transcend, even to partially replace, the biological self. The tight connection to genes got left behind in the exodus from nature to culture. Natural selection relaxed and the genetic leash became more pliant.

Culture could take over this function, previously limited to genes, because it proved capable of transmitting the same life-preserving values very efficiently. No culture has emerged that has propagated values contrary to the genetic values of selfpreservation and self-continuation (neither ethical nor scientific societies, for example, perform poorly in competition with other societies). The feeling of many sociobiologists that culture functions exclusively to arrange and control our biological predispositions is reductionist. Culture does more than this, as human history proves.

Cultural development displays such remarkable cross-cultural similarity that some scholars[21] identify cultural universals. It is extremely risky to regard these cultural universals as evidence of similarity between genes and culturegens. What we inherit, as Wilson (1998:163) indicates, are neurobiological traits that cause us to see the world in a particular way and we learn to prefer certain types of behaviour. Genetically inherited traits are not memes, but rather the propensity to invent and transmit certain kinds of elements of memory in preference to others.

Throughout the environmental change the human genome maintained its basic functions of protecting, preserving and multiplying the species. What the switch in environments and the emergence of the adult brain did was to add a corpus of knowledge and information supporting and complementing the human genome. One can surmise that the human brain developed capacities to meet the additional demands of human culture.

NATURE-CULTURE DUALISM?

To regard genes as predominantly linked to the physical side of humans, and the mind (to some extent the brain) as predominantly linked to the cultural environment may perpetuate a dualism between the physical (natural) and cultural (nurtural) dimensions of existence. Culture may become a new kind of supernaturalism triumphing over the natural environment. This would be reminiscent of the Cartesian legacy, which emphasised the mind at the expense of the body. Cartesianism contributed to the separation between the natural and the social sciences, the former focusing on an extended, physical reality and the latter on the cultural domain.

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[21] Wilson (1998:160) lists some 67 cultural universal traits compiled by the anthropologist George Murdock.

This 'dualism' is expressed in binary opposites like nature-nurture; body-mind; sensible-intelligible; immanent-transcendent; natural-supernatural; and natural science-social science. The sphere of nature belongs to the objective realm, studied by science and differing from the realm of culture and history, in which freedom and value are found (see Barbour 1997:70). On an ethical level opposites like flesh-spirit, body-soul and evil-good have been around since the Gnostic and Manichaean movements. One reason for the prevalence of mind-body dualism for many centuries was precisely this identification of body with nature and mind with higher spiritual values. In spite of present-day efforts to integrate mind and body, a nature-culture dualism persists. If we accept that humans are biological beings, that mind is part of body and that we are what we are because of the 100 000 genes characterising us, the human cultural environment cannot be isolated from the natural environment.

INTERPLAY BETWEEN NATURE AND CULTURE

The interplay between nature and culture means linking bottom-up and top-down processes. It makes no sense to welcome creativity from 'below' (the natural environment) but deny it from 'above' (cultural environment). The flow of biological information is not one-way but two-way (Wuketits, quoted by Van Huyssteen 1998:144). It must be possible to link higher-level theoretical with lower-level descriptive ones.

Wilson (1998:270) sees ethical and religious beliefs as a bottom-up human creation. It is not as a top-down process initiated by God or some other nonmaterial source reaching people by way of culture. This proposition reflects Wilson's resistance to any transcendental influence on humans. A better approach would be to combine a top-down with a bottom-up process, the top-down cultural environment incorporating bottom-up genetic drives and hereditary impulses.

Ayala (quoted by Rolston 1999:262) disconnects ethics from survival and maintains that the normative content of ethics is culturally based, not biologically driven. Moral norms are products of cultural evolution, not of biological evolution. Rolston (1990:263) correctly points out that the view that ethics contributes nothing to survival is the other extreme of the spectrum.

There is a feedback loop between biology and culture, which implies recognition of bottom-up and top-down processes.[22] The influence of the environment on life forms can be seen as part of a top-down process that interacts with and influences the bottom-up process. 'Environment' presupposes 'organism', and vice versa. Each is determined by the other. The environment is not 'other' to us, it is part of our being. Environments can be defined only with reference to the organisms that inhabit them, and vice versa. Environments change, as do organisms, and the transition to a predominantly cultural environment affected humans. As far as humans are concerned the brain plays a pivotal role in processing environmental influences. Brain cell excitation is no longer exclusively determined by biophysical forces but also obeys a higher command involving subjective feelings, wants, choices, intentions, moral values and other mental states. These include beliefs about life's purpose and meaning, God and the human psyche, and their role in the cosmic scheme (Ashbrook & Albright 1997:43).

Evolution theory does not limit what can happen in culture; on the contrary, it is itself limited, because it does not have the resources to say what can and cannot happen when culture appears. Situations arise (the Protestant Reformation, debates on nuclear disarmament, the computer revolution) which are not adequately explained by biological categories (Rolston 1999:145).

[22] Bottom-up causation occurs when many subsystems influence a system. Top-down causation is the influence of a system on its subsystems.

CULTUREGENS

Genes build an epigenetic[23] mind. Epigenesis conveys the idea of a secondary genesis ancillary to the primary determinants, a sort of epiphenomenon. The secondary epigenetic rules operate on an array of transmissible behaviours, mentifacts, and artifacts called culturegens[24] (i.e. 'culture genes', a term coined by Lumsden & Wilson; see Rolston 1998:126). A culturegen (called 'meme' by Dawkins 1989:196) is a cultural trait that an individual can choose, form an attitude about and use for effective living. Individuals have different propensities, resulting from their different genotypes, to adopt differing culturegens, hence the behavioural tendency to adopt a specific culturegen is genetically determined. According to this view a culture does not really have a life of its own. It is the product of myriad personal cognitive acts that are channelled by innate epigenetic rules, translating them upward to the social level through procedures of statistical mechanics. The upward movement is from genes to epigenesis to individual behaviour to culture. Although culture stays linked to biological hardware, it opens up boundless possibilities for cultural history (Rolston 1999:127, 156).

There are many differences between genes and culturegens (memes). Whereas genes are transported by DNA and RNA, culturegens are transported by language, writing, communication and interaction. Culturegens are more flexible in accommodating differences and mutations and they proceed much faster than genes. Whereas genes 'learn' over millions of years what is beneficial to the species, human culture does so much faster by way of conscious learning and experience. Genes do not determine beliefs but cultural selection does. Culture exceeds narrow genetic determinism, moving beyond the restrictive demands of survival by natural selection. The development of cul-

[23] Epigenesis means the development of an organism under the joint influence of heredity (genes) and environment. What humans can learn and what cultural practices they adopt are blueprinted in their genes (Wilson 1998:125, 210).

[24] Mary Maxwell proposes that culture builds on the biogram. The biogram gives us social feelings of familial attachment, submissiveness to authority, group loyalty and moral feelings. Culture enhances these feelings (Peters 1999:425).

ture, especially in the arts and sciences, is not random but a conscious and critical selection process. The basic principle of culturegens remains the survival, conservation and procreation of the species, but these driving forces are infinitely expanded. Culture breaks through the causal and serendipitous structure of natural selection by augmenting it with consciousness, rationality, history, art and religion.

There are also flagrant similarities between genes and culturegens. Both interact with and are determined by their specific environments. Where genes operate on a subconscious level, culturegens are formed in conscious interaction, both between humans and between humans and their historical and natural environment. Both genes and culturegens aim to preserve and duplicate themselves. Both develop through successful mutations, culturegens by means of new inventions, novel fashions, historical changes, paradigm shifts and so on. In both cases the unsuccessful mutations die out, although less successful cultural mutations display tenacity by surviving in subcultures. Subcultures may be seen as relatively successful mutations. In contrast to the law of nature, human culture on the whole cares for the weak and to some extent accommodates 'less fortunate' mutations by not delivering them up to nature's law – red in tooth and claw.

BIOLOGICAL (EVOLUTIONARY) ETHICS[25]

In evolutionary ethics moral judgments are believed to be based on sentiments that have evolved to promote the survival and welfare of human societies. Evolutionary ethics sees ethics as genetically based and driven. It grapples with the problems of determinism, the selfish gene versus altruism, the relation between group and individual interests, and environmental influ-

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[25] Evolutionary ethics can be traced back to Darwin, who based his moral theory on conscience. The evolution of morality is the evolution of conscience. Intellect allows reason to choose the best route to achieve what social instincts dictate. For Darwin morality was out and out a product of evolution, since both science and intellect are products of evolution (Thompson 1999:475-476).

ence. Socio-biological tenets ostensibly make it possible to proceed from 'known facts', rather than mere theory, to ethics. The facts are basically that the goal of living organisms is to pass on their own genes at the expense of all others, and that an organism should cooperate with others only if the other carries genes of the original organism or might aid the organism at some later date (reciprocal altruism) – a claim that Sussman (1999:459) finds suspect.

Cultural moral constructs may be seen to oppose biologically based values. Culture (religion) provides guidelines and principles according to which humans can live an ethically responsible life. Moral guidelines are, however, not universal and fluctuate, reflecting different cultural environments in new epochs. Although the concept of ethical responsibility seems to be in opposition to biologically grounded morals, human conduct is characterised by a struggle against natural drives. Moral prescriptions may be seen as an artificial cultural insertion taming our biological drives. These drives are said to surface, notwithstanding moral rules, in threatening circumstances like famine, war and catastrophes.

The biological link of morality[26] leads some to think that morality is an illusion and human altruism simply the superstructure of genetic self-interest. Human beings function better if they are deceived by their genes into thinking that they are bound by a disinterested, objective morality, which all should obey. These feelings are, however, ultimately attributable to biological processes. Ethics remains an illusion fobbed off on us by our genes to get us to cooperate (Ruse & Wilson, quoted by Rolston 1999:250, 253). Ruse and Wilson find no supernatural foundation for morality. It is something that has been put in place by evolution to make us function efficiently as social animals.

[26] In this context Christian ethics and social ethics are bracketed together, mutually influencing one another. Usually Christian (religious?) ethics relies heavily on a source of revelation for guidance in the mundane sphere, in some cases allowing the 'existential situation' and societal context to influence decisions. Evolutionary ethics makes it impossible to detach axiological questions and problems from our natural setting.

Without it there would be chaos. Although morality is subjective, our biology makes us think that it is objective. It is claimed that morality is merely an adaptation to further our reproductive ends. This statement is reductionistic (see Sussman 1999:459). The same could be said, mutatis mutandis, of religion and all other facets of human culture, which reduces reality to sociobiological factors. In any case, when put to social use biology itself easily becomes a socially constructed category that can limit social possibilities (Hoy 1999:18). Ruse (1999:447) considers morality a collective illusion.

Evolutionary ethics offers proposals to explain the development of the human primate from savage nature to a moral, nurturing animal. Our moral concerns have exceeded and extended our biological interests (see Rolston 1999:228). This can be ascribed to religion adding substantial depth to basic biological concerns. Imbuing human culture (nature) with transcendent values has added a new dimension to the purely physical view of existence. The nature of human values is such that it seems unconvincing to reduce the commitment of Ghandi, the struggle of Mandela, the sacrifice of mother Theresa and many other lives of compassion and love, too many to list, to basic, biologically driven instincts.

We know that our cognitive subconscious is populated by an extensive system of metaphoric maps for conceptualising, reasoning about, and communicating our moral ideas (Lakoff & Johnson 1999:290ff). We also know that the brain seen in PET scans has a subjective value-belief system that shapes culture, events and even its own biochemistry (Sperry in Ashbrook & Albright 1997:xxix). Human morality, however, presupposes freedom. This freedom must be linked to, but need not be compromised by, biological links.[27] Values always imply morality, freedom of choice. 'Ought not' implies 'can do otherwise' (Rolston 1999:71).

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27 Although Rolston (1999:71) claims that there may perhaps be a morality of genes, he concedes that morality implies the ability to identify different options and the freedom to choose between them.

Wilson (1998:274ff, 278), who advocates a union between ethics and natural science, distinguishes between only two approaches to ethics: an empiricist and a transcendental one. He opts for the former on the grounds that strong innate feeling and historical experience causes certain actions to be preferred; we have experienced them, weighed their consequences, and agree to conform to codes that express them. The empiricist view concedes that moral codes are devised to conform to some drives of human nature and to suppress others. In this sense ought is the product of a material process. This approach must be viewed as biological monism.

SELFISH VERSUS ALTRUISTIC GENE

Wilson's *Sociobiology: the new synthesis* (1975) invigorated evolutionary ethics. He dealt with the disputed issue of altruism by using the concept of inclusive fitness to indicate all the physical and behavioural characteristics of genetically related individuals that result in the transmission of genes to the next generation (Thompson 1999:479; Barbour 1976:80). Genes are no more capable of 'sharing' than of being 'selfish'. The terms 'moral' and 'selfish' are moral terms and genes are not moral agents. They simply transmit value-laden information (Rolston 1999:49). If, for example, selfishness exists in genes, it will be quite a different phenomenon from human selfishness. In the same way the kenotic structure imposed on the structure of the universe differs in important respects from the kenosis attributed to Christ.[28] The metaphor of altruism in biology is expressed in Christian examples of altruism, kenosis, love and compassion. One of the most appealing features of religion is the propagation of respect for life (created in God's image) as manifested in life-conserving ethics.

[28] Christ's sacrifice was followed by the resurrection, his incarnation by glorification, his powerlessness by empowerment by God. In the natural world an organism seldom benefits personally from altruistic action. Examples of 'sacrifice' in nature may be analogous to those in the human world, but are not the same. Most cases of sacrifice in nature benefit an organism's offspring or the species as a whole.

Cultural values with their moral constraints seem to weaken under stress when humans are threatened. Altruistic deeds in stressful times appear to be the exception. What passes for co-operation often turns out to be a mixture of opportunism and exploitation. Given a free opportunity to act in their own interests, nothing but expediency will restrain people from brutalising, maiming or murdering (Ghiselin, quoted by Rolston 1999:250-251). Biology seems to put constraints on culture, even as culture tries to override, build upon or transform our biology. This has been referred to as genes holding culture on a short leash. The fundamental claim of evolutionary ethics is that selfish persons outnumber (out-reproduce) unselfish ones, but at the same time it is claimed that (really) selfish persons who are self-deceived into thinking they are unselfish out-reproduce selfish persons who never knew their own selfishness (Rolston 1999:254).

Although the basic tenets of evolutionary ethics are in line with nature as we came to know it, it remains a broad and basic structure that fails to account for higher human faculties. How can it explain, for example, musical, artistic, or ethical capacities which contribute nothing to survival (Barbour 1997:60)?

Drees (1996:204-205) feels that it is natural to understand our constitution and behaviour by analogy with other species. Although he acknowledges the biological roots of human ethics, he feels that the influence of culture and cognitive capacities, and the behavioural plasticity thus generated, cannot be overestimated. We cannot deterministically link human ethics to our genetic heritage. Freedom stands over against determinism and freedom is self-determination. With reference to the work of Alexander, Drees (1996:207-208) concludes that the evolution of cultures with moral codes has been driven by two factors: group cohesion (for the group as a whole, against other groups) and indirect reciprocity (as a mechanism serving individual interests within a group). Acknowledging the evolutionary influence in ethics implies accepting human selfishness – which may not be easy in a culture praising altruism. An evolutionary perspective on ethics highlights that our moral language and ethical principles can be seen as a screen for amoral motives.

CULTURAL ENVIRONMENT AND THE GENESIS OF RELIGION: BIOLOGICAL ROOTS OF RELIGION?

The principles of cultural evolution can analogically and metaphorically be traced back to organic evolution. From a religious perspective there would be resistance to attempts to reduce religion to a product of evolution. However, the incorporation of human biological roots into religious thinking need not be experienced as threatening. It is positive in the sense that meaning is extended from the religious and cultural sphere to the whole of creation. While natural evolution may help us to understand human nature more fully, cultural evolution leaves scope for different models of transcendance. Davies (1999:263) reminds us that for three hundred years science has been based on reductionism and materialism, which has inevitably led to atheism and a sense of the meaninglessness of physical existence. For Davies recognition of a bio-friendly universe marks a definite shift. The division (dualism) between the natural and supernatural may, for example, be overcome by a panentheistic approach, as proposed by process theology.

If humans are biologically rooted, then so is their religion. Typical of most religions is their will to self-preservation (continuation of tradition and conserving their values), their expansionist drives (history of missions), the defence of their values (religious wars, persecutions and martyrdoms). The conservatism of many religious people (fundamentalism, fideism, sectarianism) can also be traced to these roots. For Wilson, (1998:280) religions are analogous to superorganisms. They have a life cycle, they are born, they grow, they compete, they reproduce, and in the fullness of time most of them die. In each of these phases religions reflect the human organism that nourishes them.

GOD'S ACTION IN THE CULTURAL ENVIRONMENT

Rolston (1999:38) considers God to be the explanatory dimension, for which contemporary biology leaves ample space. One can distinguish between God's action operating on the natural level through creation processes involving physical and natural laws as we came to know them, and his action on a cultural level, which involves the history of cultures and religions. From a panentheistic perspective God is perceived as present in and through physical and evolutionary processes. God freely limits his powers, respects natural laws and maintains the integrity of creation processes. His action in the human world presupposes that humans can accommodate his revelation (accommodation principle). Humans keep trying to make sense of what they experience. They organise the haphazard and the disorganised. The experience of God's revelation in history and nature is part of this meaning-giving process. God is a mind-phenomenon and cannot be known without the human brain. It also seems that the brain is 'wired' to inevitably ask the God-question. The capacity to find meaning and to experience God was impossible before the development of the neocortex which provided the capacity for consciousness, language and morals.

From a faith point of view it can be accepted that the evolutionary development of humans and the establishment of the cultural environment paved the way for religion and enabled humans to perceive and worship God. The existence of God cannot be proven empirically and has to be accepted in faith.[29] One can accept that the accommodation principle presupposes that God's revelation comes in a cultural robe which changes over time. Changing worldviews and different ways to find meaning impact on the way religion is practised. The accommodation

[29] Brown (quoted in Van Huyssteen 1999:123) attributes the Western dichotomy between faith and reason to acceptance of the religious claim 'by faith alone', which normally means that we are asked to accept it unquestioningly. Although this may be true in some cases, it denies the theological grappling with faith reflected in the *fides quaerens intellectum* dictum of the church fathers.

principle includes the role nature plays in arousing feelings of creatureliness, awe and wonder – feelings which stimulate the rational expression of the divine. To many people God's revelation in Christianity, for example, offers a perfect explanation of how everything fits together. Not only does mathematics uncannily 'fit' the reality of the physical world, but so do metaphysics and theology 'fit' the spiritual and philosophical worlds.

God's intervention in physical processes, recorded in biblical 'miracles', has theologically been explained in terms of its cultural setting. The message captured in a theology of miracles has remained intact and appealing in spite of the disenchantment process ('de-miracilisation') accommodates present-day worldviews.[30] There is no need to impose God's action on physical processes in a way which infringes their intrinsic laws. God influences believers by 'changing' their minds (hearts) at a common sense level.

The cultural environment leaves ample scope for God to influence the minds of humans in a way true to their biological nature. Both genes and culturegens want to conserve what is typical of the species. Religion fits the basic drives of preservation and continuation. The panentheistic model prevalent in process theology offers a credible way of maintaining both physical and religious integrity (see Barbour 1997:104ff). What Christianity has always believed is not incompatible with the story of life unfolding in evolutionary biology.

The cultural environment is the logical space where God reveals himself. On this level the autonomy, responsibility and co-determination of human beings as God's co-creators are in evidence. The spaces sought for God's action in quantum physics and autopoietic systems are redundant if one accepts that God is panentheistically present in, under and through all natural

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30 A reinterpretation of the miraculous events recorded in the Bible need not strip these stories of their original literary appeal. It is acknowledged that a Bultmannian demythologising process, which strips an ancient text of its cultural trappings, may also deprive it of its content.

processes. In Christianity he is encountered as the incarnated word which appeals to our reason and on our emotions.

Biologically rooted values seem to offer a common denominator that allows interaction between theology and the natural sciences. Although much research must still be done, it seems that these developments can help theology find a more integrated view of the human person. Natural science can benefit similarly.

3

MORAL EQUILIBRIUM OF THE UNIVERSE: GENESIS 3-11 AND NEW COSMOLOGY

INTRODUCTION: WHAT IS A MORAL EQUILIBRIUM OF THE UNIVERSE?

We experience the world through the language we speak, the metaphors we employ the models we use to interpret things. The world we see is more than the physical reality around us. It is a world constructed by human interpretation, co-determined by the specific culture, religion and society to which we belong. When the geocentric worldview was replaced by a heliocentric one it started a process which increasingly relativised the place of humankind in the cosmos. In the 20th century it culminated in the Western cosmological worldview, which revealed the minuscule size of our planet in the universe. The idea of human existence as the outcome of a physical reality that developed into self-conscious life seems to reinstate humans in the key position. An axiological interpretation of the universe and an emphasis on humans as moral beings restored their place and dignity in the universe. The physical universe on its own is incomplete. It cannot explain itself. Human beings are built into the scheme of things in a very basic way (Davies 1992:45; Van Huyssteen 1998:69, 86, 112). That means we must not lose sight of the human aspect – the role of human beings in the natural sciences.

There appears to be fresh recognition of the importance of values in all spheres of human activity, in worldview formulation, culture, religion and science (see Murphy & Ellis 1996:90ff). The renewed importance of values is evident in people's grappling with economic models and policies, their dealing with ecological challenges and societal problems, and their thinking about inter-faith and ecumenical encounters. Hence it is not surprising that the issue of values should spill over into the field of science and religion. The science-religion dialogue cannot be properly understood without recognising the important underlying values in both fields. One distinctly religious contribution to the debate is a focus on the impact the universe has on humans as religious and moral beings. An unexpected twist was the extension of the importance of values from human beings to the universe itself by claiming that it, too, displays a moral nature. If physical processes are sufficiently open to accommodate the acts of human and divine agents (Van Huyssteen 1998:42), it follows that they also accommodate human and divine values.

The notion of a moral universe is complex. What does it mean? Why is it important to make such a claim? What are the implications? Are we using literal or symbolic and metaphoric language when we describe the universe as value-laden or moral? If the universe can be shown to have a moral structure, its value-laden character could be considered literally true.

Many of the ideas and models that emerged emphasise in one way or another the spirituality of humans' relations with their physical surroundings: the idea of the moral nature of the universe; the anthropic principle (the idea that the universe possesses a priori properties to make human life possible); the inter-connectedness of all things; the holistic integration of humans, nature and universe; the importance of ecological concerns (e.g. the Gaia principle, viewing our planet as one big organism); the kenotic principle (based on the idea that the universe is hierarchically structured, with lower levels conditioning and serving higher levels – see Murphy & Ellis 1996:37ff, 174ff, 208ff). Developments in new physics and especially in quantum mechanics are used to support the argument for the spiritual potential of the universe. A cornerstone of this thesis is the so-called anthropic principle. Although valid criticism has been levelled at this theory, it remains influential. It seems that the universe not only harbours a hidden code that can be uncovered by ingenious investigation (Davies 1992:78ff), but also conceals an inherent, value-laden structure which can be read from finely balanced physical processes. This structure is said to have a very special message for humans.

The question is whether this moral structure of the universe is innate or imposed by us. One could argue that human artefacts do not have an innately moral structure but point beyond themselves to their maker, to what he/she had in mind when creating the object and the implicit value system that urged the creator to make it. For example, a carefully constructed bow not only testifies to a skilled craftsman, but may also indicate whether it was made for hunting, killing or recreational purposes. The bow tells a story about its maker's values, but as a physical object it is neither good nor bad.

The counter argument is that any teleological or ethical structure read from nature/the universe is simply a human construction (stance of faith), that physical processes and the laws of physics (but who made the laws?) are responsible for what is, and that it is difficult to find any meaning at all in the universe.

Although the bow (nature/universe) may point to its maker (God/laws of physics), it does not follow that it displays an innately moral structure. The bow/universe is neither moral nor immoral, since morality can only be ascribed to accountable living beings who take responsibility for their actions. Animals can be domesticated and trained and may be expected to obey or disobey commands. This does not make them moral beings, nor does their conduct display an innately moral structure (see Porter1988:93ff). Humans see reality through culturally and religiously tinted lenses. Through connotation and association, metaphors and symbols, anthropomorphism and anthropopatism (ascribing human characteristics to inanimate objects) we impose meaning on human actions and on inanimate reality.[1]

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1 Murphy & Ellis (1996:87) maintain that values are structurally inherent in the social sciences (and physical reality) and reject what they call the subjective idea that value and meaning depend purely on human choice.

In the Bible the relative consistency of animal behaviour is seen as a moral virtue, which is contrasted with the unpredictability of human conduct. In Isaiah 1:3, for example, we read: "The ox knows its owner and the ass its master's crib; but Israel does not know, my people do not understand." Nature is often seen in the Bible as testifying to God's providence, glory, goodness and care. The survival of the sparrow is not ascribed to its ability to adapt to its environment and fit into an ecological cycle; it is ascribed to God's loving care. In Psalm 19 the heavens declare the glory of God and the skies proclaim the work of his hands.

It is perfectly legitimate to ascribe specific, sensible meaning to things or relations in our world. It does not follow that we can expect everyone to accept that meaning. The claim that the universe has a kenotic (self-sacrificing) structure is based on (deduced from) the laws of physics. This implies that the kenotic structure of the universe, like the laws of physics, is universally valid. Thus a specific value becomes an imperative for everyone to follow. But this is not feasible, whether we deem this value beneficial for humans or not. It remains an interpretation, whether we profess to have physical proof of it or not. Even if a society embraces certain ecological values and tries to prohibit, for example, toxic dumping through legislation, these values cannot be made compulsory for all. Values, like religious faith, are personal and must be accepted voluntarily by individuals. Although values and religiosity are universal phenomena, they differ from person to person, culture to culture and epoch to epoch.

Any value system we read from the universe can only be seen as a personal testimony and its persuasiveness will determine its acceptability. Whether a creator intended his/her creation to have an inherently moral structure cannot be proved or disproved. To infer a moral structure from a natural entity is a stance of belief, which must be seen against its particular religious and cultural background.

One often finds that a science generates a multiplicity of pseudo-sciences. Although these pseudo-sciences all claim scientific support, they often exceed the limits inherent in that science. The different pseudo-sciences compete for public acceptance. Their proponents may be united in a religious sect or subculture which opposes the dominant religious or secular views of their culture. It is imperative to have guidelines indicating how far one may go in claiming scientific support for one's ideas and what the methodological constraints are. Participants in the science-religion dialogue have to demarcate these constraints as far as possible.

What follows is an example of how the message of an ancient text like the Bible can relate to present-day ecological concerns and be harmonised with the findings of new cosmology. A specific ethics of moderation and well-balanced power structures is inferred from Genesis 3-11. It affects human interrelationships, technological advances, and military and other destructive industries. The metaphor of balance is applied as an ethical guideline to understand human beings' relations with themselves, their fellow beings, God, the world and the universe. The message of Genesis 3-11 is compared analogically with some of the findings of new physics.

THE HUMAN QUEST FOR DOMINANCE AS PORTRAYED IN GENESIS 3-11

Literary genre of Genesis 3-11

Genesis 3-11 can be typified as proto-logical literature (Westermann 1978:72ff; Deist 1990:4ff). Proto-logical literature deals with things pertaining to the beginning, just as eschatological literature deals with things pertaining to the end. Humans continually ask proto-logical questions: How did everything begin, why are things the way they are and not different? Why are humans here and what is the meaning of life? Where do evil and sin come from? What is our ultimate destiny? The stories in Genesis 3-11 all deal with these questions in some way. They do not represent a historical, chronological account of the origins of the human race, but set the human scene, against which background the history of Abraham and the Israelites can be told from Genesis 12 onwards.

Structure of the six narratives in Genesis 3-11

The six stories in Genesis 3-11 share a common theme: the human quest for power and dominance (see Haag 1989:21-38). The theme of Adam and Eve's temptation and fall (the expression 'fall from grace' does not occur in any of these stories) in Genesis 3 is repeated in the other five stories. These stories recount the history of humans as one of continuous lust and striving for power, and its consequent loss. The striving for and consequent loss of power, structurally unify the six stories. In each story humans endeavour to overpower either God (vertical struggle) or their fellow humans (horizontal struggle). In each story the coup fails, leaving humankind less powerful than before.

This striving for power must be seen as encompassing all spheres of life. It is similar to the word for 'blessing' in the Old Testament. God's blessing affects all aspects of human life, all relationships and all needs. Power, too, affects all spheres of life. The same notion is found in the African idea of life-force (*seriti*), which empowers human beings in every sphere of life. It is crucial to understand that power and empowerment refer to enjoyment of communion and good relationships (*coram Deo, coram mundo, coram meipso*). Communion expresses intimacy between people and trust between them and God. God created humans from the earth (Adam, from *adamah*) and the female (*isah*) from the male (*ish*). They are first separated, then put in a relationship with each other.

The excessive hunger for power disturbs this relationship. When the finely tuned balance between humans, between humankind and cosmos, and between humans and God is disturbed, communion ceases and the relationship breaks down. Genesis 3-11 stresses human dependence on communion and ascribes human misery to failed relationships. Every illegitimate quest for power – be it a quest for immortality or dominance over God or fellow humans – is doomed to failure.

Genesis 3-11 from the perspective of failed attempts to seize power

First narrative (Gn 3:1-24): expulsion from paradise

In the first creation narrative it is clear that God creates by way of separation and combination. He separates light from darkness, surface water from atmospheric water, land from sea, humankind from earth, humans from animals, male from female, weekdays from Sabbath, and by implication, humankind from God. These entities are all put in relationships to each other. One party cannot exist without the other and each needs the other for its fulfilment. These relations concern human interaction with nature, with God, with other humans and with self. Genesis 2 emphasises nature's dependence on human care (Deist 1990:5). Genesis 3-11 concentrates on the relationship between humankind and God and among fellow humans. The whole of creation displays a finely tuned balance of relationships, which must be respected to preserve the harmony of creation. Harmony and dependence are complementary: without interdependence there can be no harmony, without harmony no interdependence.

After sketching the harmony of paradise, the first narrative recounts human dissatisfaction with this relationship: they want to be like God (sicut Deus). Eve listens to the snake, the symbol of wisdom and immortality. In antiquity the snake was venerated as the only creature that had succeeded in conquering death (the underworld), since it returns (after its winter sleep) from below (the underworld). Eve listens to the creature who has attained immortality in order to become like God, to attain godly power. Instead of gaining the power they hoped for, Adam and Eve lose the power and privileges they had: they lose the garden, their trust in each other, close communion with God, and life itself. They are alienated from God and each other. This alienation is symbolised by the flaming sword of the cherubim.

Second narrative (Gn 4:1-26): Cain's fall

Whereas the first narrative dealt with vertical seizure of power, the second story in the cycle is about power seizure on the horizontal level. Cain seizes power from his brother Abel. The two brothers both offer sacrifices to God. God accepts the sacrifice of Abel the shepherd, indicating that he was a successful herdsman and his herds would multiply. But God rejects the sacrifice of the agriculturist Cain, indicating that his crops would fail. The offering brought to God is the so-called 'first fruits'. A successful harvest is a token of God's blessing and indicates acceptance of the offering. The reverse applies to a failed harvest. In a sense the struggle between Cain and Abel is the struggle between rich and poor, haves and have-nots. Abel's success and wealth fuels Cain's envy and anger. In spite of God's warning to persevere, Cain succumbs to his feelings and kills Abel. Slaying Abel is also seizure of his power – his flocks. Instead of gaining power Cain loses everything he had: his relationship with God, his brother, his family and his land. As an agriculturist he has strong ties with the soil. He loses it and becomes a fugitive. He tells God, "My punishment is greater than I can bear. Behold, thou hast driven me this day away from the ground; and from thy face I shall be hidden; and I shall be a fugitive and a wanderer on the earth; and whoever finds me will slay me" (Gn 4:14).

When Eve gave birth to Cain (meaning 'I have created') she said that, with God's help, she had created a man (Gn 4:1). In bringing forth life she had in a sense become 'like God'. This triumphant feeling could not have outlasted Abel's death. The first effort to accumulate power led to expulsion from paradise, the second to loss of life.

Cain did eventually become wealthy. He also acquired power, symbolised by the city he named after his son Enoch. He was the first person to build a city, a stronghold, signifying human beings' fear and suspicion of each other. The fortified city is simultaneously a sign of human power and alienation. This mutual fear is evident in Lamech's song of revenge (Gn 4:24):

> I have slain a man for wounding me, a young man for striking me.
> If Cain is avenged sevenfold, truly Lamech seventy-sevenfold!

Third narrative (Gn 5:1-6:4): quest for power through intercourse with celestial beings

The third narrative tells how human women had intercourse with celestial beings and brought forth children who became giants. This narrative is difficult to explain and is often seen as a mythical residue. It displays, however, structural similarity with the other stories in this corpus.

Genesis 5 lists some of the descendants of Adam, from Adam down to Noah and his sons. An important message of this genealogy is that God allows the continuation of life. Each person's age is given, like a refrain. It is remarkable that virtually all the descendants reached an age of almost one thousand years: Adam (930), Seth (912), Enosh (905), Kenan (910), Mahalalel (895), Jared (962), Methuselah (969), and Lamech (777). Enoch is the only exception: he lived only 365 years. But he did not die: he disappeared, for God took him away. If Enoch is excluded, the average age of these people was 907.5 years.

The genealogy is vital for understanding the story. In Genesis 6:3 the Lord says: "My Spirit shall not abide in man forever, for he is flesh, but his days shall be a hundred and twenty years." This may be seen as his reaction to human intercourse with the celestial beings. Humans had hoped that through intercourse with celestial beings they would attain some form of immortality. This vertical effort to seize power was unsuccessful. In spite of the giants they brought into the world, the human lifespan declined to almost one tenth of what it was before. Once again the cunning effort to seize power on a vertical level failed. Their offspring were not gods or even demigods, but giants with a lifespan seven and a half times shorter than that of their predecessors. Longevity was a sign of God's blessing and proof of close communion with him. This was no longer so.

Fourth narrative (Gn 6:5 - 9:18): the deluge

This is the longest of the six narratives and has its origin in Ancient Near Eastern culture. The Babylonian flood narrative corresponds broadly with that of the Bible. In the Babylonian story the supreme God Enlil is angry with the god Ea, who allows Utnapishtim (the biblical Noah) to escape in the ark. However, Utnapishtim sacrifices to Enlil after the flood, and pleases him so much that Enlil rewards him with immortality. Thus the quest for immortality is also dominant in the Babylonian saga. In the biblical story, however, humankind does not attain immortality.

We are told in Genesis 6:5 that all people became violent. Violence is linked to power. It is the unjust exercise of power, coupled with disempowerment of the oppressed. In Genesis 6:11 we read: "Now the earth was corrupt in God's sight, and the earth was filled with violence."

Cain's sin had spread to all people. They were all alienated from each other. Fraternity turned to rivalry, displayed in human hunger for dominance. Collective violence did not benefit anyone, nor did it make the world a better place. Ultimately it left everyone powerless – all died. From the first story onwards there is a steady escalation of the ill effects of the desire for power. First humankind was deprived of paradise, then a man lost his life, then everyone's lifespan was curtailed, then everyone died – except Noah's family.

After the flood life started all over again, as in the case of Adam and Eve. God tells Noah to be fruitful and multiply (Gn 9:1). The story of the flood does not, however, represent a stage towards a better humanity. It is a sign of God's will to perpetuate the human species. This is proved by the nature of the covenant he establishes with humankind: "Behold, I establish my covenant with you and your descendants after you, and with every living creature that is with you, the birds, the cattle, and every beast of the earth with you, as many as came out of the ark. I establish my covenant with you, that never again shall all flesh be cut off by the waters of a flood, and never again shall there be a flood to destroy the earth" (Gn 9:10-11).

Fifth narrative (Gn 9:20 - 10:32): the story of Ham

This story probably represents an endeavour to explain the subjection of the Canaanites. They were enslaved by the Jews, and the story attributes it to Ham's conduct towards his father. The Jews encountered the Canaanites when they first invaded Israel (Lv 18). Their sexual deviancies were seen as the consequence of Noah's curse on Ham. The Jews, considered to be descended from Shem, subjected the Canaanites to degrading slavery.

Ham's action can be interpreted as an attempt to outshine his father. No moral judgement is passed on Noah's inebriation when he lay naked in his tent – that is, the public part of the tent where anyone could enter. Ham's mockery of his father was an act of disempowerment. Noah was dishonoured and stripped of his authority and power. Some interpreters even view it as an act of sexual subjection. In contrast to Ham, Shem and Japheth respectfully cover their father's nakedness. Ham achieves nothing through his deed of disrespect (attempted parricide?). Noah retains his power, especially his power of blessing. Ham – and his offspring – forfeit his father's blessing. They not only forfeit it: the blessing actually becomes a curse on Ham and his descendants. Once again the power seizure fails, leaving the perpetrator with less power than before.

Sixth narrative (Gn 11): the tower of Babel

In this story humans endeavour to build a tower reaching to heaven to physically overpower God. Once again they try to emulate God. The tower was intended to enable them to reach the heavens and dethrone God – a project attributed to the king of Babylon in Isaiah 14:13.

Towers (ziggurats) were common in the Ancient East. They were built as sanctuaries on high places and were seen as a kind of umbilical cord linking earth and heaven. Towers were also built for defence and symbolised power. Indirectly this story is a song of praise to human creativity, technology and cooperation. It represents the pinnacle of human effort to dethrone God and become like him. All nations participated.

There are a number of non-biblical Babylonian narratives telling of the struggle between gods and humans. The gods were afraid that humans would become too powerful and dethrone them. To avert such a takeover, they divided humans by giving them different languages.

In the Genesis story, God also divides humans through a multiplicity of languages. Instead of overpowering God, they become divided and lose their unity. The loss of communion with God issues in a loss of communion and communication between humans. Communion is impossible without communication.

Humans wanted to make a name for themselves, in Genesis 11:4 they say, "Come let us build ourselves a city, and a tower with its top in the heavens, and let us make a name for ourselves, lest we be scattered abroad upon the face of the whole earth." A name guarantees power, title and identity. Language is the vehicle of names. Without language no naming – hence no power – is possible. From Genesis 12 onwards it is God who give humans names and who renames them, with the power this entails. He initiates his covenant of grace with Abraham whom he renamed. In Genesis 12:2 he promises him: "And I will make of you a great nation, and I will bless you, and make your name great so that you will be a blessing."

Summary of the six narratives

There is an interesting alternation of horizontal and vertical power seizures:

1 vertical: Adam and Eve oppose God
2 horizontal: Cain slays Abel
3 vertical: humans have intercourse with celestial beings
4 horizontal: humans act violently towards each other
5 vertical: Ham overpowers his father (God figure); horizontal: inequality between nations
6 vertical: construction of a tower to overpower God

There is an ascending line of failure in the quest for power:

1 Two people are driven from paradise.
2 One man slays another.
3 The human lifespan is shortened seven and a half times.
4 All humans except one family are wiped out in the flood.
5 Nations are divided into classes.
6 Nations are divided through different languages.

Each failed power seizure issues in a loss of communion with God and each other.

Alienation replaces communion in all these stories:

1 Adam and Eve become shy of each other and hide from God. They are evicted from the garden. Nature becomes a threatening force, to be tamed through hard work.
2 Cain is alienated from the soil he once tilled and becomes a wanderer. He is alienated from other people and becomes a fugitive.
3 People's lives are shortened, leaving them less time for communion.
4 The extinction of humankind means the end of communion.

5 The division of nations into different classes alienates them from one another, resulting in constant war and power struggles.
6 Different languages symbolise misunderstanding, distance and alienation between people.

NEW TESTAMENT PARALLELS TO GENESIS 3-11

Temptation of Jesus (Mt 4:1-11)

The New Testament contains only one example of the way that Jesus dealt with power. At the start of his public ministry he is tempted to misuse his power. He is taken into the wilderness. When he became hungry, he was tempted to abuse his power when the tempter said, "If you are the son of God, command these stones to become loaves of bread" (v 3). Then he was taken to the pinnacle of the temple and challenged to wrongfully display his power by throwing himself down (v 4). Again, he was taken to a very high mountain and tempted to misuse his power when the tempter promised him all the kingdoms of the world if he would fall down and worship him.

Jesus refuses to exceed the limits he had been set. He allows himself to be bound by the word of God and his relationship with God. He quotes scripture to the tempter: "Man shall not live by bread alone, but by every word that proceeds from the mouth of God" (v 4); "You shall not tempt the Lord your God" (v 7); and "You shall worship the Lord your God and him only shall you serve" (v 10). Jesus' responses are the exact opposite of the human actions described in Genesis 3-11. Consequently he is not alienated from God but maintains communion with him.

The powerless God and power-seeking humans

In Jesus, often called the second Adam, the power relations between humankind and God are reversed. God is now a human being and ostensibly a completely powerless one. Jesus proclaimed as truly human and divine, shows that it is possible to be simultaneously powerless and divine. This is the purport of the so-called kenosis theology developed from Philippians 2.

In Jesus, God became vulnerable before humankind. They usurped the godly power contained in a human being by crucifying Jesus. This time the dethronement of God, which failed in the Genesis stories, succeeded. The only time Jesus was alienated from God and could not communicate with him was on the cross. On the cross he suffered being forsaken by God, an eclipse of God and rejection by God. Through this suffering he made it possible for humans to be united with God (versus alienation), to see God again (versus eclipse of God) and to worship him again (versus lack of communication).

Love versus power

The combination of love with power permits a positive view of power. Love is, paradoxically, both the attainment and the loss of power. In love power is fulfilled, need satisfied and security ensured. Thus love renders power superfluous.

BALANCE OF POWER: ETHICAL INFERENCE FROM GENESIS 3-11

The narrated stories can all be interpreted as human rejection of the balance of power that is vital to all relationships. Communion with God and one's fellow beings depends on respect for the power balance. Human beings have to accept their finitude and the limitation of their power. Humans cannot become God and their refusal to accept this reduces their potential. Humankind cannot dominate others or claim their lives or goods. Unjust domination restricts their own life. Disrespect for others (e.g. Ham's for his father) issues in degradation of everyone. Technology (e.g. constructing the ark) may be a means of survival but may not be used to obliterate the difference between humankind and God (e.g. building the tower). God has bestowed power on humankind as the crown of creation. He has also limited that power. Humans refused to accept this. The limitation of human power implies the existence of hierarchies and differences. Humans are not God, just as animals and nature are not human beings. One person also differs from another. Some are more successful and seemingly more blessed than others. This has hierarchical implications, which must be respected.

Humans, the crown of creation (image of God), are meant to rule over nature. Instead of accepting this, humankind aspires to be like God and rule their fellow humans. Human beings are also not meant to be alone. They need God, nature and others in order to be human. This need presupposes respect for others. Humankind's unique position as the acme of God's creation is evident in the human ability to relate, which is balanced on the edge of freedom and limitation. Highly sensitive relations can easily be disrupted by lack of respect, resulting in alienation from God, nature and each other. The Genesis stories do not locate evil in any non-human source. Evil is the consequence of humans' wrongful striving for power, their dishonouring of finely balanced relationships.

The Genesis narratives fail to reveal any moral improvement in man. The same motives and deeds are repeated with each new protagonist. This explains humankind's need for a saviour. The life of Jesus is an example of respect for balance of power. God must be God for humankind to be human. Jesus respects God and serves his fellow humans without losing his autonomy and freedom. His acceptance of the limitations of his own power does not prevent him from challenging the authorities and their wrongful exercise of power.

ETHICAL NATURE OF THE UNIVERSE

The world of ethics

As long as humans cherish values they will have ethics. To a large extent ethics, aesthetics and religion constitute the human spirit. There is not just one set of universally valid ethical guidelines. Ethical systems are culturally and contextually specific. This raises the question whether an ethical interpretation of the universe can be universal. Although the same scientific findings may be acknowledged by all, this does not guarantee they will have the same interpretation and ethical implications. This means that one has to be cautious when making an ethical interpretation of the universe. A major factor in such interpretations is the value most people attach to our cosmos and their insistence on knowing their place in it.

Ethics is the practical outcome of shared values. The world of values and ethics is pervasive and complex. Values and ethics may be as personal as one's fingerprints or taste in music, but they may also be shared by many people. They may change, grow or be rejected over time. Values and ethics can be interpreted from many angles and on different levels. They concern our subjective inner world but are also linked to reality. One can say that reality (ontology) concerns both logic and axiology (value theory). This confirms the interdependence of ethics and reality. Ethical codes want to be realised, actualised and personalised. They determine our identity.

The objectification of ethics is not without problems. It does not consist in metaphysical ideas. Ethical codes depend on people, institutions, ideas to embody them in a given time and space. They may differ in character, depending on their proponents. Values and the ethics they produce are not innocent. They are unthinkable without the power they exercise, the obedience they demand and the influence they exert. They determine conduct, manipulate attitudes, direct policies. In this process some values conflict with others and may override values lower down the hierarchical value scale (see Du Toit 1998b:58-65).

Importance of a finely tuned balance of power as a description of the ethical nature of the universe

How do the narratives discussed above concern the ethical nature of the universe? We said in the introduction that we cannot prove that the universe is either moral or immoral. It is a-moral. Any interpretation of a value-laden universe is made from a culturally and religiously biased point of view. Nonetheless cosmology has always been a determinant of worldview. The potential of findings in New Cosmology to either enhance belief in God or ridicule it impels reflection on the religious interpretation and possibility of an ethical universe.

There are many ethical and religious inferences to be made from the universe as we understand it today. The following come to mind: the seemingly closely knit and finely tuned nature of the universe, which may suggest a divine architect; the delicate balance of our planet, with the concomitant imperative of ecological responsibility; the seeming importance of our solar system in the large picture and the humbling effect it has; the reverence for all forms of life.

Examples of a finely tuned balance of power in the universe

The universe displays not only an extremely sensitive balance of power necessary for its development, but also finely tuned preconditions for its evolution. There are many instances of delicate power balance in the genesis and development of the universe (see Poole 1995:92ff; Murphy & Ellis 1996: 50ff). Let me cite some well-known examples.

The four basic constituents vital for the development of the universe depend on limitation and finely balanced interaction of forces (see Joubert 1998: 135,181, 224ff). These forces must be exactly balanced to make life possible. They are:

- Electromagnetic force, which controls the structure and interaction of atoms and molecules. The fine-tuning of electromagnetic forces entails fine-tuning of gravitation, since the ratio between electromagnetic and gravitational forces is crucial. If electromagnetic forces had been stronger as the universe expanded, the galaxies would have consisted almost entirely of red stars, too cool to promote and sustain life. If they had been slightly weaker, there would only have been hot, blue stars with a lifespan too short and temperatures too high to permit the emergence of life.

- Gravitational force responsible for the structure and dynamics of planets, stars and galaxies. If the gravitational constant had been stronger, nuclear reactions in the core of stars would have been too short for the appearance of carbon-based life. If it had been weaker, stars would not have become hot enough for nuclear reactions to start and we would have no suns.

- The weak nuclear force, which operates on atomic particles over very short ranges.

- The strong nuclear force, which holds protons together in atomic nuclei. For carbon to be created in any quantity inside stars the strong nuclear force must be within 90 percent of its present level.

There are many examples of the fine balance of matter necessary for the creation of life.

- Apart from the aforementioned basic forces, other finely balanced conditions had to be present for life to come into existence, including the heavy elements, sufficient time for the evolution of life forms, regions that are neither too hot nor too cold, and restricted values of fundamental constants that control chemistry and local physics. Hence, according to Murphy and Ellis (1996:51-52), only particular laws of physics and particular initial conditions in the universe allow the existence of intelligent life.

- The expansion of matter into space, caused by the finely balanced relation of forces. If the expansion had been minutely greater, there would not have been time for stars and galaxies to form. The density of the universe had to be quite precise. A universe of much greater density would have collapsed too soon to permit the development of life. A universe with insufficient density would have been too diluted to allow the formation of stars.

- The specific ratio of excess matter to anti-matter – one part in a thousand million – prevents the one from cancelling out the other. Without matter life would have been impossible.

- The molecular diversity we find depends on the exact temperature of our planet. If the temperature had been higher or lower, molecular interaction would have been reduced dramatically (Joubert 1998: 187).

These examples of well-balanced forces imply that there are limitations which must be observed for life to be possible.

Respect for power balances and preconditions necessary for the universe to evolve cannot simply be equated with a balance of power between humans and God and between humans themselves, as explained in the Genesis story. If the power balances prevalent in the universe should alter, everything would collapse. But even though the power balances between humans themselves, and between humans and God, are constantly violated, God does not forcibly intervene in human reality. The loss of human power in Genesis 3-11 does not prove such intervention. God allows humankind to act freely in every new situation. Loss of power is the consequence of human decisions. Murphy and Ellis (1996:208, 213ff) stress God's non-coercive but kenotic interaction with humans.

One cannot simply equate a kenosis theology with the hierarchical structure discerned in the universe. One cannot compare invariant physical reality with impulsive, arbitrary humans, or fixed laws with contingent human development. Any comparison between physical reality and human life is purely analogous.[2] In this analogy between physical universe and ethical life

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2 There are several biblical examples where natural consistency is compared with human inconsistency. See Is 1:3; Jr 8:7.

one compares inanimate with animate reality, physical laws with self-determined human beings, and fixed preconditions with contingent life. This can only be done analogically. The analogy makes sense in the light of New Cosmology, which highlights our relatedness with the universe. The umbilical cord of human history can be traced throughout the evolutionary development of this planet and the history of our solar system, back to the forming of heavy elements into galaxies, the formation of light elements, of quarks, protons and neutrons, all the way back to the mysterious beginning. Understandably, we try to find our identity by way of this umbilical cord.

Respect for power balance is an apt metaphor to explain our unique place in an awesome universe. It may also complement the kenotic model when we try to understand ourselves. The metaphor of kenosis may overemphasise the sacrificial self and a sacrificial ethics. The metaphor of a balance of power emphasises a relationship in which both other and self are recognised. God's preference for the poor (Weber 1989:113-137) implies empowerment of all. Levinas has indicated the vital importance of the Other/other for the vindication of the self (see his *Totality and infinity)*.

Present-day society has become critical of authoritarianism and the competitive hierarchical structures it implies. Kenotic principles, when applied by those in power and authority, can restore the balance. Kenotic principles rarely appeal strongly to the suffering and the weak. A balance of power respects those at the top of the hierarchy (let God be God) without neglecting the empowerment of those lower down the scale. The theology of a suffering God impacts on us precisely because it is the all-powerful God that suffers with us. A kenotic theology supports the empowerment of all. The powerful God became a servant to elevate and empower frail humankind.

The metaphor of respect for relationships and the concomitant power relations may also appeal to cultures with different ethical systems and to different religions. Wherever humans are found they relate to the transcendent (vertical level), and to other humans, nature and themselves (horizontal levels). These relationships invariably imply some sort of power balance that needs to be respected. Transgression harms the relationship. Genesis 3-11 promises a fulfilling life if these relationships are respected. If one internalises the value of power restriction, it also directs one's interaction with nature (ecological balance), one's view on the arms race, industrial and technological developments, and one's participation in the economic system of the day (excessive wealth, consumerism). The future of our planet depends on acceptance of this value.

4

COMMON GROUND BETWEEN SCIENCE AND THEOLOGY

INTRODUCTION

The cosmology debate is exciting widespread interest. Stannard (1993:135) refers to the Who's Who in theology and science, which lists the names of a thousand theologians and natural scientists from 41 countries who are involved in the debate, as well as 72 institutes, organisations and periodicals associated with it.

There is also local interest. The South African Science and Religion Forum (SASRF) seek to initiate local debate, relate to the international debate and make a meaningful contribution. That would include questions about the ethical, social and religious implications of the local debate, and especially the place of indigenous African cosmology in the global debate.

VALUE OF THE DEBATE

Criticism from various quarters suggests that the international science-religion debate has not reached any significant depth: it is popular but ineffectual. Both natural science and theology have specialised to such an extent that any attempt at meaningful debate is futile. On a popular level, scientists from diverse disciplines make eclectic correlations between aspects of New Cosmology and purely speculative ideas. From a theological perspective, God can never be proved – people either believe in him or not.

The debate's revival is attributed to creative speculation on quantum mechanics and chaos theory, and – like discussions of evolution – is not expected to contribute anything constructive. By the same token it is felt that intriguing examples of the fine-tuned nature of the universe and the anthropic principle[1] can be used in a religious context to impress people but not to convert them: that is the task of the gospel. Many theologians reject any kind of natural theology and blame natural science for secularisation in the West. "Science now answers questions as if it were a religion and its obvious effectiveness means that these answers are believed to be the truth – again as if it were a religion" (Appleyard 1992:228). Appleyard (1992:102-109, 229) makes an onslaught on natural science's triumph, which, along with the emphasis on economic growth, has become the religion of our time: "Faith has always been and will continue to be eroded by science …"

The debate is also influenced by a loss of faith in the natural sciences, which has made way for scepticism and a critical attitude. Instead of being the great saviours, many are experiencing science and technology as a major threat. "The last illusions of scientific innocence were blown away in the radioactive winds over Hiroshima and Nagasaki" (Wartofsky, quoted in Lamb 1989:84). "Science's achievements can simply be viewed as crimes, its knowledge as sin" (Appleyard 1992:138).

Negative experiences might bring resistance to natural science, but they also draw the attention of the general public. Huge technological tragedies such as the nuclear disaster at Chernobyl (1986) and the Bophal gas leak in India (1984), to mention but two, have helped to democratise natural science and technology. They belong to the people because they make ordinary folk suffer – even though they benefit by scientific and technological advances. Hence everyone is responsible.

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[1] The anthropic rule uses teleological arguments in favour of a finely tuned universe to substantiate the premise that the cosmos is directed to humankind and humankind to the cosmos. It is an example of a meta-scientific explanation that authorities like Freeman Dyson would call a retreat to a pre-Copernican worldview which sees humans as the centre of the universe (Wildiers 1988:261).

ITS MULTI-LEVEL CHARACTER

Even though faith in science has been eroded, for many, natural science remains the primary source of the meaning of the human condition. As for the natural scientific worldview, it remains the only plausible point of departure.

Despite all the criticism the debate is essential. Its multi-level nature and complexity do not prevent meaningful discussion. It would be very unwise to try and force the debate into a specific, predetermined mould. This article does not dwell on the various sides or status of the debate, but looks into the importance of cultural and historic developments affecting both natural science and theology. (For the structure of the debate, see Rottschaeffer 1988:218-223.)

BOTH SCIENCE AND THEOLOGY TO BE VIEWED IN THEIR CULTURAL AND HISTORICAL CONTEXTS

Both the natural and human sciences are influenced by historical developments, cultural change, ethical and socio-political circumstances, and so on. Mooney (1991:310, 327) writes: "The epistemology of science differs from that of theology, but, as we have seen, a common sociology of knowledge, arising from the dynamics of history and culture, can both critique and illuminate the efforts of each. The thought processes of each group have undergone a remarkably similar development in recent decades. Their epistemologies may differ because of the different types of human experience they investigate, but there is a common sociology of knowledge available to both …"

Epistemological and hermeneutic developments have posed similar questions for both parties. Discussions about the status of knowledge and considered opinions on truth and reality have also revealed an implicit interdependence of corresponding views. Knowledge of this common sociology of knowledge is essential to understand the level on which this new phase in the science-theology debate operates.

The development of scientific theories cannot be detached from the cultural phase in which we find ourselves. The influence of cultural pluralism and openness is equally dominant in the progress of the natural sciences. Although the Newtonian laws remain valid, the context in which they are applied has changed. Hence it is not just physical phenomena and the laws governing them that determine scientific interpretation, but also the interpretive framework in which it happens. The same facts are used to construct different stories. This gives the natural sciences the same narrative character as the human sciences.

The scientist's life world with its ethical dilemmas and ambiguities co-determines her approach to strictly scientific questions. 'Pure science' is not an intangible Platonic heaven of unchanging, universal ideas. The moment the act of interpretation starts is also the moment when these ideas are clothed in language and contingent, cultural, sociological and historical attire. This does not mean that we cannot understand earlier interpretations by different cultures.

For the Greeks, as for medieval Europeans, explanation meant describing the essence or nature of a phenomenon and indicating its place in the broader world order. The Greek philosophers saw nature as a fixed, orderly body of eternal entities and their relationships. The immutability of the underlying entities was a precondition for the intelligibility of the natural world. After Galileo and Descartes explanation entailed weighing, measuring and comparing phenomena and establishing their characteristics. As in Greek thought, nature was viewed a-historically in post-Renaissance times. In Western Europe nature was seen as creation fashioned according to a divine design from the late 16th century onwards. It was only after 1750 that a historical approach challenged the idea of fixed entities. Starting in the human sciences, these ideas, along with the idea of organic evolution, spread to the natural sciences by way of palaeontology, historical geology and biology. Evolution emphasises the historical dimension of nature. Explanation means indicating the origin and history of a phenomenon. Humankind, creation itself are explained once you have indicated their origin and evolution.

Kuhn's *The structure of scientific revolutions*, brought the realisation that natural science could no longer claim to work with fixed ideas. It was caught up in the same historical flux as the human sciences. From this point of view human ways of thinking about nature were no longer the concern of 'pure reason', transcending the contingent historical situation. All thought should be seen against a historical, cultural and social background as the work of finite beings dealing with particular problems in specific situations (Toulmin 1989:234-236; Wildiers 1988:229-230).

Thus our views of science and truth are constantly changing. According to Mooney (1991:294) science has come to be seen as a far more relativistic project, influenced to a considerable degree by social ideologies and attitudes. Its imperialistic claim to being the sole road to certain knowledge has been largely eroded, and it is increasingly viewed as just one of the ways in which humans seek to make sense of their world.

Cultural changes influence us more than we think. The symbolic order in society, language and the world of meaning influences us. In every respect we are products of cultural change, and so is everything else. We have the same type of relationship with culture as people used to have with God. In the past our specific identity was attributed to divine providence; nowadays we are explained by culture. Through its mysterious, creative power it has called us into being and written its laws on our foreheads. We are subject to it because it constituted us as its subjects (Cupitt 1987:103).

THE WORLD BEHIND AND IN FRONT OF THE TEXT

The world of theologians and natural scientists can be thought of as a text. Each interprets and understands the text within their own field according to the prevailing rules. But there is not only one set of interpretive rules. Different, often opposing approaches all seem to 'work', whether in theory development or in preaching.

The question concerns the number of accepted modes of interpretation. One could distinguish between three legitimate interactions that constitute the scientific process: metaphysical, empirical and existential (ethical).

The middle level (world within the text) is empirical or formally scientific, where the scientist is dealing with an occurrence and its explanatory rules. In theology it is the level where the biblical text, the religious tradition or dogma is studied. Even on this level there is no single meaning to which everyone agrees, although we can criticise and control the methods used to establish meaning. Differences of opinion always lead back to a study of the occurrence itself. In striving for scientific approval theology has emphasised controllability and verification. The biblical sciences in particular work with specific texts whenever possible. The textual meaning can be established by means of certain strategies. By reaching consensus on acceptable methods of text interpretation exegetes arrive at a reasonable exposition. In systematic theology language has received special attention and the challenge has been to keep propositions logically coherent. Perhaps theology has achieved acceptable scientific practice, but the actual purpose of the exercise – to promote understanding of faith – has lost its spiritual dimension.

The higher level is metaphysical, where the cause of the occurrence is at issue. What is the world behind the 'text'? This is where we work with metaphysical constructions and build metaphorical models. It does not mean that the natural sciences have succumbed to a new form of romanticism, thus restricting their own character. On this level one asks about the nature of reality itself. Why are the laws of nature what they are? Biblical texts also refer to certain realities. Here the question concerns the existence of God. In the case of biblical texts the world behind the text is questioned – the cultural and sociological circumstances, the redactors, their motives and theologies, and so forth.

The lower level is existential and ethical. Here one asks oneself: 'So what? How does it affect me?' In theology this is the level at which people are confronted and changed by the text; their entire lifestyle is influenced. In the natural sciences the questions are what to do with all this knowledge, how it affects one's own and other people's lives, and so on. The feeling of insignificance created by New Cosmology colours one's reflection on the whole process. Although absolute agreement on the legitimacy of different text interpretations is hardly feasible on this level, in some ways it is the most important level. It represents the democratising and ethical dimension of natural science. It also involves our baggage of self-understanding and pre-understanding, the social dimensions of truth, the conscious or implicit power strategies that dictate what we see and say. According to Porter (1988:377) the very structure of present-day thinking is determined by the human sciences. By continually monitoring, categorising and grading human behaviour, science constructs a kind of interpretive grid through which texts are viewed.

All three levels are part of the same process and are equally important. Theories on the metaphysical level cannot be proved but they can exert an important influence on theory formation. There may be many differences on the existential, ethical level, but essentially it is this level that makes scientists what they are. To protect us against reductionism the transcendental, formal and existential dimensions are vital.

This approach should accord with critical realism, which acknowledges the importance of accurate knowledge about objects as well as the improbability of absolute certainty. "This is because both scientists and theologians have come to recognize, each through their own distinctive experience of reality, that too many cultural, personal, and conceptual filters intervene between the knowing subject and the object known" (Mooney 1991:310). Critical realism in theology would maintain that theological concepts and models should be regarded as partial and inadequate but necessary, and indeed the only ways of referring to the reality named 'God' – and to God's relationship with humankind (Peacocke 1990:14).

This can be summarised as follows:

Text level	Theology	Natural science (new cosmology)
The world behind the text. Constructions that help to make sense of the occurrence. Often has a metaphysical nature. (Nominal)	Cultural circumstances. Social, political, economic circumstances. Redaction criticism, etc.	The condition before the beginning. Metaphors and models. Design of a natural law that explains entities. Narrative and metaphysical nature.
The world within the text. Empirical level. Structure and method. Control and verification. (Phenomenal)	The biblical text. Genre, structure, style, exegesis. The autonomous inner world of the text.	Empirical level. Control and testing. Level of theories and norms. Can have a metaphysical dimension.
The world in front of the text. Existential and ethical level. Worldview. Social and cultural orientation of scientist. (Existential)	How the text affects the reader and influences and changes her life.	Ethical responsibility of the natural scientist. What do I do with the results? Applied sciences.

Although the position could be schematised differently, the table does help to indicate the similarities between the methodologies of the natural and the human sciences. Pannenberg (1976:116) makes the point: "Not only are traditional human sciences increasingly using methods regarded as belonging to the natural sciences, there are also natural sciences which pursue 'historical' investigations." The unfortunate distinctions between natural science and human science can be attributed to the Cartesian division into res extensa and res cogitans. These distinctions are no longer functional. A prerequisite for any significant dialogue is to change from a Cartesian to a post-Cartesian perception of reality.

Aspects of such a change are:

Cartesian era	Post-Cartesian era
Humans control nature in a subject-object relationship.	Humans are part of nature. Subject and object are interdependent.
Knowledge of nature through control. Instrumentalism.	Knowledge integration. Human subject is involved in nature.
Mechanical expository model. Free from speculation and bound to empirical reality.	Holistic expository model. Organic union between humans and nature. Models and theories as metaphors. Metaphysics part of scientific design.
Quantitative experimental methods.	Qualitative hermeneutic methods.
Objective, substantial knowledge.	Knowledge subjective and historic. Moral and aesthetic values part of knowledge design.
Knowledge politically neutral and functional.	Knowledge value-orientated and functional.
Knowledge elitist and non-democratic.	The narrative design opens science up to everybody. Democratisation of truth.

METAPHOR AND THE LANGUAGE ISSUE

The value of metaphors in cosmological descriptions cannot be overemphasised. The cosmologies of Copernicus and Newton both became influential the moment the ideas were expressed metaphorically and thus made understandable to the general public (Wildiers 1988:224-225).

Both scientists and theologians employ metaphors, because they seek to describe and explain extraordinary phenomena. They are dealing with realities which may be referred to and pointed out but are beyond purely literal description. Physicists cannot see the microparticles of their models, nor can theologians see the God of their confessions. Both employ metaphoric language and describe reality in terms of models, theories and doctrines (Rolston 1987:323; Peacocke 1990:19). We now recognise the symbolic, mythological, intuitive dimensions of our thought. We also need metaphors to present explanations that supersede previous ones. Scientific theories are constructed on the basis of root metaphors like 'the world is a machine', 'the world is mathematical', and so on. Theology uses root metaphors like 'the Bible is God's word' and 'religious experience is divine revelation'. Such metaphors are extremely dangerous, according to MacCormac (1976:140-141), when their familiarity deceives us into believing that things really are the way they are described. Myths arise in both science and religion when people believe theories founded on root metaphors to be literally true (MacCormac 1976:140-141). One realises how many recent books on cosmology deal with mythology rather than science.

Thus metaphors are a way out for both theology and natural science. To express the complex cosmos in restricted language calls for metaphor. When it comes to propositions about God and some physical theories (eg exactly what happened in the beginning) we should ask ourselves whether they are literally true or figurative. This is analogous to the realism/anti-realism debate.[2]

Neither of the two options is satisfying. Reality is revealed to us and we interpret it in a specific context. It is neither literally true nor merely figurative. We interpret what we see. We compare and we reach conclusions. Without this, nothing would make sense. We cannot live without assigning meaning. This is evident in our efforts to make sense of the senselessness of evil and unjust suffering.

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[2] Realists like Planck, Eienstein, Campbell, Whitehead, the neo-Thomists, Nagel, Smart, etc, adopt an object-oriented view. Nature is decisive in the humans-nature relationship. By contrast instrumentalists like S Toulmin, F P Ramsey and G Ryle emphasise human interests in the humans-nature debate to such an extent that nature's interests are eclipsed. Human interests are emphasised even more by idealists like Eddington, Jeans and neo-Kantians like Cassirer and Marggenau. They stress the subjective nature of scientific constructs (Wildiers 1988:228-9).

Examples of metaphors used in the cosmology debate

Without commenting on their merits are:

- The point of view about space time could be used metaphorically to reinterpret the biblical view of history, the covenant and time.

- Space time is used by Peacocke to describe God's attributes. God is part of expansion of space time, thus immanently part of space time, which encompasses energy and matter. This means that God is continuing to create all the time. As a historical God who enters into a relationship with us, he is also the creator of space time which makes everything possible. God relates to us temporally. God creates and is constantly present in each instant of the physical (and derivatively, psychological) time of the created world (Peacocke 1993a:479-482).

- The phenomena of randomness and predictability that emerged from developments in quantum theory serve as metaphors for God's providence and action in the world. On the one hand we could interpret world events in a way that reflects a visible line of care and planning. But then there are details that make no sense at all. The unpredictability of situations is a predicament for freedom and personal interaction. God chose to make a world of chance, because it would have the properties necessary for producing beings fit for fellowship with himself (Peacocke 1990:156-7).

- Pannenberg uses field theory in physics to describe God's action in the world. The concept of a force field, devised by Einstein and Faraday, becomes the metaphor for the work of the Holy Spirit and even of angels in the world (Pannenberg 1989:158-167).

- Peacocke uses the micro-quantum event on the 'Heisenberg' level, and the example of nonlinear systems on the macro level, as metaphors to describe the free will and constraints God imposes on himself. In these systems there is no particular point in time of which it could truly be said, 'This will be its future state.' The future state of such systems is unknowable to God and humans alike (Peacocke 1990:151-165; 1993:479).

- The behaviour of particles in quantum physics is used as a metaphor for the integration of subject and object in theory of knowledge.

- The game metaphor also helps to explain occurrences in quantum physics. The game is far more than the aggregate of its rules. Whereas game rules are established, the play itself is unpredictable, dynamic and spontaneous. Human responsibility consists in adhering to the rules on the one hand, and utilising every possibility the game allows on the other. Despite its fixed underlying rules, the game metaphor makes it impossible for natural science to explain, for example, the behaviour of particles in quantum physics in a deterministic or mechanical way. In Christianity it is believed that God predetermines events (fixed entities) and that we are simultaneously free (indeterminate entities) (Wilders 1988:226-7; Du Toit 1984:52).

The examples are metaphors because there are no binding reasons why the associations must be made. The associations are not crucial but creative and therefore personal. The value of metaphors lies in the fact that, while preventing us from getting caught up in fixed associations, they lead to fresh insight.

THE NARRATIVE DIMENSION OF SCIENCE (NEW COSMOLOGY)

Empirical examination and theory formation in the natural sciences are complemented by the construction of a natural science narrative. It not only gives purpose and meaning to natural scientists' labours, but is also integral to their worldview and ethics. It is mainly via this narrative that the natural scientist influences popular opinion. On this level influences from other societal narratives are apparent and correlations between theology and other cosmologies can be made.

If we accept that our worldview (which is generated mainly by our cosmology) significantly influences our value systems and lifestyle, we have to accept that cosmologies cannot be forced on people. A cosmology grows on us, the story from which we derive meaning for our existence. Without this story New Cosmology could not have such a powerful influence on people's lives.

If a historian were to watch events like one watches a movie and merely look without interpreting them (if that were possible), he would see everything but understand nothing. Only by appropriating narrative interpretations, in which one assumes a personal role, can one begin to understand. In this sense science must be transformed into interpretive history to have any meaning. Thus science is subsumed under story. The interpretive narrative, one hopes, will match – but also make – one's own story (Rolston 1987:338-9).

In the post-Newtonian era, in which the dynamic, fluid nature of the universe is accepted, theory formation is likewise dynamic and fluid. The process of theory formation in natural science, the status of different theories and the realisation that we cannot always explain the occurrence we are investigating give the methodology a narrative nature. One could even speculate on the development of natural science narratives containing numerous stories functioning in a defined natural science genre.

The natural science narrative does not imply that exactness, controllability and verification are no longer important. They are, however, not the only contributing factors. The questions of relevance and pre-understanding, social and other contexts also influence the investigator. Natural scientists cannot ignore human experience and contemporary living attitudes and still hope to exercise any influence.

Science is a way of thought, not merely a body of knowledge (Mooney 1991:300). Our experiences are theory-laden – therefore our personal and social experiences are laden with religious, social and moral theories to which we are committed (Rottschaefer 1988:223). The science story affects our lives. In vitro science may be neutral; in vivo science is generated by the transformation and conflict of values (Rolston 1987:341).

Natural scientists are becoming modern storytellers. Their stories are more than science fiction which came true. The most absorbing aspect of science fiction is not the wonders of nature or technology, but how people react and are affected by them. The democratisation of natural science demands that the implications of science and technology be spelt out. It is not only people's physical existence that is affected, but also their spiritual lives. Whether the natural science narrative takes this into consideration or not, it remains the underlying question.

The cosmological story could be juxtaposed and read with other stories. The difference is that in our cultural context the story makes sense in a manner that old stories do not. This does not imply that ancient stories like the biblical creation stories are obsolete; they may still have a unique message and an impact that modern stories lack. But the cosmological story, like most others, has a remarkable influence on our ways of giving meaning to our lives.

Only the story – with its mythic and metaphoric elements – can express the existential, mystical and religious motives which animate reflection on cosmology. The contemporary science fiction story, apparently highly imaginative, should be complemented with the no less imaginative myths that fully express our human nature: our values, fragility and responsibility.

ETHICAL DIMENSION OF COSMOLOGY IN THE COSMOLOGICAL STORY

In the work of Kant, a committed Newtonian, we already observe a shift away from ontology (the core of Greek thinking) to epistemology and ethics. The natural scientist is no longer a mere spectator of natural phenomena, but a participant whose endeavours are not value-free.

Theology does not have a prerogative on ethics. Natural scientists cannot afford to ignore the ethical consequences of their labour. Theology must critically investigate all influences and offer guidance in a world fraught with ethical dilemmas. It must try to link facts to values and so link cosmology and axiology (Drees 1990:160). To consider anthropocentric ethics today is to consider cosmo-centric ethics. The two are inseparably connected. Cosmology has an implicit ethical dimension, evident in the way the cosmological story is told.

Ethics is always determined by tradition. A plurality of ethical approaches can co-exist. There is no such thing as a Christian morality. There are as many sets of Christian morals as there are Christian societies. This does not imply moral relativism that precludes discussion but moral plurality with compound dimensions of ethical issues. Historical context is always reflected in ethics. We live in a pluralistic society with a multiplicity of (sometimes competing) moral convictions. This leads to a democratisation of ethics in terms of practical and general societal issues. The formulation of such an ethics will be imperative in South Africa. The cosmological narrative that will have an impact on the process is of great importance, as it will contribute to the formulation of belief systems, ecological tenets, anthropology, et cetera (Musschenga 1990:134-159).

DIALOGUE WITH AFRICAN COSMOLOGIES

The ideal would be to allow different cosmologies to influence people simultaneously. Although these stories might contradict one another, it need not be experienced as problematic. There are inevitably different narratives, symbols and myths which interact and help to shape a certain value system. Thus both biblical and contemporary cosmologies could make solid contributions without forcing a synthesis.

A TOE (Theory of Everything) in the sense of a master narrative would conflict with the idea of a plurality of assorted narratives. A holistic approach entails integrating all of reality rather than one-dimensionality. In any case we know that there is no all-encompassing worldview that everyone shares.

Changing to an ethics based on scientific truth would mean largely substituting the natural cosmos of science for the various mythological, intuitive, mystical or other-worldly frames of reference which people used for their lives and their search for meaning (Sperry 1983:75). This could be remarkably rewarding for Westerners. Criticism of Western rational, scientifically oriented ethics comes mainly from so-called 'Third World' countries. Unamuno (quoted in Rescher 1990:112-113), for instance, states that to characterise people in scientific terms and categories succeeds only in dehumanising them, stripping them of their characteristically human traits. The salient values of the scientific approach are regularity, lawfulness, consistency and order, all of which are ill suited to the human condition. Human beings are not rational animals but a mass of contradictions. Questions as to how New Cosmology is to be received in Africa, what influence it can exercise, how it is to relate to African cosmologies, and what negative or positive implications it can have need to be answered.

Traditional African cosmology stories appear to know nothing about the origin of life as we know it today. The truths in such old cosmologies may seem archaic. They did not have scientific categories with which to interpret nature. But in the areas of morality and awareness of ultimate issues in human life they were often on the cutting edge and we may profitably test and often trust them (Rolston 1988:340). This is a sphere that calls for research.

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DOMINANT SCIENTIFIC AND TECHNOLOGICAL WORLDVIEWS: CHRISTIAN RESPONSES

INTRODUCTION

Worldviews are comfortable stories with which generations of human beings identify in order to explain themselves and the world they live in. A worldview is a harmonious picture made up of all life's jigsaw puzzle pieces. They seem to fall neatly into place and normally none is missing. The larger picture incorporates many smaller scenes, which tell how scientists, philosophers, writers, blue-collar workers and other groups view life. If one stands back, a holistic picture emerges made up of all these smaller tableaux. In the worldview gallery it is possible to view pictures of past ages, histories and cultures and to note similarities and differences between them. The closer one gets to the present, the more complex and blurred the picture becomes – like looking at the many faces in a crowd.

Many people today do not believe in smoothed over pictures explaining away all life's paradoxes. The many conflicting pictures in the contemporary worldview gallery are so confusing that we often feel it is safer not to opt for any one of them.

In South Africa we have many conflicting worldviews that have not been analysed explicitly and adequately. They concern all spheres of life, from the religious to the political, the economic and the scientific. It makes no sense to try and encourage study of the natural sciences, for example, without investigating what worldview underlies the fact that so few students show an interest in science. Although the issue is complex, we have to identify the relevant contextual, cultural and religious factors that make up worldviews in this country. We need to know to what extent worldviews overlap or share values, and to what extent they are affected by a common technological culture. It is difficult to assess the worldviews operative in a society, to indicate how they were shaped, and how one worldview was effaced and a new one came to be born. Worldviews are shaped and reshaped in a process of cultural interaction. Different interpretations and worldview models seem to compete, free-market fashion, for dominance. The social dynamics operative in any given context determines which worldview will dominate. We are discovering that existential and scientific conflicts can be traced to differences in underlying worldviews (Olthuis 1985:153). Some people hang on to old worldviews, trying to preserve them, while others maintain that we are in desperate need of a new one.

Let us take a closer look at the worldview gallery.

THE WORLDVIEW GALLERY

Your worldview is the way you understand yourself and your world, your notions about ultimate questions such as where you come from and where you are going, what place you occupy in the world and how you can live a meaningful life. No single definition adequately explains the term, which comprehends a multiplicity of models, perspectives and contexts. A very basic definition would be that worldviews comprise philosophical, theological, scientific and popular appraisals of the world.

The world may be seen as a text and a specific worldview as a reading and interpretation of that text. No reading can claim to be final or legitimate. Existential need demands that a worldview must be something you can live with. It has to answer the need for belonging and security, for explaining whence we come and where we are heading, why things are as they are, and the meaning of life. That is why worldviews stay in place even when they no longer give satisfactory answers to all life's questions,[1] and why they are consistently positive. An absolutely depressing, humanly degrading or demoralising worldview is rare.

Feyerabend (1994b:152) defines a worldview as a set of beliefs, attitudes and assumptions that involves the whole person (not only the intellect), has some kind of coherence and universality, and has a far more powerful impact than facts and fact-related theories have. Worldviews are necessarily generalisations of some aspect of the world as it is experienced. An organic worldview arises from observing organisms. A mechanistic worldview stems from observing machines. A spiritual worldview is formed by observing particular qualities of human experience. A dualistic worldview is a response to both human self-experience as mind and human experience of the world as matter (Cobb 1988:101).

For Olthuis (1985:155) a worldview is a set of fundamental beliefs explaining our calling and future in the world. It is an integrative, interpretive framework in which we judge order and disorder, the standard by which reality is managed and pursued.

A worldview is conceived of as, strictly speaking, conservative and associated with closed systems of thought. In long established societies a well-defined worldview dictates the important beliefs and principles which codetermine people's lifestyle. Such a worldview is normally intolerant of other worldviews and resists reinterpretation of its own tenets. It also transmits the values implicit in these tenets.

An intolerant worldview is no longer feasible in a world where cultural interaction and a dynamic plurality of volatile, competing

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[1] Worldviews may be believed in, but with reservation. One finds, for example, that, although the dominant worldview of science accepts evolution and a variety of models that explain it as self-evident, it is not accepted indiscriminately when it clashes with peoples' personal beliefs. Some church members accept only evolution within species, because this can be harmonised with the biblical view that God created different species.

ideas are rife. Worldviews, in the sense of particular belief systems explaining how everything fits together, may seem to have become redundant[2] in a world where technology and pragmatism, the freemarket system and science determine our lives in self-evident ways. Modern society seems to operate without any specific, articulated and prescriptive worldview. This may explain the modern experience of radical homelessness. Beneath the surface of pragmatic, pluralistic, modern and informed societies, however, one finds very specific worldviews.

WORLDVIEWS ARE PROVISIONAL, DYNAMIC AND INTERACTIVE

Worldviews are not absolute. They are culturally bound and reflect the time and place in which they evolved. There is, of course, constant influencing, whether positive or negative, between different worldviews. No worldview develops or undergoes change in a vacuum. It reflects reality as it is perceived and not as it is 'in itself'. One can never know reality 'in itself', because it is always interpreted. It is always perceived through the lenses of tradition, in which all the constituents of a civilisation play a role. According to Bohm (1988:62) the way relativity and quantum theory between them overturned Newtonian physics shows the danger of complacency about worldview. It proves the provisional, exploratory nature of worldviews. Worldviews need not be dogmatic and should reflect the spirit of their time. They usually have a kind of elasticity, which allows them to accommodate differences and seemingly incompatible ideas. This quality explains their strength. When incongruous claims become unbearable a worldview will change – as a paradigm changes in physical science.

Worldviews in modern society are dynamic. The fact that they may change rapidly causes many people to opt for a specific opinion on an issue rather than a generalised belief. A worldview, however, is not simply a world-opinion or a world-

2 This is undoubtedly the case with Christianity, Judaism and Islam, to name but three religions, whose creation stories cannot be taken literally any more.

hypothesis, but a specific conviction of the way things are. Secular modern people's opinions about, for example, a natural phenomenon like disease, may not be as reassuring as commitment to a firm belief. Despite the commitment to science and technology, our knowledge of it is none too reliable. What science we know we acquire second-hand, often on the vaguest authority, without knowing how it operates or influences present-day values and belief systems.

The intellectual history of the West shows how the history of science is interwoven with the rest of history, and therefore equally influenced by cultural changes. Throughout history worldview traditions have employed the scientific models of the day. The influence is, however, reciprocal. Science influences worldviews, but worldviews also influence science (Holmes 1983:43-44). The human sciences have been drafted on the blueprint of natural scientific methodology, but they in their turn affect the natural sciences. On the whole scientists do not like to admit that worldviews and personal beliefs influence their work, which is of course difficult to prove. Yet no scientific fact can be understood in isolation from all the intra- and meta-scientific facts that make up the scientists' world. That world in its turn is embedded in the culture and life of its time. Although a specific worldview may appear to be influenced by one dominant aspect, it is normally embedded in a context where many other factors codetermine its profile. Every facet of human life – biophysical, emotional, rational, socio-economic, ethical, 'religious' – affects worldview formation simultaneously and interdependently, with different ones dominating at different stages. That explains the many diametrically opposed worldviews and their competing claims (Olthuis 1985:155).

Although present-day worldviews may seem to be changing rapidly, they still maintain some degree of universality because of the consistency of the values underlying them. In this regard it has often been assumed to be the prime mover of the historical process, basically affecting - rather than being affected by – its psychosocial context (Olthuis 1985:154).

WORLDVIEW AS STORY

The worldviews operative in a culture is the master stories by which its members live. A worldview's effectiveness depends on the impact of the stories that embody it. For some, the important stories of our time may be the major competing scientific paradigms, for others they may be contemporary cultural history. According to Swimme (1988:47ff) the activity of story telling is focal in current political and economic activities. These stories are of vital importance, for they are not only responsible for social cohesion but also contribute to the transformation of societies. 'Story' in this sense is 'world interpretation', reflecting the nature and value of things in this world.

No religion can afford to ignore the new cosmological story told by modern-day scientists. It affects and has critical consequences for the identity of all the world's religions: their view of God, creation, humankind, redemption, eschatology, and so on. The cosmic creation story has the potential to dislodge and even entirely displace all previous worldviews. Suddenly the entire human species has a common cosmic story. Islamic people, Hopi people, Christian people, Marxist people and Hindu people can all agree in a basic sense on the birth of the sun, the development of earth, the evolution of life and human cultures. For the first time in our existence we have a cosmic story that is not tied to a particular cultural tradition or political ideology, but instead encompasses every human group. This pan-human story is already taught on every continent and in every major cultural setting.

It would, however, be detrimental to religions if their stories were to be replaced by one universal story which, through its claims to exclusive truth, objective proof and scientific interpretation, reduces religious stories of creation, salvation and meaning to mythical, culturally outdated artefacts.

On the positive side one could argue that a universal cosmological story may have the ecumenical advantage of unifying the stories of different religions and linking them together in a common worldview and the shared value system to which it gives birth. That would also be detrimental to religion, because the spirituality, attraction, meaning and value systems of world religions are intimately bound up with their stories. However much a scientific theory reflects the beauty and symmetry of physics, however clearly it reveals the exquisite fine-tuning of the universe that made life on our planet possible, however vital its concomitant value system may be for the future of humankind – it remains a scientific theory and does not see itself as a religion.

Nonetheless the new cosmology story is being established globally – in science, education, entertainment, value systems and the like. But will the story of the new cosmology remain uncontaminated? And will its authors allow it to be reinterpreted in the light of new evidence? Will it be adapted to different cultures and in future contexts, be told in different versions by poets and children? And, apart from the story itself, what will become of the values underlying it, its ideological potency, et cetera?

The real question is, however, can one continue to cling to a worldview if it has been proved wrong? Maybe the answer is both yes and no. Yes, insofar as one adheres to one's worldview because the stories from one's tradition with their values, sentiments and attitudes still have a rightful place. No, insofar as one must adapt to the most credible and acceptable information available. One can foresee that in future differing religious stories will exist side by side with that of the new cosmology.

WESTERN WORLDVIEWS OUTGROW THEIR CHRISTIAN MATRIX

A worldview claims to give a true picture of reality. Reality, however, changes and so do the worldviews that describe it. A worldview is a crucial hermeneutic key to a culture's understanding of reality. The basic outlines of a Christian worldview as it developed historically are presupposed and I merely highlight certain points to indicate the interaction with scientific worldview development.

The history of the Western world is often divided into developmental phases, each with its own particular worldview. Dilthey (see Holmes 1983:32) distinguished between the pre-theoretical emergence of a world image (Weltbild) from the worldview underlying it, which leads to a defined worldview (Weltanschauung). He identified three basic types of worldview that recur throughout history: naturalism (ruled by a scientific attitude), objective idealism (dominated by feelings and ideals, e.g. Plato and Hegel), and the idealism of freedom (governed by personal freedom and a sense of obligation) (Holmes 1983:32). Van Peursen (1975:32-111) distinguished between the mythical,[3] ontological and functional phases in Western developmental history, each with its distinctive worldview. Other scholars believe that we moved from the mythical through the religious to the scientific phase. One could also distinguish between the premodern, modern and postmodern phases of history. These phases are distinguishable but not separable, since they may coincide in the same society.

In his famous book, *The structure of scientific revolutions*, Kuhn outlined four models in the history of science (quoted by Holmes 1983:42):

- The Pythagorean model, based on the view that nature has a mathematical order, was expanded by Plato into a theory of universal forms. Platonic theory shaped the classical worldview, with its emphasis on rational contemplation and harmonious unity as marks of both justice and beauty, as well as mystical union with the divine.

[3] One should not underestimate the impact of the mythical worldview until late in the 17th century. Whereas the Aristotelian tradition had emphasised the teleological element in all things, the mythical tradition sought to ally itself with the spiritual forces immanent in all things with a view to human use and control. The primary objection against this tradition was not that it was unscientific, but that it threatened belief in a creator God who transcended nature (Cobb 1988:103).

- Aristotelian science focused more on change in nature and human art, stressing final causes or ends. A teleological worldview emerged, suggesting a hierarchical order in both creation and society and a natural law ethic based on humankind's essential ends.
- Renaissance and Newtonian science, by contrast, abandoned final causes and explained the world exclusively in terms of matter and motion – the mechanistic model often likened to a 'billiard ball universe'.
- Nineteenth and 20th century science revamped the mechanistic model – by way of energistic physics, Einstein's relativity theory and developmental biology – into the notion of a more organic, relational process, something like a force field or biosystem.

The Christian view of history, which dominated Western Europe in the Middle Ages, perceived this life as a mere stop-over en route to the next. History was seen as developing from a specific protology – God's creation – to a specific eschatology and final judgment. Christ's redemption made it possible for humankind to be saved but, although some progress may be possible, original sin precluded any 'improvement' of human life.[4] Everything that happened on earth was part of God's divine scheme and nothing could happen unless he willed it.

The modern era, by contrast, sought perfection in this world, not the next. The modern worldview was propagated by Jacques Turgot (Rifkin 1980:15ff), who challenged Plato, Aristotle, Saint Paul, Augustine and the great medieval thinkers. Turgot considered history cumulative and progressive, manifesting an overall advance towards perfection of earthly life here and now. The

[4] It is interesting to note that some Protestant thinkers believed that experimental science promised a way of reversing the effects of original sin, a way of making a better world that may in some way mirror the perfection of God's heavenly kingdom (see Brooke 1991:111).

modern age is the machine age. The universe itself is a grand machine set in motion aeons ago by a supreme technician, God, who engineered it so perfectly that it runs by itself (deism). Progress is geared towards perfection of this machine (Rifkin 1980:17-18). Progress came to be the new meta-narrative of the West, replacing that of Christian hope and eschatology. The modern worldview has been described as a shift from the transcendental to the immanent.[5] To a great extent the history of modern science has been that of its emancipation from theological presuppositions (Pannenberg 1993:73).

By the mid-18th century most elements of the mechanical worldview had been incorporated into a unified scheme, influenced predominantly by Francis Bacon (1561-1626), René Descartes (1596-1650) and Isaac Newton (1725-1807) (Rifkin 1980:19). In his Novum Organum (1620) Bacon reacted against the Greeks' emphasis on the why of things and concentrated instead on the how. The scientific method he proposed was induction: separating the observer from the observed and providing a neutral forum for the discovery of 'objective knowledge', which would allow us to take "command of things natural – over bodies, medicine, mechanical powers and infinite others of this kind" (Rifkin 1980:20). The way for Bacon's work was paved by a process of 'disenchanting' or demythologising the world. Descartes, a mathematician, followed in Bacon's footsteps and saw mathematics as the source of all things (Appleyard 1992:49ff). The natural order no longer had room for a God who could change the operating rules whenever he wished: the total predictability of the mechanical paradigm excluded this possibility.

The mechanistic view of nature, which denied nature any capacity for self-movement and interiority, was designed partly to support theological voluntarism – the idea that through these laws the transcendent God imposes his will on the world. The mechanistic view, however, became so self-sufficient that it was

5 Natural law alone kept everything together. "Der Entstehung eines Weltbegriffs in dem die Welt ein unendliches, unbestimmtes, allein durch Naturgesetze zusammengehaltenes Universum ist" (Schrey 1962:1621).

freed from its original association with the imposed will of God and a dualistic conception of human beings as composed of a spiritual soul and a mechanistic body (see Cobb 1988:103). With Newton's Principia the mechanical worldview matured. Newtonian science, as embodied in applied mechanics, became the cornerstone of the industrial revolution. Humanity had a new purpose in life. Gone was the medieval goal of seeking perfection in the next world: it had to be found here and now.

The mechanical worldview, so basic to modernism, was attacked by postmodern thinkers, who denied the possibility that reality could be represented in any truly objective fashion.[6] They deconstructed the Newtonian self-conscious agent and fiercely attacked the Enlightenment project. Their critique was mainly at the cultural, social, linguistic and philosophical levels. The veil of language made it impossible for us to reach reality 'out there'.

We find ourselves in a postmodern situation where certainty and unity have made way for a culture of uncertainty, provisional answers, contingency and conditionality. This applies to values,[7] truths, interpretations and worldviews. There is a whole barrage of new, often violently opposed views of the world and endless talk about Judaeo-Christian values, Afrocentric values, Islamic truths, Eastern truths, Western truths – each presenting a complete programme for excluding others (Said 1994:67-69). Postmodernism proposes no answer to the problems of modernity. It has simply woken us from our uncritical slumber. It also lays on us a responsibility to accommodate the different legitimate worlds which are part of our reality but which were neglected in the past.

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6 When the mechanistic-materialistic worldview could no longer be applied in subatomic physics, a large part of the scientific and philosophical community concluded that we were condemned to paradox and unintelligibility, because rationality remained identified with the mechanistic view (Cobb 1988:104).

7 Bohm (1988:59-60) even speaks about a postmodern physics which integrates matter with consciousness and does not separate facts, meaning, and value. Science would then be inseparable from a kind of intrinsic morality, and truth and virtue would not be kept apart as they currently are in science. This proposal is contrary to the prevailing view of what science should be, which is a morally neutral way of manipulating nature according to the choices of the people who apply it.

A MULTIPLICITY OF SCIENTIFIC WORLDVIEWS

It makes no sense to speak of 'the' scientific worldview, because there is no uniform way of looking at things. Feyerabend (1994a:138-139) distinguishes between what he calls the Aristotelian and Platonic approaches to science. The Aristotelian trend[8] is represented by scientists who stick closely to the facts and design experiments that clearly establish one or other of two alternatives to avoid far-reaching speculation (closed worldview).[9] The Platonic trend encourages speculation and is ready to accept theories that relate facts in indirect and highly complex ways (open worldview). What Feyerabend finds surprising is that both these trends resulted in special domains and in highly theoretical branches of biology and highly empirical subdivisions of astrophysics. He concludes that science contains many different yet empirically acceptable worldviews, each with its own metaphysical background.

A single, coherent worldview that underlies all science is, according to Feyerabend (1994a:141), either a metaphysical hypothesis trying to anticipate a future unity, or a pedagogical fake. A more realistic account would accept that there is no simple 'scientific' map of reality – or, if there were, it would be much too complicated and unwieldy to be grasped or used by anyone. But there are different maps of reality, from diverse scientific viewpoints.

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8 This approach stresses the need for close contact with experience and objects to following a plausible idea to the bitter end. It is not always easy, however, to adhere to these requirements. For example, the essential requirement of the Copenhagen interpretation, namely that the experimental setup must be taken into account when making observations, is seldom met in observations with cosmological import (see Feyerabend 1994a:136, 142).

9 Ward (1990:99-100) indicates that one could affirm a truly closed system only if it could, in principle, be completely specified and accurately predicted in all circumstances. But this has been refuted as impossible both by the Uncertainty Principle, which rules out a complete specification of all physical forces at the same moment, and by studies of the dynamics of complex systems far from equilibrium, which show that we would need an infinite amount of information to make such predictions. There is every reason to think that no consistent model that humans can devise will ever produce a complete survey of an entity's physical structure.

These maps cannot simply be pasted together in an attempt to create a single, coherent worldview. Feyerabend (1994a:142) points out that Geller and others have cast doubt on the homogeneity assumption which plays a key role in cosmology. Thus we have an overemphasised materialism in molecular biology, and radical subjectivism in some versions of quantum measurement and the anthropic principle. There are many fascinating results, speculations and interpretive proposals, and they are certainly worth noting. But pasting them together in a single, coherent 'scientific' worldview – a procedure that has the pope's blessing! – is going too far for Feyerabend. After all, who can say that the world, which so strenuously resists unification, really is – as educators and metaphysicians would like it to be – tidy, uniform, the same everywhere? Besides, a 'paste job' eliminates those conflicts that have kept science going in the past and, if preserved, will continue inspiring its practitioners.

Although one is inclined to agree with Feyerabend, it can be argued that paste jobs or rational constructions are so inherently part of our/others' thinking that we can have no worldview without them. The danger is that a specific worldview and its construction may be elevated to an exclusive position.

To be able to make its objective claims science may use real facts and figures, carefully selected models and methods. But these very claims and assumptions betray a certain worldview and have largely determined the present worldview of the West. In practice, therefore, science does not always decide how it is cited, believed in and integrated with a worldview held in a particular society. That makes the existence of only one scientific worldview even more unlikely. The science story is appropriated and reinterpreted by many interest groups in society. Science, and its practical benefits, are still highly rated by the public. But this 'science' does not exist. What the so-called educated public seems to assume is that the achievements they read about and the threats they perceive come from a single source and are produced by a uniform procedure (see Feyerabend 1994a:144-145).

The implication of an alleged Theory of Everything (TOE), which purports to present a fully integrated, logically coherent and satisfying explanation of the cosmos, is that it must radically affect the totality of human life. Many voices have been raised against such a theory, as its claims seem to be premature and overstate the facts at our disposal.

SCIENCE, VALUES AND BELIEF

One cannot overestimate the importance of the scientific worldview and the influence of its values, attitudes and orientation. The worldview that physics provides still plays a crucial role as a foundation for the general mode of thinking prevalent in most societies.

The domain of science does not, strictly speaking, include the meaning and purpose of human existence. A scientific worldview, operating within strict positivistic parameters, cannot really allow factors such as values, aesthetics, beliefs and the like to influence it. To extrapolate from what is empirically observable to everything that exists is a logical non sequitur (Holmes 1983:41).

But what science does convey is not just bare facts but also values. Bohr (1988:67-68), for example, sees matter and consciousness as inseparably linked, which implies that meaning and values are as much integrated aspects of the world as they are of us. He sees it as the task of postmodern science to overcome the separation between truth and virtue, value and fact, ethics and practical necessity.

The natural sciences are not value-free, nor can personal belief systems and commitments be totally ignored in scientific work. It is not true that science does not tell us how to live. One cannot agree with Wolpert (1992:172-173) that science has nothing to say about moral issues and that it must be left to politicians, philosophers, ultimately to all citizens, to decide what sort of society they will live in. The fact that scientists are also politicians, philosophers and citizens means that science, technology, lifestyle and worldview are inseparable. Scientists, like all of us, are not always aware of how much they are influenced by their worldviews.[10] They need not accept every aspect of a worldview to be influenced by it.

Although scientific findings may be stated factually, without values or ideologies attached to them, the inferences made from these findings, and their applications and implementations, are tied up with values and specific interests. Even if science were value-free, the implications of its findings and applications are that science (like theology) offers salvation (Midgley 1992:1), that modern society depends on applied science, and that science still provides the most viable solution for existing societies.

The power of any worldview is directly linked to the values that underlie it. Without determinative values worldviews are simply impotent stories. The notion of value, however, is associated with purpose and meaning. Keith Ward (1990:96ff) points out that the progress of modern science, which began with the firm rejection of purpose in nature in the 17th century, may be interpreted as pointing towards a form of purposive explanation in the 20th century. The main difference is that this purpose is connected with the general structure of the universe, not with particular occurrences in it. The concern with purpose points to a dimension of explanation, which differs from that of the experiential sciences. The New Cosmology story in particular underscores this. With the advent of New Cosmology scientific theories will no longer be seen simply as objective laws. Scientific understanding will be valued as a power capable of evoking in humans a deep intimacy with reality (Swimme 1988:51).

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[10] Feyerabend (1994b:158ff) has indicated that scientists are not always willing to own up to a specific worldview. If the worldview were to be spelled out in all its ramifications, it would not sound very scientific. Hence it is kept hidden, although it still affects the debate through insinuation, slogans and attitudes. According to him, most arguments about realism have this truncated character.

Examples of the evocative power of New Cosmology are the Theory of Everything, the anthropic principle, kenosis theory, and the presence of symmetry and beauty in nature.

CRITICAL REALISM AS A WORLDVIEW

In both science and theology realism seems to be the most acceptable approach to describing reality. It is a good example of how a specific approach as a sub-element of a specific worldview develops. Although realism appears to represent a unified approach over against anti-realism, it has subdivided into many positions, each representing a different perspective.

Realism in all its variations, including its stance in the postmodern debate,[11] is still much discussed. Murphy (1993:356-357) points out that critical realists use concepts to construct claims about reality without asking whether these are indeed the best concepts to apply. The history of science is a history in which conceptual systems are rejected and replaced. We must inquire into the criteria for accepting or rejecting them.

Realism accepts that there is an objective, existing world, with or without thinking subjects. Although one can construct a theory, model or view of reality, or an interpretation of the world, one cannot construct reality and one cannot construct the world unless one wants to live in a world of one's own (see Poole 1995:47).

But there are different interpretations of this one reality, different ways of approaching, depicting and describing it. The shape of religious rationality differs from that of science. Describing reality in a textual discipline is not the same as empirical description. To do justice to different ways of approaching reality, to different disciplines, epistemologies and modes of thinking, a pluralist critical rationalism, as proposed by Agassi (1991:100ff), offers a solution. Counter to relativism and in line with critical

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[11] Van Huyssteen's postmodern critical realism, criticised by Murphy (1993:355), offers critical realism more room to manoeuvre, but not without some obstacles like the reference issue.

rationalism, pluralism suggests that some answers be rejected as impermissible. But it agrees with relativism in asserting that different criteria of choice are legitimate. Whereas relativism allows a melting pot, pluralism recommends diversity.

Realists may deny that they are influenced by worldviews when conducting their experiments and formulating their theories. Worldviews, however, cannot be presented as independent of persons or as facts and/or theories; they have to be related to the individuals and the communities they affect. And a community holding realism as a worldview simply cannot be shaken by contrary facts. If it is shaken, it means that the worldview is already breaking up or that the facts presented are part of a powerful rival worldview (Feyerabend 1994b:156).

CHRISTIAN REACTION TO THE SCIENTIFIC AND TECHNOLOGICAL WORLDVIEWS

With some exceptions, the history of the West indicates that science and religion shared the same cultural environment, but that Christian theologians have found few points of contact with developments in natural science. The effort to link scientific thought to religion gradually fizzled out, until it became quite unfashionable to do so at all. Kepler, for example, still assigned the doctrine of the trinity physical meaning in the structure of the cosmos: the central sun symbolised God the Father; the surface of the spherical universe, God the Son; and the intermediate space, God the Holy Spirit. Galileo, on the other hand, argued that the earth's motion was not a matter of faith (Brooke 1991:93, 98). It is not without paying a penalty, according to Pannenberg (1993:75), that theology has abandoned the task of permeating and digesting scientific thinking in modern times. Some degree of autonomy was maintained by protesting against certain theories, like that of evolution, which opposed the biblical message of God's creation out of nothing. But by and large theologies ignored scientific theories, accepted some and rejected or reinterpreted others. The general assumption that science and education were the way to success was not denied but upheld by the church. Today Christians at grassroots level accept the worldview of science and technology as the only road to affluence and a better life.

To deny the basic presuppositions, scientific method and findings of the natural sciences from a Christian point of view is almost impossible. Western Christianity shares the cultural matrix of the natural sciences; both adhere to the same notions of what science is and how scientific research should be conducted. Yet Wolpert (1993:144ff) considers science and religion to be incompatible: science is based on reason and religion on faith. He agrees with Tolstoy that science is meaningless for religious purposes because it gives no answer to the questions 'What shall we do?' and 'What shall we be?'

On the whole the relationship between science and theology seems to be one-way only. Most scientists refrain from making any moral statements, which leaves Christians as the only agents in this field. Although science, in keeping with its method and presuppositions, tries to be neutral and objective, applied science cannot be so. The ethical debate conducted in connection with applied science is the responsibility of all members of a society.

That religion has always influenced scientists to some degree cannot be denied. One example is the principle of complementarity that Bohr used in quantum mechanics to show how the human and natural sciences influence each other (described by Brooke 1991:332ff). William James's idea of a stream of consciousness made Bohr realise its implications for introspective analysis. To interrupt the stream by looking, as it were, at one's own thoughts before they reach their terminus, is to destroy them. Subject and object are intimately bound together. The role of the subject in disturbing the object is central in Bohr's interpretation of quantum mechanics, in which the image of a detached observer is renounced. His concept of complementarity is partly sustained by the belief that it can illuminate the paradoxes of psychology as well as those of physics. A second example is the input Bohr received from Søren Kierkegaard

(1813-1855), who stresses the primacy of human choice and decision. Human life is a series of either/or choices. Attempts to achieve an overarching coherence of thought are doomed to failure since, in practice, one has to choose between incompatible courses of action. This is a long way from subatomic physics – yet the parallel is there: the physicist has to choose between mutually exclusive descriptions. Bohr assimilated the view of the human subject with which his interpretation of quantum physics resonated.

The models and metaphors scientists use to explain what they observe come from everyday life experiences – of which religious convictions form an important part. Giving meaning to life and contributing to the dominant worldview of our time is no longer the exclusive prerogative of the church, religion and religious groups. To some extent religious spokespeople must be content to follow, while others take the lead. This applies not only to the natural sciences and technology, but also to the political arena and society.

THE WORLDVIEWS OF SCIENCE AND NON-CHRISTIAN RELIGIONS

Despite objections the overall picture presented by science is accepted. But must the worldviews of different cultures and religions succumb to the master worldview dictated by science?

What are the limits of the present dominant scientific worldview and to what extent will it penetrate the world of religions? How must religions react, considering their vulnerability to global cognitive imperialism? Although one should endorse the scientific worldview, this does not mean endorsing any kind of construction that may force all people into a single mould. The fact that most people endorse a scientific worldview does not imply that other worldviews and their meanings may not be taught in schools. One may be committed to certain values and beliefs and simultaneously be self-critical and open to other interpretations, without blindly favouring one religion. But is such openness plus commitment truly possible?

Writers on New Cosmology predominantly present a worldview that integrates the findings of the new physics with the main theistic lines found in Christianity. Despite some variables, the overall picture is one in which the fascination, beauty, order and rationality of the cosmos with its finely tuned, kenotic structure are linked with the Christian God as its creator, redeemer and sustainer, immanent in and responsible for the process.

The precedence given to the Christian religion does, however, cast critical doubt on the scientific nature of this approach. How can New Cosmology claim to be so perfectly compatible with Christianity before the creation stories, models and metaphors of all other religions and philosophical worldviews have also been taken into account? To link the findings of new physics with only one religion is to make a value judgment about the truth claims of that religion. The fact that the main participants in the debate are white, Western Christians explains why Christianity is more involved than other religions.

The exclusion, by and large, of the other world religions so far raises questions about the scientific objectivity of the debate and lays it open to charges of constructivism.[12] According to Cobb (1988:100) the new consciousness resulting from historical study of worldviews, as well as the encounter with alternative living worldviews, has brought more of this unconscious material to consciousness, thereby relativising all worldviews – including all religious traditions – and making them problematic.

One would expect the scientific worldview to have a less severe impact on Christianity than on other religions, because of Chris-

[12] Constructivism is an approach in which people – through their own mental activity, experience of the environment and social interactions – progressively build up and restructure their schemes of the world around them. It centres on the importance of meaning as constructed by individuals to make sense of the world (see Poole 1995:45).

tianity's close involvement in the emergence of that worldview. Buddhism, with its highly analytical approach, ought to have fewer problems than Christianity, and Hinduism, with its assimilative flexibility, too. The real problem lies with the religions of The Book – of which Christianity is one. Somebody I once read said that when myths are written down, they die: oral tradition allows creativity, growth ... mummified myths, kept 'alive' artificially by doctrine, are so much ballast.

CHRISTIAN RESPONSES TO THE WORLDVIEW OF NATURAL SCIENCE

It is impossible to capture the variety of Christian responses to aspects of the scientific worldview. Because that worldview affects the total cultural environment, philosophers, writers and ecologists protest more vociferously than theologians do. Theological criticism is limited to some claims and effects of the scientific worldview, which normally fall outside the scope of actual scientific processes. It takes the form of protest against the effects of applied science; the impossibility to slow down or halt technocracy with its detrimental environmental effects; scientists' unwillingness to admit to the provisional nature of their theories; the way many scientists ignore the objections raised against a modernist approach; the sustained claim that only science can better our lives; and so on.

One cannot ignore the fact that many scholars tend to forget that the relationship of theory to scientific reality is not totally congruent with its relationship to either social or textual reality. For scientists issues like reference, language barrier, subject-object relationship and inter- and meta-text seem to be less problematic than they are for theologians, philosophers and literary theorists.

At grassroots level many Christians reject aspects of the scientific worldview because they still hold to a literalist reading of the Bible, rejecting historical criticism and ignoring the importance of the socio-cultural background of biblical texts with their specific worldviews, style, genre, et cetera. Inviting critical debate about defunct views is like playing chess after being declared checkmate. Concerning the claims of science, especially as portrayed in the media by science fiction writers, one cannot avoid the impression that science has become the religion of our age.[13]

But science cannot become the new religion of our day, if only because it lacks the essential features of a religion. Science, like religion, boasts of a revelation – but one that results from human endeavour. It is described as a revelation of the laws of nature. Science still needs religion to be able to posit God as the law-giver. Science can disclose beauty and symmetry in nature but it cannot inspire worship. It can offer ways of improving our lives, but in the final analysis it cannot promise self-fulfilment. It can foretell the coming end of our planetary system but it cannot offer a hopeful eschatology. It can point out the importance of reverence for life and the precarious balance of ecological systems, but it can make no moral judgments or ethical appeals. If science wants to link its theories and findings, emotions and fears, its worldview and constructions to a god, then it has to look to religion. Worldviews are rooted in faith and matters of ultimate concern. Faith integrates existing realities in a comprehensive image of an ultimate environment. It is the cohesive power that knits together the sense, values, traditions, rationality and all other experiences of human life.

A worldview is argued from, rather than argued to, because through faith it functions as an unquestionable presupposition. A worldview is, however, confronted with the demands of life as a whole (Olthuis 1985:156-158). Insofar as science has de-

[13] Ferré (1988:88-90) speaks of religious world models created by the scientific images of the Perfect Machine, the Ultimate Particle and the Pure Object. The Perfect Machine is the clockwork universe in which nothing ever goes awry. The Ultimate Particle suggests that the smallest unit underlying all other things can explain everything, representing Being in and of itself. Its properties define reality, while all other properties are mere appearances. The Pure Object is the only way to truth. It is free from subjectivity, which includes our human values of spontaneity, creativity and responsibility.

tached itself from the faith link and from value judgments it cannot deal with ultimate questions. Clearly faith in a transcendent agent has to be found in areas other than scientific knowledge (Pannenberg 1993:112-113). Religion must protest against the pretensions of some scientists – especially those who claim that science is the only way and means to a better future, that science alone can redeem humankind.

At the same time religion would be anachronistic if it ignored the knowledge of its day, if it refused to integrate scientific theories and models with its belief system. Religion would turn God into a cultural artefact if it refuses to reinterpret outdated creation accounts and continues to understand cosmic stories literally. Religion must continually learn from science. It can find scientific allies who co-determine the worldview of our time and who express the same sentiments, if in different words. Religion needs backup from natural science and technology to protest against irresponsible implementation of applied science, self-consuming materialism and ecological heedlessness.

CHRISTIAN OPTIONS IN A MAZE OF WORLDVIEWS

The theological doctrine of creation is not bound to any specific scientific hypothesis. It can invoke different scientific models, which it sees fit to integrate with its own construction (Pannenberg 1993:102). There are, however, so many different models, worldviews and constructions that many believers may prefer to hold on to the worldview informed by the results of natural science. But it is nature, the very object of scientific research, that theology would have to claim as God's creation (Pannenberg 1993:74).

Although religion's roots are in the life-oriented domain of practical reason, says Ferré (1988:91), it is pushed by its own drive for comprehensiveness to include the values of theoretical reason as well. Therefore it cannot but support science. The worldview reformulation of our time demands mutual commitment of people from all sectors of life. Scientists in these different sectors must listen to and heed the various views and criticisms. The natural sciences play a vital role in co-determining the formation and reinterpretation of our worldviews. The nature of reality is such that we need both theological and scientific concepts to make our way effectively (Murphy 1993:353).

We live in a world where a worldview projected by science fiction seems more realistic than one portrayed by Christian eschatology. But there are others who find the experience of God stranger than (science) fiction. The worlds of science and theology, of faith and reason, of dream and reality all need each other. One can only hope that the worldview designers of our time will be brave and ingenious enough to incorporate all aspects important to humankind.

6

CARTOGRAPHY OF CULTURAL AND NATURAL LANDSCAPES: MAPPING METAPHORS IN SCIECNE AND RELIGION

GEOGRAPHIC MAPPING AS A METAPHOR FOR OUR RELATION TO NATURE

In Saint-Exupéry's *Little prince* (1991:49-55) the little prince happens to land on a planet occupied by a geographer. He compliments the geographer on his beautiful planet and questions him about its geography. The geographer is unable to answer because he has no explorers and would rely on them to gather information. "I haven't a single explorer on my planet. It is not the geographer who goes out to count the towns, the rivers, the mountains, the seas, the oceans, and the deserts. The geographer is much too important to go loafing about. He does not leave his desk. But he receives the explorers in his study" (Saint-Exupéry 1991:50-51). (Interestingly, the philosopher Kant, who lectured in geography as well, never left his Königsberg!) Nonetheless, having explained to the little prince what geographers do, he asked him to describe his own planet. The little prince replied:

> "I have ... a flower."
> "We do not record flowers," said the geographer.
> "Why is that? The flower is the most beautiful thing on my planet!"
> "We do not record them," said the geographer, "because they are ephemeral."
> "What does that mean – 'ephemeral'?"
> "Geographies," said the geographer, "are the books which, of all books, are most concerned with matters of consequence. They never become old-fashioned.

> It is very rarely that a mountain changes its position. It is very rarely that an ocean empties itself of its waters. We write of eternal things."[1]

The little prince obstinately insisted on learning the meaning of 'ephemeral'. When the geographer explained that it meant that "which is in danger of speedy disappearance", the little prince regretted having left his frail flower behind on its own.

Very much in passing the author then points out that, by implication, humankind on earth is probably not far removed from the 'ephemeral' category.[2] The comment reads (Saint-Exupéry 1991:55): "Men occupy a very small space upon the Earth. If the two billion inhabitants who people its surface were to stand upright and somewhat crowded together, as they do for some big public assembly, they could easily be put into one public square twenty miles long and twenty miles wide. All humanity could be piled up on a small Pacific islet."

Human beings have mapped their world. Virtually every discipline, practice, philosophical system, tribe and individual has been mapped. Whether the maps are of the physical environment – land, the atmosphere, oceans, celestial space, the human genome – or cultural maps like anthropological, economic or political maps, the fact is that our entire reality has been charted. Many maps are not drawn to scale and use symbols to represent reality. The map of London's underground railway is user-friendly but by no means accurate! If we had to have all the maps of humankind at our disposal the differences in worldview, anthropology, God concepts, epistemology, ontology, cosmol-

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1 'Eternal things' are eternal according to human thought and construction. A good example is the recent decision (August 2006) by the International Astronomical Union that Pluto isn't a planet any more. Our solar system now has only eight planets and Pluto, renamed UB313 is the largest dwarf planet. A planet is redefined as "a celestial body that is in orbit around the sun, has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a … nearly round body shape, and has cleared the neighbourhood around its orbit."

2 See Foucault's (1973:387) dictum: "Man is of recent origin and destined to disappear soon."

ogy, technology, politics, economics and the like would be apparent.

The whole modernist project can be summed up by the mapping metaphor. Mapping is a metaphor for our cultural handling of our world. From mapping our natural, physical environment we can move on to mapping the whole of human reality and draw maps of our genetic, psychological, social, political and religious worlds. But it's not just a matter of representation; more importantly, it needs interpretation.

Maps are cultural artefacts depicting our efforts at representing reality. But reality cannot be 'mirrored' accurately any more than it can be known *an sich*. Although almost 'everything' has been mapped, maps of physical reality remain vitally important. When Galileo changed the map of our solar system he turned the whole of human culture upside down and started the scientific revolution and the Enlightenment. Thus the shift from a static to a dynamic worldview inspired Hobbes, after his encounter with Galileo, to construct his entire philosophy round the metaphor of motion (see his map of the classification of the sciences, Hobbes 1968:149). Mapping the human genome is probably going to be the revolution of the 21st century.

The 'rediscovery' of human reason during the Enlightenment is reflected in the priority that D'Alembert assigns rationality in his *Preliminary discourse* (his manifesto for the Enlightenment). He calls the *Preliminary discourse* a world map (*mappemonde*) of knowledge. The world map of human knowledge has three continents – reason, memory and imagination – each with its various countries and each country with its provinces. The continent of reason, naturally, is at the centre and the largest. Its cardinal feature is philosophy, divided into the science of being (metaphysics), religious sciences (theology, religion and thence, through abuse, superstition), human sciences (logic, ethics), and natural sciences (mathematics, physics). The continent of imagination is the source of secular and sacred poetry (including narrative, dramatic and allegorical verse). The continent of memory is the source of history (secular, literary, sacred, ecclesiastic and natural). Reason alone ('the known') yields knowledge ('what science tells us'); memory and imagination produce something else. Poetry and history belong to the unknowable. Both natural and revealed (religious) knowledge fall under philosophy. Revealed theology (and things like good and evil), are knowable in the same way as zoology and botany are (see Gieryn 1995:429-432).

The modernist hangover (*überdruss*) we are experiencing today is a result of maps that have become inadequate. The Enlightenment map contained directions (reason) to find a treasure (truth). Once the treasure on a treasure map has been found, the map (its information) becomes worthless. Reason's treasure hunt has come to an end.

MAPPING MEANS CONTROL

A map is an amazing instrument. It is like surveying Paris from the top of the Eiffel tower (see Barthes 1983). Maps give an overview, departure points and terminals, truth, insight, understanding. They reduce the world to a few beacons and lines, to concepts and symbols that we believe capture reality. Maps disenchant the world. Knowing and naming things domesticate them, close distance, verbalise mystique. Cartography disciplines nature. Nature is disciplined through the formation of the various natural scientific disciplines.

Maps are about boundaries. People turn natural boundaries into political boundaries; they create artificial boundaries where there were none in order to demarcate 'inside' from 'outside'. Boundaries identify by classifying, as is evident in anthropological topography (cf Kant's denigration of non-European peoples). Thus maps indicate physical boundaries (rivers, mountain ranges); symbolic boundaries (religious maps, political boundaries, maps showing the spread of aids); and man-made physical boundaries (Berlin wall, Jewish wall on the Palestinian West Bank).

Harley (1997:164) sums it up:

> Power comes from the map and it traverses the way maps are made. Maps are a technology of power, and the key to this is the cartographical process. By this I mean the way maps are compiled and the categories of information selected: the way they are generalized, a set of rules for the abstraction of the landscape; the way the elements in the landscape are formed into hierarchies; and the way various rhetorical styles that also reproduce power are employed to represent landscape. To catalogue the world is to appropriate it, so that all these technical processes represent acts of control over its image which extend beyond the professed uses of cartography. The world is disciplined. The world is normalized. We are prisoners in its spatial matrix. For cartography as much as other forms of knowledge, 'All social action flows through boundaries determined by classification schemes'.

CARTOGRAPHY AS A SCIENCE,[3] SCIENCE AS CARTOGRAPHY

A map is a visual representation of reality. The aim of mapping is to produce a 'correct' relational model of the terrain. Initially art and science combined in map making. Those maps were relegated to wall decorations once science became the sole motive for making maps. Although it is claimed that mapping, as all sciences should be, is value free, this is not really the case.

[3] Kant believed that geography (together with anthropology) defined the preconditions for all knowledge and that such knowledge was a necessary preliminary – he used the term 'propaedeutic' – to everything else. Hence, while geography was obviously 'pre-critical' or 'pre-scientific', its foundational role meant that it warranted close attention. Geography organises knowledge synthetically by ordering space, as opposed to history, which provides narration in time. Geography is an empirical form of knowledge, marked by contingency and particularity as much as by the universality that can be derived from first principles – presumably one of Kant's aims in order to make it more critical and scientific ...

Some of the values governing the cultural production of maps are ethnicity, politics, religion and social class (Harley 1997:158).

Usually a map is a two-dimensional, geometrically accurate representation of a three-dimensional space. Road maps are perhaps the most widely used maps today and form a subset of navigational maps, which include aeronautical and nautical charts, railroad network maps, and hiking and cycling maps. Quantitatively, the largest number of drawn map sheets is probably composed of local surveys conducted by municipalities, utilities, tax assessors, emergency services providers and other local agencies. A map is a cultural symbolisation of physicality. We usually consult a road map when we don't know or are uncertain about the route to a destination, or are looking for a short cut. But empirical experience precedes abstraction. People tend to be very conservative about familiar routes and do not easily change them, even if someone were to point out a shorter one.

The map is not our ultimate goal, but a means to an end. It helps us to get to a place we want to reach in order to do something else (business, a visit, a holiday). A map is just that: a map, not a territory.

To a great extent mapping (metaphor for truth) does become an end (life) for cartographers and scientists. It occupies most of their lives. Scientists are cartographers. Compiling a map is very different from consulting one. The map has to show some resemblance to the world 'out there'. Not just anyone can compile a map. It takes an expert to do so.

Science and culture require ongoing cartography, because our cultural and intellectual landscape is forever changing. A map is not an arbitrary construct but a representation of reality. Scientists mediate between humans and nature. They help society to read the world correctly. Nature can easily mislead us. Knowledge and truth help us to know nature, safeguard ourselves and use nature to our advantage.

As a guidebook, a road map tells us the right way. If we don't follow that way we end up on false tracks. There is only one right way and many false tracks. Science, being truth, usually doesn't offer alternative routes. It is either exclusively true or it is nothing. It is, however, reductive. Scientific truth represents no more than a particular slant on the world.

Maps as routes to truth are a figment of modernism. In real life truth as an ultimate is constantly transcended. Western society is built on an epistemology of representation. The world is communicated to us via our senses, intellect, mind and memory. Because these are unreliable, we rely on interpretations of reality captured in cultural development, which includes religion, history and tradition. Reality is represented primarily by words, which are obviously reductive. Their meaning is determined by a fixed definition and their position in the sentence. That is why one often needs a lot of words to describe reality. In the sciences reality is represented by mathematics, natural laws, models and metaphors. Those representations are likewise reductive. Although the mathematical and nomological systems that science has devised ostensibly represent reality very adequately, mathematics remains a symbolic system and reality is more than just symbols. Kant pointed out the impossibility of knowing reality as it really is (*Ding an sich*). We can never know the Kantian *Ding an sich*.

MAPPING THE MENTAL WORLD: CULTURAL GEOGRAPHY

Culture in the sense of interaction between life and physicality started millions of years before the advent of homo sapiens. The earliest forms of life were characterised by interaction with their environment, transformation of the environment and transformation by the environment. Culturally human beings are latecomers to the arena of earthly life, uncreatively copying nature and its technology that evolved over the ages. By and large we are ignorant of the complex natural history to which we owe our existence and have only just begun to get an inkling of its miracles.

The term 'nature' is the trickiest to define, with 'culture' coming a close second. Natural processes grow in complexity, reaching a zenith in rationally self-conscious homo sapiens. Crucial aspects of life are to be found in inanimate or material nature, such as energy, atomic and molecular activity, chemical and electromagnetic activity, natural laws and the like – building materials and conditions for generating life of varying degrees of complexity. The evolution of humans into verbalising beings (*zoon logon egon,* see Heidegger 1976:165) epitomises nature's emerging self-awareness or personification. Verbalised existence is self-conscious existence, which is how people recognise themselves as part of nature and see nature reflected in various spheres of their existence. Nature determines science (natural laws/*lex natura*), rule of law, religion (*lex divina*), art and philosophy (natural philosophy, cosmology). Human beings are nature's self-replication, and as nature's 'other' humans can function beneficially or detrimentally in relation to themselves. In *Das Kapital* Marx observes, "Man opposes himself to Nature *as one of her own forces*" (quoted by FitzSimmons 1997:189).

Human beings are nature personified. Epitomising her being, they give nature meaning. In them nature achieves consciousness, thus permitting the creation of a mental world, a world of ideas. That is nature in a cultural dimension. Culture is an epiphenomenon of nature, piggy-backing on nature. It depends on physical nature but also transcends it, just as thought depends on the physical brain but is more than the brain and transcends its physical matrix. By verbalising nature, human beings recreate her as sacral nature in their religion; in their science they recreate her as predictable, rule-governed nature; and in technology *homo faber* (literally 'workman', since *faber* (Latin, 'worker') refers to the strong human thumb that enabled humans to be become tool makers) transforms her into manageable nature to serve human needs.

'Culture' may be difficult to define, but 'nature' is even more so. The fact that both terms are human constructs relating to the specific value or motive one has in mind when using the word accounts for the difficulty. They are 'interpreted as …' or 'regarded as …' whenever they are explicated in terms of some concept or other. Nature may be interpreted in terms of Darwinian evolution, divine creation, big-bang cosmology, molecular and biological sciences, and so forth. Culture is interpreted in anthropological terms; religiously in terms of Christ (Niebuhr); philosophically in terms of mind (Hegel), history, idea, being, existence; or in terms of contemporary information and computer technology (ICT).

NATURE PREPARES HUMANS FOR CULTURE

In how far does our genetic substratum control the cultural superstratum? Gould (quoted by Dupré 2001:39) said: "Humans are animals and everything we do lies within our biological potential." This implies that there is no other, extraneous source that governs us. In other words, things like hope, motivation, perseverance, kenotic sacrifice, love – all values, in fact – are reducible to biological, non-reductive physicalism. Many scholars object to this view, calling it reductive, but Jeeves (2004:240) affirms it: "Linden Eaves, having shown us the links between genes and aspects of physical and mental growth, gave us evidence of relationships between genetic factors and the development of religious behaviors, beliefs, and values ... [T]he nature of the interdependence increasingly uncovered by scientific research makes a substance dualism harder to maintain ..."

The social brain hypothesis posits that the brain develops primarily to equip an animal to fit in with other members of the species. No member of a species can survive on its own, survival is bound up with a group. Hence the evolutionary equipment of an animal that can survive only as a member of a species (within a specific cultural environment) is no less important than its equipment to survive in a particular physical environment. In the case of homo sapiens this means that nature prepares us for culture, for culture and all it entails is the mode in which the human species survives.

Baumeister (2005:29) states with complete conviction: “The real question is whether people are better suited to any other form of life than in a cultural society, and the answer to that is no.”

One must be critical of Baumeister’s preponderant emphasis on nature, who in her wisdom predetermines what is good for human beings and prepares them for that. With reference to chimpanzees, for instance, he writes: “So, again the sequence in evolution appears to be that first there were some beginnings of language in other species, and then our own species evolved to be capable of far more extensive use of language. Mother Nature recognized the value of speaking before we appeared on the scene, and we were designed to capitalize on this” (Baumeister 2005:17). In this view nature is personified as a purposive planner, which does not accord with our current understanding of how evolution operates.

Instead of regarding nature as the wise planner of the future of humankind, Dawkins’s notion of accumulative evolution – underscoring its gradual nature, with the occasional leap (‘punctuated equilibrium’) caused by interaction between species and environment – may be more accurate (Dawkins 1986:60ff).

In this context the interaction between brain and thought is analogously applicable to the nature-culture relationship. Culture supervenes on nature, the substructure (in Marxian terms, culture is the superstructure of nature).

HOBBES VERSUS BOYLE

Boyle not only established experimentation as a scientific method, but in his polemics with Hobbes it became clear how bias, ideology and worldview influence our interpretation of ‘empirical reality’. In the 1660s Hobbes and Boyle were engaged in a controversy about an air pump: how would one make it, how could it be made, what would be its uses? The pump demonstrated the power of a vacuum, ‘nothingness’. It certainly was one of the most public scientific experiments ever conducted. Everybody got embroiled in the argument. It confirmed the value of scientific experimentation, exceeding that of speculative reason. The controversy went beyond just Boyle's experimentalism and Hobbes's rationalism: "[A]t issue as well was the constitution of the social order itself in Restoration England." It centred on "which authoritative and authentic knowledge could be assigned or denied to knowledge producers by *where* they were located (and how)" (Gieryn 1995:424; also see Jacob 1997:58-60).

Robert Boyle offered his corpuscular or atomic philosophy, as opposed to pantheism or materialism, and made it the foundation of chemistry. This amounted to a Christianised Epicurean atomism (the world is made up of lifeless atoms colliding in the vacuum of space) that Boyle elevated to the status of a hypothesis to be tested experimentally. He saw atomism not just as a theory but as a theory worthy of consideration. The Puritans, like Boyle, upheld the dualism of matter and spirit. A providential God, not chance, was responsible for all motion in the universe. Hobbes and the radicals believed that all matter was endowed with soul and that spirit was immanent in nature. Thus nature operated autonomously. If spirit resided in people and nature, they can be independent of organised churches supported by tithes and learned ministries. Vitalism, with spirit diffused equally throughout the material world, could also be used to support the notion of human equality and justify in cosmic terms antimonarchical and even democratic political ideals (Jacob 1997:58). The Puritans and Boyle triumphed. The experiments of the Puritan savants also offered a way to knowledge through induction and the testing of hypotheses, as opposed to Hobbes's deductive rationalism.

Both sides submitted their own maps of reality: "The two maps depicted *alternative* cultural universes, with important places and landmarks given different labels and with distinctive grounds for locating a border here or there. The maps guided presumed users to where they could find authentic and credible knowledge and told them why they could not find it outside that space" (Gieryn 1995:425).

MAPPING HUMAN NATURE

Human nature is ancient and has come a long way.[4] That is evident in our genetic geography. Our nature is genetically determined but at the same time malleable. Human nature is primarily determined by nature, who provides the 'building blocks' for cultural influencing. Culture, too, is ancient and is transmitted by cultural DNA ('memes') comprising tradition, education, books, religion, media, trade and any number of influencing factors.

The bill of human rights in South Africa's new constitution gives a fair indication of post-apartheid anthropology and, indirectly, of how human nature is perceived. The bill of human rights is meant to protect human beings against their fellows, against those aspects of human nature that makes them prey on each other like wolves (*homo homini lupus*).

We know now that our language construction is physically determined (Lakoff & Johnson); that rationality has biological roots (Wuketits); that our thinking is governed by the physicality of the brain (D'Aquila & Newberg); that on the whole nature sets the parameters for our cultural development (Baumeister). Whereas religion once was the main source of human identity, its role is increasingly taken over by technoscience, gene mapping being the cardinal example.

CARTOGRAPHERS OF HUMAN NATURE

Every proposal of what human nature is represents a reductive attempt to find a transcendentally inviolable fulcrum which will finally encapsulate what human nature 'actually' is: human beings as sinners (flesh, mortality, finitude); images of God; persons (individuals, social beings); verbalising animals; self-conscious nature; apex of evolution; creators of meaning; work-

4 The selfish gene theory holds that every coding segment of DNA seeks its own immortality, and the reproductivity of the organism is the mechanism with which DNA makes more DNA. Genes are selfish and they want to replicate themselves, even if it means eliminating other genes in the competitive process.

ers; technicians; designers; irrevocably ‘thrown in the world’ (*Geworfenheit / Dasein*); playful person (*homo ludens*); carriers (slaves) of age-old genetic codes (DNA) (Dawkins).

We are born into a society that has already been mapped, where human life is governed by culture and tradition, and where truth is contained in sacred scriptures and secular educational texts. At birth we are irrevocably assigned to a particular group according to our gender, religion, nationality and language. We are destined to form part of a host of classificatory systems and social statistics. Whereas we are born with a relatively open-ended nature that can grow and develop, our cultural identity is quite rigidly dictated. We are born ‘in sin’, more specifically as ‘lost sinners’ needing a roadmap or compass to survive – lifebuoys to be supplied by religion in the form of revelation, scriptures, laws. The roadmap also comprises moral and ethical codes that travellers must observe, as well as doctrinal systems of deliverance that they have to accept. It means that you cannot use just any map: other, ‘alien’ religions will lead the faithful on false tracks. Acceptance into a group comes from using the right map; it means respecting the distinctions of in-group/out-group, true/false and good/evil. Most religions point the way to paradise or the hereafter and believers spend their whole lives travelling to a destination that they only reach when life is over. The image of a curriculum vitae works on the same principle: once you have completed your curriculum vitae, you are no longer around to enjoy it.

We draw the map of human nature, then the map draws us. Human behaviour can be changed by way of changing self-descriptions. That was the tenet in the works of Freud and Marx (Rorty 1980:379). We construct the values that are supposed to shape us. An important question is, which cartographers help to alter the map of human nature, culture and civilisation? Nowadays the map of human nature is no longer drawn by a handful of theologians, philosophers and politicians. It is dictated by far greater, more powerful agencies like the media, technology and consumer society. Upshot is that all these maps are designed by humans, even though they may appeal to one or other source of authority. Foucault indicated that the distinction between 'natural' and 'unnatural' is fundamentally linguistic. He insisted on the paradoxical distinction that the one thing that is not natural is nature itself (quoted by McGrath 2001:112).

Mapping human nature means controlling it. Foucault claimed that many phenomena, such as present-day sexuality, exist because we construct them. The very naming of an object includes the will to control it. There's probably no such a thing as human nature *an sich*. That would be the same as trying to pin down a person's identity or personality in terms of some explanation. The human will to meaning seems inevitably to entail transcendence. Religion promises realities beyond the finitude of mortality and death. Sociology proceeds descriptively and depicts human nature without prescribing normatively what it should be, because there is no transcendent norm (see Weber). Religion describes reality from the angle of a belief that the world was created by God and that its fate (outcome) will be determined by God.

But there is growing resistance to such attempts to pin down human nature.[5] Fukuyama (2002:130) quotes Paul Ehrlich, who expressed the hope "that people would abandon all talk of human nature once and for all because it was a meaningless concept". This is not simply a rational choice we have. We are irrevocably part of nature, immersed in natural processes and dependent on the natural environment. Without the working concept of human nature it would be impossible to reach any self-understanding or understanding of others. But 'nature' is a broad, ambiguous concept and its meaning has to be determined anew in every context.

Have we shifted from radical transcendentalism to radical naturalism? Western anthropology was characterised by a theological interpretation. We are reverting to a different interpretation of

5 "However, when we talk about the nature of man, we enter a metaphysical dimension of the world, which completely escapes the modern empirical methods of science" (Liana 2005: 36).

human nature – a radically physicalist one. Oviedo (205:117) says we must resist "the complete naturalization or secularization of the maps of human nature".

CONTOURS OF THE RELIGIOUS MAP: HUMAN BEINGS AS *IMAGO DEI*

For 2000 years the notion 'image of God' typified the Western image of human nature. But the image of God was only a dim, barely visible watermark on the map of human nature. On that map the Fall and Sin stood out sharply and dictated the bodily aspects of human nature – 'the flesh', desire, concupiscence and mortality. The immortal soul was housed somewhere in this earthenware vase, awaiting trial and tribulation.[6]

The map of human nature has changed radically. Sharply profiled is the wonder of its evolutionary development, mind-body unity, the absence of soul, the impossibility of a 'fall', the naturalness of suffering and death, DNA strings and genetic codes, the 'image of our evolutionary past' and the promise of a better future.[7]

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[6] Our worldview affects our concept of God. Long before Feuerbach typified religion as a human projection and the gods as mirrors of human desires and consciousness, Hume (1963:40-41) stated that "[t]here is a universal tendency among mankind to conceive all beings like themselves, and to transfer to every object, those qualities, with which they are familiarly acquainted, and of which they are intimately conscious. We find human faces in the moon, armies in the clouds; and by natural propensity, if not corrected by experience and reflection, ascribe malice or good-will to every thing, that hurts or pleases us."

[7] In the February 2001 edition of the journal *Nature* the Human Genome Project announced that the "sequencing of human DNA was essentially complete". Originally it was expected that the human genome would comprise some 100 000 genes, but it turned out to house between 30 000 and 40 000 – double that of a fruit fly. An important development in this regard is the International Haplotype Map, or HapMap. Blood samples collected from around the globe will be used to characterise individual genetic differences, using the database sequence as a key for the comparison. The goal is to determine genetic contributions to disease precisely and even tailor drugs to the patient's unique genetic makeup. HapMap can also be used to highlight slight differences among various groups of the human population. If human nature is viewed simply as the sum of the base pairs, then such differences can be used to justify a variety of ill conceived agendas (Hewlett 2004:188).

The map of human nature has been secularised. The supernatural and the transcendental are part of its evolutionary development and transience. We realise that by now we are created co-creators of human life. This places an enormous responsibility on us: our technological manipulation of life, our 'playing God'. Humans are changing the map, at the same time following its directions to an open future. In the process we realise that we are not entirely free to decide on either plan or direction. We are already determined to some extent by our own technology.

HUMAN BEINGS AS *IMAGO IMAGINIS* (IMAGE OF AN IMAGE): OUT TECHNOSCIENTIFIC IDENTITY

In our virtual culture reality has become ephemeral, fleeting images flashing past us, especially on the electronic media. This insight dawned even in the days of post-structuralism when books represented reality: behind each book or text there are other books in an ever receding line of texts without any possibility of tracing a primary or normative text. "We become disoriented in hyperspace and lose perspective and the ability to position ourselves cognitively in the great global, multinational and decentered communicational network in which we find ourselves caught as individual subjects" (Jameson, quoted by Duncan 1996:430).

Cobb (2005:175) avers that the market economy and technology have taken God's place:

> By others, providence has been taken over by the polytheism of commodity fetishism and a universe reenchanted with mythical powers represented by the iconography of brand logos ... By yet others the role of divine providence has been transferred to technology, as the great, protective matrix in which we spend our lives, from which we obtain our blessings, and which demands and receives our absolute loyalty ... Whatever deep need we have for there to be a power in the cosmos that is omniscient, om-

> nipotent, and omnipresent, the constant whisper of knowledge and rumours on the Web provides a convincing simulacrum.

Caputo (1997:82) writes: "In the future we will see our religion not as supernatural doctrine but as an experiment in selfhood." Consequently we will have to salvage practices of selfhood, valuable modes of consciousness and ways of self-expression.

MAPPING OUR FUTURE: INTERDEPENDENCE BETWEEN HUMANS AND NATURE; FAITH AND REASON; NATURAL AND HUMAN SCIENCES; PHYSICALITY AND SPIRITUALITY

If existence precedes essence, our real-life experience is more important that our abstractions from it. But human beings should not be subdivided into essences and existences either – any more than one should propound either a substantial or a relational ontology. It is not a matter of either brain or thought, of either reason or extension. Nature and culture, faith and reason are intertwined. We must alternate between maps of reality without creating a single mega-map, a master narrative. To live meaningfully is to compose without blotting out certain instruments. Ultimately science and technology are there to serve life. When they become entities in their own right they alienate us from life. Life (terrain) comes first, our mapping is secondary. The map we consult helps to orient us to the world. The technical artefacts we have devised should enhance life. Heidegger cites a good example when he shows how something like a bridge (technoscience) is integrated with human existence.

That is the point Heidegger (1971) makes in his essay, *Bauen, denken, wohnen*.

He starts the essay by asking what it means to *dwell* (German, *wohnen*). We dwell by building. The purpose of building is to dwell: one builds a dwelling place. Heidegger briefly refers to buildings and structures (in a city) that are not dwelling places but form part of the dwelling horizon. Dwelling refers to where we live, not a place where we seek shelter or work. Etymologically the activity of building is the same as dwelling (to dwell is to build). In High German *bauen*, 'to build', means 'to dwell'. It can still be traced in the word '*Nachbar*' (neighbour), which is made up of '*neah*', 'near', and '*gebur*', 'dweller'. 'To be, I am, you are' (*ich bin, du bist*) means 'to dwell, I dwell, you dwell'. Building as cultivating (Lat. *colere, cultura)* and building as the raising of edifices (*aedificare* – see edification) are both subsumed in genuine building. Building in the sense of dwelling is people's daily experience on earth (*das Gewohnte*; quotidian). The quotidian has to do with building. The point Heidegger is making is that dwelling is not experienced as what people *are*; dwelling is never thought of as the essence of humanness. But what does it mean to dwell (*wohn*)? The Gothic word '*wuniasi*' means 'to be at peace'. Peace, *Friede*, means *das Frye* (free) which is preserved from danger*. Hence the fundamental character of dwelling is saving and preserving* (Heidegger 1971:149).

What is it that is preserved? First of all, the earth: "Earth is serving bearer, blossoming and fruiting, spreading out in rock and water, rising up into plant and animal" (Heidegger 1971:149). But earth is inconceivable without sky, humans are inconceivable without gods. Hence dwelling includes earth and heaven, gods and humankind. The four are one. "To dwell on the earth means to dwell 'under the sky'. The four – earth and sky, divinities and mortals – belong together in one" (Heidegger 1971:149).

Dwelling is to preserve all four. "Mortals dwell in the way they preserve the fourfold in its essential being, its presencing … Mortals dwell in that they save the earth ... To save means to set something free into its own presencing" (Heidegger 1971:150). "To spare and preserve means: to take under our care, to look after the fourfold in its presencing" (Heidegger 1971: 151). To explain what 'presencing' is about – being the interaction between the foursome that establishes a special order of existence (*Dasein*, 'cause to appear'/'call into being') – Heidegger cites the example of a bridge. A bridge is a thing (*das Ding*). To

Westerners in their mapping of the world a bridge is and remains a bridge (= thing). "The consequence, in the course of Western thought, has been that the thing is represented as an unknown X to which perceptible properties are attached" (Heidegger 1971:153). Stripping objects (things) of all non-empirically observable attributes is the legacy of Western science. A bridge is a bridge and the theory of strength of materials can determine its molecular structure. We cannot know a bridge as a *Ding as sich*; proper bridge construction depends on proper physics and engineering.

The inability to relate Heidegger's playful interaction between the four factors ('fourfold') to a thing like a bridge is in fact a modernist attrition. It is spending our whole life on a map (representation) without ever reaching the destination (life) that the map is supposed to guide us to. For a bridge to 'bridge' it has to be drawn into the arena of gods and mortals, earth and heaven. Heidegger (1971: 154) writes: "To be sure, the bridge is a thing of its *own* kind; for it gathers the fourfold in *such* a way that it allows a *site* for it." The site on a river bank is vacant, empty space. Once the bridge has been built it becomes a location. The bridge gathers the fourfold in such a way that it allows a site for it. It is only once a 'thing' has turned space into location that one can speak of a site. A space (*Raum, Rum*) indicates a location that has been cleared, a settlement and lodging (cf Heidegger's notion of a clearing (space) in a forest – *Lichtung* as metaphor for truth). "A space is something that has been made room for, something that is cleared and free, namely within a boundary, Greek *peras.* A boundary is not that at which something stops but, as the Greeks recognised, the boundary is that from which something begins its presencing" (Heidegger 1971:154). Thus Heidegger turns all geographical categories topsy-turvy for the sake of integrating all dimensions of human existence.

The idea of a cultural landscape approximates what Heidegger had in mind. The concept of a cultural landscape is a bridge between space and society, culture and environment, natural science and human science. Whereas initially geography, being a science, was tinctured by empiricism and logical positivism, it was broadened by expanding the landscape to incorporate historicism, interpretation and humanity. "Landscape studies today are still primarily associated with humanistic inquiry; however, this distinction is less important as epistemological boundaries become blurred in the movement away from methodological dogma" (Rowntree 1996:127). The concept of landscape integrates nature and culture. Rowntree (1996:135), following Jackson, lists the following features of creating landscape:

- Landscape is anchored in human life.
- It integrates community and environment. The separation and dichotomy of humans and nature is a 19th century aberration and in time will pass.
- Landscapes are living, therefore judgments of landscape quality should assess it 'as a place for living and working'.
- The individual dwelling is the elementary unit in the landscape.
- Understanding landscape requires attention to the prosaic environments of the workday world, the vernacular.
- All landscapes are symbolic in that they represent striving to achieve a spiritual goal of making the earth over in the image of some heaven (special meaning).

Landscapes are constantly changing; there is no such thing as a static human landscape.[8]

The traditional line between nature and culture, organism and machine, the natural and the artificial is being systematically erased. We are increasingly living in a world where these old kinds of dualisms are losing their value. "Instead we are living in a culture defined as one where the distinctions among humans,

[8] Sauer (quoted in Rowntree 1996:141) saw landscape as the principal source of information on how humans change the earth.

animals, machines, and the non-physical are progressively blurred" (Barnes & Gregory 1997:179).

Many people equate culture with civilisation, hence with cities as opposed to nature, countryside, undeveloped areas. Nature is only 'artificially' reappraised and romanticised by disillusioned urbanites seeking a brief reprieve from stifling urban space. "Urban-economic geography took Space as its unique object of analysis; but it was Space devoid of nature, a 'featureless plain' about which it could theorize in increasingly mathematical terms ... Cultural geography addressed Nature but eschewed formal theory, working with metaphor and narrative at the uncomfortable margins of proper science" (FitzSimmons 1997:188).

THE WILL TO TRANSCENDENCE: SEEKING UN-MAPPABLE REALITY

The modernist project is complete. Nature, God and human nature have been mapped. What difference has it made? Are we really better off, post-religion and post-ignorance? Is a cushioned life of guaranteed human rights, employment, medical care and education really without hazards? Does global democracy make the world a safer place? Do we understand life better after the ICT communication revolution? Is our restlessness assuaged by the avalanche of entertainment that we have within arm's reach?

Map is not territory, the road map is not the journey. Explaining life does not guarantee living. Postmodernity has dispensed with pinning down humans and nature by mapping them. It means dispensing with mega-metanarratives: "... it is [the] privileging of aesthetics over ethics, of the politics of place and localism over realities of the internationalism of capitalism ..." (Duncan 1996:442). Postmodernism focuses on the incommensurability of reality. If we cannot measure, we cannot compile maps. Maps are about measurement and comparison. We are confronted with incommensurability, not only in Heisenberg's principle of quantum uncertainty, but also in anthropology's search for understanding, in cognitive sciences and the dead-end street of our metaphysics and epistemologies. Bernstein (1983:91) already pointed out that "the truth of the incommensurability thesis is not closure, but *openness.*" Foundationalism is closure.

We are living in a post-representational era. Not that we don't represent – but we do it knowing full well that *signifiant* and *signifié* do not coincide exactly. In a cartographic context: "They honestly confront the impossibility of representing reality in language – that is, the radical undecidability in the relation between signifieds and signifiers." Such honesty challenges assumed 'connectedness': "... this does not imply that there is no truth, but rather that if there is, we are incapable of pinning it down" (Duncan 1996:449). It implies metaphorising understanding and symbolising existence.

Metaphorising understanding (as above) does not mean that we don't know what we are saying or that we cannot know anything. It means that meaning is 'open', is more than what we are saying. There are maps (meaning) alongside and behind the maps (meaning) that we present. That introduces a playful element into our serious project of mapping (assigning meaning). And in the mapping game, like in poker, we are constantly testing each other's maps/cards/plausibility (epistemologies): it is to constantly 'up the ante'.

The will to transcendence manifests itself in the acknowledgment that reality is 'more' than human rationality and scientific methods. "In a certain sense such relativism requires one to approximate the ancient, pre-Socratic Greek acceptance of both religious and scientific knowledge, where the world of gods ... [was] a sensuous correlate of the aspects of intellectual knowledge" (Worringer, quoted by Bunske 1996:370). Bunske (1996:370) continues: "It requires recognition that there are different kinds of truth, with each having its own set of criteria or test validity. It further requires that the criteria for one set of truths be not applied to another, that is, the truth of religious belief, a myth, or an imaginative, artistic insight, image, or orientation should not be tested by Cartesian-inspired methodologies."

Don Cupitt (quoted in Thiselton 1995:115) says that "the quest for transcendence constitutes a life-enhancing mistake we need to keep on making".

"In the film 'Fight club' Tyler tells the first cell of disenfranchised young men: 'You are not your job, you're not how much money you have in the bank, nor the car you have, the contents of your wallet. You're not your f***g khakis.' He circles around to tell them: 'You are not special. You are not a beautiful and unique snowflake. You are the same decaying organic matter as everything else.' With this Tyler invites them to make the one unimpeachable connection with reality that is available to them: to pound one another senseless with their fists; this is the ritual action that allows them to have an experience of ecstatic transcendence" (Cobb 2005:293).

CONCLUSION

Mapping nature is one of the achievements of modernism. Mapping the human mind appears to be a more elusive ideal. The most effective language for mapping the mind (which includes emotions like faith, hope, love, fear and loneliness) has always been built on the grammar of transcendence. The transcendent realm encompasses religion, philosophy, myths, symbols, metaphors and every other linguistic capacitator for storing meaning that cannot be expressed unambiguously. Unambiguity kills all imagination and creativity and puts an end to 'open dialogue'.

Life is an open dialogue (and transcendence is open to the future), in which techno-scientific capitalism is a reluctant participant. We suffer from loss of hope of the better future that modernism promised and tackled with short-lived gusto, but failed to bring about. We romanticise 'ancient' cultures, in which ignorance swathed the unknown in mythical allure. Another naivety is little more than mist before the sun of rationalism: modern Western culture harks back to transcendence by resorting to belief in angels, UFOs, New Age adventures and secular spirituality. These alternatives entail a choice between exclusiveness and inclusiveness, between either/or and both/and. Must we really choose between techno-scientific capitalism and premodern transcendence, or can techno-scientific capitalism be reconciled with spiritual values?

Neither techno-scientific capitalism nor any form of transcendence should be treated as absolute. Both are threats to humankind. Techno-scientific capitalism is a closed system prone to unbridled growth (like cancer). Any form of spiritual fundamentalism offers its adherents the certitude of one-sidedness and fanatical hope, with all the fatal consequences we hear reported on the daily news.

Is the Heideggerian ideal articulated in his *Bauen denken wohnen* still attainable? Should the story of the little prince's rose not form part of our authoritative mapping manuals? Can techno-scientific capitalism and ecological responsibility, map and territory, nature and soul be reconciled? Without a doubt meaningful survival, if any, depends on that. Maybe only a new god can save us (à la Heidegger) by charging the human mind's dynamo with new energy. If human greed and unbridled growth are not curbed, the very notion of a human mind is illusory anyway. That would leave us spectators of a contest in which brute nature and evolutionary, inherited drives fight it out ruthlessly to the bitter end.

Mapping nature and the consequent techno-scientific achievements are a monument to human ingenuity. Maps of human nature can be found in sociology textbooks. Maps of the human mind remain an open agenda. Mapping the mind means opening Pandora's box and losing hope.[9] Without hope there is no

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[9] Note that hope should not be confused with a desire for limitless power (unbridled growth). Hope in our context is not synonymous with a desire to be like God (*sicut Deus*). It is the hallmark of sufferers, those who want to escape from oppression and suffocation and long for a meaningful, communal life.

transcendence – and the transcendence offered by human greed is just veiled immanence.

May the ideal remain that after all our mapping we will remember that a road map is always just a map. Mapping isn't life but must take us to a destination where we can celebrate life, respectfully in all its open versatility!

7

LIMITATIONS OF THE CONCEPT 'LAW OF NATURE' AS A SOURCE IN SCIENCE, PHILOSOPHY, THEOLOGY AND LAW

INTRODUCTION

Greek philosophy is dominated by the problem of reality (τὸ όν) – that, is of ontology. The question was whether the human mind could have any contact with reality at all, and if so, what difference that would make to human life. Greek philosophy rests on the belief that reality is divine, and that the one thing needful for the soul, which is akin to the divine, is to enter into communion with it (Burnet 1978: 10). For the early Greeks human beings lived in a charmed circle of law and custom, but the world around them still seemed lawless – so much so that, when the regular course of nature came to be observed, they could find no better name for it than 'law' or 'justice' (δίκη) (Burnet 1978: 86).

To discover a law is to impose regularity and certainty on nature, society, events. It is to discover a source[1] to guide one's life. That is the ontological enterprise. Humans resort to 'unambiguous' sources such as nature, God, law, reason, science, custom and experience to justify their convictions and actions. So in human history we find the emergence of laws of nature, laws of human nature, scientific laws, God's laws, natural law, human law, moral law and so on.

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[1] The word 'source' is used in a broad semantic sense ranging from cause, origin, root, beginning, informant, agent, reference to generator, reservoir, justification, law, proof, theory, premise, presupposition, sanction. In physics, for example, it refers to the point or part of a system where energy or mass is added to the system.

Today postmodern diversity seems to have cast doubt on the appositeness and exactitude of law in various disciplines. Laws give certitude only up to a point: they have their limits and are not unequivocally applicable to all situations.

There is an urgent need for interdisciplinary reflection on the way we use law, and especially on how nature features in law. The motive is not to lessen diversity but to clarify meaning. While it is probably inadvisable to try and standardise the meaning of concepts like nature, causation and normativeness, some clarity is needed if we want to retain these words as meaningful referents.

The history of human thought is the history of the discovery and interpretation of these explanatory sources, as well as their refutation, reformulation or rejection. In most sciences the discovered source or cause of things was given the status of law. Science is the activity of finding the law or energy underlying natural and human phenomena. Broadly speaking, the natural sciences interpret law in terms of empirical observation, which is the basis for formulating laws and principles of nature. Theology finds the beginning of all wisdom in the law of God. God's law is revealed in Scripture and reflected in nature. Jurisprudence links all law to 'natural law', God's law or the laws governing human nature (as expressed in history of traditions and present-day positive law). Philosophy links law to order in nature, the logic of mind or ethics. As in Greek thought, the discovery of law as an explanatory source was infused with the divine in the various disciplines. But things have changed. Explanatory laws (as well as nature) have been stripped of the divine dimension. In science the link between the natural and the supernatural was severed by the scientific revolution; in law Grotius separated law from religion; in philosophy Hume freed human reason from meta-natural influences; and in theology Karl Barth's critique of the *analogia entis* divorced theology from natural theology and, therefore, nature.

The challenge we face today is to strike a healthy balance between the natural and transcendent (metaphysical) aspects of disciplinary endeavours. Nature, broadly speaking, is the only immanent source of our experience of life and our theories of its origin. Even supernatural causes are ineffective without nature as presupposition, referent and medium.[2] In God-talk, for example, we either say something about God or nothing, notwithstanding the metaphorical and analogical language we use. What we say about God can only be in terms of our life experiences in the natural world. Nature gives us 'windows' on the supernatural. On the other hand we never perceive 'pure' nature without our theoretical and ethical framework. Popper indicated that even observational statements are theory-laden and hence fallible (quoted in Evers 2006:12). Worldview, science and religion encompass both the natural and the metaphysical. Our worldview determines what we believe and how we live. Therefore we have to be conscious of the elements co-determining it. Our interpretation of the source of things determines our view of the end or outcome. Protology determines eschatology. Cause predicts effect. Fact determines value.[3]

But how do we know that our interpretation of the sources we identify is correct? Referring to 'nature' to determine what is

[2] Clayton (2004:619) mentions "agent causation" and ubiquitous divine causation as examples of non-physical types of causation. "Such approaches posit mental or divine causes that affect outcomes without introducing new energy into the physical world … some versions actually contradict physical descriptions of the world." The difficulty here is that human thought is not conceivable without physicality and physical action can be traced back to human thought (will). One could posit that God's will is not linked to physicality as the human will is. Clayton uses this idea to enable him to introduce supernatural causal influences into the physical world. The Copenhagen interpretation, quoted in support, alleges that the quantum principle allows the subject (observer) to define what happened in the past. In this sense "the minds of sentient beings occupy a central role in the laws of nature and in the organization of the universe …" (Davies, quoted in Clayton 2004:624). Clayton admits, however, that informational final causes do not "prove God" (633).

[3] Here Hume's natural fallacy is pertinent: it is impossible to derive a moral 'ought' from an empirical 'is'. The source doesn't determine the outcome. For example, we know that evolution is blind and not predetermined to take a specific direction. This does not mean that humans, as sources of action, cannot set and attain specific goals, but these are limited. Hume (1978:475) writes: "… nothing can be more unphilosophical than those systems, which assert, that virtue is the same with what is natural, and vice with what is unnatural."

natural, for example, is highly selective.[4] We describe, generalise, romanticise and idealise nature. "The *is* (of nature) is often ugly, amoral, or indeed immoral as evolutionary biology shows."[5] Nature, 'red in tooth and claw', cannot be overly romanticised.[6] There is no norm, especially no moral norm, to determine exactly how nature should serve as an example for human conduct. There are simply too many variables. Humans cite nature as a norm for human conduct very selectively, usually if the example suits their convictions. To quote Evers (2006:16) "Nature is not normative any more … Nature only represents the contingent status quo and thus the starting-point for technical and manipulative interference. Nature is a variable."

Human nature is even more difficult to pin down.[7] Fukuyama (2002:130) quotes Paul Ehrlich, who expressed the hope "that people would abandon all talk of human nature once and for all because it was a meaningless concept". This is not simply a rational choice we have. We are irrevocably part of nature, immersed in natural processes and dependent on the natural environment. Without the working concept of human nature it would be impossible to reach any self-understanding or understanding of others. What one should consider is abandoning the ideological use of the concept as a power strategy to determine and prescribe human conduct. Perhaps human nature is not definable but open. Fukuyama (2002:130), for example, defines hu-

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4 Michael Cavanaugh (2003:765) distinguishes five uses of the *nature concept*: (1) the common natural-supernatural distinction; (2) analogous to Stoic physics-based theology, everything is included in nature; (3) referring primarily to earthly things, distinguishing between human and nonhuman activities, that is nature 'uncontaminated' by human intervention; (4) the popular definition of what is natural in the human life world, like culture; (5) referring to 'normal', acceptable human practices as opposed to actions deemed 'perverse'.

5 "A very good argument could be made, using basic kin selection theory, that there is a natural and human right to revenge" (Fukuyama, referring to Robin Fox 2002:115). If my kin have been robbed or killed it is 'natural' to take vengeance.

6 "There is no real evidence that Nature is in any well-defined sense 'simple' or 'beautiful'. Indeed, the hallmark of most natural phenomena is a deep complexity masquerading as simplicity" (Barrow 1988:348).

7 "However, when we talk about the nature of man, we enter a metaphysical dimension of the world, which completely escapes the modern empirical methods of science" (Liana 2005:36).

man nature as "the sum of behaviour and characteristics that are typical of the human species, arising from genetic rather than environmental factors". This definition raises several questions: What is typical of the human species? Are the less 'typical' features unnatural? Which genetic factors determine human nature? We have only just started to fathom genetics. Why dissociate environmental influences from human nature? No other species can be understood in isolation from its ecological environment.

The following may be a better definition: *Human nature is the concept used from various perspectives to understand the human phenotype and its conduct in light of specific genetic and environmental factors.* Any attempt to define human nature should be 'open', because human nature is co-determined by a number of contextual and genetic variables. Such a 'definition' allows us to speak of human nature in a provisional, explanatory – not a normative – way. This can accommodate the different angles from which nature and human nature are viewed in the natural sciences, philosophy, theology and law. 'Nature' is a broad, ambiguous concept and its meaning has to be determined anew in every context.

WHEN LAWS IN PHYSICS 'BREAK DOWN'

The identification of 'laws of nature' is basic to the development of the natural sciences. It has become increasingly difficult, however, simply to invoke a 'law of nature' to explain phenomena. Under certain conditions these laws break down. Besides, different laws may operate in different universes. The development of cognitive and other brain sciences in particular makes it increasingly difficult simply to fall back on laws of nature.[8] Barrow (1988:300) warns that our confidence in the charming 'simplicity' of nature may be misplaced. "Nature may look simple

8 "Life is like a form of software that runs on certain complex biomolecules. As such it cannot be 'explained' or reduced to the laws of physics that govern the forces of Nature… A structure like the human brain is more complex than the underlying laws governing the chemical and atomic forces" (Barrow 1988:303).

only because we have unlocked so few of its secrets. As we dig deeper into the microscopic structure of matter and space-time, we may strike a seam of great complexity created by the simultaneous interplay of an enormous number of factors. Such a situation might appear as lawless, as pure chaos." This statement does not nullify developments in natural science but testifies to its advance from modest beginnings.

The Copernican revolution marks the start of a process which was to isolate nature from the influence of the church, philosophy[9] and supernatural belief and let nature speak for itself (see Jacob 1997:19-20). Scientific reason came to be interpreted as 'instrumental reason'[10] (Touraine 2000: 2-5; 34-35; 196; Altmann 2002:231ff). The Copernican revolution laid the foundation for classical, mathematical physics, which culminated in the Newtonian laws. Mathematical physics depicted science as a self-explanatory system with its own laws, methodology and language. It no longer needed spirits, mysticism or superstition to explain its subject. The things we see and touch do not belong to different realms governed by different rules. All matter, the uniform, invisible substance underlying all appearances, is governed by the same rules.

Roger Bacon (1210-1292) used the term '*lex*' to describe regularities in nature, without reverting to the notion of a single Divine Lawgiver. Instead of a single set of unifying laws of nature with one source, he proposed many different rules (*regulae*) for particular classes of phenomena (Barrow 1988:58). The term 'law of nature' in its present-day sense became current in the days of Kepler and Descartes, culminating in Newton. Descartes legitimised the new concept by associating it with God; secondly, he upheld the ontological claim that nature is 'endowed' with laws; and thirdly, he opened up a new epistemo-

9 Descartes divorced physics from philosophy (Barrow 1988:65).

10 Altmann (2002:232) links instrumentalism to Bellarmino as its founding father. As a philosophical position i*nstrumentalism* considers theory purely a mathematical device to represent facts - it entails no commitment to the nature of any reality behind the facts.

logical perspective by arguing that these laws are imprinted on human minds (Achtner 2001: 166-167).

According to Achtner (2002:168) natural laws have to meet four criteria: they must be universally valid, be expressible in mathematical formulas, include a necessary relation between cause and effect, and be predictive. Altmann (2002:198) views laws of nature as dependent on metaphysical principles to describe and predict how nature works. Strictly speaking laws of nature are *laws about models of nature,* and in applying them models are 'used'.[11] Attempts to use them in causal explanations are doomed to failure and lead to profound conceptual errors. The nature we perceive is not nature 'out there', the Kantian *Ding-an-sich*, but a map of nature. There are no 'laws of nature' in the Kantian *noumenological* sense, because we do not have access to nature (Altmann 2002:189).

The postwar period saw a steady erosion of many supposed laws of nature and the symmetries supposedly underpinning them. This was a result of the development of sensitive technological probes that debunked long-standing scientific assumptions: "Traditional conservation laws have been questioned; many apparent symmetries of Nature have turned out to be 'almost' symmetries upon closer scrutiny; elementary particles of Nature, like the neutrino, once routinely believed to possess no mass, are now equally routinely believed to possess a small but non-zero mass.[12] … For some deep reason it appears that Na-

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[11] Barrow refers (1988:8) to Popper's distinction of three worlds: World I contains real physical objects, World II represents states of consciousness (subjective experience, thoughts, perceptions) and World III objective knowledge. World I cannot be represented without moving into either World I or II. Studying World I leads to theories about World III, made possible by the intervention of our minds (World II). The question is whether laws of nature really exist in World I or whether they originate solely in World II. It is a matter of *adequatio intellectus et res.* Various emphases lead to different positions represented by empiricism, positivism, operationalism, instrumentalism, idealism and realism. However, real life is never divided into watertight compartments. However one chooses to view the scientific status of the laws of nature, the ways they are perceived in the life world and in the sciences differ dramatically.

[12] The example Barrow (1988:306) gives is the supposed symmetry between matter and anti-matter in physical processes. We now know that what we call 'matter' de-

ture has an inordinate fondness for lawlessness that is slight, for symmetry that is almost, but not quite, perfect" (Barrow 1988:296, 305, 306). Barrow (1988:296) points out that the descriptive map of the laws of nature can, and clearly does, change with time. It remains an imperfect representation of the underlying reality. He adopts an either-or position: "There are either constant laws or there are no laws. It does not matter whether we happen to know what they are or not. If the laws we believe to be invariant are found to change, it demonstrates our ineptitude, not Nature's inexactitude."

Laws of nature are 'superseded' by various supervenient theories and limited to the physical plane. Although human thought, for example, is impossible without the physical substratum on which it depends, the laws operative in the physical substratum do not determine it.

HUGO GROTIUS: LIBERATION OF LAW FROM THEOLOGY AND METAPHYSICS

A much neglected field in the science-religion debate is jurisprudence. Traditionally jurisprudence was influenced by the theological and philosophical worldview of the time. What we believe to be nature and natural is reflected in law and, conversely, the law co-determines what is considered natural (i.e. acceptable). The very essence of natural law is to infer the nature of the world from human nature so as to determine what law should be. The problem is that what is understood by the nature of the world or human nature does not represent uniform values and differs from one time and place to another.

Law is challenged by the same diversity and relativity as other sciences. It has to reconsider its sources and authority; it has to spell out what it understands by human nature, diverse social expectations and opposing moral claims. It has to operate in a multicultural, international and non-essentialist context. Twenti-

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cayed and was annihilated just a little more slowly than 'anti-matter'. Without this 'matter' the universe would not have developed.

eth century pragmatic law operating in the ambit of instrumentalism does not meet these challenges.

Grotius's secularisation of law took place at the time of the scientific revolution. It was characterised by dissociation from supernatural ideas and a focus on human experience to determine what human nature was. Law started to reflect the values of human society and not those proclaimed by religion.[13] Law, in whatever context, can never be divorced from the morality of a particular society. Durkheim (quoted in Dershowitz 2004: 135-136) insisted that law itself – positive law – must have a moral component. Morality is the source of law and of religion in a general sense. Morality, however, is not fixed but changes with time and place.

The Stoics probably made the most significant contribution to the doctrine of natural law, evidenced by Cicero's writings (Van Zyl 1993: 113-114). Later Stoic philosophy, as reflected in the *Meditationes* of Marcus Aurelius (AD 161-180), maintains that universal nature, which is God, requires rational beings to assist one another and refrain from injuring others. Hence they must live in accordance with nature (Van Zyl 1994: 98).

Cicero, who was an eclectic rather than a thoroughgoing Stoic, accepted the Stoic distinction between *lex aeterna, ius naturale* and *ius humanum*. *Lex aeterna* is the rational law of the cosmos, the *logos* which rules the universe.[14] Human reason, an emanation of cosmic reason, rules human life as *recta ratio*,

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13 Dershowitz (2004:24, 27) writes: "God's law has been the source of justification for genocide crusades, inquisitions, slavery, serfdom, monarchy, anti-Semitism, anti-Catholicism, bigotry against Muslims, genocide against Native Americans, homophobia, terrorism, and many other wrongs." In view of this religion cannot serve as a source to determine rights. Rights are too important to be left to theological discourse as a litmus test of right and wrong.

14 The Stoics (Zeno, 339-264 BC; Cleanthes, c331-230 BC; Chrysippus, 280-207 BC) reverted to Heraclitus's cosmology, in which fire, the regulating principle of the universe, is described as divine reason (*logos*). Seeds of this logos (*logos spermatikoi*) are present in human reason, thus establishing a direct link between human beings and God. The Stoic *logos* personifies eternal law, which is the norm that helps people distinguish right from wrong. Stoic ethics requires humans to pursue happiness by living in conformity with nature and hence with the divine will.

hence natural law is part of eternal law (Van Zyl 1994: 99) and is innate in human nature universally, thus linking all people with the cosmic order. Cicero identified *natura* with divine providence and such concepts as power, reason and divinity. He said (quoted in Van Zyl 1994: 101): "If those things [plants] which take root in the earth live and grow by means of nature's art, so much the more earth itself should be sustained by the same power. Nature therefore governs the world."[15] He distinguished between *ius naturale* and *ius civile*, following the Greek distinction between positive written law peculiar to a particular state or society, and unwritten natural law common to all people. Unwritten law (*lex non scripto*) derives from nature (*lex nata ex natura*), has innate power and is therefore applicable to all humankind.

Hugo Grotius (1583-1645) accomplished the judicial revolution in which law was secularised. He did not accept that natural law (as opposed to 'a law of nature', which is a law of physics) emanates from the divine will. Things are good or bad by their own nature. This deviated from the Calvinist ideal, in that God was no longer the only source of ethical guidelines. For Grotius the seat of natural law was human reason,[16] which, as part of God's creation, was itself divine. In his *De iure ac pacis* (quoted in Van Zyl 1991: 754) he defines natural law as a "dictate of right reason which, by establishing whether the conduct of another is in harmony or in conflict with natural reason itself, indicates the

[15] The belief that natural law was inscribed on the human mind and therefore universal was poignantly illustrated during Spain's conquest of the Americas. The Spanish Dominicans' notion of nature as imprinted in natural law and expressed in natural rights moved some of them to criticise the Spanish government. The natural rights of indigenous peoples became an issue. The Dominican Albertus Magnus, taking his cue from Aquinas, concurred that 'Indians', who by birth were naturally destined for slavery and resisted, could be hunted as wild beasts. The premise was that indigenous people committed grave offences against natural law, like murder, cannibalism, sodomy and theft and on these grounds could be punished (killed). Fortunately the influence of Hugo Grotius and others changed this approach, although it did not prevent the epoch of colonialism from unfolding (Van der Ven 2004:222).

[16] Just as sin was the prime human characteristic in Christian theology, in law the distinctively human attribute was *right reason*. Natural law could be known through human perception. Human perception underscored that human beings have a right to life, liberty and property, as well as the right to defend themselves against those who rob or threaten to kill them or deprive them of their liberty. (For an extensive list of rights see Dershowitz 2004:160-168.)

existence of moral turpitude or moral necessity in such conduct, and therefore determines whether such conduct should be forbidden or enjoined by God, the Creator of nature". Natural law is so immutable that even God cannot change or countermand it. Grotius, like the Stoics, believed in a universe governed by chance and necessity.

Since the source of a right or law determines its status, it has always been innate in humans to find a transcendent authority for their way of life, laws and traditions. This transcendent external 'source' is usually seen as nature, God, human instinct or some other objective reality.[17] The American Declaration of Independence cited "the laws of Nature and of Nature's God" as the colonists' primary source. Ironically, less than a century later, the United States denied the confederate states the right to secede by invoking the 'same' law of nature (Dershowitz 2004:5, 87).

Should divine natural law be replaced by secular natural law? Dershowitz (2004:61) answers the question thus: "Just as human beings created an intervening God, organised religion, and the afterlife, so, too, have we created divine natural law, secular natural law, and other moral and legal fictions deemed essential to satisfy some of our most basic and enduring needs."

Anatole France (quoted in Dershowitz 2004:34) observed: "Nature has no principles, she furnishes us with no reason to believe that human life is to be respected. Nature, in its indifference, makes no distinction between good and evil." This is not to say that nature can be ignored. "Any attempt to build a system of morality that completely ignores nature will fail. Nature has a vote but not a veto on questions of morality" (Dershowitz 2004:35). For Dershowitz (2004:62, 65) what is considered 'natural' is, like religion, a human invention, dressed up by humans as discoveries and revelations to give it greater authority.

[17] Hume (1978:483) has already criticised this position: "… we must allow, that the sense of justice and injustice is not deriv'd from nature, but arises artificially from education, and human convention."

But law cannot do without values and most values have a supernatural or metaphysical dimension. If law is to take its cue from experience and humans morals, then it must inevitably take note of transcendent values. The only difference is that there is no single source for determining these values and law has to grapple with a multiplicity of values operative in various contexts.

This does not mean that there are no commonalities between different sets of values. The increasing importance of international human rights, international law, the World Court, and related constitutions adopted by democratic governments calls for greater international agreement on the nature of these laws.[18]

EMPIRICIST PHILOSOPHY: DETACHING HUMAN PERCEPTION FROM META-NATURAL CAUSES[19]

Usually we refer to 'nature' metaphorically. The term is seldom defined and it is taken for granted that everyone knows what it means. Nothing is as natural as the natural. We accept that it stands over against the unnatural. Unnatural is what is artificial[20] or contrary to nature, the miraculous (Hume).

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[18] Rome's expanding international trade created a need for a legal and procedural code less complex than Roman law. The law of peoples (*ius gentium*) – as distinct form civil law (*ius civile*), which applied only to Roman citizens – incorporated all legal rules that nations had in common at that time. This was related to natural law (*ius naturale*).

[19] Some features of philosophical naturalism (quoted in Hardwick 2003:116) are: only the world of nature is real; nature is necessary in the sense of requiring no sufficient reason beyond itself to account for either its origin or its ontological ground; nature as a whole may be understood without appeal to any kind of intelligence or purposive agency; all causes are natural causes.

[20] Proctor (2004:644-650) distinguishes five 'visions' of nature: evolutionary nature, emergent nature, malleable nature, nature as sacred and nature as culture. He makes the important point that the "vision of malleable nature challenges the boundaries of nature and the natural, because what lies beyond these boundaries – the unnatural, the artificial – is now less easily distinguishable from the realm of nature" (p.644).

The three volumes of Hume's *A treatise of human nature,* written in France, were published in 1739 and 1740. His exposition of human nature laid the foundation for scientific methodology and empiricism, as well as the interpretation of nature on which evolution depends – a good century before Darwin's evolution theory (Altmann 2002:71). His views on nature, epistemology, religion and morals represent a scathing critique of the way conclusions are drawn in science, law, philosophy and theology.

Nature has endowed humans with the ability to link unrelated events in a metaphorical way. Humans, like all other mammals, rely on their experience for survival. We remember having experienced events contiguously and are prone to impose a 'causal relation' between them. The causal relation comes to take on the value of a 'law': we expect A to follow B in a specific instance, according to our experience. This 'law' becomes part of custom, folk wisdom and education. Often we identify the force or power behind the causal input. What Hume indicated was that we are often wrong. Barrow (1988:296) writes: "Undeniably, human beings have a habit of perceiving in Nature more regularities and patterns than really exist there, and of extrapolating unjustifiably without noticing the fact."

In this regard Hume (1978:155) writes: "*What is our idea of necessity, when we say that two objects are necessarily connected together?* … I perceive that they are contiguous in time and place, and that the object we call cause *precedes* the other we call effect." The concept 'natural law' has a dual aspect. Natural laws can describe what happens naturally - as *effects* - or be seen as a set of rules which determine what will happen - as *causes*. According to Barrow (1988:21) elevating *effects* to the status of natural laws is "nothing more than a mental shorthand for particular sequences of events that we often observe to occur in conjunction, and so an essential product of our way of thinking and observing". The problem, as Hume indicated, is that it does not exclude accidental generalisations.

Hume redirected human thinking to nature by emphasising the role of the observing subject. For Hume (1978:157) reason cannot come up with any idea on its own: "… reason alone can never give rise to any original idea, and reason as distinguished from experience can never make us conclude that a cause or productive quality is absolutely prerequisite to every beginning of existence … [S]ince reason can never give rise to the idea of efficacy, that idea must be derived from experience, and from some particular instances of this efficacy, which make their passage into my mind by common channels of sensation or reflection."

Our ideas are copied from impressions (sense perceptions), since we experience only particulars from particular experiences. All ideas are determinate, while abstract ideas are indeterminate and, therefore, cannot exist. We cannot legitimately invoke meta-natural or supernatural concepts to describe something beyond physics and observation. All ideas are traceable to impressions and all mental comparisons are necessarily comparisons of one idea with another (Radcliffe 2000:13-14).

Since we cannot see the 'force' or 'power' supposedly responsible for causation, Hume resorted to custom to explain it. Altmann (2002:93) stresses the importance of this notion: "It was Galileo Galilei (1564-1642) and after him Sir Isaac Newton (1642-1727) who taught us that the primary task of science is to *observe and describe events* rather than explain their origins.[21] Science was thus liberated from having to discuss the history of the chain of events in order to find first causes … Hume's concept of causality permits us to consider an isolated state of motion … and, because we observe force-free motion, we must conclude that *forces and motion are not causally related.* This allowed Newton to discover the correct effects entailed by

[21] Newton broke away from the scholastic idea (following Aristotle) that things had innate properties that determined their intrinsic strivings. Barrow (1988:61) quotes Newton's opinion on this: "That Gravity should be innate, inherent and essential to Matter … is to me … an Absurdity." Newton viewed external laws as imposed by God, as society imposes laws on its citizens.

forces, which would have been impossible if he had been involved in the fruitless Aristotelian search for first causes."

Hume debunked the common idea of necessity as a modality of causal relations (see Locke). "In no single instance," says Hume (1978:400), "the ultimate connexion of any two objects is discoverable, either by our senses or reason, and that we can never penetrate so far into the essence and construction of bodies, as to perceive the principle, on which their mutual influence depends. 'Tis their constant union alone, with which we are acquainted; and 'tis from the constant union that necessity arises. If objects had not a uniform and regular conjunction with each other, we shou'd never arrive at any idea of cause and effect." We impose a causal relation between two successive occurrences (the sun shining and a stone warming up). But all we experience is the conjunction (contiguity) of the two, nothing else: any causal relation we postulate is of our own making, the effect of custom on the imagination.

What is natural is seldom taken to be the conclusion reached from studying nature and tracing constant laws that govern its operation. Hume's work remains pivotal in the developmental history of discarding untested links between the origin and outcome of phenomena. Apart from Popper's response to a "Humean anti-inductivist philosophy of science which holds that no scientific theories can be *known* to be true so that truth-claims on scientific grounds are on the whole meaningless" (Evers 2006:13), the challenge remains to justify the causal links we make on a religious and ethical level.

The philosophical critique of modernism questioned single ontological archetypes like law, nature, God, truth, unity and the like to explain the multiplicity of often dichotomous phenomena. Postmodern multiplicity and Derridean *différence*[22] converted

[22] Stacy (2001:85) writes: "The goal of Derrida's 'decentering' of speech in favour of writing is to move us away from our 'logocentrism,' the word he coined to describe the western philosophical tradition's search for universal answers; answers to the questions that philosophy poses about what is 'true', 'right' and 'beautiful'; or to put it

the solitary fountainhead of explanation to multifarious, changing streams feeding the river of understanding.

THEOLOGY 'WITHOUT' NATURE VERSUS NATURAL THEOLOGY

Christian theology is extensively affected by developments in the natural sciences. It grapples with God's activity in the world in light of the conviction that God willingly subjects himself to the laws of nature that he 'created'. It has to deal with the possibility of a closed, physical explanation of the universe. It is challenged by the biological idea that the story of the 'fall' makes no sense in biological terms, which 'interventionist' models and the miracles they entail have become untenable. It is confronted with explanations from cognitive science giving physical reasons for religious experience. These are only a few problems raised by the natural sciences. On other levels it has to deal with fundamentalism, diversity, other religions and historically contingent factors relating to ethics and morals. The Bible gives no direct guidance on such issues and religious ideas must be reinterpreted in ways that uphold traditional values and creatively initiate new ones.

In Christian theology revelation is the source of knowledge of God. God reveals himself in nature, but this is only meaningful in light of his specific revelation in the Bible.

While a theology of nature is firmly embedded in revelation and theology (top-down approach), natural theology proceeds from physical experience of nature (bottom-up approach). The distinction between the two approaches is highly synthetic since they are interdependent. For example, a theologian practising a theology of nature is bound by prior religious commitments that are part of her tradition. She would filter out present-day scientific findings that do not conform to the prior commitment. This seems contradictory, for the worldview in which that tradition or

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in philosophical terms, the search for Logos, God, creative subjectivity, and the meaning of full self-consciousness."

revelation originated is foreign to her. It leads to double schizophrenia: she pretends to be part of something she is not part of, and simultaneously rejects a view that makes sense in the present.

If a theologian is uncomfortable with an outdated worldview, then the appealing aspects of a tradition must be reframed in terms of a present-day worldview, using the freedom offered by hermeneutics.[23] Ted Peters (2005:2) states that a theology of nature "starts from faith; but then takes initiative for raising hypotheses that re-interpret what science tells us about nature". This inverts standard scientific procedure by reinterpreting presentday scientific findings to accord with those of a bygone era. It can only make sense if the 'hypotheses' Peters refers to do not contradict what has become self-evident. Religion remains a stance of belief. Natural theology cannot prove its notion of transcendence, as no theologian of nature can prove the existence of God.

Natural theology (*theologia naturalis*) holds that God can be known without the aid of revelation. In Roman Stoicism *theologia naturalis* was the term denoting knowledge about the essence of things, not a theology of empirically observable nature (Moltmann 1985:57). Natural theology originated from Aquinas's cosmological and teleological arguments. Hume launched a devastating attack on the teleological argument. Our experience of the world does not rule out the possibility that its order could have happened by chance or indeed that there might have been not one but many designers (Southgate 2003:8). A *theology of nature*, by contrast, proceeds from a religious tradition based on religious experience and historical revelation. This is what preoccupies most writers in the science and religion debate (Southgate 2003:8).

[23] Of course we can relate meaningfully to people holding a very different worldview from our own – which does not mean that we would be comfortable living with that worldview.

Natural theology features in various versions of religious naturalism.[24] Whereas naturalism asserts that there is no ontologically distinct or superior realm, religious naturalism believes that the world has religious aspects that can be experienced within a naturalistic framework. Religious naturalism is rooted in the ideas of thinkers like Spinoza, Thoreau, Samuel Alexander, George Santayana and Ralph Burhoe (Stone 2003b:784). Experience of the sacred dimension of nature plays an important part. This is, however, a limited aspect of the person and work of God as explicated in theism. The idea of a personal[25] relationship with God falls away in religious naturalism. Its proponents are mostly well versed in religion and find religious naturalism the only way to maintain their rational integrity (see Stone 2003a:91).

Barth's revelational theology (*theologia revelata)* is diametrically opposed to any *theologia naturalis*. It presupposes God's self-revelation through the reign of grace (*regnum gratiae)* in a human history determined by sin and death (Moltmann 1985:59). The cardinal human attribute in Christian theology is sinfulness. Even the more elevated notion of humans as created in God's image is qualified by their fall and inevitable corruption. Nature, too, is affected by human sin and yearns for deliverance (Rm 8). In their natural state (*status corruptionis*) humans seek God or discern him in his general revelation in nature. That is the background to Karl Barth's radical '*Nein*!' to Emil Brunner's natural theology. It does not mean that God is not present in nature, only that in our natural state we simply don't detect him there: "If God be not found in the COSMOS, He is to be found nowhere"

[24] Other variants of naturalism are methodological naturalism, which holds (in the realm of scientific knowledge) that nature is all there is, and metaphysical naturalism, which insists that nature is all there is (on all levels). A further distinction it that between 'hard' and 'soft' naturalism, where 'hard' naturalism is associated with scientism and reductionist materialism, and 'soft' naturalism denotes religious naturalists who accept the emergence of systemic wholes that cannot be reduced to their physical antecedents (see Haught 2003:770). Goodenough (2003:102) speaks of 'spiritual naturalism', that is scientific understanding linked to sentiments like belonging, communion, gratitude, humility, assent and awe.

[25] Hardwick (2003:112) says that the religious naturalist's God cannot be personal. She also denies any form of cosmic teleology or metaphysical final causality and any cosmically comprehensive conservation of value.

(Barth 1972:309). Barth's radical protest against natural theology is expressed in his rejection of the *analogia entis.* There is no analogy between nature and God. We can know God only through an analogy of faith (*analogia fide*).[26] Augustine saw human nature as fallen and sinful (prior to the fall it represents the ideal view of nature – which can be seen as quite unnatural!). He considered nature as expressed in natural law to reflect divine reason (*ratio divina*) and God's will (*voluntas Dei*) as laid down in his commandments. *Ius divinum* was the same as *ius naturale*. This conviction eventually legitimised the ideological function the church came to fulfil in the Roman Empire.

CONCLUSION

The concept of natural law has become ambiguous in science, philosophy, theology and jurisprudence. Dershowitz (2004:149) states: "We seek to discover, create, or construct a natural law that is not dependent on God's word, nature's message, or some other metanatural source." Since this seems impossible, he rejects natural law in toto as a source for jurisprudence.

The historical development towards the diversification and secularisation of the concept of nature cannot be ignored, nor can it be artificially reversed. The re-'enchantment' of nature, conspicuous in some present-day spiritual movements, will probably not occur on a general scale. Disciplines which do not allow for a secularised view of nature as part of the present-day worldview will inevitably remain dualistic. The de-deification of nature does not mean that it no longer exerts a vital influence on humans. Some cardinal human values remain linked to nature. Most people still feel respect and responsibility for nature. It continues to evoke feelings of wonderment, awe and rever-

[26] "Wir mussen es wieder lernen, die Offenbarung als *Gnade* und als *Offenbarung* zu verstehen und uns damit von aller 'rechten' onder 'unrechten' theologia naturalis in immer neuen Entscheidung und Bekerung abzuwenden" (K Barth: *Nein!*, in *Theologische Existenz Heute*, 1934, Heft 14, 8, 12).

ence. The cognitive, biological and medical sciences reveal new facets of nature that enhance these feelings.

The challenge facing the science and religion dialogue is not to artificially re-enchant nature or secularise the religious view of it. Neither is it called upon to combat scientific naturalism or what is often regarded as religious fundamentalism. The challenge is to define and explain clearly what a specific discipline means by concepts like nature, source and law and to indicate how this relates to the discipline itself as well as to human life. That entails taking proper cognisance of the impact of such views. A clear grasp of the disparate emphases of different disciplines does not jeopardise plurality but may promote interdisciplinary understanding and respect.

Is there a middle way? For Shermer (2004:23) it is a provisional morality for a scientific age that provides empirical evidence and a rational basis for belief. Dershowitz (2004:149) seeks to discover, create or construct a natural law that is not dependent on God's word, nature's message or some other meta-natural source. He finds it in contingent human experience as manifested in current positive law. Achtner (2002:180-181), after revisiting some historical landmarks in the development of the nature concept, concludes that it is difficult to relate the concept 'laws of nature' to theological reasoning. His historical survey shows that the ideal of laws of nature has no theological origin, despite the fact that it was associated with theological thinking in different ways in various times. He concludes "Finally it turns out that the concept of 'laws of nature' is alien to theology and neither conceiving of God as working *through* the 'laws of nature' nor as acting *against* them seems to be necessary from a scientific point of view or reasonable from a theological perspective." Liana (2005:41) sums it up: "Maybe the language of natural law is not good enough to enter into a dialogue with modern humans."

Our world is characterised by its dualisms, incompatibilities, paradoxes and mysteries.[27] Hardwick (2003:115) writes: "Theologians and naturalists must come to see that, in contemporary terms, physical reduction, very broadly conceived, eliminates nothing from our experience or from history and culture." We often relate to people whose values, beliefs and lifestyle differ totally from our own. It does not prevent us from having meaningful conversations with them or collaborating fruitfully in the workplace. Cultural and disciplinary plurality may be a precondition for creative new developments.

The aesthetic, religious and symbolic value of nature remains important to humans. Barrow (1995:44) puts it aptly: "Rationality is not much in evidence in the history of conscious life on earth. On the other hand, mythical, symbolic, and 'religious' thinking – all those ways of thinking that the rationalist would condemn as 'irrational' – seem to characterise human thinking everywhere and at every time."

The broader picture of diversity is challenging, but so is the openness of evolutionary development. It undermines our securities and calls us to action. It is also exciting and inviting. Possibilities opened up by the vision of emergent nature taking us along as co-creators give transcendent value to our immanent struggles.

[27] This includes those who may lay claim to firmer ground. Ursula Goodenough (2003:103) says that "ineffability … characterizes the theism of many persons who consider themselves religious naturalists".

8

THE RESTORATION OF SUBJECTIVITY IN SCIENCE, RATIONALITY AND KNOWLEDGE SYSTEMS AS A PRECONDITION FOR SCIENTIFIC INTEGRITY

INTRODUCTION

These days the statement that knowledge is power[1] only applies under very specific conditions. Not only are we threatened by a vast multiplicity of knowledge systems, but the systems themselves are suspect because of the ulterior motives and power strategies underlying them. Buying into a particular knowledge system may, wittingly or unwittingly, disempower rather than empower one. Hence our beliefs and convictions, our commitment to a particular knowledge system need proper justification. The question is: who determines and who circumscribes proper grounds?

Knowledge, and particularly the epistemological tradition, is constructed in such a way that the phenomenon of knowledge raises more questions that it answers. Knowledge (especially reflection on the precise nature of knowledge in a post-epistemological context) has become a mystery[2] and probing questions are asked about its purpose, what it means to us and what we want it for (see Stroud 1989:32ff). Lawson (2001:ix) writes: "For we are lost. Lost in a world that has no map ... because we can no longer imagine how such a map could be constructed. For we find ourselves in a world without certainties; without a fixed framework of belief; without truth; without decid-

[1] The statement that knowledge is power, a tool for dealing with reality derives from the positivism of Bacon and Hobbes.

[2] Dretske (1989:90) observes: "Any theory of knowledge that leaves it a mystery why we need or want knowledge, why we prefer it to mere true belief, is a theory that leaves *knowledge* a mystery."

able meaning. We have no unique history, but a multitude of competing histories. We have no right or moral action but a series of explanations for behaviour. We have no body of knowledge, but a range of alternative cultural descriptions."

Knowledge cannot be scrapped and 'redesigned' overnight. Neither has the phenomenal development of knowledge since the scientific revolution become meaningless. What has happened is that we attach a different value to acquired knowledge; that we differ about the objectives for which it is used; that many of the assertions based on this knowledge exceed its range. The striving for knowledge is a striving for its anthropocentric value. Hence the fact that epistemological theories have become a mystery is linked to human self-understanding and calls for insight into the mystery.

Critical appraisal of knowledge systems is almost impossible without tracing the development of the epistemological tradition from Grecian times,[3] and particularly since the Enlightenment, to the present – a task far beyond the scope of this article. Hence we confine ourselves to a few eclectic references. The assumption is not that philosophical reflection on knowledge is the sole criterion of knowledge systems, yet its persistent influence, especially on scientific development, is undeniable.[4] These days the development and impact of knowledge are subject to many factors other than the philosophical, scientific or religious systems that traditionally governed it. The role of globalisation, the media and especially large corporate institutions in our knowledge development and choice of knowledge systems cannot be overestimated. The reduction of the human environment to a technoscientific, economic environment and the imposition of knowledge systems and morality on that environment are among the greatest challenges to the preservation of intellectual freedom.

[3] The Greek philosopher Pyrrho, of the Sceptic school, refused to accept any knowledge claim unless a plausible criterion was provided – a challenge that the Stoics and Epicureans took on.

[4] In this respect epistemology is *First Philosophy*, in the sense that it lays down guidelines for all other philosophical (including scientific) knowledge.

For the purpose of this article knowledge systems are seen as the local and global, formal and informal body of knowledge available in a society and the formal selection that is made from it to train and equip its members to participate in, and contribute meaningfully to, that society.[5] This includes all sources of knowledge, such as cultural traditions (language, religion, morality, indigenous knowledge systems [IKS], folk wisdom), curricula of educational institutions (including literary sources), the media (newspapers, television, internet, communication and information technology), the 'fixed' knowledge systems existing in all government, comercial and other social institutions, diverse worldviews and the like.

Clearly every organism gains some form of experience from its environment, even if it is limited and can only be considered knowledge in a metaphorical sense. The history of any organism's life cycle is a body of knowledge that a researcher can describe.[6] Van Huyssteen (2006:76) sees evolutionary epistemology as the science that describes such processes: "Therefore, if adaptations of all sorts are forms of knowledge, then evolution itself is the process by which knowledge is achieved." It is only in humans, the highest primates, that the development of the neocortex – with the concomitant development of higher consciousness, language and culture – made it possible to exceed the genetically fixed boundaries of environmental interac-

[5] Virtually every discipline offers perspectives on, and definitions of, knowledge. In an epistemological context Lehrer (1989:152) defines knowledge as "undefeated justified acceptance", conceding that this covers only the formal aspect of theory. The substantive part is coherence theory of justification, "in which personal justification results from a special relationship between the things one accepts … There must be a match between what one accepts as a trustworthy guide to truth and what really is a trustworthy guide to truth sufficient to sustain justification as error is corrected by elimination or replacement" – an approach that he calls 'foundational coherentism'.

[6] Dretske (1989:91-92) writes: "Animals need internal indicators of the conditions, generally *external* conditions, *in which* their behavior occurs and *on which* its success depends … So plants, too, need accurate representational mechanisms … Unless these representations are, by and large, correct, neither the individual nor the species will survive … The same might be said for the *parts* of organisms … A system can't maintain q at the proper level unless it has some way of *telling* what the value of q is, and telling *is*, or at least requires, successful representation."

tion. This applies to the extent that we are virtually unaware of our genetic equipment and attribute the history of our interaction with the environment entirely to acquired skills and knowledge. Only humans record the experiential history of their ancestors and, via tradition and bodies of knowledge, hand it down to posterity. Using their accumulated experiential knowledge, later generations are able to overcome environmental limitations.[7] More than that, humans surpass every other species in their interventions in the environment to make it suit their needs. Indeed, humans have created an environment, a life world for themselves that is so virtual that it can only secondarily be regarded as an environment in the narrow sense of the word. This implies that the human environment has become a human creation to the extent that they largely determine the way it influences them: their interaction with the environment has become an interaction with themselves. Our virtual environment generates virtual knowledge appropriated by virtual individuals. Our virtual environment generates virtual knowledge appropriated by virtual individuals. This begs the ontological question asked in the film *The Matrix* – a question that cannot be divorced from the knowledge question. To escape from this virtual knowledge, virtual environment and existence is all but impossible. This applies not only to individuals belonging to the same culture, but cross-culturally as well.

This, then, is the background to the question: who determines our knowledge systems and the resultant life world? How do we escape from the virtual straitjacket?

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7 It does not mean that knowledge develops cumulatively, linear fashion. Its development is evolutionary, hence 'open'. Van Huyssteen (2006:79) actually argues that linking Darwinism with Popper's philosophy leads to a new concept of rationality, in which the evolutionary principle of error elimination for the sake of survival is also the basis of rationality. This is not new, as it is the scientific basis of epistemology. He quotes Munz: "We can therefore say that on this view of rationality, the path of reason is not a secure path which leads from certainty to certainty; rather, it is a wild display of imagination, the products of which are scrutinised by criticism" (Van Huyssteen 2006:79).

REPRESENTATION AND LANGUAGE

Epistemology has to do with our awareness of our world and the way we theorise about it. Theorising is closely linked with representation. The Greek word ϑεωρέω (theoreo) means 'to look at, view, behold, to be a spectator'. Θεωρία (theory) is the act of observing. Without delving into its etymology, the connection between theorising and observation (experience) must be acknowledged.

Theorising is also linked with language. Different language usage influences theorising, and vice versa. Theorising and representation are determined by language no less than by empirical observation (one of the most fascinating aspects of representation is to what extent one can theorise without observation – a question that preoccupied Kant).

Theorising about and representation of reality are possible because the experience we gain of the world is 'present' to us when we theorise, just as the language we speak remains present to us even when we stop talking.

Epistemology determines ontology. What is real refers to our understanding and interpretation of reality. This is evident in the Copernican revolution. Copernicus's conjectures about our planetary orbits were confirmed by Galileo's telescope, which proved the value of scientific observation as a means of verification. Scientific observation came to precede theorising and established an irrefutable benchmark for truth. Today we know better.

We have reached the end of the modernist project of finding an epistemological Archimedean point. The theories and methods to reach incontrovertible theoretical certainty continue to elude us. It does not invalidate the epistemological project, but it does call for critical comment. Such criticism is subsumed under the term 'post-foundationalism', which seeks to incorporate foundational truths in a broad project of human knowledge. "The back and forth between the epistemic skills of responsible judgement and interpreted experience will therefore turn out to be the heart of a postfoundationalist notion of rationality" (Van Huyssteen 1999:116).

Epistemology is more than just theory of knowledge. It entails investigation and assessment of successful cognition, using the sense faculties, memory, introspection and reason at our disposal. Epistemology thus appraises all areas of human research and pronounces on the mental strategies and justification of its products.

> Within its purview, then, are various kinds of cognizing, including processes such as thinking, inquiring, and reasoning; events such as changes in one's world view or the adoption of a different perspective on things; and states such as beliefs, assumptions, presuppositions, tenets, working hypotheses, and the like. Also within its purview is the variety of cognitive successes, including true beliefs, and opinions, viewpoints, that make sense of the course of experience, tenets that are empirically adequate, knowledge, understanding, theoretical wisdom, rational presuppositions, working hypotheses likely to be true, responsible inquiry, and the like (Kvanig 2005:286).

In a post-epistemological context one cannot contemplate human beings and science without allowing for language. The knowledge project is tied to language and knowledge reform presupposes linguistic reform. In this regard Thiselton (1995:28) cites Wittgenstein's *Philosophical investigations*: "A picture held us captive. And we could not get outside it, for it lay in our language and language seemed to repeat it to us inexorably."

Science demands positivist interpretation, which, in the form of *instrumentalism* (according to which scientific theories are predictive tools without any descriptive purpose), makes social functioning possible (see Feyerabend 1981:17). The problem is that positivism (hence empirical scientific knowledge) is regarded as the sole source of reliable knowledge. Hence relativisation of scientific attempts to establish representation is a major point of reference in the history of the evolution of scientific thought systems. This calls for comment.

The development of Western thought systems, science and epistemology converges in the issue of representation. Science represents the world through accurate description. Truth is linked to representation, for it is the irrefutable description (via natural laws and scientific theories and formulas) of an independent world. And, so we believe, accurate description of the world gives human beings power to control and manipulate it. "In the light of the Great Project [Western ideal of accurate representation of the world – CWdT], Western culture has been able to regard itself not merely as being more economically successful than previous or alternative cultures but more advanced, having begun the slow acquisition of those modestly eternal truths known as facts and the placing of them within a theoretical framework" (Lawson 2001:xviii-xxix).

The representation problem was thwarted from the outset by the problem of a self-referential paradox. The representation ideal assumes an observer, a universe and a theory, but this trinity had to form part of a single theory of presentation. "Each of the options available has been extensively explored. Materialism involves embedding the observer and the theory in the universe; idealism the embedding of the theory and the universe in the observer; and the so-called linguistic turn ... the observer and the universe ... in the theory" (Lawson 2001:xxix). But the representation project cannot have an observer, for the observer is part of the universe under observation. At any rate, if the ideal of a neutral, objective version seeks to exclude historical, cultural and subjective factors, a human observer does not fit the role (which, ironically, calls to mind the determining role of the subject in quantum mechanics). In his *Philosophical investigations* Wittgenstein tried to surmount the problem by making the observer-universe relation a language-universe relation. But that is no less paradoxical, for a 'separate' symbolic language that describes the language-universe relation is not part of the world, hence cannot describe it.

Thus all attempts at establishing objective representation founder on the self-referential paradox – analogous to that of the Cretan who said that all Cretans are liars. Here are some other examples:

- "All meaningful statements must be empirically verifiable" – which is not an empirically verifiable statement.
- "There is no truth" – implying that the statement is not true.
- Russell's famous example (quoted in Lawson 2001:xxxv) of the barber who shaved everybody who did not shave themselves. If he shaved himself, however, it is a paradoxical statement. If he does not shave himself, he should do so, for he shaves everyone who does not shave himself. And if he does shave himself, he ought not to, for he only shaves those who do not shave themselves.

Where does that get us? We have to admit that knowledge is a human business and all the noble ideals of neutral, objective, universal knowledge are fraught with paradox.

Our experience of reality differs from its expression in scientific language. We also express experience in poetry and religion. Scientific language is a particular observation language that pragmatically examines the relation between the behaviour of human beings of a certain class (observers) and a set of physical situations. Feyerabend (1981:18, 23) describes it thus: "the observational language of physics is a positivistic observation language whose interpretation is the same as the interpretation of classical physics *before* the advent of quantum mechanics." Observation language contrasts with everyday language, in which the descriptive signs are coloured by people's prejudices

(Feyerabend 1981:29). There is no such thing as a uniform everyday language (as opposed to scientific language which, as a symbolic language, is uniform). "*The interpretation of an observational language is determined by the theories which we use to explain what we observe, and it changes as soon as those theories change"* (Feyerabend 1981:31, 33). Scientists adapt observation language as soon as a new theory has linguistic implications. Everyday language also changes, but the dynamics and the reasons are entirely different. Knowledge must be substantiated, and this substantiation adds value to our convictions and commitment to knowledge systems. "Justification ... has an *instrumental* utility, a utility in promoting the reliability of the beliefs for which it is available. If it didn't do that, it would be hard to see what value it would have" (Dretske 1989:95-96).

But scientific language is functional in the insider world of scientific research and, as such, bound by the rules of that game. In that sense it is closed. Lawson (2001:134) writes: "The case will be made that the structure of knowledge reflects the character of the search for closure on the part of individuals ... The search for closure involves the attempt to eradicate the gaps and squeeze out openness, as if it were possible to provide a world of material alone. As a result knowledge as a whole and each sub-division of knowledge exhibits this character." But the scientific project remains incomplete – even when we achieve understanding and have reached 'closure'. "Although we sometimes have the illusion that knowledge could be completed, if not as a whole at least in some respects … The search for closure cannot be brought to a close, and as a consequence knowledge can have no limit" (Lawson 2001:135).

Naive knowledge operates without requiring substantiation of every statement, although it is not unsubstantiated. The substantiation of everyday statements is linked to belief, conviction and opinion within specific, unique contexts. This does not mean that the knowledge problem will disappear if we return to the commonsense wisdom enshrined in our everyday language-games and life-forms. Besides, we should remember that "widely held beliefs have often been (and indeed still are) plain wrong, and moreover that their wrongness has much to do with the influence of certain linguistically entrenched or acculturated ways of thinking" (see Norris 2006:78-79).

VIRTUE EPISTEMOLOGY AS EXAMPLE OF POST-EPISTEMOLOGICAL INCLUSIVENESS

Postmodern criticism of the attainability of immutable, foundational knowledge systems has had such an impact on epistemology that one could speak of a post-epistemological era, characterised by a post-empirical, post-foundational attitude. This does not mean that epistemology is no longer important, but that its special position as the exclusive substructure of science has had to make way for a more inclusive approach to knowledge.

This is evident in, for example, the emphasis on what is called virtue epistemology. Traditionally one would expect epistemological virtue to involve intellectual abilities manifested in knowledge, a correct methodological approach to knowledge, accuracy, a critical orientation, logical consistency, et cetera. Wood (1999:14-15), however, sees intellectual virtue as "an abiding, acquired trait that reliably allows us to orient our intellectual lives – our believings, reasoning habits, and cognitive powers – in ways that contribute to human flourishing, most notably to success in cognitive endeavors such as gaining understanding, acquiring truth and avoiding falsehood, being able to revise one's beliefs in the face of new information, and so on". Credulity, folly, superstition, obstinacy, deliberate naivety, on the other hand, fall in the category of intellectual vice.

A virtue epistemology, then, is a matter of attitude rather than of method.[8] It emphasises human wisdom as a differentiated,

[8] The emphasis on a particular scientific method as the exclusive access to truth has been relativised in the postmodern context. Method design has always proved to be reductive. Examples include the Baconian method for the natural sciences, Descartes's "Discourse on method", Locke's "Historical plain method", Mill's methods and Husserl's phenomenological method (see Wood 1999:21).

comprehensive understanding aimed at human flourishing. However, virtue also varies from one philosophical tradition and one culture to the next. Consequently it is analysed in every philosophical framework. The power strategies that underlie knowledge and truth claims have been highlighted by Foucault (Du Toit 1996:36-38).[9] As a result claims to universally valid knowledge systems, and the idea of a universal human nature that enables us to pin down knowledge, behaviour or objectives have to be regarded with suspicion: "the notion of virtue is not captive to any one account of human ends and purposes, religious or otherwise" (Wood 1999:22).

LOCAL KNOWLEDGE SYSTEMS AND THE PROBLEM OF PERSPECTIVISM

Knowledge systems do not exist in a vacuum; they always appear in the form of a particular tradition. The Enlightenment model of rationality was blind to this (see MacIntyre 1988:7). The phenomenon of human rationality is universal, but the specific form it assumes in a particular era and culture varies, because every rational tradition has a distinctive history.

The fact that rationality is biologically rooted, is universal, has to comply with specific epistemological requirements in a particular scientific discourse, et cetera, does not mean that its form is unvarying. Rationality has to be integrated with all other human functions and should not be viewed in isolation. MacIntyre (1988:76) puts it thus: "in different cultures desires and emotions are organized differently and there is therefore no single invariant human psychology." Different human psychologies presuppose differences in morality, beliefs and values.

[9] The view that power underlies everything virtually precludes the demand for objectivity. On what do we base our decisions? Truth is tainted. Many would say that a lot of the decisions made in post-1994 South Africa were based, not on objective knowledge, but on emotive factors like guilt, anger, retribution, restitution, etc. But what judgment is apolitical? MacIntyre (1987:398) maintains that even philosophy, which purports to be objective and unbiased, is, one way or another, political.

Thus rationality is also bound up with traditional context in all its manifold manifestations. Different, competing systems of rationality all have their own luggage. “Each has its own standards of reasoning; each provides its own background beliefs. To offer one kind of reason, to appeal to one set of background beliefs, will already be to have assumed the standpoint of one particular tradition” (MacIntyre 1988:351-352). Yet many saw the acceptance of contextuality and the concomitant relativism and cultural determinism as the end of scientific development. Lawson (2001:xvii) describes this feeling about perspectivism as follows: “we stand at the end of a great tradition, which has provided us with a tolerant, liberal environment that has husbanded the valuable and discarded the worhtless. It has done so on the basis of an adherence to empirical, rational thought and endeavour. If it is accepted that there is only perspective, all of this is at risk. For there can be no agreed method for advance, nor any notion of what progress would comprise, and as a consequence we will be at the mercy of those who can shout loudest and longest in the pursuit of their own ends and their own values.”

But is pluralism and perspectivism the end of progress and universal understanding? Does this mean that cross-traditional debate on rationality is impossible? According to MacIntyre a relativist standpoint would preclude rational debate and rational choices between opposing traditions. A perspectivist standpoint, on the other hand, denies the possibility of making truth claims on the basis of any tradition. “Yet if this is so, no one tradition is entitled to arrogate to itself an exclusive title; no one tradition can deny legitimacy to its rivals” (MacIntyre 1988:352). From a perspectivist position the only solution is to avoid true-false categories altogether and rather to treat different rationality models as complementary perspectives on the reality in question. MacIntyre rightly regards both the relativist and the perspectivist standpoints as attempts to move beyond the Enlightenment ideal of truth and rationality, according to which methods and the irrefutable principles that underlie them guarantee certainty (see MacIntyre 1988:353). For MacIntyre the solution lies in moving beyond any theory of rationality and concentrate on the underlying practices of enquiry. In studying the rationality of a particular society a researcher would always start with its contingent historical circumstances, beliefs, institutions and practices, which offer a point of departure. In every society one finds texts and/or people that are authorities on its tradition. But traditions are always in a process of flux. "Authoritative texts or utterances may be shown to be susceptible to (change), by actually receiving alternative and incompatible interpretations, enjoining perhaps alternative and incompatible courses of action. Incoherencies in the established system of beliefs may become evident. Confrontation by new situations, engendering new questions, may reveal within established practices and beliefs a lack of resources for offering or for justifying answers to these questions" (MacIntyre 1988:354-355).

EXPOSURE TO OTHER KNOWLEDGE SYSTEMS AND THEIR INTEGRATION WITH LOCAL CONTEXTS

Theorising characterises all traditions. Theorising presupposes the possibility of modifying one's own system and evaluating other systems. Reception of other systems is complex, involves intensive theorising and passes through the familiar phases of confrontation with new beliefs, inconsistencies in existing systems, ambivalence about unprovable assumptions, et cetera. It also presupposes a tradition of rational inquiry, which includes openness to criticism and scope for changing one's own system. Facets of a culture that are considered peripheral are obviously changed more easily ('neutral' science and technology would fall in this category), while aspects that belong to the core of a tradition and concern belief and worldview are usually far more resistant to change. Beliefs based on faith and tradition are difficult to change, because rival models are probably equally reliant on faith and as unprovable.

Although most scientists espouse the view that science is neutral and universal, it is not true that a 'neutral body of knowledge' is established in the same way in different societies. Many factors influence the successful implementation of knowledge systems in different communities, as well as the specific form they take. Examples are the role played by religion, the educational and research culture, as well as the level of industry and the economy. Knowledge and self-perception cannot be separated and decisively influence the development of any epistemological culture.

Hence to speak about knowledge systems is incomplete unless one is familiar with the geography of knowledge and its decisive impact on human rational development. Although human reason is open and fluid, it was traditionally assumed that there is a fairly clearly defined, cultural rational identity. Changes in thought paradigms were understandable and were usually accepted by society at large and especially by scholars, to the extent that they were affected. As a result of exposure to the global culture and technological diversity this no longer applies. "It is now not uncommon for it to be argued that there are no facts that can be identified independent of culture and society, of perspective and theory, and increasingly there are those who find in the retreat from the certainties of the past, an opportunity to proclaim the value of alternative traditions and cultures, and a means to denounce what are seen to be the tired and outdated canons of the West" (Lawson: 2001:xvi-xvii).

On the face of it, it would seem as if we are far more disposed to accept other systems when they are 'neutral'. 'Facts'[10] are considered neutral and technoscience rests on facts. In a foundationalist context this 'neutrality' is manifested in the precedence of self-knowledge over knowledge of others; of neutral knowledge over knowledge based on opinion or context; of knowledge of the natural order over other knowledge.[11] Thus

10 The Latin word for 'fact', *factum*, refers to an event, deed or opportunity and was not used as a substitute for something entailing a judgment until the 17th century. Using the word 'fact' as a substitute for a judgment can be very misleading (see MacIntyre 1988:357). To logical positivists facts remain crucial, in that knowledge is gleaned "through a combination of observation and logical deduction, along with the precise defining of our terms ... based on a secure foundation of agreed facts" (Lawson 2001:xvi).

11 The place that natural knowledge occupies in our self-understanding has increased with the growth of scientific knowledge. Today it is as powerful as it was in the heyday of the Enlightenment, although greatly tempered by factors such as human values, beliefs and history. An example is the environmental determinism of the late

epistemological foundationalism determines the rules for all other 'knowledge utterances'. First fact, then value; first nature, then culture, belief, opinion (see Taylor 2004:80-81). The further we move from epistemologically founded knowledge, the more knowledge becomes mere opinion, conviction or personal truth. Despite criticism of epistemological reductionism, it cannot be denied that it is the basis on which virtually all sciences - including human sciences – operate.

Although theories may be debated within a specific science, outside the scientific forum one often encounters uninformed faith in science, and the natural sciences in particular are accepted as factual. Most people consider disputes about the theories underlying technoscience irrelevant. They are seen as a problem for the sciences, although there are plenty of controversies about things like values, language and tradition. Belief is usually part of a metaphysical system and is value-laden. Where deeply entrenched values are at issue they are defended tooth and nail.

MacIntyre (1988:368) has indicated how difficult it is to reconcile competing points of view. "The multiplicity of traditions does not afford a multiplicity of perspectives among which we can move, but a multiplicity of antagonistic commitments, between which only conflict, rational or nonrational, is possible."

The mere availability of knowledge and sources of information tells us nothing about their reception. Besides, nowadays knowledge systems are not clearly defined and we are inundated daily by a deluge of knowledge in the form of media,

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19th and early 20th century: "Environmental determinism in the late 19th, early 20th centuries alleged that we are what nature makes us. Man is a product of the earth's surface; a child of the earth; dust of her dust; mothered by the earth which fed him, set him tasks and directed his thoughts" (Barnes & Gregory 1997:174). This was a powerful incentive for the 'scramble for Africa' initiatives of the 1880s. Environmental determinism provided intellectual legitimation for colonisation: if because of their natural environment a people could not 'develop', then it was 'the white man's burden', as Kipling put it, to intervene and show them how.

technoscience[12] and labour practices, whose underlying values are not spelled out or readily identifiable.

What determines the will to master knowledge systems and appropriate them? The Kantian challenge, *sapere aude* (think for yourself, be led by your reason), is a performative contradiction, because while propagating intellectual freedom, it also prescribes a path for the intellect (see Norris 2006:130). Norris (2006:130) maintains that "it seems self-evident that beliefs are to a large extent non-volitional, or subject to various kinds of causal or socio-cultural influence". Knowledge systems are embedded in a cultural context that has a particular power of attraction or repulsion. Usually they are linked to some reward: belief systems offer salvation and happiness; the knowledge corpus that is part of formal education systems promises job opportunities and career possibilities; corporate knowledge systems have to be mastered for access to, and promotion in, a company; narrative knowledge systems contain superstitions about the role of various forces (ancestors, predestination, good and evil, happiness and fate) in human life. Scientific models, by contrast, are considered detached, because they have no direct bearing on the life world and the happiness of individuals or groups.

CONTEXTUAL VERSUS UNIVERSAL RATIONALITY

Rationality, like intelligence, is a universal human given. Without objectivity and universal rationality science and understanding are not possible. Harding (1998:55) indicates that in important respects modern sciences and technologies, no less than other cultures' traditions of systematic knowledge, are local knowledge systems. If it is true that natural science studies the environment and considers its knowledge output to be universal,

12 Technological artefacts are products of an extremely successful combination of theoretical and practical reason. Technoscientific artefacts are considered neutral and are desirable because they create jobs and enrich and simplify life. But they are not neutral and embody a particular rational culture and worldview. In this sense we may speak about the 'silent colonisation' of the world by technoscientific values.

does it reduce the human body of knowledge to uncreative formulae, generalised truths? Human knowledge is polysemic and pluriform, and is always contextual. So-called universal knowledge, too, is always appropriated in a particular situation and temporo-historical context. So the human sciences cannot look alike. Religion is an example. The various religions represent a variety of self-interpretations informed by diverse interpretations of transcendence. Whether the dualism – immanence/transcendence, physics/metaphysics, transcendental philosophy/empirical philosophy, belief/reason – can ever be resolved by any philosophical system or trans-disciplinary initiative is a moot point. Maybe the dualism (or rather, dual perspectivism) should rather be seen as characteristic of human nature. Absolutising one of the dimensions is a reduction of human nature. Rorty (1987:29) summarises the opposition between the two approaches as follows: "To be on the transcendental side was to think that natural science was not the last word - that there was more Truth to be found. To be on the empirical side was to think that natural science – facts about how spatio-temporal things worked - was all Truth there was." What is true is that traditional metaphysical bastions are coming under fire and that on the human journey through the 21st century 'new' metaphysical bastions are being erected.

Even though rationality is a universal human datum, it does not mean that it assumes the same form everywhere. Knowledge systems and their underlying rationality are both local and universal. Emphasising only the universal dimension is to deny the local diversity and personal creativity embedded in a particular linguistic or cultural milieu. Emphasising only the local dimension is to deny common human rationality as well as the hermeneutic capacity to understand. Of course there are limitations to the range and success of universal rationality, as well as the degree to which we can really understand foreign local contexts. Besides, individual and cultural exclusiveness typically maintains that the 'other' does not understand 'my' personal and/or cultural context. The psychological background to this attitude makes sense, because the fact that my personal or cultural context is far more complex than an outsider can appreciate safeguards me against her negative interpretation and appraisal. To say that Europeans cannot understand Africans or Orientals protects the latter against adverse European criticism; to declare a tradition Oriental absolves Africans and Europeans from the expectation to be informed about that system. Citing a tradition is often purely referential (indicative), but it may also be ethnocentrically oriented, entailing connotations of superiority or inferiority. History does, however, testify to successful transcultural communication and interaction. There are no pure traditions or cultures and the intellectual property of all cultures should be applied to the common benefit of all.

There are other examples of rational exclusiveness: male rationality cannot really understand female logic; religious rationality differs from scientific rationality; inter-generational differences in rationality are insurmountable; and the rationality operative in ancient texts is inaccessible to present-day readers. Refinement of complexity can be taken to the point of the absurd. The diversity that universal rationality has to overcome is also found in local contexts. Members of closed communities, even members of the same family, may say that they do not understand each other. Indeed, one can claim not to understand oneself. The principle behind this is that there is something like personality, community, tradition, identity *an sich*. It is entrenched behind a wall of hermeneutic impenetrability.[13] But we know that identity is open, that it grows and changes – even though some traditions or minority groups apparently manage to

[13] This strategy has been pointed out by the developmental psychologist Simmel, who interprets cultures from an objective and a subjective perspective. He emphasises "the role of purposefully maintained social and psychological distance between persons", which takes the form of secrecy. The history of human societies contains abundant examples of secret organisations that make secrecy a universal sociological phenomenon. The analogy of flirtation by way of concealing the body is clear. "The proof of the dynamics of keeping and revealing secrets is the activity of flirtation … The basic need for clothing has been turned into the cultural process of *hiding and revealing the body simultaneously*." The dynamics of revealing and concealing has to do with distance between self and other. "Yet the process of such distancing is always ambivalent – with united opposites in conflict, creating ambivalent patterns of temporary dominance of one over the other, reversal of such dominance, and the feeling of 'generalized distancing' " (see Valsiner 2000:35-36). For the important role of secrets in African communities, see De Jong 2004:257ff.

preserve their value systems unchanged. We also know that the holistic context in which rationality functions is unique, because the emotive value of belief, the associative and connotative value of words and images for every individual is unique. Nevertheless we are able to communicate and understand each other.

This confirms the importance of a holistic approach to epistemology that is characteristic of current thinking. Knowledge should be viewed against the background of human nature – and in this respect the role of subtle power strategies cannot be overestimated. Whether these strategies are regarded as colonising, proselytising or apologetic, they colour our view of the understanding and communication of knowledge systems. A non-foundational attitude emphasises the local and contextual nature of knowledge.[14] It "highlights the fact that every historical context, every cultural or social group, has its own distinct rationality ... Non-foundationalists offer a picture of human knowledge as an evolving social phenomenon shaped by the practical implications of ideas within a larger web of belief" (Van Huyssteen 1999:63-64).

AFRICAN CONTEXTUALITY

In Africa informal knowledge systems have the greatest impact. African oral traditions focus on folk wisdom and traditions, which determine communality, health, future opportunities and happiness. In post-apartheid South Africa the effort to promote and revitalise indigenous knowledge systems (IKS) is a wholesome development, provided it is not seen as a counter-measure to so-called 'Western' science. IKSs are important because they

[14] The reasons given for the contextual nature of rationality are that rationality is always intrinsic to a particular practice; that the belief upheld in a particular practice cannot be applied to evaluate another practice; and that there are no standards of rationality that can be used to judge other practices. The rationality of science, for example, differs radically from that of religion (Van Huyssteen 1999:79-80; 2006:19). Thus rationality becomes incommensurable and there is no chance of communal consensus.

incorporate age-old African values and experience. Inevitably they also contain elements which, from a narrow scientific viewpoint, would be considered 'primitive' and 'superstitious' – especially when it comes to sangomas and medicinal knowledge. The point, however, is that IKSs also reflect social values, which are pertinent to reflection on any knowledge system. Home remedies and proverbs are cases in point.

In Africa the absence, by and large, of a formal scientific culture (a product of modernism), in which participants are used to rival models and criticism of these, contributes greatly to a naive attitude towards criticism of existing models. This applies to most outsiders to scientific discourse. Nevertheless the epistemological principles that underlie science function in the everyday life world, where people are more or less familiar with the justification of propositions, logical consistency and inherent congruence in argumentation and theorising, experimental adequacy of theories, and so on. Van Huyssteen (1999:160) distinguishes rationality from objectivity: "rationality is possible (more often than not) in the absence of regular scientific objectivity."

The fact that so-called Western knowledge systems are treated with suspicion is attributable to the colonial connotation that they have acquired over the years. These systems went hand in hand with colonial religion, trade and job creation. By and large colonial systems were accepted (under duress in many instances) in tandem with inherited traditions. In Africa Western-oriented artefacts, industries and technology made an impact as being 'modern' (cf the obsession with communication technologies and motor transport).

Africans, however, were debarred from the inner sanctum of science and technology and from the better educational institutions (apart from the few who studied abroad), which also excluded them from decision-making positions in the economic world.[15] The few that managed to make a breakthrough became

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15 Knowledge systems are pursued mainly with a view to career opportunities. In non-industrialised countries opportunities, and the resultant access to appropriate knowledge systems, are lacking. Under apartheid there were few opportunities for

strangers in their own communities and observed traditional community values only when they went home to visit. Their formal education consisted in learning neutral, factually based, scientific values and a new (technical) language; instead of absolute truths they were told that 'truth' does not exist; instead of gaining insight into the world, science fragmented it and they were left with a reductive worldview; instead of creating values, existing contextual values were broken down and 'universal' truths were propagated.[16]

The transfer of knowledge systems via technology is far more subtle than physical colonisation. "When modern technology is transferred, therefore, more is provided than hardware alone. The underlying fabric of the receiving culture – its ethical views, its patterns of approach to the world, its religious convictions – are implicitly jeopardized to the extent that the artefacts and methods of modern civilization entwine themselves within the customs and institutions sprung from different mentalities" (Ferre 1995:93).

Economic globalisation undeniably displays colonialist tendencies. It is virtually impossible for any country to survive in a global economy without the technoscientific systems and artefacts that modern-day economies are based on. Technoscientific artefacts are accompanied by implicit scientific knowledge and, although it affects most people only indirectly, belief in the underlying scientific principles is unshakable.

Africa's perception of truth is not only epistemologically oriented, but also life oriented. It does not exclude the possibility of changing its own tradition or participating in a foreign tradition.

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black South African learners to enter and grow in the corporate sector. Black workers were employed as unskilled labour. The change in 1994 opened the labour market to black workers. The majority had no suitable qualifications and had to be trained on the job. Overnight the knowledge systems associated with the labour market, which used to be worthless to black students, became an important factor.

16 At present there are many initiatives to further trans-disciplinary study and consilience of sciences. This is laudable, provided no individual science becomes the sole interpretive filter (see EO Wilson's *Consilience*).

In the regard, MacIntyre (1988:392) writes: "The historical particularities of traditions, the fact that each is only to be appropriated by a relationship to a particular contingent history, does not of itself mean that those histories cannot extend to and even flourish in environments not only different from but even hostile to those in which a tradition was originally at home."

KNOWLEDGE SYSTEMS AS PART OF HUMAN SELF-UNDERSTANDING: THE SUBJECTIVE ASPECT AND VALUE DIMENSION OF KNOWLEDGE SYSTEMS

The scientific revolution, as we all know, isolated objectivity as the basic component of science. This assumes a subject who is "ideally disengaged, that is free and rational to the extent that he has fully distinguished himself from his natural and social worlds, so that his identity is no longer to be defined in terms of what lies outside him in these worlds" (Taylor 1987:471). Today there is a drive to restore the role of the subject and the experience of self, as well as many other factors that are excluded by a narrow empirical approach. Human experience and self-understanding are constitutive for science, not simply an epiphenomenon of scientific objectivity. Taylor (2006:57ff) emphasises that emotions are linked to objects. Emotion is the experience that our situation has specific properties that are not neutral, otherwise we would not be affected by emotion. Emotions, such as fear, shame, self-consciousness and a sense of dignity, bring a certain import to a situation that affects me and this is a particular form of experiential knowledge! (Taylor 2006:60-61.) However, unlike in the natural sciences, we cannot pinpoint the properties of the specific 'import', as the example of shame proves: "But with the shameful, this [objective, scientific – CWdT] pattern of explication breaks down. For the shameful is not a property which can hold of something quite independent of the experience subjects have of it. Rather, the very account of what shame means involves reference to things – like our sense of dignity, of worth, of how we are seen by others – which are essentially bound up with the life of a subject of experience" (Taylor 2006:64). Subject-referential qualities do not accord with an objectified worldview, yet we cannot say that they put emotion in opposition to reason. The important point that Taylor (2006:72) makes is that subject-referential emotion is essential for our understanding of what it is to be human. We have already noted that rationality cannot be separated from what it is to be human, from human self-understanding. Emotion, too, cannot be divorced from the epistemological enterprise, because our lives are always tied up with interpreted emotion. Furthermore, we are always trying to articulate the interpreted emotion – hence human beings are self-interpreting animals (Taylor 2006:75). Human agents and their knowledge are tinctured and that has to be taken into account. Elsewhere (1987:476) Taylor writes:

> It becomes evident that even in our theoretical stance to the world we are agents. Even to find out about the world and formulate disinterested pictures, we have to come to grips with it, experiment, set ourselves to observe, control conditions. But in all this, which forms the indispensable basis of theory, we are engaged as agents coping with things. It is clear we couldn't form disinterested representations any other way.

But are we always completely honest in the explicit articulation of our emotions – especially about the motives underlying the emotion? The negative ulterior motives for our scientific practice, our account of reality and our 'objective judgments' are as constitutive for the findings we publish as the role of emotion. We like to refer to ourselves and our knowledge systems as modern, credible, commendable and universal. Nobody likes to mention the power systems underlying their knowledge systems (see Thiselton 1995: 124-134; 138ff). The fact that knowledge systems are based on power systems is not new and has been pointed out by various authors in different contexts. The following quotations need no further comment:

Niebuhr (1960:45) says: "... for it is significant that men cannot pursue their own ends with greatest devotion, if they are unable to attribute universal values to their particular objectives. But men are no more able to eliminate self-interest from their nobler pursuits that they are able to express it fully without hiding it behind and compounding it with honest efforts at or dishonest pretensions of universality."[17]

And further (Niebuhr 1960:34): "Men will not cease to be dishonest, merely because their dishonesty has been revealed or because they have discovered their own deceptions. The development of social justice depends to some degree upon the extension of rationality. But the limits of reason make it inevitable that pure moral action, particularly in the intricate, complex and collective relationships, should be an impossible goal."

Furthermore (Niehbuhr 1960:232): "The nations of the world which pretended to fight against the principle of militarism have increased their military power, and the momentary peace which their power maintains is certain to be destroyed by the resentments which their power creates."

Edward Said (1994:65) refers to the problem from the perspective of the intellectual's role in society: "Is the intellectual galvanized into intellectual action by primordial, local, instinctive loyalties – one's race, or people, or religion – or is there some more universal and rational set of principles that can, and perhaps do govern how one speaks and writes? In effect I am asking *the* basic question for the intellectual: how does one speak the truth? What truth? For whom and where?" Said (66-67) cites Peter Novick's book, *That noble dream,* to make his point: "Objectivity has had to do service in wartime as 'our', that is American as opposed to fascist German, truth; in peacetime as the objective truth of each competing separate group – women, African-Americans, Asian-Americans, gays, white men, and so on – and each school (Marxist, establishment, deconstructionist,

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[17] By way of example, Smith (1978: 295) refers to the idea that Western development is identified as the generator of all development: "The West is active, it makes history, it is visible, it is human. The non-Western world is static, it undergoes history, it is non-human."

cultural)." Said (1994: 67-68) then affirms that the critique of objectivity confirmed the constructed nature of knowledge – that

> … the so-called objective truth of the white man's superiority … rested on a violent subjugation of African and Asian peoples, who, it is equally true, fought that particular imposed 'truth' in order to provide an independent order of their own. And so now everyone comes forward with new and often violently opposed views of the world: one hears endless talk about Judeo-Christian values, Afrocentric values, Muslim truths, Eastern truths, Western truths, each providing a complete programme for excluding all the others. There is now more intolerance ... than any system can handle. The result is an almost complete absence of universals, even though very often the rhetoric suggests that our values (whatever those may happen to be) are in fact universal.

But aren't we all like that? And, if so, what prospects are there of meaningful encounter and integration of different traditions? We should be aware that there has to be consensus on what we accept as rationality. If not, different groups will arbitrarily impose their own criteria to serve their own power interests – a common cause for conflict.

Local knowledge is pragmatic and reflects local needs and interests often far better that universal knowledge. In this sense, universal knowledge forms the backdrop against which local knowledge features. "In contrast to metanarratives that claim to bind together the totality of discourse and action into overarching unity, local narratives are more responsive to the diversity of micro-practices in everyday life and the plurality of language games that pervade our discourse" (Van Huyssteen 1999:210).

CONCLUSION

The history of epistemology, with its *Wirkungsgeschichte,* growing complexity and inevitable culmination in post-epistemology and post-foundationalism, can easily incline us to epistemological agnosticism (not knowing). If philosophy has reached its end, and so has modernism, that end is a meaningful *telos*. It is an end in the sense of the completion of a project from which we have learnt a lot about what it means to be human. Epistemology is an anthropocentric enterprise, and as such it is changeable. We dare not stop interrogating our knowledge system, even if the exact nature of knowledge continues to elude us. The human project is open-ended and, as our landscape changes, so does the answer to the question of what knowledge is.

9

SOME BARTHIAN PERSPECTIVES ON THE PRESENT SCIENCE-RELIGION DEBATE: WHAT IS THE PLACE OF 'NATURAL THEOLOGY' TODAY?

INTRODUCTION: BARTH IN PRESENT-DAY SOUTH AFRICA?

Concepts of God and nature are dynamically variable. This demands ongoing reconsideration of them. Cosmology and natural theology have been part of human thinking since it was first recorded, and experienced a golden age in ancient Greece. The aim of this article is not to propose a new natural theology; nor does it seek to resurrect older models. It is necessary, however, to examine the extent to which nature actually does play a role in people's faith, to take note of developments in the natural sciences which put the idea of natural theology in a whole new context, to investigate the place of natural theology in the dynamic science-religion debate and to make room for meaningful interaction between nature and faith. Barth is examined from this perspective, as he represents a radical rejection of natural theology and proposes instead a theology exclusively based on revelation.

In studies like this one the South African context is relevant, as Barth is to this day highly regarded in South African Reformed theology; two South Africans (the theologian Wentzel van Huyssteen and the physicist George Ellis) are prominent in the global science-religion debate; and more particularly because the debate on the relations of God and nature, and of natural science and religion, has not yet taken off in South Africa, being limited to a few interested individuals.

WHAT DO WE MEAN BY NATURAL THEOLOGY?

Natural theology was traditionally seen as a means of obtaining knowledge about God from nature (physical and human nature), applying the light of human reason to reach knowledge about God's nature and works insofar as they are revealed in physical and human nature. Linked to this are the 'proofs' of God's existence, as identified by Aquinas and many others after him.

In the context of Barth's thought, however, the definition must be extrapolated to the concept of autonomous human reason, which includes all human endeavours to make sense of human existence outside the realm of revelation. It therefore includes all sciences (including theology) which seek truth outside the revelation of Jesus Christ. This means that all human reasoning activities outside divine revelation constitute natural theology. Barth sees natural theology as an expression of human self-awareness and self-confirmation (*Selbstbewahrung und Selbstbehauptung*) before God.

Wissink (1983:7) adds the following relationships to the problem area of natural theology: theology – philosophy; nature – grace; Christianity – other religions; Catholicism – Reformation; and others. Terms which surface in the debate range from intolerance, Pelagianism, heathendom, metaphysics and scholasticism to culture, orthodoxy, missionary work, rationality, hermeneutics and certainty. This is no exaggeration, as for practical purposes one must take into account the whole of Barth's theology in order to understand his dismissive attitude towards natural theology.

Natural theology was a minor issue in the Reformation. That the heavens declared the glory of God was not questioned until the modern period, when the interest shifted from nature versus grace, and from works versus faith, to reason versus faith and natural religion versus revelation (Wisnefske 1990:55). The problem flared up again at the beginning of the scientific revolution in the 16th century, when Kepler and Galileo declared the independence of science as the 'book of nature', as against religion's 'book of revelation'. This was the start of human rationality's declaration of independence, which became typical of all natural theology.[1] Cuputo (1997:112) refers to the Enlightenment's simplified version of the world: "There was *rational theology*, which consisted of a body of universal truths … and there was *revealed theology*, which consisted of a body of propositions that were 'above reason' and were to be believed on authority of faith."

In our day the debate on the distinction between natural, supernatural and scientific explanations of the origins of the cosmos and of life on earth is still raging.[2] There was no such debate in Barth's time, or rather, it was still in its infancy. Then, nature was not an object of deliberate theological reflection. Hummel (1994:156) points out that, following Schleiermacher, theology has become a theology of the historical revelation in strict opposition to natural theology: "Seitdem hat es im deutschen Protestantismus keine natürliche Theologie im klassischen Sinn mehr gegeben … Die 'natürlichen Theologie' wurde zu einer Art Ketzername, und damit verschwand auch die Natur als Gegenstand theologischer Reflexion."

Barth launched the natural theology debate by characterising the theology and thought of his time as natural theology.[3] Unde-

1 The human-nature dichotomy leads to dualism. "This artificial separation of man from nature (giving man a categorical spiritual dimension) which is alien to many Christians is an important reason why some scientists have disowned the Christian cosmological view" (Miller 1995:140).

2 Natural theology seems to be part of our natural life, an attempt to make sense of our natural existence. It persists in our time in spite of being discounted by theologians. "Simple involvement in natural life seems to lead people to an unsophisticated assertion that there is a God" (Wisnefske 1990:93).

3 The best-known example was Barth's confrontation with Brunner (his "No!") in 1934. Brunner, in a paper *Nature and Grace. A contribution to the discussion with Karl Barth*, took up his position as an admirer of Barth, but listed six points in which he thought Barth overstated his case. We simply name these points without discussing them, as they are mentioned by Brown (1967:79-84): 1 *Image of God*: Barth argues that the image of God in humans has been completely destroyed by sin. Brunner says humans are still human - starting point for natural theology. 2 *General revelation*: Barth exalts revelation in Christ at the expense of revelation in nature. 3 *Preserving grace:* Saving grace, emphasised at the expense of grace at work in the

niably the contextual circumstance of the rise of Nazism contributed to his opinion. Hauerwas (2001:168) sees Barth's *Church dogmatics* "... as the attempt to develop a theological metaphysics and ethics that witness to the God who is the beginning and end of all that is". Many people perceived this as imperialist and totalitarian. "Yet without such a theology, the church would have been even more devoid of resources in its confrontation with Hitler" (Hauerwas 2001:169). This is not a very convincing reason (Bonhoeffer felt no need for it, and found his answer in precisely the opposite direction: living in the world radically and responsibly, *sicut Deus non daretur*), and if it really was the case, it was not very effective and certainly not a helpful approach to today's world. In my opinion the chief emphasis of Barth's reaction against natural theology should be seen as the personal threat that modernism,[4] science and the somewhat independent development of theological sciences posed to Barth.

Apart from his debate with Brunner, Barth focused mainly on Christian natural theology and hardly at all on the question of natural theology in the sciences. In *The readiness of man* he

creation and preservation of the universe. Brunner emphasises God's gracious preservation, which he considers a starting point for natural theology (see Calvin's idea of the preservation of the elect*).* 4. *The divine ordinances*: Barth's denial that we can see the hand of God in certain divine ordinances. A divine ordinance of preservation must be seen as a *lex naturae*, and therefore as pagan. 5 *Point of contact (Anknüpfungspunkt)*: The grace of Christ has no point of contact in humans. 6 *Whether grace abolishes or perfects nature (gratia non tollit naturam sed perfcit)*: Over-exalting grace at the expense of nature.

4 Modernism represents the impossible possibility that we can engage in 'God-talk' without knowing God, do theology without believing in God and preach the gospel without having encountered God. This was the reason for Barth's concern. Humans became knowing Subjects, submitting everything to their investigating, scrutinising and defining reason. God cannot become a study object – he is the unknowable subject confronting humans. Barth states (CD II/1:21): "As knowledge of faith the knowledge of God is just like any other knowledge in that it also has an object. We have seen that thereby the primary objectivity of God is to be distinguished – but not separated – from the secondary. But as knowledge of faith the knowledge of God is unlike any other knowledge in that its object is the living Lord of the knowing man: his Creator, from whom he comes before he knows him … But this means that knowledge of this object can in no case and in no sense mean that we have this object at our disposal. Certainly we have God as object, but in not in the same way as we have other objects."

attacked Christian natural theology (CD II/1:135). It amounts to a sermon of conversion, in which a sinful person (in this case, a theologian) is confronted with the fact that he cannot save himself (is not prepared to subject himself to God's judgment and mercy): "It involves self-denial to deny the basic idea in all natural theology ... It involves self-abnegation. And how is this possible? How can man jump over his own shadow? ... What else is the God whom he affirms he knows immediately ... but his own reflection, the hypostasising of his self-consciousness ...?" (II/1:136). Theology, or natural theology, appears to accept revelation and grace, and gives them precedence materially and formally, but behind the humility lurks a monopolising of the Word. "To be sure, the disguise of its position of monopoly is a distinctive feature of natural theology in the Church (even in Catholicism) ..." (II/1:137-138). Although the believer was thrown off balance for a moment by the Word which questioned him, "he has now absorbed and domesticated revelation itself" (II/1:139). Barth's criticism is radical – no competition can be countenanced: "If grace is alongside nature ... it is obviously no longer the grace of God ... If God's revelation is alongside a knowledge of God proper to man as such, even though it may never be advanced except as a prolegomenon, it is obviously no longer the revelation of God, but a new expression ... for the revelation which encounters man in his own reflection" (II/1:139). Although Barth himself made use of the work done by colleagues and established a respectable theology, that does not gainsay this judgment: "The triumph of natural theology in the Church, described as the absorbing and domestication of revelation, is very clearly the process of making the Gospel respectable ... What is all open unbelief, and how hopeful it seems, compared with a 'victory of faith' in which man has already conquered faith by being a believer along with all the other things he is, by making even the Gospel into a means of his self-preservation and self-defence! We can make only a brief reference to the abundance of religious, moral, political, philosophical and scientific forms in which this can take place" (CD II/1:141).

Barth says that natural theology usually starts from nature, "... from the nature which he has not lost even as a Christian, but which he still puts into effect as a Christian in a way which is particularly triumphant and formally conclusive; that is to say, by domesticating the Gospel, which is to make it innocuous ... It is in its naturalness, i.e. respectability, that it has its indestructible glory" (CD II/1:142).

BARTH'S POSITION ON NATURAL THEOLOGY AS THE NECESSARY CONSEQUENCE OF HIS THEOLOGICAL MODEL

While Heidegger criticised natural theology on the basis of the nature of Being[5] and philosophical insights, Barth criticised it from the position of the theology. His crisis theology developed into a theological model intended to immunise God, revelation and theology against any rational criticism or scientific investigation. There is almost no aspect of Barth's theology that does not impact, directly or indirectly, on his opinion of natural theology. We cite only a few examples.

Barth's theological model is so effective that it could be said to have colonised the theological world. After Barth, it was practically impossible to work outside his model without opening oneself up to his criticism. Just as the criticism of metaphysics in philosophy brought an end, *de iure*, to philosophy, so Barth's ideas brought an end to theologising as an independent discipline. Gauchet (1997:34), for example, responds as follows to the idea of God as the *Ganz Andere* (Wholly Other), which removes God as an object of modern thought because people cannot know God but can only be known by God the Subject: "The more God is thought of and venerated as the Wholly Other, the less his creatures' existence is perceived and treated

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5 This is not the place to go into Barth's distinction between *analogia entis* and *analogia fidei*. He describes *analogia entis* (natural theology) as follows: "...you acknowledge an analogy between God and man, and therefore one point at which God can be known even apart from His revelation. That is to say, you acknowledge the analogy of being, *analogia entis*, the idea of being in which God and man are always comprehended together" (CD II/1:81).

by them as being controlled by something other ... Emphasising divine difference proves to go hand-in-hand with broadening the power humans have over themselves and the order they comply with." Barth has been accused of deism and dualism because of his emphasis on the *Ganz Andere*. In the words of Torrance (1970:122): "The achievement of this distance or separation of the divine from the human led Barth to conceive the relation between grace and nature, revelation and religion, in such a dialectic and diacritical way, that he could be trapped into speaking of God as everything and of man as nothing, which appeared to cast such a slur upon the creation that he was accused of Marcionism as well as deism." Torrance (1970:122) ascribes this to the Lutheran and Augustinian dualism in which Barth's theology is rooted. Barth did indeed try to break free from this dualism by establishing a 'positivistic theism', to such an extent that Blumhardt speaks of an "astounding and unheard of objectivity in the matters of God" (cited in Torrance 1970:123).

With reference to the way Barth deduces theology from revelation, McGrath (2003:140) says: "There is an inherent circularity within the dogmatic method, in that it ultimately rests upon a 'self-positing and self-authenticating Word of God', which explains but is not explicable, and which authenticates without being authenticated." For that reason Barth's theology is classed as revelatory positivism and Christ-centred monism which, if taken literally, must of necessity isolate theology from the world and all other disciplines.

Barth remains within the framework of scientific rhetoric when he explains that, like any other scientist, he is led by his field of investigation. If theology's field of investigation is – exclusively – God, and if positive knowledge of God is obtained from the way God makes himself known, then it is impossible to use another field of enquiry (nature) as a clue to understanding God. Barth therefore makes much of the epistemological implications of the doctrine of *sola gratia.* Scientific objectivity and theological truth converge in the doctrine of justification (Torrance 1970:127-128).

BARTH'S STANCE ON NATURAL THEOLOGY IN VIEW OF THE INFLUENCE OF KANT AND HEIDEGGER

Kant's opinion on the (im)possibility of knowing God

To understand Karl Barth's radical rejection of natural theology, we must consider his particular circumstances and contemporaries.[6] We confine ourselves to Kant and Heidegger.

In Kant's thinking, God is not an object of knowledge open to human investigation. His reasoning is, of course, different than that of Barth, as Kant does not deem God to be empirically accessible to the senses and therefore knowable. God's sole significance is to further our understanding of nature or as a postulate in moral thought. As Wisnefske (1990:51) says: "For much of theology after Kant, 'God' is defined by the function it served in consciousness: it is whatever makes possible a feeling of absolute dependence; it is whatever conditions authentic existence. Whatever fills a certain function in human experience, or conditions certain activity, is 'God'." The notion of reason as the only reliable source of knowledge was increasingly to come under fire. Torrance (2004:211) says: "Until the emergence of Kant's *Critique of Pure Reason* it was reason that depicted man as the image of God. Kant challenged the capacity of reason to deliver knowledge of God and substituted reason with the ethical, the sphere of moral will as home of religion.

Wisnefske (1990: 51) indicates that after Kant, God could no longer be an object of direct human knowledge, but only "an idea of ours, useful for our understanding of nature, or a postulate of our moral activity. God therefore served human endeavor".

Kant (2002:46) says: "Thus the worth of all objects *to be acquired* through our action is always conditioned. The beings

6 Barth's theological endeavours cannot be understood in isolation from the assault they triggered on 19th century theology, although the conflict was not defined until 1929-1930 (see McGrath 2001:268).

whose existence rests not on our will but on nature nevertheless have, if they are beings without reason, only a relative worth as means, and are called *things;* rational beings, by contrast, are called *persons*, because their nature already marks them out as ends in themselves, i.e., as something that may not be used merely as means …" If Kant speaks out against the objectification of the other for our own benefit, this would apply even more to the objectification of God. God, however, is an object not of empirical knowledge but of religious knowledge. Similarly, Rorty (1980:382; see also 383ff) says that what is laudable about Kant is not his 'epistemological' distinction between the transcendental and the empirical standpoints, but rather his 'existentialist' distinction between people as empirical selves and as moral agents.

Barth had to separate the Christian God from the God of philosophers or the God of experience and thought. The only way to do this was to refuse to acknowledge God as an object of human thought, experience or investigation.[7] God cannot be known without his revelatory initiative, neither can he be experienced outside it. If God in his mercy makes himself an object of knowledge in Jesus Christ, then and then only can he be known. Barth (1973:275) summarised Kant's view in his *Protestant theology in the nineteenth century:* "So far as the objects of intuition and the understanding of empirical knowledge are concerned God, Freedom and Immortality are not objects of our knowledge; that means: they are not objects of our theoretical knowledge. They are not to be comprehended simply as existent reality. Metaphysics – metaphysical cosmology, psychology and theology – is impossible, if one understands by it a theoretical knowledge of objects, the concepts of which must be devoid of corresponding intuitions." Barth (1973:273) understood the implications for theology: "From now on theology would no longer be able to formulate its tenets, no matter on what foundation it might base them, without having acquired a clear concep-

[7] This, of course, is not how human thought works. We do not think about God only when his word addresses us. In our naive experiential world, we experience God differently.

tion of the method of reason, which it also uses in the construction of its tenets."

Interestingly, Barth's criticism of natural theology is in fact more like criticism of rationalism and epistemology, and has little to do with nature or with knowledge of God. In Barth's terms it would be disastrous for theology if discourse about God was made possible and determined by human abilities. That would be to confirm Feuerbach's theory of God as a human projection. Barth assumes that any natural theology necessarily tries to choke out Christian theology otherwise it is not natural theology (Wisnefske 1990:53,54). This, however, is simply a caricature of natural theology and all human culture.

Caputo (1997:58) reminds us that much of our "absolute presuppositions" (our Platonic legacy) surfaced between Descartes and Derrida. Kant tried to show that some could be proved, but only by giving up the old metaphysics of God: "Instead of being objective truths propping up an objective God, Kant made them into just structural presuppositions and postulates of our knowledge and our moral action." Caputo (1997: 81) proposes a 'non-realistic' view of God which asks us to give up the old 'objective' doctrine of God, and instead regard talk about belief in God as a guideline for the way we see ourselves and shape our lives.

Some of the consequences of Kant's philosophy are that many people dropped a rationalist objectification of God, and moved the *Platz Gottes* from reason to experience and human emotion. Post-Kant, much theological writing has defined 'God' in terms of his function in human consciousness: God is whatever makes possible a feeling of absolute dependence; God is whatever conditions authentic existence. This makes it impossible to distinguish God's activity from a process of consciousness, and consequently modern theology is an easy target for Feuerbach's charge that God is a projection of human feelings. Barth's reaction to Schleiermacher and existentialism was a result of his rejection of any attempt to view consciousness or feeling as a locus for knowledge about God.

Barth's view of natural theology and Heidegger's ontology

To understand Barth's implacable opposition to natural theology it is helpful to consider a contemporary philosopher like Heidegger, who shares Barth's attitude to natural theology from a philosophical position.[8] In the 1920s both Barth and Heidegger reacted to the postwar crisis of European culture. Barth focused on the evangelical Christian community, turning the religious rhetoric of the time on its head, while Heidegger's ontological rhetoric on the meaning of being was aimed at the existentialist community. Both were responding to the spiritual crisis which followed the First World War: "Each of them invites the reader to understand the crisis metaphorically. Barth figured the human situation as the crisis of human sinfulness before God. Heidegger understood the situation as the crisis of inauthentic being in the world" (Klemm 1987:447). Eighteenth-century optimism in the afterglow of the Enlightenment had disappeared, and Barth silenced investigative reason by denying that God could be an object of thought. Theology as positive knowledge of God was impossible. The only knowledge of God came from God himself when He, freely and mercifully broke into human reality – and this was not available to humans: "If this 'breaking in' does not occur, our thought remains merely empty, formal, critical and unproductive, incapable of mastering the rich world of appearance and of apprehending each particular thing in the context of the whole" (Barth 1972:48). In the words of Klemm (1987:448), "Theology thus receives a negative knowledge of God: theology knows God as wholly other than reason or unreason, language or silence, subjectivity or objectivity, and wholly other than the mediation of any of these." Logically, then, natural theology is situated within human reason; it strives to move from bottom to top (a bottom-up approach), and in Barth's opinion it is just as taboo as any other attempt to know God by rational means.[9]

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8 Other thinkers like Nietzsche and the theologian Kierkegaard, not discussed here, followed the same approach. For a discussion of Kierkegaard's position, see Connell (1999:159-164).

9 The distinction between the 'from below' and 'from above' approaches is relative and reductive. Nothing comes entirely from either 'below' or 'above'. The metaphysical presuppositions in any natural theology, the a priori presuppositions in sci-

Heidegger highlights the crisis metaphor in the inauthentic (*uneigentliche*) life (Dasein). Humankind has been subjected to the fallen state (*Verfallenheit*) of Dasein. Dasein includes guilt and death: "Die Sorge birgt Tod und Schuld gleichursprünglich in sich" (Heidegger 1976:306). Human Dasein is characterised by truth (being) and untruth (concealment), and people have no control over the appearance of being in the mode of enlightening truth any more than they have, in Barth's opinion, control over God.[10] God, the *Ganz Andere*, breaks into human existence freely and mercifully; likewise, for Heidegger truth breaks into human Dasein. Conscience identifies authentic Dasein, and is rooted in its openness: "Das Verstehen des Gewissensrufes enthüllt die Verlorenheit in das Man. Die Entschlossenheit holt das Dasein auf sein eigenstes Selbstseinkönnen zurück. Eigentlich und ganz durchsichtig wird das eigene Seinkönnen im verstehenden Sein zum Tode als der *eigensten* Möglichkeit" (Heidegger 1976:307).

As we have seen, Heidegger shared Barth's negative feelings about natural theology. Natural theology is concerned with ontologically causal, technological thinking, which is diametrically opposed to the nature of faith and being. It destroys what it seeks to prove. Connell (1999:152-156) identifies five objections which Heidegger has to natural theology. Firstly, theistic arguments are useless to express humans' relationship with God and to interpret it theologically. The fact that theology is rooted in faith makes natural theology impossible. Faith excludes any natural theological proofs. Secondly, theistic arguments are hypocritical in that believers claim to be questioning

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entific models, the value systems in 'the neutral, value-free practice of science' have all been debunked repeatedly. Barth's theology is not exclusively 'from above'. Any theology is embodied in the language, imagery and context of its time. Barth's rejection of the idea that God finds a human point of contact is a metaphysical statement in the service of his ideal: to disallow on a human level any possibility of knowing God. We use this distinction with the stated reservation in mind.

10 "Die existenzial-ontologische Bedingung dafür, dass das In-der-Welt-sein durch >>Wahrheit << und >>Unwahrheit<< bestimmt ist, leigt in der Seinsverfassung des Daseins, die wir als den *geworfen Entwurf* kennzeigneten. Sie ist ein Konstitutivum der Sorge" (Heidegger 1976:223).

God's existence, whereas they actually accept it as true. For the same reason, believers are incapable of posing genuinely philosophical questions like 'why is there something, and not nothing?' To believers, philosophy is nonsense! Thirdly, theistic arguments provide ontological reasons for ontological questions. The being of entities is not itself an entity. "To try to answer ontological questions – questions of why what-is is and why it is meaningful – in terms of a particular entity, even when that entity is God, is worse than useless" (Connell 1999:154). Fourthly, theistic arguments are causal, deducing the existence of God as the cause of specific observed effects. Their causal nature helps to obscure being. "What is more, the very god they infer is part and parcel of this desolate condition" (Connell 1999:154). Finally, the God whose existence is deduced by means of theistic arguments is a false god. Interestingly, Heidegger does not think that ontological causal thinking is necessarily flawed – only that it leads to the god of metaphysics instead of to the true God. The god *causa sui* is the god of philosophy, not the God before whom mankind falls to its knees in awe (Connell 1999:155).[11]

BARTH'S VIEW OF THE POSSIBILITY OF THEOLOGY AS A SCIENCE AND THE PLACE OF NON-THEOLOGICAL SCIENCES

Barth's negative attitude to the role of the natural sciences in theology is important, because people today view nature through the lens of natural science. Barth wanted at all costs to preserve theology's independence from all other sciences and from any kind of natural theology.[12]

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[11] Heidegger's positive response to Nietzsche's verdict that God is dead should be seen in this context: "The pronouncement 'God is dead' means: The suprasensory world is without effective power. It bestows no life. Metaphysics, ie, for Nietzsche Western philosophy understood as Platonism, is at an end. Nietzsche understands his own philosophy as the countermovement to metaphysics, and that means for him a movement in opposition to Platonism" (Heidegger 1977:61).

[12] Barth intends *a fortiori* to exclude theology from science. Like other sciences, aetiology must be guided by its object of study. In order to explain what he means by science, he quotes Heinrich Scholtz's six postulates: (1) the proposition postulate (freedom from contradiction); (2) the coherence postulate (unity in the objective

Barth set theology as a science apart from the other sciences. “If theology allows itself to be a science, it cannot at the same time take over the obligation to submit to measurement by the canons valid for other sciences.” Theology could not set its own standards for science (which included good theology). “To put itself in a systematic relationship with the other sciences, theology would have to regard its own special existence as fundamentally necessary. That is exactly what it cannot do. It absolutely cannot regard itself as a member of an ordered cosmos, but only as a stop-gap in an unordered one” (CD I/1:9). Barth saw the consequence of any attempt to establish theology as a science as “... in fact destructive, (the) surrender of theology to the general concept of science ...” (CD I/1:9). He goes on to say that theology can only be a science if it spells out precisely what it understands as ‘scientific nature’. His scorn of the sciences is evident in these words: “No science possesses manorial rights to the name of ‘science’, nor is there any theory of science with final authority to give or to withhold this title” (CD I/1: 10).

Barth grants scientific status to theology, because in that way theology as a human attempt (a ‘bottom-up’ one – CWdT) to find truth will have solidarity with other sciences in their own search for the good (note the humility intrinsic to scientific endeavour). Theology does not intend to leave the concept of science to the other sciences, and for that reason Barth objects to what he calls the “‘heathen’ general concept of science”. This means that the sciences are human constructs of reality, whereas theology cannot design a construct of God to suit itself. Theology as a science is therefore a fait accompli, because God has revealed himself to humankind. In the words of McGrath (2003:139): “For the early Barth, one of the most dangerous threats faced by the church was the subversion of its own iden-

realm); (3) the controllability postulate (all propositions must be testable); (4) the congruity postulate (concerning that which is physically and biologically impossible); (5) the independence postulate (freedom from all prejudice); (6) it must be possible to break all propositions down into axioms and theorems, and test them on that basis (CD I/1:7-8). Barth rejects the last five, and only accepts the first on certain conditions. For a discussion of this, see Clark (1963:52-75).

tity through the intrusion of ‘religion’ as a human construction, leading to the dislodging of the gospel itself.” This implies that theology as a human construct is the same as natural theology. Nevertheless, Barth does not consider the heathenish appearance of the sciences so serious that theology has to dissociate itself from them – rather, he proposes that the sciences should be brought under the church's umbrella! (This is not to say that he supported the development of something like a Christian science – CD I/1:10-11. See also Clark 1963:71-74.) We could just as readily understand that any natural theology should also be brought under the church’s umbrella, as all the disciplines, including theology, form part of the created realm, and can only arrive at truth through God's gracious gift of faith.

THE POSSIBILITY OF KNOWING GOD

Barth relativises any capacity for human knowledge, methodology or language-based knowledge when it comes to knowledge of God. In this regard, language, rationality, science, theology, philosophy or any other human capability have as little chance of acquiring knowledge of God as does natural theology. It would be wrong, therefore, to single out natural theology as the one and only way by which God cannot be known. God cannot be known by means of any theology, human piety, rational intelligence, science or methodology. The only way to know God is through faith, as a hidden God. Paradoxically, there is a difference between knowledge of a hidden God and the impossibility of knowing the (hidden) God. God's hidden nature is qualified: “... nothing can be more misleading than the opinion that the theological statement of the hiddenness of God says roughly the same thing as the Platonic or Kantian statement, according to which the supreme being is to be understood as a rational idea withdrawn from all perception and understanding ... For on this view God is understood as a rational idea, which, however transcendent, is general, ‘pure’ and non-objective” (CD II/1, 183). At the beginning of this volume he puts it like this: “We cannot equally well ask about the knowledge of the World-Ground or the World-Soul, the Supreme Good or Supreme

Value, the Thing in itself or the Absolute, Destiny or Being or Idea, or even the First Cause as the Unity of Being and Idea, as we can ask about knowledge of Him who in the Bible is called God and Lord" (CD II/1: 6).

God can only be known via the faith which He Himself gave to humans through revelation, a faith characterised by judgment and mercy. God gives this faith only by way of revelation. The question is whether faith as a human capability (or starting point for divine revelation) is not also a God-given capacity of human beings (the human creation)[13] analogous to reason, science, language[14] and emotion?[15] The answer will be that faith – as a human capacity, like language, reason and emotion – must be distinguished from faith instilled by God (since heathens or believers in non-Christian religions also have faith).[16] Thus Barth sees God-given faith as a separate metaphysical gift to humankind, to be understood metaphorically as the process which takes place in the case of the elect,[17] who receive a new life in Christ 'from above' through the proclamation of the revealed word. But faith is not an independent human ability or capacity. What is more, "to speak of Him in our human words, this in no sense means that our human viewing, conceiving and speaking possess their own capacity for God – even a capacity awakened and actualised by revelation and faith" (CD II/1:194). What

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13 "The fact that we are created in the likeness of God means that God has determined us to bear witness to His existence in our existence. But it does not mean that we possess and discover an attribute within ourselves on the basis of which we are on a level with God" (CDII/1, 188).

14 The sufficiency of our thought-form, and of the perception presupposed in it, and of the word-form based on it, collapses altogether in relation to this God (CD II/1: 190).

15 "And again, it would be a misunderstanding of the *Deus definiri nequit* if theology and proclamation tried to renounce the viewing and conceiving of God Himself in order to become a theology and proclamation of the subjective feelings and experiences of the pious man or a theology and proclamation of the underlying feeling of 'absolute dependence'" (CD II/1:193).

16 Faith as a leap in the dark or *sacrificium intellectus* is similarly a human strategy. "The *sacrificium intellectus* as the last despairing, audacious act of self-confidence, in which man thinks he can decide upon his very knowledge of God, has turned out to be a bit of conjuring … Even interpreted as a leap into faith, it does not create a position which cannot be attacked and is not attacked" (CD II/1:9). It would be the same as, for instance, a religious philosophy of authority.

17 "The revelation of God is that God has given to the creature whom He has chosen and determined for this end …" (CD II/1: 199).

we say about God, whatever images we use, cannot be true if God does not make it true. "It is settled that as such our images of perception, thought and words neither are nor can be images of God. They become this. They become truth. But they do not do so of themselves; they do it wholly and utterly from their object. Therefore the hiddenness of God remains" (CD II/1:194).

We cannot give God a name (CD III/1:187); we cannot even know him as the eternal one. "We must not, therefore, base the hiddenness of God on the inapprehensibility of the infinite, the absolute, that which exists in and of itself, etc. For all this ... is the product of human reason." Hence any use of or reference to God outside the context of faith is meaningless. "If we incorporate Him into any of our worldviews, it may help us to complete this worldview; but at the same time it will reveal its godlessness ... We are not master of God, and for this reason we cannot apprehend Him of ourselves" (CDII/1: 189).

Revelation and faith are miracles by means of which we can understand the incomprehensible (CD II/1:197). The gift of faith should be understood metaphorically, as the following point illustrates: although Paul battled to establish the idea that we can only be saved by faith in Jesus Christ (by the gospel, not the law), and although Luther had to rediscover this truth and confirm it in the context of the Catholic theology of his time, in Barth's time this idea was self-evident in Reformed circles. Nevertheless modernism and, in theology historical, editorial and textual criticism, have made faith something of a human propensity.[18] Barth radicalises faith afresh by seeing it as a gift 'from above', and strips all human thought, language, rationality, science, natural theology and so on, from the capacity to know God. Just as, in Reformed doctrine, people are unable to save themselves, so they cannot be saved by 'faith alone' if this faith is seen, directly or indirectly, as a human instrument to ensure

[18] For this reason Barth states (CD I/1: 33) that if faith is to be serious, there "... must be a conflict of faith with itself". He spells this out as a conflict of church-based (or revealed) faith with itself: "For at this point, in its opposition to Roman Catholicism and to Protestant Modernism, evangelical faith is at conflict with itself "(CD I/1: 36).

salvation in the context of theology, science, philosophy, language, emotion, piety or any other human capacity. Reason (Descartes) and faith alone (Luther) led modernism to false, foundational certainties (see Du Toit 2006:208). These certainties have been eroded by postmodernism and post-foundationalism.

But Barth, too, broke them down. Just as theological modernism had reached a certain prominence, Barth proclaimed the 'impossibility' of theological thought and put an end to theology as an independent science (alongside but not subject to the Word). In a typically dialectical way, Barth – with qualifications – restored to theology the ability to know which he had denied it. Even natural theology was restored! Barth speaks of the natural theology and natural revelation deduced by the church fathers from the relative 'viewability' and conceivability of God that are granted to mankind. He permits natural revelation, provided it is not regarded as a human capability. "This revelation [the natural revelation and natural theology of the fathers – CWdT] occurs in the sphere of the creation of God, but not in the power of the creation as such ... [It is in the dispensation of Jesus Christ] that God – *sicut mihi es* – becomes knowable and therefore viewable and conceivable to us. If, in view of these creaturely *dispensationes*, we for our part venture and are permitted to venture to speak of God in our human viewings and concepts, and therefore to make use of the possibilities given to us in our relationship to the creation in general, the legitimacy and strength of this use does not originate from a revelation proceeding from the creation, but from a revelation entering into the creation and illuminating it. The fact that the one revelation of God in Jesus Christ actually does illuminate the creation and our relationship to it, and therefore also our human possibilities of viewing and conceiving, means that we are given the authorisation and command to make use of them" (CD II/1: 200). The created dispensation includes all human capabilities and means, from reason to language, science and therefore also natural theology as it is understood through the natural sciences. The qualification which Barth insists on is that these capabilities should not be regarded as human achievements, but as knowledge and understanding coming from God: "... our viewing and conceiving remain absolutely behind God as their object and behind faith, which is, from our side, the power of their movement. Therefore our knowledge reaches its goal only in God himself and in faith" (CD II/1: 201).

The question is whether in our post-Barthian time postmodernism[19] and post-foundationalism did not achieve the same in the secular sphere! The security of knowing, the absoluteness and unity of knowledge, Archimedes's fixed point of objectivity, the fundamental security which modernism brought have all been taken away again. The difference must surely be that whereas Barth restored believers' security and firm knowledge of faith and Divine revelation 'from above', postmodernism and post-foundationalism did not – and did not want to, since their objective was not the church and theology or a soteriology, but human knowledge systems.

THE SACRAMENTAL DIMENSION OF DOCTRINE ELEVATES IT ABOVE NORMAL RATIONALITY (NATURAL THEOLOGY)

In Christ, God is genuinely present on earth without loss of his divinity, because the person of Christ is not anchored in his humanity (*anhypostatos*) but has its substance in the Logos (*enhypostatos*). This metaphysical construct legitimises knowledge of God, human language and even natural theology, provided they are rooted enhypostatically in the Logos. The same applies to human thought, the human person, human understanding of the world and even natural theology (!), if they are anchored in the Logos. Just as faith changes bread and wine into the body

[19] There are of course many similarities between Barth's theology as a reaction to modernism and postmodernism's reaction to modernism. For a similarity between Barth and Derrida, see Green (1999.91-108). Barth explains knowledge of God by using an image of concealment and revelation. For Derrida, *difference* functions as an alternative to *presence* (objectivity and accessibility). In the context of *difference*, the sign functions as a trace which moves meaning dynamically from trace to trace in a dialectic of revelation and concealment. Barth and Derrida both make use of "the same double nature of language" (Graham Ward, quoted in Green 1999:97). As in the comparison with Heidegger, this is not to say that there are not differences as well.

and blood of Christ (though not physically observable) in the eucharist, so the human person, human rationality, language and insight change when they acquire a sacramental dimension through the revelatory Word of God.[20] This enables Barth to say (CDII/1:110): "The place in which revelation takes place becomes ... objectively another place by now becoming the place of revelation. Man in the cosmos, who is confronted with God's revelation ... becomes, as man confronted by God's revelation, objectively another man ... But this otherness of man is – always in the first place quite objectively – his truth, his unveiled reality: the truth and reality also of his cosmos." Outside the 'place' of the revelatory Word, human truth is falsehood, human knowledge is veiled in darkness, and the human cosmos is nothing but natural theology. Barth provides a further example of this in his explication of Psalm 36:9 (With thee is the fountain of life: in thy light shall we see light") when he says that Israel, like its neighbours, looked to the stars and natural phenomena like storms in order to make statements about God. The difference is that insofar as Israel's statements were made "under the revelatory word", they obtained a different meaning. "It is because and as God speaks and acts in Israel that man in the cosmos becomes objectively another, namely the one who in the whole cosmos encompass of his existence can now know and has to acknowledge the might and glory of this God" (CD II/1:112). The following passage sums it up: "We can now see what is involved in this remarkable biblical reference to man in the cosmos as such ... By pointing to man in the cosmos, they [ie biblical references – CWdT] point to a certain extent through him to the man of the revelation of God, i.e. to the man who, in

[20] God reveals himself by concealing himself in cosmic creatureliness in Jesus Christ, who is an enigma (*Erde*) but who also enlightens as an enigma (*Welt*) (CDII/1:56). Barth himself uses the sacrament as a token of revelation: "He unveils Himself as the One He is by veiling Himself in a form which He Himself is not … He uses its work and sign, in order to be objective in, with and under this form, and therefore to give Himself to be known. Revelation means the giving of signs. We can say quite simply that revelation means sacrament, i.e., the self-witness of God, the representation of His truth, and therefore of the truth in which He knows Himself, in the form of creaturely objectivity" (CDII/1:52). Green, correctly in my view, says that "Karl Barth's theology can thus be accurately described as a semiology, a theological semiotics".

the covenant of God with his people, in the unity of the members of the body of Christ with their Head, is a participant in ... the knowledge of God. They do not consider taking man in the cosmos seriously and addressing him in his ‘nature’ – which really means in his self-understanding. Rather they say to him that he no longer really exists as such; that in his self-understanding he now exists only in one monstrous misunderstanding. For his original and proper truth has now been opened up to him by God’s revelation. They point to ... Jesus of Nazareth, to the judgement fulfilled in Him, to the grace which man has found before God in Him. They point to Him as the origin and future of man in the cosmos” (CD II/1:112).

Thus we are dealing with an event analogous to the sacramental changing of the bread and wine – an event which people readily understand as one in which the same object acquires new meaning. This was described by Heidegger (1971:15-89) in his essay “The origin of the work of art”. As *Erde* (earth), the work of art is simply a physical, autonomous fact. At the same time it is the work of art veiled and concealed. Understanding and internalising the work, experiencing the work as an event constitutes its world (*Welt*). The impact of the work comes from the object itself and is not determined by the subject. Analogously to Barth’s view that people under the Word find themselves in a different place and are altered in their being, Heidegger (1971:35) takes the example of Van Gogh's painting of a pair of shoes: “*[Welt]* comes to the fore only by bringing ourselves before Van Gogh’s painting. This painting spoke. In the vicinity of the work we were suddenly somewhere else than we usually tend to be.” “The art work opens up in its own way the Being of beings. This opening up, i.e. this deconcealing, i.e. the truth of beings, happens in the work” (Heidegger 1971:39). In this way our understanding becomes ontological, and not merely methodologically determined.[21]

[21] See Du Toit (1984:48). For a detailed discussion of Heidegger's essay, see pp 43-51.

To Barth, people under the revelatory word find themselves in a different place and see themselves and the cosmos unveiled. Similarly, Heidegger sees the change of *Erde* into *Welt* as an unveiling action, and sees people experiencing every day that reality metaphorically acquires new meaning. So the light fades for researchers and scientific investigators, and so people appropriate meaning in order to make sense of the world and their own existence. Cognitive scientists explain the process as an outcome of normal human brain functions, regardless of the area – religion, aesthetics, science or ethics - which gives rise to it. The specific 'medium' (be it a metaphor, myth, work of art, sermon, film, poem or scientific model) is a matter of chance. On the secular level the experience can be interpreted as a sacramental dimension – an event which people find holy, moving, insightful, related to words and understanding.

To return to Barth, a good example of how understanding takes place can be seen in the account of creation, which Barth treats as a "creational work of art" that "opens" in order to reveal, behind the material nature of the work (as myth), the world of God's work. Barth's contribution in this regard is an excellent example that can be used to put an end to futile arguments in the science and religion debate. In his typically dialectic way, Barth states that "… the history of the covenant of grace with its miracles, and especially the great central miracle, is not only undoubtedly historical but also … highly 'non-historical' … it is not a 'historical' history … it can be the object only of a 'non-historical', pre-historical description and narration" (CDIII/1:79-80); "… the biblical history of creation is pure saga … we ought not to be offended because they are sagas. We are no less summoned to listen to what the Bible has to say in the form of saga than to what it has to say in the form of address, doctrine, meditation, law, epigram, epic and lyric" (CDIII/1:82-83); "the creation stories of the Bible are neither myths nor fairy tales. This is not to deny that they are myths, and perhaps in part fairy tale, in the materials of which they are constructed …They are not a historical cover for non-historical speculation" (CDIII/1:84). Discussing myths in more detail, he goes on: "… [myths] demand that they should look through the story … How can we understand myth if we ignore this demand and do not try to meet it? Myth has always arisen and still arises from the higher recognition, divination and poetic understanding of this kind of eternal truth. It has always been a worthy *alter ego* for philosophy … [myth] only appears to tell of creation but in reality it speaks of a particular view or solution of the enigma of the world; of a combination of real or supposed world-elements by which a man or an era thinks that they can explain the existence of these elements in their cyclical aspects. Never is man more himself and at home in his world, never does he have in his own strength a better understanding of himself and his world, than as an inventor and author or an intelligent hearer and reader of myths" (CDIII/1:85).

What Barth says here applies specifically to natural theology, as he refers specifically to "man in his own strength". What does it mean to "look through" a myth? In Heidegger's example, it means to penetrate the art work as *Erde* and to experience how *Welt* appears from it. On the religious level, it means to hear God's word in human words. When Barth looks through the creation myth, he finds a world of creation which he deems to be literally true in a theological sense and on which he bases his entire dogmatics. This emerges from the following well-known statement: "His creation is the external basis of this covenant" (CD III/1:96). In the creation of light, which is effectively summoned from the darkness, Barth sees an analogy to the history of chosen and rejected people in the Bible (Jacob-Esau, David-Saul, Judas-Apostles) (CD III/1:123). In human beings formed in the *imago Dei* he first sees Christ as an image of God in which all humanity participates and where men and women reflect the I-Thou relationship between creator and creature in an *analogia reflectionis,* also manifest in the inter-trinitarian relationship (CD II/1:194-206).[22]

[22] For a concise discussion of this, and for the ethical dimension of interdisciplinary work and the connection between *imago Dei* and human rights, see Van Huyssteen (2006:111-165).

Barth's entire theology is based on his way of looking through the biblical texts in all their multiplicity of genres as *Erde* to discover behind them the word of God as *Welt*, which addresses its dynamic appeal to humanity.

CURRENT PERCEPTIONS OF NATURE (AND A POSSIBLE NATURAL THEOLOGY) VIA THE NATURAL SCIENCES

Nature has traditionally been experienced as provident, threatening and mysterious, and its religious, romantic and aesthetic dimensions have been emphasised. Most people still find these dimensions relevant, while others can be added such as nature in its ecologically sensitive mode – especially as a source of recreation, knowledge, technological manipulation and benefits to humanity – as well as issues of ownership.

Nowadays, especially in developed countries, the religious and aesthetic dimensions of nature are mediated by the natural sciences. We never encounter 'pure' nature: it always comes in a ready-interpreted form. Many people find that this does not interfere with, but intensifies, their experience of beauty, admiration and wonder.

This implies that a reinterpretation of natural theology has become essential, not as a new proof of God's existence but as a necessary dimension of the interpretation of faith in order to arrive at intellectual honesty in the modern world.

Although many believers manage to keep the modern, scientific worldview image in a state of coordinated tension with the biblical worldview, others find this unsatisfactory, and in the absence of a public forum for discussion, implausible biblical statements are written off as myths without any attempt to incorporate them meaningfully into a modern hermeneutic system. Not every statement in the Bible is a myth, and not all myths are meaningless for the construction of values that could contribute positively to contemporary societies. The revision and explication of theological and doctrinal rhetoric are prerequisite for meaningful contributions to present-day inter- and trans-disciplinary discourse.

In Barth's terms, does this mean compromising the exclusivity of the divine revelation in Jesus Christ? I do not think so. Barth's radical view of revelation should not prevent us from, where appropriate, complementing and even reinterpreting revelation with the aid of physical, biological, ecological, health and other dicta from the natural sciences which have become part of the modern worldview. Those explanations are in no way meant to compete, on a soteriological level, with faith when it comes to the exclusivity of salvific events. Appropriating these events does not abrogate believers' responsibility towards the world they live in and the values developed with the aid of insights from natural science.

Many theologians do not suffer from a paranoid fear that theology is incapable of functioning as a scientific discipline and are ready to enter into dialogue with other sciences about joint and mutual responsibility for our world. This does not mean that the scientific voice of theology cannot address a prophetic appeal or cannot invoke faith in the course of such dialogue. Interested parties from various fields are in fact looking for possible contributions of believers from all religions in view of the problems threatening the world and its peoples. In his book on the place and role of order in theology and natural science, Torrance takes us beyond the dualistic view that natural sciences only ask 'how' questions and theology only asks 'why' questions. "That sharp distinction had the effect of importing a deep split between science and theology" (Torrance 1985:20). These questions are interdependent and inseparable – which does not mean that theology and natural science have amalgamated, though it does mean that both sides can and should influence each other so that each can make its own distinctive contribution. Torrance sees the concept of order as a common denominator which unites both disciplines: "The fact that natural and theological science both operate under the constraint of an ultimate ground of order, which will not allow a divorce of natural order from the order that ought to be, shows us that there is only one rational order pervading the entire universe" (Torrance 1985:21).

CONCLUSION: A NEW NATURAL THEOLOGY?

Does the debate between natural science and theology result in a new kind of natural theology?[23] The answer is yes and no. No, in that it does not posit new proofs of the existence of God (attempts at that, like certain aspects of the anthropic principle and the 'natural intelligence' debate, have been criticised); and yes in the sense of Barth's opinion, because it represents something of an effort to understand. To most supporters, however, it is not an attempt which ignores the Word of God, but rather to look through words in order to see more clearly. Looking not only at words but also at physical reality is to see how the light that pours out from the cosmos is broken up by the prism of the Word to display the many-coloured spectrum of God's grace.

Taking Barth seriously does not mean attributing natural theology to a bunch of 'radical' natural scientists and theologians who 'go too far' in their interpretation of evolution and other natural scientific findings. The church is under threat in the first place from a Christian natural theology which is revealing itself in the form of human self-justification, self-preservation and self-

[23] Natural theology is distinct from a theology of nature. In Barthian terms natural theology, being *analogia entis*, is a theology 'from below', premised on human beings, their empirical observation and sciences. A theology of nature, on the other hand, is part of God's revealed word and can therefore be seen as analogia fidei. Peters (2005:2) puts it thus: "Natural theology starts with unfaith and finds in nature evidence for the existence of God. Theology of Nature, in contrast, starts with faith and interprets the natural world as God's creation." In the same vein Barbour (1997:100) writes: "A theology of nature ... starts from a religious tradition based on religious experience and historical revelation." Peters (2005:2) distinguishes a minimalist theology of nature that adapts to changes in worldview according to prior religious commitments from what he calls a maximalist theology of nature, in which God constitutes our knowledge of the natural world. I find this distinction (like the one between 'from below' and 'from above') artificial, for how do I know whether my experience and belief are determined exclusively by one or the other?

defence. The real threat is self-assured fundamentalism, self-justifying foundationalism and smug, blinkered traditionalism.[24]

Barth gives natural theology a place on the left hand of the Word:[25] "In the middle, so to speak, there stands the real prophetic-apostolic witness of God's speaking and acting in the history of Israel and in the history of Jesus Christ. But on the right there stands independently the reference to the direct confirmation by God Himself … [through the] speaking of the Holy Spirit ... Then on the left ... there stands independently the reference to man in the cosmos: man with the ability to receive the voice of the cosmos" (CD II/1:99-100).

How do we hear the voice of the cosmos today? I hear the voice of the cosmos (natural theology) through a modest attempt to understand what we can learn of the world and the cosmos by listening to the evidence of the natural sciences (in a science and religion debate); through an obstinate wish to interpret those insights in the light of God's word; through blatant honesty about the failure of our theories to prove the existence of God (anthropic principle, natural intelligence debate, and proofs of God); through altruistic responsibility, as a created co-creator, for the fate of God's creation (ecological responsibility and respect for life); through developments in genetic engineering; through self-relativising respect for cultural and religious diversity (religious, cultural and human rights); through understanding the fragile evolutionary process and the biological and corporeal embodiment of our thinking (physical relativising of our epistemologies); and through solidarity with the fate of all life-forms on our planet (social and ethical dimensions of faith).

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[24] We should bear in mind that Barth described church history, in particular, as natural theology. "All refutations apart, natural theology can do so much that we must seriously ask whether there is not good reason to present the history of Christian theology and the Church in general … as one long history of 'Christian' natural theology" (CD II/1: 127-128).

[25] There are three witnesses: God, mankind and the cosmos. God, who speaks through his Word; mankind's witness of the power of the Word to strike them and change them, and the voice of the cosmos in all the dimensions in which we can understand and interpret it (CD II/1:99).

In this approach to natural theology, there is a greater need of understanding than of self-justification; an acknowledgement of the vulnerability and interdependence of all forms of life on this planet; and an admission that people find meaning in value systems and personified transcendence

10

EVOLUTIONARY BIOLOGY: A LINK BETWEEN RELIGION AND KNOWLEDGE?

INTRODUCTION: RESURFACING OF THE EVOLUTIONARY MODEL

The current science-religion debate appears to be the culmination of the Western epistemological tradition. Many epistemological positions are being reconsidered or revamped in light of challenges posed by the natural sciences. Epistemological theories like foundationalism, realism, critical realism, post-foundationalism and postmodernism claim to occupy the best position for tackling the science-religion relationship. The resurgence of natural theology, naturalism and evolutionary biology broadens the debate. Gregersen and Van Huyssteen (1998) single out the following six models:

- post-foundationalism (Van Huyssteen)
- naturalism (Willem Drees)
- pragmatism (Eberhard Hermann)
- complementarism (Fraser Watts)
- contextual coherentism (Gregersen).

Although these models are distinguishable, they overlap in many areas.

It would be a mistake, however, to think that the debate is restricted to philosophical and epistemological positions. It goes much further: important religious issues like divine providence, God's role in ongoing creation, mind-body dualism, the moulding of present day worldviews, ethics and anthropology all feature in the discussion.

The evolution model is increasingly used in different disciplines to understand humans and their actions in the world. Following developments in quantum mechanics and molecular biology, the focus of theological attention has shifted from the macro to the micro level. The struggle to explain God's actions has probed beneath the surface of the visible world into the realm of quantum physics and molecular biology. Biology seems to have become a kind of model science, usurping the role of physics as the main generator of worldviews (Gregersen 1999:135). The influence of evolutionary biology is evident in evolutionary psychology and evolutionary ethics, as well as language theory and society as a social system. Evolutionary psychology researches the biological roots of behaviour to understand human sexuality, consciousness, fears and preferences. Evolutionary ethics studies the human genetic composition to explain social and cultural patterns and lifestyles. Theologians have to rethink the nature of their rationality and their theological models, like the doctrine of creation, divine providence and action in the world, eschatology, the problem of evil, human sexuality and ethics.

Models are reformulated for various reasons: to uphold the consistency of scientific knowledge and the credibility of religious convictions; to provide an approximately adequate view of reality; or to develop images and metaphors that communicate a religious message to people whose worldviews have been shaped by the sciences (Drees 1996:198). Theologians are compelled to relate to the ideas of evolutionary biology because of the magnitude of its claims and its apparent influence on present-day worldviews. According to Van Huyssteen (1998:141) the natural selection paradigm must be metaphorised to include some of our most crucial epistemic activities such as learning, science and religion.

Although the evolutionary model has been around since the days of Darwin and neo-Darwinism, it has never been applied as widely as in our time, to fields as disparate as religion, psychology and culture. In the past modernism and foundationalism prevented the application of an open-ended model that favours evolutionary multiplicity. Only in postmodern times have these options been taken seriously.

Van Huyssteen (1998:160-161) hopes to overcome the present strained science-religion relationship by presenting evolution by natural selection as the common ground for all forms of rationality. He believes this may put an end to the idea that natural science is a superior form of rationality and that it may prevent religious rationality from retreating into an esoteric safe haven. He does not see science and religion as two distinct rationalities, but as nourished by the same biological roots and situated in the context of a living, developing and changing tradition. Willem Drees (1996:3), on the other hand, feels that to claim that science and religion are separate cognitive enterprises of equal status is too easy a way out. The claim that theology is a rational enterprise does not obviate all problems and the science-religion dialogue cannot simply be resolved by presenting evolution by natural selection as the common ground for both disciplines. Neither is it clear how this will resolve the modernist distinction between science and religion as separate rationalities: is the idea of common biological roots all that different from the general idea of a common humanity, a common language and a common culture, and if so, how does it help us overcome obstacles in the debate? One need to determine exactly what these common biological roots are, and how evolutionary epistemology really influences rationality, promotes interdisciplinary collaboration and links science and religion as separate disciplines.

This article confronts the challenge by focusing on autopoietic systems.

IMPLICATIONS FOR THE DIALOGUE BETWEEN THEOLOGY AND THE NATURAL SCIENCES

Although religious knowledge presupposes faith and faith-related experiences, and although scientific knowledge is based on empirical observation, the cognitive rules governing the two disciplines are allegedly the same. It must be recognised that science and religion approach their subject matter differently. They ask different questions and answer them on the basis of distinctive methodologies, yet yield answers which are mutually harmonious and enriching.

Gilkey proposes a 'two-language' approach, according to which both science and religion offer linguistically distinct yet complementary approaches to reality (McGrath 1998:186). In view of this one may expect a theological response to the findings of evolutionary biology. The theological response should not, however, be limited to apologetic arguments indicating the place and action of God in evolutionary biology; it should also spell out the religious implications of such things as evolutionary epistemology and evolutionary ethics. How, for example, do the evolutionary metaphors of struggle, survival and power affect religion? From a postmodernist position Foucault, and many others in the Nietzschean tradition, have pointed out the important role that power plays in human interaction. Christianity, in spite of its ostensible emphasis on altruistic love and the weakness of the cross, has marked, implicit power-seeking features. The role of power in human life needs to be re-evaluated in the light of evolutionary biology. In Nietzsche's words (quoted by Thiselton 1995:16-17), Christianity has sided with everything that has been botched, and everything that is weak and low; it made an ideal out of antagonism to all the preserving instincts of strong life.

Both science and religion greatly influence human self-understanding and worldview formation. Faith wants to understand (*fides quaerens intellectum*). Religious arguments, like scientific arguments, must be logical, consistent and congruent. We know that both religious and scientific knowledge is influenced by tradition and culture, custom and fashion and that both may be prey to biased approaches like foundationalism, reductionism, absolutism and relativism. These commonalities in themselves provide a basis for dialogue.

Barbour proposes four possible stances in the science-religion debate: dialogue, conflict, integration and independence. The involvement of theologians in the debate must be seen in light of the struggle to come to grips with the challenges posed by natural science and specifically by evolutionary biology. What cannot be doubted is that the science-religion debate depends on some form of consensus in the area of cognition and human self-understanding so as to determine the place and importance of both disciplines.

In the last few decades Christian apologetics has shifted its focus from doctrinal issues to the science-religion debate. Fascinating developments in the fields of physics, molecular biology and New Cosmology have made it possible to understand the creation process without the God hypothesis. In this sense science has become the religion of our age (see Appleyard 1992). In reaction to this theologians have resorted to biblical hermeneutics, linguistic theories and useful scientific models to put their case. Models like those of quantum physics, autopoiesis and evolutionary epistemology give them an opening to introduce God's action into these processes. Because of their indeterminate elements, anthropic theory, autopoietic systems and evolutionary epistemology all offer scope for divine action. Theologians' apologetic motive may, however, colour their evaluation and selection of scientific findings.

At all events, theologians seem to take an apologetic stance in the science-religion debate. Theology is at a disadvantage, since the agenda is largely determined by the natural sciences. It is up to theologians to harmonise biblical ideas with contemporary scientific models, rather than scientists having to accommodate religious ideas. Instead of God filling the gaps in scientific theories, the opposite seems to happen wherever the scientific models (especially those that allow indeterminacy, like quantum theory and autopoiesis) offer space to explain God's action in the world. However, one would not like theological engagement in the debate to revert to a non-interactive stance, in which the exclusiveness of God as the *Ganz Andere* stymies any dialogue. Theologians' contribution seems to fit the so-called theology 2 level (Gregersen 2000:39-41), where broader philosophical, symbolic and metaphoric reflection takes place. Thus Swinburne (quoted in Watts 1998:171) says that he doesn't invoke God to explain fine tuning, or what science cannot explain. He postulates God to explain *why* science explains. The main motive for dialogue is not to harmonise different positions. Watts (1998:178) points out that if scientific claims can be regarded as consistent with theology, then it must also be possible for those claims to be inconsistent with theology. If not, then everything in science must be consistent with everything in theology.

EVOLUTIONARY BIOLOGY

When it comes to humans and their cultural creations such as moral systems and religious positions, evolutionary biology seems to offer more than physics does. Living organisms (studied in evolutionary biology) demand a more powerful explanatory paradigm than that offered by the fundamental laws of physics. Evolutionary biology deals with the dynamic interaction between organisms and their environment. In physics and chemistry phenomena are primarily classified in terms of what they do and in terms of their micro structure, whereas biology classifies them primarily in terms of their purpose or function. Consequently biology offers a wider variety of explanations, since what happens may be explained in functional terms, how it happens can be shown in causal terms, and why the organism is structured so that this behaviour can happen can be described in evolutionary terms (Drees 1996:18-19). From the side of cosmology, ecology and Christian spirituality there has been a general insistence over the last few years that life needs to be approached holistically. Evolutionary biology demonstrates the tightly knit relations between organisms and their world.

DIALOGUE BETWEEN RELIGION AND EVOLUTIONARY BIOLOGY

Drees (1996:196ff) identifies six positions in the debate on evolution and religion. The first three represent theological approaches to evolution, and the last three scientific and evolutionary explanations of religion. The theological approaches are:

- Creationism (conflict model). The debate is marked by a literal reading of the Bible. The Bible and evolution are seen as mutually exclusive.
- Design argument. This approach to evolution is more open. Its emphasis is on the idea that the natural order displays evidence of design. The design argument also underlies the anthropic principle, as applied in cosmology. As in creationism, the options are mutually exclusive: the natural order is the product of either purposeful design or of chance, since natural selection operates on diversity attributable to random mutations.
- A mediatory approach. Christian beliefs are not considered necessarily inconsistent with the evolutionary origin of species. God's action in the world is explained in different ways. Some see divine action hidden in what science calls chance; others see chance as chance also from God's side. Yet others opt for God as the 'primary cause' of the evolutionary process, the laws of nature and the required initial conditions, but consider the evolutionary account to be complete in itself, requiring no special divine intervention in the realm of causality. Theological positions may be reviewed and reformulated to defend the consistency of scientific knowledge and religious convictions.

The following three positions are identifiable in the evolutionary approach to religion and morality:

- Focus on the history and evolution of Christianity and other religions, studied by 19th century theologians like F.C. Baur, Albrecht Ritschl, Von Harnack and Troeltsch.
- Focus on the significance of Christian faith for the evolutionary process, for example the role of religious faith in the evolution of the human species.
- Focus on currently relevant theological proposals, with due regard to our knowledge about the evolved character of the world, morality and religion.

EVOLUTIONARY EPISTEMOLOGY

Discourse on evolutionary epistemology and its affinity with postmodernism has a significant impact on our perception of knowledge. Evolutionary epistemology links human understanding with its biological roots and has implications for various disciplines, ranging from theology to psychology, sociology and, of course, epistemology itself.

Evolutionary epistemology is a by-product of evolutionary biology and provides models for human self-understanding. It posits that the growth of knowledge is akin to the evolutionary growth of organisms. All knowledge is shaped and informed by innate principles, which have influenced human thought because of their adaptive value. Recent studies of autopoietic systems present fascinating examples of how knowledge and the human body are structurally related.

The main thesis of evolutionary epistemology is that human mental capacities result from organic evolution. Wuketits (quoted by Van Huyssteen 1998:137ff) considers the model of evolutionary epistemology to be a Copernican revolution, since it eliminates the need to impose supernatural principles on religious thinking from 'outside'. Thinking and knowledge can now be seen as part of the same biologically based process.

Evolution itself is regarded as a cognitive process. Acquisition of knowledge is characteristic of all living beings, hence human rationality, too, is biologically based. This calls for interdisciplinary reflection and promises to offer common ground for science-religion dialogue (Van Huyssteen 1998:148-149). Wuketits (quoted by Van Huyssteen 1998:149) maintains that information processing occurs on the genetic level (where information is transmitted by inheritance), on the preconscious level (where an information processing system like the nervous system is prerequisite) and on a conscious level (where rational knowledge is made possible by consciousness).

Van Huyssteen (1998:132) considers the theory of evolution by natural selection to be the principal link between religion and knowledge. The importance of this is that it appears to bridge the gap between the physical and metaphysical, between mind and body, inner and outer world, naturalism and supernaturalism. This becomes possible because of the common biological roots allegedly sustaining religion and knowledge: human thinking and reasoning, human emotion – including spirituality – all have their roots in biology.

For Van Huyssteen (1998:152) the significance of evolutionary epistemology lies in its ability to break down the modernist subject-object polarisation, according to which cognition is a function of active systems' interaction with their environment. From the perspective of evolutionary epistemology cognition is not an endless, cumulative chain of adaptations, but a complex interactive process in which we move beyond our biological roots without ever losing touch with them – views that Van Huyssteen considers vital for a post-foundationalist epistemology. Natural evolution must be understood as a non-deterministic theory, which acknowledges the importance of environmental interaction in the development of human cognition and culture.

NATURAL SELECTION AND AUTOPOIETIC SYSTEMS

Humberto Maturana and Francisco Valera constructed the model of autopoietic systems,[1] which has far-reaching implica-

[1] Autopoietic systems belong to the so-called third generation of systems theory. The first generation is the classical system of antiquity, which saw systems as harmoni-

tions for ideas about the nervous system, perception, language and cognition in general. Autopoietic systems describe the nature of living, as opposed to non-living, systems and thus explain the nature of life. Maturana and Valera's work is based on some fundamental observations of living systems:

- Living entities have individual autonomy. They belong to a species and group, and are affected by their environment while remaining self-defined entities.
- Living systems are essentially mechanistic. Their behaviour and development depend only on the properties and interrelations of their components and their interaction with neighbouring elements.
- All explanations are made by observers and one must not confuse their interpretation with what they are observing. Observers perceive both an entity and its environment and relate the two. Interactive living components cannot do this.
- Consequently any explanation of living systems should be non-teleological, that is, it should not have recourse to ideas of function and purpose (Mingers 1989:161).

The principle of autopoiesis is deduced from the operation of cells, which produce large numbers of complex chemicals that remain in the cell but also participate in its actual production processes. The cell is an autopoietic system, since it produces only itself. It differs from allopoietic systems, which produce something other than themselves, and also from heteropoietic systems which are produced by humans for a specific purpose. Allopoietic systems do not define their own organisation, but depend on an observer to determine their identity. Autopoietic systems do not depend on any observer to perform their functions; they are autonomous and define themselves by producing their own parameters.

ous wholes with well adjusted parts. The second generation is modern systems theory, which originated in the mid-20th century and emphasises the system-environment distinction. Third generation systems theory, of which autopoiesis and self-organisational systems are examples, emphasises the importance of self-reference (Gregersen 1999:119-120).

Hence an autopoietic system is a dynamic system, a composite network producing components that, through their interaction, recursively regenerate the network of elements that produced them. This network represents a unity in space, in which the elements exist by constituting and specifying the system's boundaries as surfaces of cleavage from the background through their preferential interactions within the network (Maturana, quoted by Mingers 1989:164). There is nothing to suggest that autopoietic systems cause particular structures to arise. There is no need for functionalist or teleonomic ideas such as purpose to explain living things, although they may be useful in the descriptive language of observers who focus not only on components but also on their unity and the history of their development (Mingers 1989:167). Even reproduction, heredity and evolution are secondary to the establishment of a single autopoietic entity. Although it does interact with its environment, the environment does not determine changes in the state of the system. Successful autopoiesis leads to the selection, within the organism, of a structure suited to its specific environment, although the environment does not specify the adaptive changes that will occur. Autopoietic systems behave purely in terms of their particular structure at that point in time and the interaction of neighbouring components. The idea that DNA contains or transmits information or that the brain processes formal representations or symbols is purely metaphorical and does not describe how such systems actually operate. Autopoiesis shows how systems function in a decentralised, non-hierarchical way purely through the individual interactions of neighbouring components (Mingers 1989:168-170, 173).

AUTOPOIESIS AND EPISTEMOLOGY

The epistemological relevance of autopoiesis lies in the role of the observer. The domain of description inevitably relates to the describer. This means that observers can never escape from the descriptive domain and have access to absolute, objective reality, which takes us back to the distinction between appearance and reality. It also underscores the likelihood that perceptions and cognition are evolutionary adaptations to the real world – an idea propounded by J.L. Austin in his *Sense and sensibilia* (1962).

If we accept that observers constitute their own reality, that we are all observers with our own version of reality, and that reality is not an absolute given from the outside, then the question is what we need to observe in order to agree that understanding has occurred. We observe two different aspects of another human or animal: its behaviour in relation to its surrounding world and, secondly, its body – its physiology.

Maturana alerts us to the fact that behaviour and physiology are distinct domains which do not intersect. The term 'languaging' can be used to depict our behaviour in our environment, and 'emotioning' to depict our physiological state or body-hood. Languaging refers to behaviour, which is always relational since it concerns the organism's connection with the world in which it lives. Maturana saw languaging as a particular kind of behaviour, a second order of coordination: the coordination of coordinations of behaviour. Languaging enables us to reflect on and report our experiences and is the most obvious means of interacting with one another. It happens on a connotative rather than a denotative level. In languaging we construct our own reality. In this virtual world in which we are immersed we structure our behaviour to make sense. Languaging is the act of reflecting on behaviour. Once we have reflected we are cognitively different - our physiological coherence has changed. Cells, organs or bodies do not choose – they simply live – but as languaging beings we bring forth a higher-order self-reflection, which becomes crucial for our existence (Fell & Russell 1994:8).

Maturana sees emotioning as bodily predispositions to action, maintaining that certain behavioural characteristics can be used to identify certain emotions (Fell & Russell 1994:9). These emotions are described in metaphors that yield a coherent cognitive model of our body-hood. In this context metaphor serves not to represent an external reality but to organise and describe our experience. Emotions like love, fear, domination, submission, anger and joy are displayed in our body-hood and are described metaphorically. Our feelings do not necessarily correspond with our emotioning, since feelings are a commentary on our experience, shaped in languaging. It is in lived experience that we come to understand. The convergence of languaging and emotioning permits semantic connection, which, through conversation, results in cognition. It is not our rationality that distinguishes us from animals, but the way in which our rationality and emotions are braided together (Fell & Russell 1994:12).

The linking of languaging with emotioning helps us to overcome mind-body dualism. Knowledge has bodily roots and is linked to our body-hood, while rationality is associated with experience.

METAPHORIC APPLICATIONS OF AUTOPOIESIS ON A SOCIETAL LEVEL

Autopoiesis has fascinating metaphoric applications. Humans can be seen as autopoietic systems and, as such, are autonomous and independent. Human societies can be seen as biological systems because –

- they survive
- their methods of survival meet autopoietic criteria
- the system may well change its entire appearance and its apparent purpose in the process (Mingers 1989:172).

Niklas Luhman has written extensively on the societal implications of autopoietic systems. He sees societies as self-referential systems based on meaningful communication. They use communication to constitute and interconnect the events (actions) which make up the system and can thus be regarded as autopoietic. Social systems exist only by reproducing the events which serve as their components. These are events and actions which they themselves produce and they exist only for as long as this is possible. The environment of a social systems includes other social systems. The political system includes, for example, the economic and medical systems, and so on. Societies make communication between different social systems possible, although society itself cannot communicate (Luhman 1982:131).

Sociocultural evolution began with segmented systems. All traditional societies that attained sufficient complexity for 'high' culture were stratified and hierarchically structured. Modern society, by contrast, uses function rather than hierarchy to differentiate subsystems. Modern society is about the political subsystem and its environment, the economic, scientific, educational and religious subsystems and their environments. These subsystems with their communicative networks have become globalised. A self-referential system defines itself by the way it constitutes its elements and thus maintains its boundaries. In systems theory the distinction between system and environment replaces the traditional emphasis on the identity of guiding principles or values. Differences, not identities, create the possibility of perceiving and processing information. The social system can change its own structures only through evolution. Evolution presupposes self-referential reproduction and changes the structural condition of reproduction by differentiating mechanisms for variation, selection and stabilisation. Society, however, cannot plan itself – just as evolution cannot plan itself. But a self-referential system which tries to absorb planning may speed up its own evolution, because it becomes hyper-complex and forces itself to react to the ways in which it copes with its own complexity (Luhman 1982:132-135). The emphasis thus falls on difference rather than identity, autonomy and not control, relation and not ontology, dynamism and not stability, evolution and not planning. These have become the traits of present-day, postmodern societies.

GOD'S PLACE IN AN AUTOPOIETIC MODEL

Gregersen has attempted to demonstrate how divine action fits into autopoietic systems. He recognises that religious and biological conceptions of life differ, as do the ways in which these disciplines read, describe and re-describe reality (Gregersen 1994:25ff). Although theology and biology are both rational disciplines, their specific focuses and aims differ so radically that their language, metaphors and style of reasoning cannot be compared. The point, however, is that the challenges presented to theology by the natural sciences force it to interact with the sciences by adopting their language, models and theories and redescribing the theological interpretation of reality in these terms. This is not to say that apologetics becomes the standard language of religion, although it has an impact. Gregersen (1999:122) calls utterances on this level 'theology 2', as distinct from 'theology 1', which is the language of faith. In his view Christian faith should not be prematurely translated into the philosophical or scientific language of an abstract 'theology 2'.

On an existential, everyday level we combine religious and scientific metaphors to make sense of our situation. On this level scientific and religious metaphors do not compete but are integral to our reasoning, even though the actual metaphors may not always be compatible. The present multiplicity of scientific and religious metaphors and models for describing reality were not part of the worldview of biblical times, which made it easier for those writers to reflect a harmonious picture of the world.

Gregersen (1999:133) finds it possible to be simultaneously an evolutionist and a theist, to hold on to creation faith and to evolution. God is not just 'behind' life processes; in some way, he is 'present' in them. He is not only the pre-moral initiator of a pre-moral world, he is also the moral inspirer of sentient beings like humans and higher mammals (Gregersen 1999:130,138). His main thesis is that God creates and transforms the world by supporting and stimulating self-making systems (Gregersen 1998:354). God is a triggering cause, switching in and out in order to keep the course of history on track. God does not, however, replace the ordinary operations of nature. He is the underlying causality that enables creatures to bring themselves forth in their given setting (Gregersen 1998:358-359). Gregersen uses the Genesis concept of God's blessing as a metaphor to express the way God allows binary relations between creator and creature and multilateral relations between creatures in the horizontal nexus of time, conjoining life processes and cultural processes. God's blessing gives creatures the power to reproduce themselves abundantly. This blessing is bestowed not only on individual creatures but also on their inner operations, thus accommodating the principle of autopoietic systems. God is continually upholding the reproductive and self-productive capacities of matter, from the simplest to the most complex forms. As creator of a self-evolving world, then, God is continually acting amorally or pre-morally (since randomisations occur, with no distinction between good and evil), but God does not act immorally, that is with evil intent (autopoietic theodicy?) (Gregerson 1998:348, 351ff, 355). Gregersen (1998:356-357) interprets God's incarnation to include his intimate knowledge of the (biological) particulars of the actual world. God is the compassionate co-sufferer of the trials and errors, accomplishments and breakdowns of creatures. In this sense he supports and stimulates creatures, who, for their part, are co-exploring the joys and risks of God's creation. It is not clear what place these risks have in issues like suffering, evil and death. Gregersen (1999:133) sees no theological answer to the problem of animal pain and human evil other than acknowledging that God's creation remains unfinished. From a biological point of view pain, suffering and death are unavoidable, natural features (Gregersen 1994:142ff).

Gregersen (1998:361) sees God as constantly shaping and remoulding the spaces for divine action in autopoietic systems. He believes his structuring model of divine action has specific advantages:

- The model allows for divine influence on natural processes while transcending the popular idea that God acts only by creating the world system as a whole.
- It accommodates God's infinite capacity for self-relativisation, as evidenced by the incarnation.
- It links the idea of God's blessing to his interaction with human beings.

This amounts to a radically temporalised and localised form of divine interaction with self-organising systems (Gregersen 1999:128).

The autopoietic system poses fundamental questions for ethics and human responsibility when it comes to the place of human ethics in autopoietic systems. One has to keep in mind Luhman's view of present-day societies and the fact that societies (ethical systems) cannot be planned. On an ethical level Gregersen (1994:146) believes that the religious worldview must be able to accommodate natural selection as a basic condition established by God and, as a culture-transmitting spiritual power, it must be able to influence the form that process takes. An evolutionary understanding of morality, or religion for that matter, seems to be at odds with the very concept of morality or religion.

Van Huyssteen refers to the ethical impact of evolutionary epistemology and gives it a cognitive slant. He sees the everyday choices we make as a paradigm for rationality in action, an example of how we intelligently cope with the world (Van Huyssteen 1998:140). The evolutionary model, as in postmodernism, proposes a multiplicity of explanatory models, views and interpretations of our interaction with the world. Does this favour ethical pluralism and relativism? The same question applies to the world of religions, where the insistence on just one, exclusively true religion no longer holds water.

Drees (1996:204-205) considers it natural to understand our constitution and behaviour by analogy with other species. Although he acknowledges the biological roots of human ethics, he feels that the influence of culture and cognitive capacities, and the behavioural plasticity thus generated, cannot be overestimated. We cannot deterministically link human ethics with our genetic heritage, although its importance cannot be ignored (freedom, i.e. self-determination, is the opposite of determinism). With reference to the work of Alexander, Drees (1996:207-208) concludes that the evolution of cultures with moral codes was driven by two factors: group cohesion (the group as a whole, against other groups) and indirect reciprocity (a mechanism serving individual interests within a group). Acknowledging the evolutionary influence on ethics implies accepting human selfishness – which may not be easy in a culture eulogising altruism. An evolutionary perspective on ethics makes us realise that our moral language and ethical principles may be a smokescreen for amoral motives.

If human genetic information is linked with non-genetic, cultural information, which is transformed by language and example, the question arises to what extent this applies to the phenomenon of religion. It would also be difficult to ascertain the exact ratio between genetic influences on the one hand, and cultural, cognitive or other influences on the other. Through ritual and story religions mediate between the genetic and cultural levels as they transmit cultural information to the brain, the steering mechanism of individuals. Drees (1996:212-213) cites three general claims about religion in an evolutionary perspective. Firstly, humans, their cultures, languages, aesthetic and moral codes, and their religious practices are seen as a result of a natural, evolutionary process; secondly the actual history of morality and religions and their actual functioning in the web of genes, mind and culture are very complex and not clear; and thirdly, religion must be seen as a significant contributor to the evolutionary process. Along the same lines Wuketits (quoted by Van Huyssteen 1998: 146-147, 157) does not see the complex patterns of human culture (and religion) as the exclusive result of the principle of organic evolution, since it exhibits its own characteristics and system conditions. Cultural evolution requires explanations beyond the biological theory of evolution. Certainly it depends on specific biological processes, but once started it obeyed its own principles and human evolution embarked on an entirely new course, even acting on organic evolution in its turn.

CIRCULAR REASONING AND THE USE OF ANALOGY AND METAPHOR

Gregersen (1999:129) acknowledges some measure of circular reasoning when using biological theories as a hermeneutic guide for constructing theism, and theism as a hermeneutic guide for interpreting biological theories. He sees this, however, as part of any hermeneutic endeavour and as part of a pragmatic coherentist[2] epistemology like Rescher's, which he makes use of. Gregersen's style of reasoning resembles most of the positions held in the science-religion dialogue. Whether we find a causal link for God's action in the field of quantum physics, the kenosis model, the anthropic principle or autopoietic systems, there is always some circular reasoning when biblical ideas are related to those of natural science. Science and religion use distinct sets of metaphors. Different disciplines generate different metaphors. Metaphoric 'openings' in science provide opportunity for religious intervention, and vice versa. New metaphors may be invented or scientific ones 'borrowed' and extended for theological purposes. While this makes theology subservient to non-theological metaphors, it prevents irrelevance.

We cannot escape the analogical and metaphoric nature of our reasoning[3] (see McGrath 1998:179ff; McGrath 1999:144-174). Metaphors give 'epistemic access' to the world. The world informs our theories, even though our theories never adequately describe the world. Metaphors allow us to depict reality without being naively and incorrigibly descriptive (Duce 1998:118-119).

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2 Whereas empiricism uses inductive reasoning, coherentism starts out with a larger set of holistic theories in order to rule out less efficient theories in favour of more workable ones (Gregersen 1999:129).

3 As an example of the use of analogy in the natural sciences, it is interesting to note that Darwin got the concept of natural selection from the methods of livestock breeders and pigeon fans, who used artificial selection as a means of generating and preserving desirable characteristics in the animal world. He then applied the term in a metaphoric, non-literal way to indicate a process which he believed explained the diversity he observed in nature (Ruse 1986:35; McGrath 1999:157ff).

Whereas scientific models and metaphors may be seen as useful fictions requiring no personal commitment or as symbolic representations for particular purposes, in theology they are seen as 'given' and are taken more seriously, like the metaphor of God as father and shepherd. In religion we live by metaphors, while in the scientific realm they may be regarded as dispensable scaffolding.

Analogy may be used to show that, despite differences, the things being compared are identical in crucial, relevant ways. Ruse (1986: 34) calls this analogy-as-justification. As an example we take the analogy between the development or evolution of organisms and the supposed development or evolution of scientific knowledge. Herbert Spencer (1857) argued that we see everywhere a 'law of progress' in the form of complexity arising from simplicity, or heterogeneity arising from homogeneity. It happens in science (culture) as it happens in nature. We know, however, that organic evolution is not progressive and that, although science seems to be progressive, not all scientific change is. Most scientific theories, including the most highly acclaimed ones, have come crashing down (Ruse 1986:49). The progressiveness of science does not lie in the formulation of final, immutable truths. Kuhn has shown that science proceeds via radical epistemic revolutions.

POSTMODERNISM AND EVOLUTION

Postmodern ideas seem to be congruent with the findings of evolutionary biology. Randomness, for instance, is comparable with Derrida's idea of *différence*. Many other notions from evolutionary biology accord with postmodernist thinking: that of complexity creating new complexity; holism and interconnectedness; self-preserving and self-generating systems; the denial of progressive evolution; mind-body unity; openness and self-reference; the influence of the environment; the role of the observer and the fact that meaning relates to the observer. Van Huyssteen (1998) has pointed out the importance of postmodern ideas for post-foundationalism and the role evolutionary biology plays in this.

The question is to what extent these ideas will filter through to the existential level of religious experience. For many years the church was the custodian of truth, had a monopoly of knowledge, determined the worldview based on this knowledge and prescribed the resultant lifestyle, ethics and value systems. The church claimed its knowledge was revealed in the Bible, God's special revelation. Today religions are challenged to bring their belief system in line with the prevailing worldview. Theology must redescribe its worldview with the rationality proper to religion. This can only be done in terms of metaphors developed by, for example, evolutionary biology, which they have to apply analogically to the world of faith. Theology, like all epistemological activities, is highly selective. It relates to its environment but applies its own criteria to determine which environmental inputs will be allowed to influence it (Gregersen 1994:126). Although intra-theological criteria are changeable and often diverse, the science-religion debate represents an earnest endeavour to grapple critically with the challenges.

11

ARTHUR PEACOCKE'S CONTRIBUTION TO THE SCIENCE-THEOLOGY DEBATE

INTRODUCTION

In the past interaction between science and religion on the South African theological scene was largely limited to traditional Protestant and Catholic conceptions of God and creation. We appeared isolated from theological developments in cosmology, biology and creation science elsewhere in the world. One of the reasons may have been the powerful influence of Protestant Calvinism, which permeated our society and was reflected in school curricula, preached from pulpits and promoted by so-called Christian National education.

In general, Protestant Calvinism insists that the Bible cannot guide science, but that it does guide us towards a proper relationship with God. At the same time it does not permit any scientific notions that would seem to contradict Scripture or interfere with basic doctrine. One also finds, strange as it may seem, that many natural scientists who are perfectly comfortable with new cosmology and accept evolution theory still read the Bible in a thoroughly fundamentalist manner, which nullifies their criticism of creationism and the like.

One is reluctant to challenge, on a religious level, a society already shaken by political and social change. Yet postmodern, post-Darwinian people need a reformulation of the main Calvinist doctrines, which date back to the 16th century. We need new, creative theological models that reflect our present-day context. The work of Arthur Peacocke could make an interesting and important contribution in this regard. It provides an excellent introduction to new cosmology and simultaneously addresses major issues such as creation, the fall, original sin, human freedom, the status of Scripture, the person of God, divine providence, the person of Christ, human suffering, the place of evil, the role of chance and freedom in God's work, God's interaction with the world, and so on. He offers a fresh slant on these issues by exploring them in the context of new cosmology.

Arthur Peacocke has devoted much of his life to physical biochemistry and molecular biology. As a theologian he has indicated how science affects our theological interpretation of this world. Science is not reinterpreted in the light of Scripture, as many believers would have it. We find the exact reverse in Peacocke's work, namely a reinterpretation of the Bible and theology in the light of science. He represents a new theological genre, which reformulates the Bible and Christian tradition rationally to fit the basic assumptions of the latest scientific findings, especially those of new cosmology. He likes to quote Einstein: "The eternal mystery of the world is its comprehensibility" (Peacocke 1993b:81). Although that refers exclusively to scientific comprehensibility, one cannot ignore the fact that from many religious and cultural viewpoints the world has always been interpreted as perfectly comprehensible.

Peacocke does not simply bend scientific data to fit his theological ideas. He adheres to the basic ideas that science has produced over the years and uses them rationally and consistently to present his lucid arguments in the science-theology debate. He combines scientific and theological ideas in metaphors that stimulate new thinking. Peacocke opts for a holistic, integrated approach, apparent throughout his work. He is not prepared to uphold theological tenets that are incongruent with his scientific beliefs. That appears to be his golden rule. The rationale behind it is that creation allows us to make perfectly valid theological inferences about God's attributes, the act of creation and so on. Creation remains a source of general revelation and may not be contradicted by any other source or revelation, including Scripture. Hence we have to reformulate such historical doctrines about God in the light of the current, widely accepted scientific narrative and continue to do so as that narrative changes. He believes that the traditional affirmations of Christian theology must be adapted, even revamped, if Christian theology is not to operate in an intellectual vacuum (Peacocke 1981:xiii). Does this mean his work is a long awaited response to empiricist scepticism about the transcendent, launched by David Hume over 200 years ago? That is what we shall be looking at in this article.

Peacocke's use of recent scientific models and metaphors to explain theological issues makes his theology contingent, historical and contextual. There are still many uncertainties surrounding the first three minutes of the so-called Big Bang; there is still much speculation in quantum mechanics. Overall, however, the model is secure and theological inferences are drawn from that overall image. One may expect that, under the influence of this core of certain, substantiated scientific evidence, the critique of modernism will be revitalised. This critique is directed against belief in science which culminates in science being the belief. It is interesting to note some thinkers' sensitivity to any objections that smack of postmodernism.

The kind of theology that emerges from the application of scientific data speaks credibly to a generation living with these models. Peacocke (1994:656) writes for a post-Christian community where acceptance of biblical authority does not go unchallenged. He does not accept that Scripture alone provides clear understanding of God's word. "How can we know that these scriptures, this tradition, are transmitting to us the genuine word of God?" he asks. Because we cannot know that, he avers, Protestant and Catholic theology have become more open to the broad streams of intellectual enquiry in our culture, including the sciences, as well as to each other and to other religions (Peacocke 1984:39).

One could ask whether science has not become the new key to unlock and understand the Bible, with biblical ideas explained and reinterpreted in accordance with the current scientific narrative. Such a view is reinforced by the fact that Scripture is a fixed body of texts about God, confined by historical and contextual boundaries, while science is experienced as an open, evolving testimony to God. Science thus becomes the new canon for understanding the process of creation and for understanding the nature of God in and through this process. Natural being and becoming are the model for understanding divine Being and Becoming (Peacocke 1993b:300).

Of course, one could also reformulate theological ideas from a psychological, literary or philosophical point of view. But these disciplines' impact on worldview is less radical than that of the new cosmology.

PEACOCKE'S THEOLOGICAL METHOD

Peacocke addresses familiar theological issues from a scientific angle and challenges the church to reformulate its stand on traditional Christian doctrines. He looks for new images and metaphors to convey the most accurate scientific picture of the world. His theology is replete with imagery reflecting the nature of God the creator, the act of creation, and the continuing process of God's creative interaction with the world (Peacocke 1993a:483).

One cannot accuse Peacocke of exaggerated belief in science. He acknowledges the limits of both science and theology, and he does not flinch from awkward questions. He knows that in modern physics matter, energy, space and time remain wrapped in mystery. The ultimate depths of reality are still unplumbed (Peacocke 1989:12).

His anti-reductionism has been acclaimed in many quarters. He rejects both dualism and reductionism and propounds a hierarchical epistemology that leads to a philosophy of emergence. Knowledge claimed by one reality cannot be explained by, and reduced to, a lower-ranking reality. He considers reality to consist of hierarchical levels of complexity, each to be interpreted and explained by methods and concepts appropriate to that level. The hierarchy relates to complexity, not authority. Higher levels of complexity incorporate information from lower levels and expand on it. What is real at the atomic level is not more or less real than social or personal reality. The social level, however, incorporates relevant input from lower levels. By the same token theologians, when considering humankind's place in creation, have to take cognisance of the latest scientific findings (see Nelson 1991:520; Russell 1991:506).

Methodologically, Peacocke combines critical realism in the natural sciences with critical-realistic theology. Both rely on metaphor and deal with realities which, although recognisable and identifiable, elude strictly literal interpretation. As a critical realist he offers a scientifically objective survey of theological interpretation, emphasising its rational aspect.

Peacocke presents his case creatively and sensitively. Issues which have been experienced as problematic for many years are analysed in a dynamic, arresting way. Rejecting the *sola scriptura* principle, he feels free to reformulate basic views on God, humankind and creation. Yet scripture is not discarded; it is simply placed in a different genre. In the same way he quotes passages that are consistent with his views from the early church fathers and reformers.

Although Peacocke's point of departure is the natural world, one cannot typify his ideas as a resurgence of natural theology. The natural theology proposed by earlier thinkers like Teilhard de Chardin and Brunner did not work with the same model and simply did not have as much to offer; it was not as challenging. Peacocke uses nature to reinterpret God radically, not simply to reinforce preconceived images of him. Jesus was the ultimate revelation of God's being to humankind in a mode that humans could understand and appropriate. This, according to Peacocke (1986:101), confirms that nature in its actuality, materiality and evolution – of which Jesus was indubitably part – is, potentially at least, both an expression of God's being and the instrument of his action.

While much of Peacocke's thinking seems to agree with process theology, he is not a process theologian. He commends process theologians for taking God's activity in the world, which they describe in terms of law-like evolutionary processes, seriously. But he is critical of the way they interlock with panpsychism, an approach which sees mental and physical aspects in all world events (Peacocke 1986:85). In his view process theology overemphasises God's total receptiveness to all events in the world. Peacocke (1993b:209) does not see God as directly involved in all that happens, nor does he consider all events to affect God equally.

Peacocke's theology is positive. From the multiplicity of structures and processes he infers a personal creator, who intentionally created this rich pluriformity and 'delights' in it (Peacocke 1991b:109). Peacocke also rejects the idea of a 'fall' from original perfection. There was no golden age, no ideal past, no perfect individual 'Adam' from whom present-day human beings are descended. Humans emerged in nature via natural processes which, by and large, science now renders intelligible. Sin, which is real, is about falling short of God's intentions for us and is concomitant with the possession of self-consciousness, freedom and intellectual curiosity (Peacocke 1989:16, 17, 20).

INTERACTION BETWEEN SCIENCE AND THEOLOGY

Peacocke devoted much of his work to the science-theology relationship. He not only contributed to the resurgence of this debate, but also set a credible standard for the interaction of science and theology, acknowledging their different language systems and attitudes and recognising the contribution both disciplines could make to the debate (Peacocke 1981:xivff). Peacocke reminds the sciences that they will have to be more willing than they once were to accept that their models of reality are incomplete and applicable to restricted areas only. And theology should neither be impervious to the sciences' changing outlook on humans and nature, nor be subservient to them (Peacocke 1984:51-54).

A new worldview must be accompanied and explained by appropriate metaphors, otherwise it will simply not become part of people's thinking. One of the best ways to explain the implications of such a new paradigm is to link it to entrenched traditional beliefs that may be affected by it.

The use of examples from physical science to refute a literal understanding of the fall, Jesus' miracles, the immaculate conception, divine omniscience, the resurrection and so forth, may seem superfluous to theologians who reject these things on hermeneutic grounds anyway. Peacocke uses examples from physical science to underscore what many theologians have been saying for some time. He reconsiders what theological hermeneutics has been doing all along from the angle of what may be called scientific apologetics. We know, for example, that the story of the fall is part of a cycle of protology literature found in Genesis 1-11 and should not be understood literally. A literal reading is questionable (if one accepts evolution theory) not simply because the fossils leading up to homo sapiens do not suggest a perfect pre-fall state and a radical break.

HERMENEUTICS AND THE USE OF METAPHOR

Peacocke was accused of not paying sufficient attention to hermeneutics or the role that rhetoric and language play in theology. Although formally this may be true, Peacocke's hermeneutics can be deduced from his work. He clearly reads Scripture in a non-fundamentalist way and takes note of the context in which texts are presented. But how does he go about linking science and theology?

Van Huyssteen has shown, with reference to McMillan, that it would be an epistemological fallacy to infer theological doctrines directly from contemporary science. It would be a grave categorical error, for example, to infer creation directly from the Big Bang, the Spirit of God from field theory, divine providence from chance, evil from entropy, or design from the anthropic principle (Van Huyssteen 1995:15). He suggests developing a conceptual framework that would yield a finely tuned epistemological consonance by carefully focusing on the nature of rationality in theology and science (Van Huyssteen 1995:16).

Peacocke does not make unwarranted inferences. His use of models and metaphors aids him in applying relevant scientific data to theology. He does not operate in a finely tuned epistemological framework, but this does not prevent him from thinking consistently and congruently. He considers scientific and theological models to be analogical and metaphoric, hence not explicitly descriptive. It is their very elasticity that makes them so useful. In his view a critical or sceptical and qualified realism is appropriate in the domains of both science and theology (Peacocke 1984:41). In both domains the models are, as he puts it, 'candidates' for reality. They are not faithful pictures, but they are more than useful fictions. They reflect reality and are to be taken seriously but not literally. Metaphors can be referential without being naively descriptive (Peacocke 1984:42, 46). Models in science and theology are concerned less with picturing objects than with depicting processes, relations and structures. He seems to limit metaphor simply to a stylistic figure. Metaphor could be seen much more broadly, however. Narratives and doctrinal statements, for instance, could also be metaphoric.

Peacocke affirms the diaphoric part of metaphor – that is, its 'is-not' dimension. God is always more than we can think or say. We can never speak of God definitively or exhaustively. "Thus," says Peacocke (1984:49-50), "the Christian mystic is your true critical realist – compelled to be aware both of the reality of God and of the utter inadequacy of human speech about him." With reference to Sally McFague, he underscores the models of God as Mother, Friend, Lover, et cetera. Such models use metaphors, which gives their affirmations the concomitant 'is'-cum-'is-not' character. In this way different models could be combined metaphorically without contradicting each other while still enriching our perception (Peacocke 1993b:167). The models of 'making' and 'emanation' are particularly apt to describe God's creation, as they emphasise God's immanence in, and his transcendence over, creation. The metaphors of author and composer make the same point (Peacocke 1993b:169-177).

The recourse to models and metaphors is an appropriate strategy in the debate. When scientists speak metaphorically they cannot be accused of naively applying their findings to theology.

NEW REFLECTIONS ON CREATION

Peacocke deals with the doctrine of creation in his Bampton lectures. This rethink to some extent restores the significance of the doctrine of God and creation, which featured less prominently in the 20th century (Peacocke 1979:48). Whereas modernist science somewhat obscured the wonder of nature and God's place in it by (over-)confidently explaining everything in terms of laws and relations, the same science now restores the lost wonder and awe.

The doctrines of God and creation are inseparably linked. Creation is not merely a means to an end, as in Barthian theology where it is simply the outward ground and presupposition for God's covenant with humankind. In Peacocke's theology the creation process is an end in itself.

That God is creator does not mean that he is just an ordinary cause in the evolution of the universe. That would be to revert to 'God of the gaps' theology and deny his uniqueness and distinctness from the world (Hill 1990:392). In affirming God's immanence Peacocke (1993b:154) wants to see his hand, not merely in isolated interventions or gaps, but in the ongoing process of creation itself. The entire process is integrated and consistent.

In human beings matter, after successive levels of self-transcendence, became self-conscious and personal, self-transcendent and corporeally self-reflective. This is a fundamental feature of the cosmos and a clue to its meaning and intelligibility. This process eventually reveals the immanence of the transcendent creator (Peacocke 1986:129). Humankind, nature and God are still in a process of becoming. Human beings are actually human 'becomings', caught up in an ongoing evolutionary process.

Evolution occurs inorganically, geologically, biologically, socially and culturally. It entails a continuous, almost kaleidoscopic recombination of component units into an increasing diversity of new forms, which last only for a certain time, after which they are reformed from the same basic elements into new, more complex patterns (Peacocke 1991b:103).

EMERGENCE AND OPEN-ENDEDNESS

Creation can be explained metaphorically in terms of emergence and emanation. The history of creation is a seamless web, a continuity that is becoming increasingly intelligible. Peacocke sees it as a process of emergence of new forms of matter, with several organisational hierarchies of these forms appearing over time. They develop new properties, behaviours and a network of interactive relations. So one would anticipate continuity, with new meanings emerging out of old ones, subsuming them perhaps but not denying them (Peacocke 1991b:103).

In the dynamic picture that is presented to us the world of entities and structures displays genuinely emergent properties that are not reducible to their precursors and thus constitute new levels of reality. New realities emerge and old ones pass away, so that God's creative activity is both past and present. Though God the creator acts in all events (a stance of faith), not all events are equally perceived as acts of God. Some events reveal more to us than others (Peacocke 1986:100).

INTERPLAY OF LAW AND CHANCE

For Peacocke the role of science is to elicit all the possibilities inherent in the stuff of the universe so as to evoke a 'ringing' of possibilities (Nelson 1991:521). Chance and law work together as part of God's instrumentation, the means through which he acts as transcendent lawgiver and immanent manifestation of potentialities in the world (Peacocke 1986:99).

DIVINE BEING AND BECOMING: THE DOCTRINE OF GOD

Panentheism

Peacocke uses the concept of panentheism to describe God's relation to the world. In this sense it is his theological method. Panentheism is the belief that God's being encompasses and permeates the whole universe, so that every part of the universe exists in him; but his being is more than the universe and is not exhausted by it. For Peacocke God is the fundamental creative power immanent in all physical processes. The emphasis on God's immanence is counter to deism, according to which God created matter in such a way that it assembles itself in increasingly complex ways, culminating in the emergence of intellectual and spiritual beings (Peacocke 1986:181).

One may easily infer that God is the process itself that reached self-consciousness in human beings, who then created a projection of God. Although God is immanent in nature, he also transcends it. God creates a world that is, in principle and in origin, other than himself, but he creates it within himself (Peacocke 1993b:300ff). God is thus not the process which became self-conscious in human beings. He encompasses the process and transcends it. Peacocke uses the metaphor of a composer to describe the relationship. When listening to a passage of Beethoven's music one actually encounters the composer as a creator, but many aspects of the composer's personality do not feature in that particular piece of music. So it is with God in creation. We can infer what kind of a God is involved in the process, although he may be much greater and more than the process. But we can know what our inferences allow us to know.

In the past the concept of God the creator was overly dominated by the externality of God's creative acts. Using the metaphor of mammalian females, whose embryos grow inside the mother's body, Peacocke (1984:64) seeks to emphasise the feminine aspect of God creating the world within herself. God is transcendent over, and immanent in, nature. She creates a world that is in principle and in origin other than herself, but she creates it within herself. God continues the process of creating. The emergence of novelty, of higher orders of complexity arising from the temporal process of non-equilibrium thermodynamics and biological evolution, underscores this continuous creation. If God is fully immersed in time as an immanent, continuing creator, then he cannot know the future. Hence one may question whether God can guarantee the eventual fulfilment of history (Russell 1991:508).

God's interaction with the world

God does not intervene unlawfully or miraculously in a lawful world. God interacts with the world and communicates with humankind in ways that are consistent with the way he made them, which is consistent with the descriptions of that world given at other levels by the natural and human sciences (Peacocke 1993b:211). To intervene as a Deus ex machina would be inconsistent with the whole process, which is meticulously fine-tuned and so impressive that the so-called 'anthropic' or 'biotic' principle was formulated (Peacocke 1994:650).

Peacocke uses top-down causation and information transfer to explain God's interaction with the world. In many complex systems the macroscopic state and character of the system as a whole is a constraint on – and effectively a cause of – what happens to the constituent units, which behave in ways other than they would have done had they not been part of that system (Peacocke 1994:653). Top-down causation may be considered a model for God's providential activity, although the nature of the causal joints is not always certain. In how far, for instance, does the model allow real freedom at the lower levels?

Self-limited omnipotence and omniscience

God imposed constraints on himself in creation and has a 'self-limited' omnipotence and omniscience. He so made the world that there are certain areas (e.g. human free will) over which he chose not to have power. God's self-limitation concerns systems whose future states cannot be known – even by him – since they are in principle unknowable (Peacocke 1993b:121-122). God's self-limited omniscience applies to the subatomic constituents and nonlinear systems of the world, which are unpredictable. God has allowed himself not to have overriding power over all that happens in the world, or to know the exact course of events. He actually put his ultimate purpose at risk by incorporating open-endedness, and eventually human freedom, into the created world (Peacocke 1993b:123).

God and time

Peacocke's view of God and time must be read in the context of his self-imposed limited omnipotence and omniscience. Peacocke's view totally subverts major theological tenets such as free will, predestination, God's alleged immutability and impassibility, and his relation to eternity. Special relativity in particular changed Peacocke's view on these matters. We no longer accept the Newtonian theory of one universal flow of time. There are many times, specific to different observers, each with their own positions and velocities. The question is, to which of these times does God relate? (Peacocke 1993b:129-130).

There is no place in Peacocke's theology for eschatology. God does not work with any predetermined blueprint. Peacocke finds the concept of God the deterministic law-giver, prescribing everything in advance, inadequate and even false. Accordingly he looks for metaphors associated with probing experimentation, exploration and improvisation to reflect more accurately what God is up to in his continuous creative activity (Peacocke 1984:65).

God is the creator of physical time. He is also above time. He transcends time, but not in the sense of viewing the whole course of earthly time from a mountaintop – as if from another dimension, 'above' or 'outside' time, so that our before, now and after are all spread out for him to see. God cannot see ahead in time in the sense that everything is actually predetermined. Analogous to the indeterminacy of events at the subatomic level, one can say of future events that, at most, only the range of possible outcomes of certain events is predictable and thus known to God (Peacocke 1993b:128-9). Hence God is not timeless. He is temporal in the sense that divine life stands in relation to us. God creates and is present every instant of the physical and psychological time of the created world.

The only assurance we have about future events is that whatever happens, God will be there. We could, to some extent, predict broadly what may happen, but we could be wrong and we are subject to the randomness of events.

Hence God has not created the universe in order to achieve a specific aim or reach a specific point. The creation process itself can be God's only aim and he can only hope that it will develop so that his future relations with humanity will be what he wills. He suffers with his creation all the way in so far as it does not evolve according to his will.

Suffering creation and the suffering God

From a scientific viewpoint suffering can be viewed as a normal, natural part of the evolutionary process. Theologically speaking, it evokes many questions which relate directly to God's place in suffering. Peacocke argues that suffering occurs within the divine being. God himself suffers with creation. He suffers in, with and under the creative processes of the world with their costly, openended unfolding in time (Peacocke 1984:68-69; 1986:132; 1993b:126). Suffering occurs within the divine being. God is involved in evolutionary processes and suffers with nature (Peacocke 1993b:126-127, 308-311). Through the cross God suffered with Jesus and thus with all creation. In the Word-made-flesh the manifestation of God himself passed through the gateway of suffering and death to fullness of life and the consummation of humanity in God's presence – so the final agony and apogee of the evolutionary process is the paradox of a human being on a cross exalted by God to divine life (Peacocke 1986:132).

Pain and death must be seen as preconditions of life. New forms of matter only arise from the dissolution of old ones; new life comes through the death of the old (Peacocke 1991b:103). Consciousness and awareness cannot evolve without the nervous system, which implies pain. What theologians used to call 'natural evil' now seems to be a necessary part of the production of new life and consciousness (Peacocke 1989:14). God's act of creation still proceeds, and God is immanently present in and at the whole process. The process includes the operation of chance in a law-like framework as in the origin of life, the emergence of new forms of life through the costly mechanisms of natural selection and the death of old forms, and the emergence of sensitive, free, intelligent persons with growing consciousness and self-consciousness – a development that inevitably involves increasing sensitivity to pain and the concomitant experience of suffering (Peacocke 1993b:125).

Kenosis

Peacocke uses the idea of kenosis (see Phil 2) to describe God's relationship with creation. We can speak of God's vulnerability – indeed, his self-emptying (kenosis) and self-giving in creation. Different meanings of God are communicated at different levels of creation, according to their capacity to receive the information: the message and meaning of God. If God is creating through the kind of processes we see in the sciences, then he must be regarded as a self-offering, suffering love active in creation (Peacocke 1989:15-18; 1993b:308-11, 23ff). God's kenosis and self-inflicted vulnerability were designed to achieve an overriding purpose: the emergence of free persons

(Peacocke 1993b:124). God could not enforce this but had to wait for it to happen.

The person and work of Jesus

Peacocke demythologises Jesus' immaculate conception and his miracles and sees him as an ordinary human being (Peacocke 1993b:275ff, 268-74). The only difference is that Jesus was fully open to God. He is the manifestation of God's transcendence immanent in human life. Jesus is the perfect vehicle for conveying to us what the transcendence and immanence of God may be. God, who had all along been immanent in the whole temporal creative process, expressed himself directly, personally and concretely in and through a particular person who, humanly speaking, was totally open to him (Peacocke 1986:101).

Jesus is God's self-communication and self-expression in a human person. In Jesus' cross we see God's self-offering love. Our positive response to this is the beginning of our salvation. Peacocke quotes Irenaeus who said, "Our Lord Jesus Christ, the Word of God, of his boundless love became what we are that he might make us what he himself is." Peacocke sees this as a positive understanding of redemption: not restoring the past perfection of a mythical Adam, but an initiative that raises humanity to the life of God. This, then, seems to be Peacocke's qualified eschatology – namely that we may be raised to share in God's life as Jesus did. Peacocke acknowledges the importance of hope, but our hope must be centred on this world in the sense that its centre and arena must be the world we know (Peacocke 1971:197).

Peacocke's soteriology seems to be analogous to Abelard's subjective atonement. We react subjectively to the experience of Jesus' cross. The question is: why only Jesus' example and not that of so many other saints through whom God also must have acted and who were similarly open to God?

EVALUATION OF PEACOCKE'S CONTRIBUTION AND ITS MEANING IN A SOUTH AFRICAN CONTEXT

Peacocke reflects in a phantasmagoric manner on the images and models of Christian theology in the light of his scientific understanding of the natural world. His implementation of the new cosmological model for theology is unique. He gives us a new assessment of nature and its minuscule processes. The most minute particle of matter has sacramental worth. We were born in the stars and the stars have come a long and miraculous way (see Peacocke 1986:116ff; 1989:21).

Peacocke's work can be regarded as an apologetic theology redescribing traditional theology to be rationally credible from a scientific and secular perspective. One could, however, question its existential appeal, especially since the gaps left by the loss of Christian eschatology and Christian hope are not really filled. Science answers the 'how' questions but not all the 'why' questions of existential concern.

Can science and theology really answer ultimate questions in the same manner? Judging by the foregoing not without making very arbitrary, unprovable assumptions. Several questions remain:

- Are we not back in a modernist frame of mind, stuck in a closed system where all ideas must be consistent with the overall programme? Should a system acknowledging the possibility of randomness, indeterminacy and chance not perhaps be more open to the possibility of miracles and unexplained events? Are present-day people not more open to miraculous events than modernism was?

- Is Peacocke's theology existentially and pastorally satisfying? Does it provide comfort for sufferers and hope for the dying – or should these questions not be asked?

- What is the place of Scripture in this 'post-canonical' age? Is it simply to be used in so far as it fits the new models of God, world and humankind? Can we accept that God does not necessarily speak most clearly through the Bible, and that he speaks as clearly through other religions in their context? God may have revealed himself magnificently in Christ, but there are many other clear manifestations. If Christ's objective atonement is rejected, we must not depend exclusively on models like altruism to describe God's interaction with the world. Equally useful models could be inferred from other world religions and philosophies.

- What ethical imperatives arise from the new cosmology? Must kenosis and altruism, for instance, become overarching ethical norms from which all other norms are deduced? How must Peacocke's view of evil, suffering and death as necessary components of the whole process be handled? Does this hypothesis make it easier to decide on issues like abortion, euthanasia?

- Peacocke's work introduces new factors into the theodicy debate. God can no longer be blamed for innocent suffering, since he is not accountable for natural disasters. God must abide by the process and what it allows. Although the overall unfolding of the creation process may accord with his will, many developments may be counter to it. His will cannot be enforced on free human beings. We have to take responsibility for our circumstances and actions. Our destiny is in God's hands, but our lives here and now are ours to direct – in his way, if we so choose (Peacocke 1971:199).

Knowledge of the process that brought everything into existence seems to be essential for believing in a God who interacts with us and is present in every moment of this process. What must we believe and what can we hope for? Can believe that we will be taken up into the life of God, as Jesus was? We can hope that the future will be as finely tuned as our past was. What about mind-body integrity? If God 'waited' fifteen billion years for us to be created, does it make sense to believe in another kind of existence outside the mind-body unity we know?

It is unfair to expect Peacocke to answer all the questions raised. Does it make sense to ask them at all? Can questions relevant in one genre of theologising be asked in another genre? Presumably not. The questions must, however, be answered. Peacocke falls back on models and metaphors to try and answer some of them. The hardware-software model from computer science is one that could be used to some extent to explain our future existence with God.

It seems appropriate to conclude with an acknowledgement of our limitations and the mystery of the cosmos. To say that God created the universe does not explain either God or the universe, but it keeps our consciousness alive to mysteries of awesome majesty which we might otherwise ignore (Drees 1991:79).

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TOUT EST BIEN? NATURAL AND SUPERNATURAL CAUSES OF EVIL: PERSPECTIVES FROM HUME'S TREATISE AND VOLTAIRE'S CANDIDE

INTRODUCTION

The questions of evil, theodicy and natural disasters surfaced again after 24 December 2004 when the tsunami[1] hit the coasts of Indonesia, India, Sri Lanka and Thailand, killing over 200 000 people. This makes the Lisbon earthquake on 1 November 1755, which left over 20 000 dead, pale into insignificance. The influence of the Lisbon quake on mid-18th century thought is evidenced by a substantial volume of literature on the subject. This natural disaster apparently weighed more heavily on the European mind than all the soldiers killed in the Seven Years War (1756-1763).[2]

In mid-18th century Europe evil, theodicy, humankind's place in the grand order of the universe, and the role of reason and

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1 Two giant tectonic plates, which have been pushing against each other for millennia, suddenly shift. The left plate has been sliding under the right at the rate of a few centimetres a year, but now the top plate suddenly springs up, lifting perhaps 60 feet along a 1000-mile ridge. Above, ocean surface hardly ripples. But the seismic bump was enough to displace trillions of tons of water in a few seconds. As it neared shore, the speed slowed, and large waves formed, in some places very large ones.

2 The battle of Rossbach on 8 October 1758, killed 80 000 soldiers (20 000 Prussians and 60 000 French).

3 Some historians, following Troeltsch, regard the 18th century (rather than the 16th) as the beginning of modern history. In this view the individualism and toleration of the Renaissance and Reformation did not lead to significant social, cultural, and political changes until the 18th century.

science in getting to the truth were hotly debated topics,[3] which are still haunting us today. Rational explanations are inadequate in the face of traumatic events. We resort to strategies like interpreting the event as evil, then personifying evil and looking for reasons why the calamity befell us. Ultimately the cause of the catastrophic event is either God, the devil or (human) nature. The basically religious tenor of this sort of reasoning is that we are punished for our sins, individually or collectively;[4] or, on a more ‘positive’ note, that our faith is tried and tested, that we pass through training sessions to make us stronger, humbler and more faithful;[5] or simply that tribulations happen (naturally) and at such times the faithful are not alone but are accompanied by God, who suffers with them.[6] Voltaire and his generation broke out of this paradigm, and focussed on human responsibility for misery or its amelioration. The challenge was to ‘naturalise’ religious ideas without doing away with religion. They managed to do so by highlighting the deformed societal structures of mid-18th century Europe.[7]

Hume puts the quandary aptly in his *The natural history of religion* (1963b:40f): “We are placed in this world as in a great theatre, where the true springs and causes of every event are entirely concealed to us; nor have we either sufficient wisdom to foresee, or power to prevent those ills, with which we are continually threatened … No wonder, then, that mankind, being placed in such an absolute ignorance of causes, and being so

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4 In the words of Saint Augustine (Confessions 1969:28): “… Thee O Lord, who teachest by sorrow, and woundest us, to heal; and killest us, lest we die from Thee.”

5 Peacocke (1984:68-69; 1986:132; 1993:126) argues that suffering occurs within the divine being. God himself suffers with creation. He suffers in, with and under the creative processes of the world with their costly, open-ended unfolding in time. See also Polkinghorne 1989:68.

6 Leibniz (1966:41) says concerning physical evil “that God will sit often as a penalty owing to guilt, and often also as a means to an end, that is, to prevent greater evils or to obtain greater good.”

7 Voltaire’s satirical slant must be read against the background of the revolt against the overwhelming influence of the church in his time. Today, according to Oviedo (2005:115), the challenge is to rescue the topic of sinfulness from an excess of naturalisation and to acknowledge a greater degree of influence from other factors: human decisions, social tendencies and cultural environments; factors decisive for a recovering of the Christian understanding of evil.

anxious concerning their future, should immediately acknowledge a dependence on invisible powers, possessed of sentiment and intelligence."

The phenomenon called spirituality elevates our lives above the mundane level (and science and technology are mundane), and is 'effective' only if we interpret events in the style described above. A spirituality that focuses solely on positive aspects like celebration of life, wonderment and awe, inspirational relationships with God and our fellows is not sufficient, since these things represent only half the story of our lives. The other half is represented by experiences of evil, suffering, sin and punishment.

The science and religion dialogue is about creating meaningful, complementary spaces for both the natural and metaphysical dimensions of human experience. Oviedo (2005:116) puts it thus: "... how can we still propose a theological understanding of human nature despite the continuous impact of science and alternative anthropological explanations, which impose ever more stringent limitations on the transcendental dimension that forms such an essential component of what theology has to contribute to the discussion?"

THE QUESTION OF EVIL IN NATURE RELATES TO DIVINE AND HUMAN INTERACTION WITH NATURE

Nature is dynamic and subject to constant change. It has to do with undetected evolutionary processes in nature, as well as detectible changes that follow human interaction with nature. When human interaction has a harmful impact it may trigger processes beyond human control, like global warming, ecological disasters, the apparent impossibility to get rid of weapons of mass destruction, and the effects of technological (including genetic) intervention. These leave humans at the mercy of their own creations (Du Toit 2005:129-131). Unlike God, they – his co-creators – take control of evolution (Midgley 2005:278). God, on the other hand, allows the physical world to be itself. It is inevitably a world where order and disorder interlace each other and where chance exploration of possibility will lead to the evolution of systems of increasing complexity, but also of malfunctioning systems. God accords to the processes of nature the same respect that he accords human activity (Polkinghorne 1989:66-67).

In line with Polkinghorne, Peacocke (1993:154) argues that God's hand must be seen, not in isolated intrusions, not in any gaps, but in the ongoing process of creation itself. God created matter in such a way that it tends to assemble itself in increasingly complex ways, which eventually led to the emergence of intellectual and spiritual beings (Peacocke 1986:181). In a lawful world God does not intervene unlawfully or miraculously, which would be inconsistent with the whole process (Peacocke 1994:650). God imposes constraints on himself in creation and has a 'self-limited' omnipotence and omniscience. He actually put his ultimate purpose at risk by incorporating open-endedness, and eventually human freedom, into the created world (Peacocke 1993:123).

Good and evil are human constructs. Shermer (2004:68) categorically states that there is no such thing as absolute evil.[8] The word 'evil' is a descriptive adjective that merely qualifies something else, like thoughts or deeds. The noun 'evil' implies an existence all on its own, which Shermer denies exists. Nature cannot be evil. The drives that lead us to sin are often found in other social animals, who manifest behaviour that, on the face

8 It may be good to be reminded of Augustine's view of evil as privatio boni (St Augustine 1969:107-108). Augustine refrained from the Manichean (1969:127-128) idea of two Gods – one good and one evil. He allots no substance to evil. Evil is corruption that diminishes the good. He states: "… therefore whatsoever is, is good. That evil then which I sought, whence it is, is not any substance: for were it a substance, it would be good. For either it should be an incorruptible substance, and so a chief good; or a corruptible substance; which unless it were good, could not be corrupted. Thou madest all things good, nor is there any substance at all, which Thou madest not. And to Thee is nothing whatsoever evil; yea, not only to Thee, but also to Thy creation as a whole, because there is nothing without, which may break in, and corrupt that order which Thou hast appointed it. But in the parts thereof some things, because unharmonised with other some, are accounted evil." Also see Hick (1977:179-187).

of it, strikingly resembles some human behaviour (Midgley 2005:82). But animals don't sin. It is the experience of our fallible human nature that gives rise to the idea of fallen nature and natural evil. This is the reasoning behind the notion of original sin (peccatus imputatim), since we are born with it (see Midgley 2005:85). Evil as a physical concept requires human evaluation of behaviour and its effect on other humans. Nature including its disasters, is not evil. Humans are the only exception.[9] Evil in humans takes the form of moral evil, and what is considered moral may differ from one age and culture to another.[10]

The problem of human interaction with nature lies on the level of values[11] and morals. Humans evolved to become the only moral and rational primates, distinguished by thought systems and values that divide their actions into (usually binary) oppositions of good or evil; right or wrong; just or unjust; religious or secular, and so on. There are many scales to assess what is good or bad, ranging from petty crimes, which most people are guilty of on occasion (like skipping a stop sign), to hard crimes that typify the transgressor as evil (e.g. murder) or radical evil (mass murder, holocaust, genocide, apartheid crimes, September 11).[12] At all events, as part of nature people can act in ways that affect their own nature (and lives) detrimentally.

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[9] Nature itself is mindless. We may share 98% of the DNA of the chimpanzee, but the chimpanzee cannot lecture on the DNA that determines it.

[10] In his *Theodicy* Leibniz (1966:40) says: "evil may be taken metaphysically, physically and morally. Metaphysical evil consists in mere imperfection, physical evil in suffering, and moral evil in sin."

[11] See in this regard Keith Ward (2003:257) who stresses the idea of values when he says: "The reason why the universe exists is that God chooses to realize a set of distinctive values by creating it. The reason why the laws of nature are as they are is that they are necessary means to realizing the values God chooses."

[12] The idea that humans embody radical evil is also contentious. The classic example is Hannah Arendt's coinage of the banality of evil in connection with the trial of Wichmann for his participation in the holocaust. Arendt said: "Except for an extraordinary diligence in looking out for his personal advancement, he had no motives at all" (quoted by Midgley 2005:98-99). In the words of Shermer (2004:74-75) "The mass murders, the brutality, the sadism – those were not what was unique about the Nazis. The brutal murder of whole populations has been with us since the beginning of recorded history." We all remember the words of the twelve year old Anne Frank, when contemplating her fate as Jewish refugee in the Netherlands: "Toch houd ik ze vast (de dromen ideale, mooie verwachtingen) ondanks alles, omdat ik nog steeds aan de innerlijke goedheid van den mens geloof" (Frank Anne 1947:218-219).

Humans determine what is natural, taking their cue from what is often called natural law (ius naturae) in order to structure their lifestyle. Human morals, influenced by religion, custom and tradition, tend to reflect what humans consider natural and unnatural. What they consider unnatural is usually seen to be evil. What is natural is not scientifically deduced from nature. Nature is too wild and varied to provide guidelines for human living,[13] but understanding human evolutionary and genetic development can help us to understand some of our drives and peculiarities. This understanding, however, plays a relatively minor role in shaping our morals.

How do we come to determine what is natural? Here we look to Hume for guidance.

HUME (1711-1776) ON HUMAN NATURE AND CAUSALITY

Hume's *Treatise of human nature*, written in France, was published twenty years before the appearance of Voltaire's Candide. Hume's exposition of human nature laid the foundation for scientific methodology and empiricism. He is considered a proto-Darwinist, since he prepared the ground for the interpretation of nature on which evolution depends – and did so well over a hundred years before evolution was conceived of (Altmann 2002:71).

Hume has to enter into any discussion of Voltaire's Candide because of the light he sheds on the notion of causality as it operates in human thinking. The question of causality – who or what causes evil and misery, and why? – is basic to the question of

[13] Nancy Murphy (2005:96) makes the interesting remark that Darwin took his cue for the survival of the fittest idea (competition for food provides the mechanism for change), from Thomas Malthus who in his Essay on the principle of population stated that population, if unchecked, will grow geometrically whereas food supply will increase, at most, arithmetically. Thus struggle, competition and starvation are the natural result. In his Descent of man Darwin (1871) came to view sociality, rather than life-and-death struggle between individuals, as typifying the animal world. Murphy (2005:98,105) points out that economic and theological and biological theories, influence scientists' view of nature.

evil and theodicy and typifies the main arguments in Candide. Causality as 'detected' in the physical world operates similarly in the world of morals and religion.

We impose a causal relation between two events because of their contiguity. "What is our idea of necessity, when we say that two objects are necessarily connected together? … I perceive, that they are contiguous in time and place, and that the object we call cause precedes the other we call effect" (Hume 1978:155). However, "… reason alone can never give rise to any original idea, and reason as distinguish'd from experience, can never make us conclude, that a cause or productive quality is absolutely prerequisite to every beginning of existence … [S]ince reason can never give rise to the idea of efficacy, that idea must be deriv'd from experience, and from some particular instances of this efficacy, which make their passage into my mind by common channels of sensation or reflection" (Hume 1978:157). Our ideas[14] are copied from impressions (sense perceptions). We experience only particulars, so our ideas come from particular experiences. All ideas are determinate, while abstract ideas are indeterminate and therefore cannot exist. We cannot legitimately invoke metaphysical or supernatural concepts to describe something beyond physics and observation.[15] All ideas are traceable to impressions and all my mental comparisons are necessarily comparisons of one idea with another idea (Radcliffe 2000:13-14).

[14] My thought of one idea moves on to another because of resemblance to it. Certain experiences are linked because they happened contiguously in the past, in close temporal proximity.

[15] This is one of the reasons for Hume's anti-religious sentiments. In the Dialogues concerning natural religion (1963a:116), Hume, by word of Cleanthes, reduces all religious arguments to experience. The demonstration of the Being of a God cannot be done since arguments a priori or by abstract arguments without any recourse to experience are not allowed. Hume introduced the Deist machine metaphor for the universe. He says (1963a:115): "Look around the world: contemplate the whole and every part of it: You will find it to be nothing but one great machine, subdivided into an infinite number of lesser machines, which again admit of subdivisions, to a degree beyond what human senses and faculties can trace and explain. All these various machined and even their most minute parts, are adjusted to each other with an accuracy, which ravishes into admiration all men, who have ever contemplated them." He saw the author of nature as resembling the mind of man (Hume 1963a:116).

Since we cannot see the 'force' or 'power' that we suppose to be responsible for causation, Hume reverted to custom to explain causation. Altmann (2002:93) stresses the importance of this notion: "It was Galileo Galilei (1564-1642) and after him Sir Isaac Newton (1642-1727), who taught us that the primary task of science is to observe and describe events rather than explain their origins. … Hume's concept of causality permits us to consider an isolated state of motion (that is, disregarding the chain of states going back to its origin), and, because we observe force-free motion, we must conclude that forces and motion are not causally related. This allowed Newton to discover the correct effects entailed by forces, which would have been impossible if he had been involved in the fruitless Aristotelian search for first causes."

Hume debunked the common idea of necessity as a modality of causal relations (see Locke). "In no single instance", says Hume (1978:400), "the ultimate connexion of any objects is discoverable, either by our senses or reason, and we can never penetrate so far into the essence and construction of bodies, as to perceive the principle, on which their mutual influence depends. 'Tis their constant union alone, with which we are acquainted'; and 'tis from the constant union that necessity arises. If objects had not an uniform and regular conjunction with each other, we shou'd never arrive at any idea of cause and effect." The imposition of a causal relation[16] between separate phenomena is mere custom or habit: "'Tis only from experience and the observation of their constant union, that we are able to form this inference; and even after all, the inference is nothing but the effects of custom on the imagination" (Hume 1978:405; see also Altmann 2002:72-73).

[16] Hume (1978:155ff) gave rules for the cause-effect relationship which include aspects like contiguity in time and space; the cause must be prior to the effect; there must be a constant union between cause and effect and the same cause must always produce the same effect, and the same effect never arises but from the same cause.

FROM CAUSATION IN NATURAL EVENTS TO CAUSATION IN HUMAN CONDUCT

Hume held the meta-ethical view that moral judgments principally express our feelings. He saw moral values as matters of social convention. Humans do not have a separate faculty of moral perception. Morals are attributable to our faculties of sensory perception. Hume sees the operation of the mind when viewing causality in nature and causality in human affairs (morality) as analogous: “We must now shew, that as the union betwixt motives and actions has the same constancy, as that in any natural operations, so its influence on the understanding is also the same, in determining us to infer the existence of one from that of another” (Hume 1978:404). Our mind cannot attribute necessity to the operations in nature and deny the same necessity in human operations: “Now moral evidence is nothing but the conclusion concerning the actions of men, deriv’d from the consideration of their motives, temper and situation” (Hume 1978:404). And in his Dialogues he writes: “What I have said concerning natural evil will apply to moral, with little or no variation; and we have no more reason to infer, that the rectitude of the Supreme Being resembles human rectitude than that his benevolence resembles the human” (Hume 1963a:187).

The moral world mirrors the natural and philosophical worlds: “If this be the case in natural philosophy, how much more in moral, where there is a much greater complication of circumstances, and where those views and sentiments, which are essential to any action of the mind, are so implicit and obscure, that they often escape our strictest attention, and are not only unaccountable in their causes, but even unknown in their existence?” (Hume 1978:175). Hume anticipated the concilience of the sciences as well. In the introduction to the Treatise he says: “In pretending therefore to explain the principles of human nature, we in effect propose a compleat system of the sciences, built on a foundation almost entirely new, and the only one upon which they can stand with any security. And as the sciences of man is the only solid foundation for the other sciences, so the only solid foundation we can give to this science itself must be laid on experience and observation" (Hume 1978:xvi).

The importance of Hume's ideas for our subject is the way humans observe events in physical reality, connect these events in a causal and necessary way and transpose this method of arriving at the truth to the level of human experience in general and morals in particular. We impose a causal link between a person's motive and the ensuing deed. As in the case of natural phenomena, the link between motive and deed on a moral level is established through custom (the way the mind operates).[17] On a religious level we ultimately attribute whatever happens to the will of God. Nothing transpires unless God wills it. Bad experiences raise the question why God willed (allowed) that to happen to me. We then come up with all sorts of motives God could have had (sin, disobedience, a test, etc.) to inflict the event on us.

However, for Hume events on the moral level are typical of human nature and would be understandable if we had all the information available – which we rarely do. Virtue and vice emanate from the same human nature.[18] The problem lies in our conventions and mode of interpreting events. Hume (1978:474) views the sentiments of morality to be natural and typical of the world's nations. Virtue and vice are both natural.

[17] Custom is a principle of human nature. All inferences from experience are effects of custom, not of reasoning. Custom is one of the 'principles of nature' which renders our experience useful to us, as providing a kind of pre-established harmony between the course of nature and the succession of our ideas (Altmann 2002:87,106). Custom, as used by Hume, is thus some feature of mind, not of the community. The capacity of the mind to use causal statements correlates, according to Altmann (1978:101), with physical properties that the brain acquired during the evolution of the species.

[18] This idea facilitates a feeling of fatalism as far as human conduct is concerned. Mary Midgley (2005:82) says that acceptance of human natural motives like aggression, territoriality, possessiveness, competitiveness, and dominance creates a feeling of fatalism because we shall be committed to accept bad conduct as inevitable. All these power-related motives are important also in the lives of other social animals, and appear there in behaviour which is, on the face of it, something strikingly like much of human behaviour

Hume denies that we derive our sense of justice and injustice from nature. Nature is not just or unjust – it is simply nature. The notion of justice and injustice "arises artificially tho' necessarily from education, and human conventions" (Hume 1978:483). Hume (1978:474) regards nature as natural, that is not miraculous, as opposed to the rare and unusual.

HUME ON EVIL

In his *Dialogues concerning natural religion* Hume (1963a:172), by word of Philo, discusses Epicurus' old yet unanswered question: "Is … [God] willing to prevent evil, but not able? Then he is impotent. Is he able, but not willing? Then he is malevolent. Is he both able and willing? Whence then is evil?" When Hume answers the question about God or evil, he proceeds from sensory observation as the only ground for verifiable statements. Concerning the attributes of God, Philo says: "But there is no view of human life or of the condition of mankind, from which, without the greatest violence, we can infer the moral attributes [of God], or learn that infinite benevolence, conjoined with infinite power and infinite wisdom, which we must discover by the eyes of faith alone" (Hume 1963a:175-176). Hume maintains that we can only speak of God by analogy with humans. The alternative is to refer to divine attributes, infinitely perfect but incomprehensible (Hume 1963:172). "You are obliged, therefore, to reason with him merely from known phenomena, and to drop every arbitrary supposition of conjecture" (Hume 1963:178).

Hume stresses our will to find the agent causing happiness or misery: "As the causes, which bestow happiness or misery, are, in general, very little known and very uncertain, our anxious concern endeavours to attain a determinate idea of them; and finds no better expedient than to represent them as intelligent voluntary agents, like ourselves; only somewhat superior in power and wisdom" (Hume 1963b:54).

Hume continues to give four reasons for the existence of evil – reasons that are surprisingly familiar to present-day participants in the science-religion debate. "The first circumstance which introduces evil, is that contrivance or economy of the animal creation, by which pains as well as pleasures are employed to excite all creatures to action, and make them vigilant in the great work of self-preservation. The necessities of nature, such as thirst, hunger, weariness, may cause some diminution of pleasure" (Hume 1963a:180). Yet there is a good reason why animals are susceptible to such sensations (pain, thirst, hunger).

The second reason for apparent 'evil' is "the conducting of the world by general laws" (Hume 1963:180).[19] This reason relates to the first one, since human life depends on what we call 'accidents'. We may think that the world could be a much better place if pleasing and fair attributes were distributed abundantly everywhere, but there are good reasons why they are not: "Some small touches, given to CALIGULA'S brain in his infancy might have converted him into TRAJAN: one wave, a little higher than the rest, by burying CAESAR and his fortune in the bottom of the ocean, might have restored liberty to a considerable part of mankind. There may, for aught we know, be good

[19] Hume is, once again in line with present-day natural scientific thinking. An example of a present-day natural scientific explanation is given by Worthing. Mark Worthing (1996:146) refers to the influence the discovery of the second law of thermodynamics and the concept of entropy had on the theological discussion of the problem of evil. He refers to Rob Russell who said that entropy is a prefiguring of evil on the physical level. Evil is likened to a disorder, a dysfunction in an organism, an obstruction to growth or an imperfection in being. This must be understood anthropomorphically. We cannot imagine development in nature without an increase in entropy. Tillich indicates that destruction has no independent stand in reality as a whole and depends on being. This begs the question whether order and good are not conversely dependent on entropy and evil for their existence (Worthing 1996:147). This idea finds consonance in Philip Hefner who alleges that creation and chaos belongs together by nature (Worthing 11996:48). With reference to Leibniz, CF von Weisäcker says that there are possibilities in the world, but not possible worlds. The world's characteristics are the conditions of its existence. Departing from the idea of the present world, we distinguish possible other worlds which are fictitious. Our world becomes the only possible one because it is the only real world (Worthing 1996:153-154). Barrow and Tipler find support in Leibniz's 'best of many possible worlds' argument for their own version of the many-worlds hypothesis of quantum mechanics (Worthing 1996:154).

reasons, why Providence interposes not in this matter; but they are unknown to us … If every thing in the universe be conducted by general laws … it scarcely seems possible but some ill must arise in the various shocks of matter" (Hume 1963a:181).

The third reason is the great frugality with which all powers and faculties are distributed to every particular being. All animals are well adapted to their environment. "Every animal has the requisite endowments; but these endowments are bestowed with such scrupulous an economy, that any considerable diminution must entirely destroy the creature. Where-ever one power is increased there is a proportional abatement in the others. Animals, which excel in swiftness, are commonly defective in force … Nature seems to have formed an exact calculation of the necessities of her creatures" (Hume 1963a:182). Hume stresses the idea of work and industry (on the principle: if you don't use it, you lose it). Humans can attain much more (improvement of the arts and manufacture; perfect cultivation of land; exact execution of every office and duty) through hard work and industry (Hume 1963a:183).

"The fourth circumstance, whence arises the misery and ill of the universe, is the inaccurate workmanship of all the springs and principles of the great machine of nature" (Hume 1963a:184). Hume appreciates the way all parts of nature hang together and are accurately adjusted. If any small part is touched, it affects the whole. "Thus, the winds are requisite to convey vapours along the surface of the globe, and to assist men in navigation: but how often, rising up to tempests and hurricanes, do they become pernicious? Rains are necessary to nourish all the plants and animals of the earth: but how often are they defective? What more useful than all the passions of the mind, ambition, vanity, love, anger? But how oft do they break their bounds, and cause the greatest convulsions in society?" (Hume 1963a:184-185). He considers the a priori of a deity that could have created all for the better, but immediately discards the idea as too presumptuous for blind creatures. Nature has to be as it is. "The whole presents nothing but the idea of a blind Nature, impregnated by a great vivifying principle, and pouring forth from her lap, without discernment or parental care, her maimed and abortive children" (Hume 1963a:186).

THE WORLD OF VOLTAIRE

Voltaire's age is typified as *l'âge de lumière, l'âge philosophique, siècle de la bienfaisance, siècle de 'humanité'*. It is broadly coextensive with the 18th century, beginning with the Revolution of 1688 and the writings of Locke and Bayle, and ending with the American Declaration of Independence of 1776 and the French Revolution of 1789. In general terms, the period was characterised by the optimism of Leibniz[20] and Pope, a shift of emphasis from old to new anthropological metaphysics, from a preoccupation with natural science to the life sciences, a turning away from dogma and traditional conventions, and critical reappraisal of established authority in religion, politics, philosophy and the arts. The aim was a secular, social ethic which could be defended 'by reason' without invoking supernatural revelation, and which would therefore be universal and secure (Adams

[20] Leibniz published his *Théodicée* in which he focuses on the problem of moral evil in 1710. He cannot regard moral evil as an imperfection staining the Creator's own activity, and he prefers to interpret it as due to metaphysical evil, the imperfection characteristic of all finite existence. Leibniz's appeal here is to his principle of the 'compossibility' of God's attributes. God in his omniscience recognises what we ourselves must understand, that any created world would have some imperfection. In his infinite goodness he has chosen the least imperfect world, and by his omnipotence he has created it, 'the best of all possible worlds'. Leibniz states it as follows (1966:73) "Nevertheless, when one says that the goodness alone determined God to create this universe, it is well to add that his GOODNESS prompted him antecedently to create and to produce all possible good; but that his WISDOM made the choice and caused him to select the best consequently; and finally that his POWER gave him the means to carry out actually the great design which he had formed." For Leibniz (1966:79) God's wisdom only shows the best possible exercise of his goodness: after that, the evil that occurs is an inevitable result of the best. He continues: "I will add something stronger: To permit evil, as God permits it, is the greatest goodness (79-80). Leibniz' theodicy was judged as precarious in its theological implications. If our woes and sins are basically due to our essential imperfections as God's creatures, we cannot complain of the Creator; but can He then rightly condemn us for being such as He has created us?" Leibniz's reduction of the moral antithesis, good-evil, to a metaphysical one, infinite-finite, has been criticised as compromising ethical judgment and all basic valuation, human or divine. Voltaire's irony may be recalled here: "If this is the best of all possible worlds, what must the others be like?"

1966:82). The human situation and human liberty, humans' place in society, the interrelation of social and natural phenomena became the guidelines of thought.

The body of citizens with a say in public affairs included the new bourgeoisie with its growing affluence. The new middle class was imposing its values on society, using commerce and education as vehicles of social change. The hold of the clergy lessened, as did papal domination. Dissent was thriving in the new, less hierarchical society; religion gained new and deepened meaning in various social strata, from philosophical deism and Rousseau's religion de Genève to popular revival movements like Pietism and Methodism. A spate of printed material circulated: periodicals, encyclopaedias, novels, histories, newspapers, as well as book clubs and circulating libraries. Voltaire's books sold one and a half million copies within seven years. On the whole universities were not instrumental in fostering change, largely because of their ties with the established churches.[21] Intellectuals overcame their isolation by forming circles and meeting in coffee houses and salons. Thus the French philosophes combined to produce the Enlightenment's prime enterprise, the Encyclopédie edited by Diderot and D'Alembert from 1751 onwards (Dictionary of the history of ideas, vol. 2, 2003: 91-92).

Continental thinkers like to see the starting-point of modern thought as humankind's three 'humiliations': the recognition that the earth is not the centre of the universe; that humans, rather than being created in the divine image, are creatures of nature like other animals; and that human reason is subject to passions and subconscious urges. To this one should add the human addiction to religion or drive towards metaphysical explanatory principles. In the view of the Enlightenment these 'humiliations' were intellectual conquests dictating the human race's peculiar responsibilities: pursuing scientific truth, individual happiness in

[21] Where these commitments were loose, as in Scotland and Göttingen, the universities played a leading role.

a viable society, and the conditions and limits of liberty. Instead of a static, immutable divine order comes a new sociological perspective; society and culture are regarded as products of history (i.e. of the free, creative human will) and as subject to change (Dictionary of the history of ideas, vol. 2, 2003: 92).

CANDIDE (1759)

Voltaire's Candide was the bestseller of the 18th century. The reason lies beyond the story, in the ideas it reflects – ideas for which the 18th century reader was more than ready. Candide or Optimism, to give the book its full title, endeavours to ridicule the optimism of philosophers like Lessing, Rousseau, Pope (the poet), and Shaftesbury. The late 17th and early 18th century saw the rise of 'Pelagianism' or 'Socianism' (more often called deism), rational Christianity or natural religion, which had close affinities with 'philosophical optimism' and 'systematic idealism'. Its exponents often tried to justify social attitudes like submission and benevolence without recourse to traditional theological sanctions.

Voltaire ridicules Leibniz and Pope's 'Whatever is, is right'. Candide travels to many countries and comes face to face with evil in every one of them – Westphalia, Prussia, Holland, England, Italy, Spain, Portugal, Paraguay, Surinam, Cayenne, Russia, Turkey. Eldorado is the sole exception. The experience of evil is universal: the Lisbon earthquake, murder, rape, hunger, cold, castration, venereal disease, mutilation, plague, flogging, execution, torture, cannibalism, shipwreck, assassination, civil war, prostitution, the Inquisition, the Jesuits of Paraguay, slavery, judicial corruption, religious intolerance and the suffering of the innocent.

Pangloss ('all tongues') and his student Candide maintain that "everything is for the best in this best of all possible worlds". This idea is a reductively simplified version of the philosophies of a number of Enlightenment thinkers, most notably Gottfried Wilhelm von Leibniz. To these thinkers, the existence of any evil in the world would necessarily signify that God is either not entirely good or not all-powerful, and the idea of an imperfect God is nonsensical. In their view people perceive imperfections in the world only because they do not understand God's grand plan.

Master Pangloss taught the 'metaphysico-theologo-cosmolonigology'. He could prove to admiration that there is no effect without a cause; and, that in this best of all possible worlds, the Baron's castle was the most magnificent of all castles, and My Lady the best of all possible baronesses. "It is demonstrable," said he, "that things cannot be otherwise than as they are; for as all things have been created for some end, they must necessarily be created for the best end. Observe, for instance, the nose is formed for spectacles, therefore we wear spectacles. The legs are visibly designed for stockings, accordingly we wear stockings … Swine were intended to be eaten, therefore we eat pork all the year round: and they, who assert that everything is right, do not express themselves correctly; they should say that everything is best" (ch 1:1-2).

Because Voltaire does not accept that a perfect God (or any God) has to exist, he can afford to ridicule the idea that the world must be completely good, and throughout the novel he heaps merciless satire on this notion. In his essay, Bien, tout est bien (Adams 1966:86-91), Voltaire indicates that the idea that all is well may rest on the idea of a perfect God, on unalterable physical principles, on general laws, but "in fact one shouldn't grudge anyone the consolation of accounting as he can for the flood of evils that overwhelm us … The system of all is well represents the author of all nature as a potent, malicious king, who never worries if his designs mean death for four or five hundred of his subjects, and poverty and tears for the rest, as long as they gratify him" (Adams 1966:90-91).

The optimists, Pangloss and Candide, suffer and witness a wide variety of horrors, which do not serve any apparent greater good, but point only to the cruelty and folly of humankind and the indifference of the natural world. Voltaire expresses many of the same sentiments that Hume substantiated philosophically. Pangloss's optimism is based on abstract, supernatural arguments rather than real-world experience, which prevents him from making sound judgments of the surrounding world and taking positive action to redress wrongs. He is meant to lampoon Leibniz's blind optimism and excessive abstract speculation.

Pangloss struggles to find justification for the terrible things in the world, but his arguments are patently absurd, as when he claims that syphilis needed to be transmitted from the Americas to Europe so that Europeans could enjoy New World delicacies such as chocolate. What Pangloss intimates is that in order to attain the good we often have to pay a price, albeit often without any reward.

In chapter 4, on hearing the news of Cunegunde's death, Candide cries:

> "O sage Pangloss, what a strange genealogy is this! Is not the devil the root of it?" "Not at all," replied the great man, "it was a thing unavoidable, a necessary ingredient in the best of worlds; for if Columbus had not caught in an island in America this disease, which contaminates the source of generation, and frequently impedes propagation itself, and is evidently opposed to the great end of nature, we should have had neither chocolate nor cochineal" (ch 4:9).

Candide's optimism prevents him from giving up his sentiments even in the absence of any reward.[22] While Jacques drowns, Pangloss stops Candide from saving him "by proving that the bay of Lisbon had been formed expressly for this Anabaptist to drown in". While Candide lies buried under rubble after the Lis-

[22] A present-day example of this is the New Age so-called idea of synchronicity. The basic idea that everything is related may be true to some extent, but the 'method' used to determine these links and how the individual is affected by it, depends of wild flights of the imagination, utilising every possible association and connotation that come to mind (see James Redfield 1993).

bon earthquake, Pangloss ignores his entreaties for oil and wine and instead struggles to prove the causes of the earthquake. By the novel's end even Pangloss is forced to admit that he doesn't "believe a word of" his own earlier optimistic conclusions.

Candide rejects Pangloss's philosophies in favour of an ethic of hard, practical work. With no time or leisure for idle speculation, he and the other characters find the happiness that has so long eluded them. This judgment against philosophy, that pervades Candide, is all the more surprising and dramatic given Voltaire's status as a respected Enlightenment philosopher.

Eldorado, on which Candide and his friends accidentally stumble, represents utopia. But for all its worth its wealth and comforts, absence of crime and abundant food and knowledge, life lacks verve. If our world was the best of all possible worlds, mirroring Eldorado, the question is whether this boringly perfect, almost eventless world would not have been worse than real life, rife with challenge, passion and suffering. Kahn (quoted in Adams 1966:187) said: "The trouble with any 'perfect' or 'best' world is precisely that it does not leave room for amelioration or for activity, social or otherwise. Paradise, Eden, City of God are places of rest, not to say of otiosity, because they are perfect. As Faust knew so well, if all human needs and wants are satisfied – as they are in Eldorado – life is at a standstill. Science, too, is a museum-like 'palais des sciences', seems to require no further work, for its already existing perfection."

When Candide acquires a fortune in Eldorado it looks as if the worst of his problems might be over. Arrest and bodily injury are no longer threats, since he can bribe his way out of most situations. Yet his new-found wealth brings him misery, as it brings out the worst in people and attracts false friends. In fact, Candide's optimism seems to hit an all-time low after Vanderdendur cheats him; it is at this point that he chooses to make the pessimist Martin his travelling companion. As terrible as the oppression and poverty that plague the poor and powerless may be, money and wealth (the perfect world?) clearly create at least as many problems as they solve.

Candide and his companions find happiness raising vegetables in their garden. The symbolic resonance of the garden is rich and multifaceted. As Pangloss points out, it is reminiscent of the Garden of Eden, in which Adam and Eve enjoyed perfect bliss before the fall. However, in Candide the garden marks the end of the characters' trials, while for Adam and Eve it is where their troubles begin. Moreover, in Eden Adam and Eve enjoyed the fruits of nature without having to work, whereas the main virtue of Candide's garden is that it forces the characters to perform hard, humble labour. In the world outside the garden people suffer and are rewarded for no discernible cause. In the garden, however, cause and effect are easy to determine: careful planting and cultivation yield good produce. Finally, the garden represents the cultivation and propagation of life, which, despite all their misery, the characters choose to embrace. The symbol of the garden urges us to work without rationalising, the only way to make life bearable (Adams 1966:131).

EVIL AND THE BELIEF THAT ALL IS WELL

Nature is not evil. What we interpret as evil in nature is part of the natural environment. Many species are sacrificed in the evolutionary process for it to arrive at a species that survives in its environment. But is human evil natural? This is less easy to answer. The Anabaptist James tells Candide:

> Men must, in some things, have deviated from their original innocence; for they were not born wolves, and yet they worry one another like those beasts of prey. God never gave them twenty-four pounders nor bayonets, and yet they have made cannon and bayonets to destroy one another.

Candide asks Martin whether human nature had always been as corrupt and cruel as it is now.

> "Do you believe," said Martin, "that hawks have always been accustomed to eat pigeons when they came in their way?" "Doubtless," said Candide. "Well then," replied Martin, "if hawks have always had the same nature, why should you pretend that mankind change theirs?" "Oh," said Candide, "there is a great deal of difference; for free will –" (ch 21).

In 1752 Voltaire wrote that the time-worn question of moral and physical evil should only be revived when one has something new to say (Morize 1966:105). The Lisbon quake, as presented in Candide, offered just that. On 16 December 1755 the Poème sur le Désastre de Lisabonne was printed, depicting God as indifferent, even cruel to humanity. Voltaire writes that the conclusion is simple: the catastrophe immediately raises the question of good and evil. What must one think of it? Admit two principles? Believe that all is well? The philosophers offer a priori solutions, metaphysical and absolute. The optimism of Pope[23] and Leibniz is nothing but discouraging fatalism; physical and moral reality give it the direct lie (Morize 1966:106).

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[23] Pope, in his Essay on man (1733-34) emphasised the duty of humans to "submit" because "whatever is, is right" and everything which seems like "partial evil" are really universal good. Pope seemingly holds that evil is an illusion – the unreality of evil theodicies. When seen in a broader, or divine perspective it has a different character (Vicchio 1989:116-118, 208). In his Epistle 1 of his Essay on man Pope (Croly, 1835 Vol.I:26) writes:

> Cease, then, nor order imperfections name,
> Our proper bliss depends on what we blame.
> Know thy own point: this kind, this due degree
> Of blindness, weakness, Heav'n bestow on thee.
> Submit. In this, or any other sphere,
> Secure to be as blest as thou canst bear:
> Safe in the hand of one disposing Pow'r
> Or in the natal or the mortal hour
> All nature is but art unknown to thee;
> All chance, direction which thou canst not see;
> All discord, harmony not understood;
> All partial evil, universal good;
> And spite of pride, in erring reason's spite,
> One truth is clear, whatever is, is right.

CONCLUSION

Theology must find space in a world increasingly populated with secular, non-theological ideas. The evolutionary traces of morality and religion are becoming increasingly evident. For Shermer (2004:149,251) evolution generated moral sentiments because it needed a system to maximise the benefits of living in small bands and tribes. Evolution created and culture honed moral principles because of the further need to curb the passions of body and mind. And culture, primarily through religion, codified those principles in moral rules and precepts.

Perhaps a commodious attitude is the best way to deal with theodicies. Within this relationship there must be space to say: "Let science be science and theology be theology." The beauty of metaphysical systems lies in the game it permits within their confines. To end the narration of our joy and sorrow, our fear and hope would be to kill the passion of our metaphors and myths. The same goes for the genre of theodicy. To let go of human teleologies would be to violate hope. The credibility of our hope requires, however, a critical teleology.

We cannot consent to 'bad theodicies'. Vicchio (1989:208-209) has indicated that theodicies must be logical, true to the form of life out of which it arises, and must take the individual sufferer seriously. We cannot evade the fact that we humans always perceive the world as already interpreted within a specific anthropomorphic[24] frame of mind. Hence what science may interpret as natural may become evil in a human context. Science could rid us of improper and superstitious interpretations, of myths and metaphysical theodicies that keep us in bondage – but would this not leave us detached, emotionless observers, uninterested in the world around us, resigned to cultivating our

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[24] Hume (1963:41-41), says in this regard: "There is an universal tendency among mankind to conceive all beings like themselves, and to transfer to every object, those qualities, with which they are familiarly acquainted, and of which they are intimately conscious. We find faces in the moon, armies in the clouds; and by a natural propensity, if not corrected by experience and reflection, ascribe malice or goodwill to everything, that hurts or pleases us."

own little garden? While our theodicies or unrealistic optimism may serve as a panacea for the human predicament, they simultaneously render us immobile.

The value of Hume's work is that it makes us aware of fallacies of the mind, especially when imposing unwarranted causal relations and causal necessities on events. This becomes acute on the level of interpersonal relations and morals. We are aware of the limitations of the idealism of thinkers like Hume and Berkeley. Idealistic critique must be combined with realistic notions in what we call critical realism. But we need more than just critical realism. We need a critical values approach, which combines the insights of natural science and philosophy with other human values. These values must be critically scrutinised to rid them of cultural and religious idiosyncrasies that run counter to the insight of our time. The preservation of our planet, human dignity, the will to believe, hope and commitment are some of the commonalities that could unite us in a critical values approach.

Candide urges us to move beyond self-deceptive rhetoric and face up to the fallacies of our time.

Voltaire sought to redress the wrongs of his world and initiate reform on all levels of human life. This is a legacy worth pursuing. Any theology that keeps its followers immature renders them a disservice. Voltaire's satire betokens humankind's coming of age.

On the more 'serious' level of the science-religion interaction we have to deal with confronting worldviews. Theology cannot simply be relegated to poetry or metaphysics. Good theology must consistently juxtapose different interpretations of worldview and trust religious intuition to evolve in this context. The challenge for theology is to engage with nature, especially in its techno-scientific mode, in a manner that opens up credible vistas of the transcendent, comprehending the experience of awe, wonderment, respect and worship.

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THE METAPHYSICAL MIND IN ITS PHYSICAL ENVIRONMENT: RELIGIOUS IMPLICATIONS OF NEUROSCIENCE

INTRODUCTION: THEOLOGY AND SCIENCES OF MIND

Sciences of the mind have mushroomed since the 1990s. Three major fields are neuroscience, cognitive science and Artificial Intelligence.[1] Cognitive science comprehends a cluster of disciplines dealing with mental functioning: motor control, perception, recognition, language, memory and reasoning.[2] One

[1] Theories of consciousness are not limited to specific disciplines, however. Philosophies of mind abound and provide a meaningful background to the debate. Of interest is the quantum mechanical approach, which has recently become a popular model to explain consciousness. According to Scott (1995:140) its attractiveness may stem from a law of minimisation of mystery, according to which consciousness is mysterious and quantum mechanics is mysterious – since the two mysteries may have a common source. For Hodgson (1991:383-385) a strong indication of the close relationship between mental events and the development of quantum physical states is the element of non-locality in both. Mental events bring together, non-sequentially, elements associated with spatially separated physical events, and in that respect are indifferent to spatial separation. It follows that mental events somehow span space to permit simultaneous experience of, and action upon, matters associated with spatially separated physical events. According to the theory of relativity (instantaneous) correlations can be effected between spatially separated events only in the quantum world (see also Chalmers 1996:333-358). The applications are, however, limited and function only by way of analogy.

[2] Cognitive science, first started in the 1970s, studies conceptual systems. These systems may be seen as the cornerstone of rational functions. They include memory and attention, thought and language. Cognitive science holds that reason is not disembodied but arises from the nature of our brains and bodily experience. Reason builds on and makes use of forms of perceptual and motor inference. It is a bodily function. Many conceptual inferences are sensorimotor inferences. Reason is not seen as universal in the transcendent sense. It is largely unconscious, metaphorical and emotionally engaged (Lakoff & Johnson 1999:4, 10, 20). Human categories are conceptualised in prototypes. Each prototype is a neural structure that permits us to execute some sort of inference or imaginative task, relative to a category. To make sharp distinctions we develop essence prototypes, which conceptualise categories as if they were sharply defined (Lakoff & Johnson 1999:19-20). The main contribu-

branch of cognitive science deals with computer modelling of mental processes (Murphy 1998:14). Other important fields of study include behavioural neuroscience, which probes the neurobiological substrates of behaviour, while cognitive psychology deals with aspects like human learning and memory. Arbib (1999:81) distinguishes between brain-talk, mind-talk and spirit-talk. Brain-talk concerns lesion data, anatomy, neurophysiology and neurochemistry. Mind-talk is about intention, action, perception, consciousness and responsibility. Together they are regarded as neuroscience embedded in cognitive science. Spirit-talk is construed as mind-talk or God-talk, something that regards identity as rooted in our relation with God. Although these approaches can be distinguished, they cannot be separated. To avoid reductionism mind-brain sciences must take into account the whole person in its environment and different contexts. This seems to be an unattainable goal. Such is the nature of complex systems, and the human person embodies ultimate biological complexity.[3] However, neuroscientific models of religious experience abound and challenge theologians to respond.

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tion of cognitive science is that it denies that reality, divided into categories, exists independently of human minds and bodies. We impose a rational structure on the world. The world does not have a fixed category structure. Lakoff and Johnson (1999:77) identify a basic level of concepts that arises partly from our motor schemas and our capacity for image formation. Our brains are structured to project patterns from sensorimotor areas to higher cortical areas. The basic level is the highest level, at which we have mental images that stand for an entire category (Lakoff & Johnson 1999:27). It is the level at which most of our knowledge is organised. Metaphysical realism seems to work at this level (Lakoff & Johnson 1999:29). They also distinguish colour and spatial relations concepts, which link up with basic level concepts (see Lakoff & Johnson 1999:23ff, 30ff). Since these concepts are about what the body does, namely perceive and move, they infer that the body actually shapes these concepts (Lakoff & Johnson 1999:39). The biological perspective and the focus on our sensorimotor systems explain why our concepts fit the way we function in the world so well (Lakoff & Johnson 1999:43). We acquire a large system of primary metaphors automatically and unconsciously simply by functioning in the most ordinary ways in the everyday world from our earliest years, and so we all naturally think in terms of hundreds of primary metaphors (Lakoff & Johnson 1999:47, 59). The cognitive unconscious has the following properties: it is intentional, representational, propositional, truth-characterising and causal (Lakoff & Johnson 1999:116-117).

3 Given 100 billion neurons, each with on average 3 000 connections, every human being has something like 100 trillion (10^{14}) synaptic switches.

Many scientists reduce the religious aspects of human culture to brain functions under specific circumstances. For some the mind has simply become brain. The human person and her experience of reality are seen from the perspective of brain functions. The concept of soul is replaced with that of mind.[4] The experience of awe and mystery (Rudolph Otto's *mysterium tremendum et fascinosum*), of the transcendent, hearing voices from God, seeing angels, devils or UFOs, typical near-death experiences and the like can allegedly be explained as brain functions occurring under certain circumstances. Is God really something that exists 'out there', beyond and independently of us? Or is God the product of an inherited human perception, the manifestation of an evolutionary adaptation that exists exclusively within the human brain?

The way the brain is involved in religion is a peripheral topic in the sciences. It is linked to the problem of how the brain generates any kind of consciousness, which may well be one of the biggest mysteries left for science to solve. Brain-mind studies have aptly been called a 'mindfield'. Although such studies have progressed far beyond the notorious Cartesian idea that the mind is transparent to itself, they lack a clear interdisciplinary terminology and reference system, while confusing models and metaphors abound.[5] The question is whether neuroscience,

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4 Soul-body dualism has been rejected by most theologians as part of the Platonic and Cartesian legacy. Instead, the meaning of terms like 'body', 'soul' and 'spirit' is considered to overlap and they are used in a functional way to describe phenomena of human existence (Anderson 1998:182). Similarly, 'mind' cannot replace the traditional meaning of 'soul' as a separate entity endowed with an eternal nature. For a thorough discussion of the theological development of the soul concept, see Brown et al (1998).

5 Apart from viewing brain functioning as analogous to metaphor, it is important to note that neuroscientists use diverse metaphors to understand the working of the brain. Happel (1999:294-295) mentions metaphors like landscapes and maps, transmitters and receivers, keyboards, housing and rooms, mosaics, networks, machines, computing centres with inputs and output, and even scripts, drama, actors and audiences. Apart from viewing the human brain from a metaphoric perspective, its actual functioning could be seen as metaphorical. This presupposes not only the metaphoric nature of language, but also the metaphoric way in which humans interact with their environment. There are usually many ways of solving a problem, responding to challenges and interacting with people. Depending on circumstances, value systems, level of personal creativity and the input of different examples and

neuropsychology, cognitive science, philosophy and religious studies can come together in a meaningful dialogue.

Theology, a relative newcomer to the debate, is faced with fundamental challenges it cannot ignore. Arbib (1999:81) argues that we cannot approach theology without some sense of the intricacy of the human brain. The possibility exists that religion can be reduced to nothing more than brain chemistry. Arbib (1999:81) believes, for example, that religious longing can be explained in terms of the physical properties of the brain. He sees theology as the study of those aspects of the human condition for which many have found an answer in God. Neuroscience and science in general, increasingly see God as non-interventionist: he does not capriciously change the laws of physics or work miracles in response to prayer (Arbib 1999:100). In the science-religion debate God's activities in the world are increasingly linked to the natural order of physical reality. Peacocke (1999:244ff) is a good example. With reference to God's action on the level of the human brain, he says that experiences of God often seem ineffable, indescribable in terms of any other known experience or by means of any accessible metaphors or analogies. Therefore it must be possible for God to influence those patterns of events in human brains which constitute human thoughts, including thoughts of God and a sense of personal interaction with God.

The point of departure in this article is that religion and religious experience are a necessary product of human biological and cultural evolution.[6] The universal appearance of religion in all its

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associations, the person acts uniquely in each situation. This metaphoric style of living is what makes life interesting and unpredictable. Without it we would operate in much the same way as computers run their programs.

6 Ashbrook and Albright's *The humanizing brain* (1997) represents one of the most astute efforts to link brain functioning with theism. They use the hypothesis that the human brain is the product of three major structural and functional developments: the reptilian, paleomammalian and neomammalian brain. The reptilian brain's major structure is the brain stem, the paleomammalian brain's major structure is the limbic system, while the neomammalian brain includes the human neocortex. The functions of each of these structures correlate with attributes of the trinity, used as a suggestive analogue for understanding clues to God's way of being God (Ashbrook & Albright 1997:51). According to Ashbrook and Albright (1997:15) faith is built into

forms and functions proves this. Religion (including the myths and superstitions often linked to it) seems to be indispensable to humans. According to Teske (2001:93) human spirituality is a product of the very processes of human evolution that make the social construction of human culture, human meaning and individual psychology possible. Brain-mind studies can help religious people to understand their religious experiences. The theological emphasis on the human person as an interrelated unity will help to obviate reductive and simplistic approaches in the debate.

THE MIND'S PROPENSITY FOR RELIGION

Human culture as we know it has always been characterised by awareness of the transcendent, inexplicable and mysterious. It leads to religious phenomena like visions and dreams; encounters with ghosts, angels and demons; and death and near-death experiences. Religion is unimaginable without an experience of divine revelation or some sort of encounter with transcendent reality. These experiences are preserved in holy books, folklore and oral traditions and in the mythologies of different cultures. Since the birth of our species every cultural group, however isolated, has believed in some form of spiritual reality. Does this

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the activity of our biology, our nervous system, our neurocognitive processes, our humanising brain. These authors (1997:44,127) hold that reality is mediated by the lens of the human brain. They acknowledge that this is an anthropomorphic approach (strongly criticised by Rottschaefer 1999:57-66), but suggest that their approach goes beyond anthropomorphism, since reality itself is humanlike, hence any reality we perceive must of necessity be humanlike. Elsewhere Ashbrook (1989:78) states that to use the brain as a basis for analogical expression is in fact a metaphoric model of God. God is not the brain; yet brain metaphors are the most explicit clue to understanding God - more than metaphors of God as lover, friend, father or rock. The attentional capacities and functions of the reptilian brain reflect the ever present, unchanging character of God as well as God's eternity, omnipotence and immutability (Ashbrook & Albright 1997:63-64). The limbic system of the paleomammalian brain (as well as the amygdala and hippocampus) mirror God's interactive, nurturing and persuasive character (Ashbrook & Albright 1997:71-109). When it comes to the neomammalian brain and the neocortex, the authors correlate the functions of the left brain and right brain respectively with God as the source of order and reason (left brain) and with God's relational character (right brain) (Ashbrook & Albright 1997:130; see also Ashbrook 1984:331-350). The frontal lobes, responsible for intentional activity, correlate with God as a purposeful deity (Ashbrook & Albright 1997:132ff).

not imply that spirituality is an inherent characteristic of our species, that is, a genetically inherited trait? Are we 'wired' to believe in universal concepts like God, soul and an afterlife? Are religious experiences the consequence of some divine action, or are they merely the effects of our brain's chemistry, a sensory hallucination that we interpret as spiritual? Recent studies show that such experiences are traceable to neural activity and can even be synthetically induced by electrically stimulating specific brain areas.

Humans, and specifically the human brain, seemingly developed in such a way that they display a propensity for the religious. This propensity does not necessarily preclude the existence of God. For most people interaction with God through prayer, worship and ritual is one of the ultimate experiences of reality. God can also be believed to have created humans in the course of cosmological, evolutionary and biological history as we understand it. This includes the experience of God, mediated by the brain processes discussed in this article. This remains, however, a stance of faith, lacking empirical proof.

EVOLUTIONARY DEVELOPMENT AND THE BIOLOGICAL ROOTS OF RELIGION

In recent studies much has been written about the biological roots of rationality. By the same token we can accept that human emotions and experiences are biologically rooted, hence that religion, too, has a biological base (see Peterson 2003:104ff).

Humans seem to have acquired a strong religious aptitude through evolutionary development. They have been burying and, presumably, weeping over their dead and preparing them for a journey to the hereafter for more than 100 000 years. Joseph (2001:108) reports that it is evident from Upper Paleolithic cave art that the nether world of the Cro-Magnon and other Upper Paleolithic peoples was haunted by the spirits and souls of the living, the dead and the unborn, both animal and human. The preoccupation with the hereafter, and the consequent evolution of religions, seem natural if one assumes that the development of the neocortex and consciousness led to a new awareness of time and space, self and other.

The emergence of a sense of time and space changed the human environment. A species arose which was challenged by questions about the meaning of life (where do we come from and where do we go after death? why are we here?), the relationship between people and world, the interpretation of dreams, and causal relations, to mention but a few. It is quite inconceivable that a species with higher levels of awareness should not begin to ask religious and philosophical questions. Humans were evolutionarily equipped to grapple with questions that inevitably accompany higher states of consciousness. A new worldview changes our environment dramatically. Humans as self-organising (autopoietic) beings develop new systems, structures, values, rules and interpretations to deal with a new environment. A new environment generates responses from the organism to the challenges it poses. This is cultural evolution. Typical of most religions is their will to self-preservation (conservation of traditions and their values), their expansionist drive (history of mission) and defence of their values (religious wars, persecutions, martyrdoms). Wilson (1998:280) sees religions as analogous to super-organisms. They have a life cycle: they are born, grow, compete, reproduce, and in due course most of them die. In each of these phases religions reflect the human organism that nourishes them.

The capacity to find meaning and experience God was impossible before the development of the neocortex, which permitted the faculties of consciousness, language and morals. From a religious point of view one could say that the evolution of humans and the creation of a cultural environment paved the way for religion and enabled humans to perceive and worship God. Changing worldviews and different ways of finding meaning influence the way religion is practised and the divine is experienced. Belief in God adapts to the needs of each era.

The cultural environment leaves ample space for God to influence human minds in ways that are congruent with their biological nature. Religion can harmonise with our biological drives. Both genes and culturgens (cultural DNA, encoded in language, cultural artefacts and traditions) conserve what is typical of the species. Religion accords with the primary drives of preservation and survival. The basic tenets of Christian belief are not incompatible with the story of life as it unfolds in evolutionary biology. The biological roots of religion do not exclude the reality of God. Rolston (1999:38), for example, considers God to be the explanatory dimension for which contemporary biology leaves ample scope.

MODELS OF THE MIND-BRAIN RELATIONSHIP

There are many models to explain the mind-brain relationship. They vary from a reduction of mind to pure physicalism on the one hand to substantivising mind into something separate from the physical on the other. The most popular and acceptable view is that mind and brain form a unity, although mind is not just physical. We shall examine some of these models, with special reference to supervenience theories of mind. But first a few introductory remarks on brain and mind.

Brain

The brain is determined by the neurochemistry of the body. Changes at the molecular level lead to global personality changes. Individual neurons, governed by their chemical makeup, contain one of many different neurotransmitters that are used for communication from one cell to another. Most brain-imaging techniques[7] begin by taking an image of the brain at rest to establish a baseline, followed by another, called an

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[7] CAT scans (computerised axial tomography) make it possible to study correlations between abnormalities and human behaviour. PET scans (positron emission tomography) permit research correlating localised brain activity with the performance of specialised cognitive tasks. MRI scans (magnetic resonance imaging) provide more detailed pictures revealing locations of brain damage. SPECT is single photon emission computed tomography. EEG (electroencephalograph) measures brain waves.

activation study, during the performance of some activity. Brain-imaging techniques are used to determine the various brain structures involved in different religious experiences. In the normal mode of brain functioning everyday experience is that of time and matter, and the output of the brain is self-operative. Neural impulses normally follow certain pathways to produce the perceptions associated with our five senses and the muscle movements associated with the motor systems of the brain. But neural impulses can also travel a fundamentally different route through the same labyrinth of neural circuits. In this rare mode senses, time and movement lose their usual perceptual boundaries. This mode is called a state of Absolute Unitary Being (AUB) and represents a mystical, religious experience (Holmes 1993:204). This brings us to the question of mind and its independent ontological status.

Mind

In the present context we understand mind broadly as consciousness (having thoughts, perceptions and feelings), awareness, soul, the seat of self-identity and self-understanding. This includes humans in all their relationships – their cultural, linguistic, religious and personal context, that all contribute to the specific character of the stream of conscious experience. The complexity of mind as the hub of all factors constituting the person makes it extremely difficult to define, model or explain it. The mind can be viewed from, among others, a psychological,[8] a phenomenological, a philosophical, a neurological and a religious angle. Each approach has its own terminology and interests. Our present interest is to understand the nature of mind and its brain-body link. The mind is never empty. An unbiased, objective approach to mind is impossible.

Mental properties are epistemologically irreducible to physical ones. They emerge from physical properties and are dependent

8 Chalmers (1996:26-27) mentions some psychological notions for which the term 'consciousness' is used. They include: wakefulness, introspection, reportability, self-consciousness, attention, voluntary control and knowledge.

on them, but cannot be reduced to them (Peacock 1999:230). We cannot simply refer to the lower brain state level as physical and the higher brain state level as non-physical. We understand too little about neurologically organised matter to explain the manifestations of the mental or the spiritual (Stoeger 1999:143,135). The question is whether mind has independent ontological status, or whether it is simply a brain function.

The tradition of empiricism with its focus on physically observable reality views the metaphysical or trans-physical as transcendentalism. The post-Cartesian age is anti-dualistic and pro-integrationist. It could happen that mind-body integration may eventually favour a one-dimensional physicalism and materialism at the cost of spirituality. It seems likely that evolutionary biology, cognitive science and neuroscience will ascribe morality, spirituality, religion and values to a physical, this-worldly source rather than to a transcendent cause (see Wilson 1998:261). But let us briefly look at some models of the mind-brain relationship:

- Dualism (Eccles, Popper): This is the Cartesian tradition. Mind (soul) and body are separate entities. The person is seen as soul. John Eccles favoured dualism, because he could find no explanation for mind other than the postulate of a nonmaterial mind or soul.

- Holistic dualism: The person is a composite of separable parts but is to be identified with the whole and is seen as a unity.

- Reductive materialism/monism (Paul Churchland, Sidney Shoemaker): Mind (soul) and brain are identical.

- Non-reductive physicalism (Nancy Murphy, Roger Sperry, John Searle): This is a form of monism that stresses the oneness or unity of reality as its essential aspect. The person is a unitary physical organism without a separate, non-physical soul, but is not reducible to the physiology of cells or the chemistry of molecules. The complex functioning of humans in relationships gives rise to higher human capacities, such as morality and spirituality (Post 1998:195). Murphy (1998:128) sees no need to postulate anything beyond ordinary experience to account for our ability to relate consciously to God. Non-reductive physicalism denies the existence of a nonmaterial entity (mind or soul) but does not deny the existence of consciousness or the significance of conscious states or other mental phenomena (Murphy 1998:130-131). Searle (1992) maintains that consciousness has ontological status. He rejects both dualism and materialism and accepts that consciousness is both a qualitative, subjective mental phenomenon, and at the same time a natural part of the physical world.

- Eliminative/reductive materialism (Jacques Monod, Richard Rorty, Francis Crick, Daniel Dennett): The person is a physical organism, whose emotional, moral and religious experiences will all ultimately be explained by the physical sciences. For Crick (1994) the mind is nothing but molecular biology. He believes that a complex system such as human consciousness can be explained by the behaviour of its parts and their interactions.

- Emergentist monism (Clayton 1999:209ff): This model recognises the existence of only one kind of thing. There are no two substances like the Cartesian *res extensa* and *res cogitans*. The world is one and constitutes a distinct order. The person is a complexly patterned entity within the world with diverse sets of naturally occurring properties, each of which needs to be understood by a science appropriate to its own level of complexity (ontological pluralism). The multiple layers of explanation (explanatory pluralism) account for the physical, biological, psychological, spiritual and other dimensions of the human person.

- Supervenient theories of mind: The human mind is literally a metaphysical phenomenon. Like all metaphysics it is linked to the physical, but transcends it; it operates with physical concepts, denotative language and the physical environment to construct a world that supervenes the physical.

The challenge is to combine the different aspects of the human makeup and explain how the many brain networks cohere to constitute a personality. This is undertaken by computational neuroscience, in which computational models provide the most efficient way to make the complex, non-linear interactions between different elements at one biological level 'fit' the constraints of the next, higher level (Arbib 1999:85-86).

Consciousness, although a property of the physical brain, is not physical but real. This means that not only physical entities are real, otherwise consciousness would be an illusion. Physical and non-physical entities are thus related in a peculiar way.[9]

Mental states supervene on brain states. Generally speaking a particular mental state, or a particular sequence of brain states, each of which is a necessary condition for a certain mental state, will not be completely determined by the brain states themselves but by constitutive relationships at the level of mental states (Stoeger 1999:143-144). Physical explanations of thoughts, feelings and emotions should be distinguished from

[9] Murphy (1999:xi) alleges that every time a mind introduces new energy into the world an equal amount of energy departs, in some mysterious way, from the universe – that is to say, if we observe the law of conservation of mass-energy. Both the physical world and the human brain can be seen as the interplay of matter and energy (Ashbrook & Albright 1999:139). Stoeger (1999:134) believes that we have to include life, consciousness and mental capacity as possible properties of matter, or of entities with mass-energy, even though we do not yet understand the laws of nature that relate to these remarkable characteristics. He bases this conclusion mainly on the fact that mass-energy is highly organised in definite ways. Many inanimate systems have lifelike qualities. What distinguishes genuine living organisms from merely lifelike systems? There is a nonmaterial something inside living organisms, something unique and, literally, vital to their operation. That something is not molecules, for they are not living things. It is only a system of molecular processes that, taken collectively, may be considered alive. The nonmaterial something is information, answers Davies (1999:30, 36, 40, 92, 61ff). Penrose (quoted by Clayton 1999:193) believes that there is no such thing as a conscious substance that is ontologically a different sort of thing from physical phenomena. The information operative in consciousness, for example, differs from the algorithmic kind found in genes.

explanations of those states in their own terms and within their own interrelationship. Thoughts have an intentional quality (intentionality) – they are 'eccentric' in the literal sense of being outside themselves, focused on things outside themselves.

Supervenience[10] designates a dependent but generally irreducible relationship that higher-level states have with lower-level states or properties. Supervenience is a relation between two sets of properties: B-properties (high-level properties) and A-properties (basic, low-level properties). A-properties are usually physical (brain and body, in our context). They are enforced by a complete theory of physics, which includes mass, charge, spatiotemporal position, the exertion of various forces and so on (Chalmers 1996:33). Chalmers (1996:35) distinguishes between logical and natural supervenience. Natural supervenience is nomic or empirical. Logical supervenience is defined in terms of logically possible worlds (and individuals). Biological properties, for example, supervene on physical properties. Even God could not have created a world that was physically identical to ours but biologically distinct. One could imagine a B-property that may be logically possible, but which could never occur in the real world because it is naturally impossible.

Chemical properties are supervenient – or supervene – on physical properties, and mental states are supervenient on brain states (Stoeger 1999:142). Clayton (1999:199-ff) distinguishes between strong and weak supervenience. In strong supervenience there is a direct and full relationship of dependence between the mental and the physical. The physical determines the mental in its emergence and in all its subsequent behaviour. Micro properties completely determine the macro properties. Mental properties are macro properties. Weak supervenience means that although physical structures and causes may determine the initial emergence of mental states, they do not fully

[10] Epiphenomenalism is similar to supervenient theories of mind. It is a theory that conscious mental life is a causally inconsequential, immaterial by-product of physical processes in the brain. Mental life is something other and more than its conditions of origin.

determine the outcome of subsequent mental life. Mental states are dependent on, but not reducible to, physical causes. There are mental causes that are not themselves products of physical causes.

But what is the nature of these independent thought processes? They cannot be non-physical, since no thought, awareness or form of consciousness has a non-physical source. What weak supervenience seems to suppose is a level of thought that exists on its own and in a sense comes from 'above' or from 'outside', independently of lower physical causes.

The problem lies in the isolation of brain and mind. No form of life can be isolated from its environment. In the case of humans, the brain is adapted to serve a highly complex form of life in a complicated and ever changing environment. Mind represents the 'conscious buffer' between a physical, supportive organism and its creative interaction with its environment.

What weak supervenience denies is that mental events or concepts are physically based. It holds that mental events are of a different type from physical events. The reason for positing their more-than-merely-physical character is to maintain the eminence of the human person and allow for God's physical, independent interaction with human persons. It is, however, unnecessary to 'transcendentalise' brain functions in order to preserve human uniqueness and dignity. I believe it is possible to maintain the physical dependence of thought processes as well as their soulful, free character. It is similar to the distinction between the rules of a game and the game itself, or the notes of a Bach fugue and the improvised manner in which it is played. Although the rules of game/notes of a fugue are fixed, the game or the performance cannot be predicted. In a sense the game exceeds the rules and the performance of a piece of music exceeds the score. The human brain may work according to physical rules, but the human person's interaction in a specific context under specific circumstances is open and free. To introduce a 'soul substance' into the mind would be to abandon the debate between theology and neuroscience and would put us back on the road of dualism.

The following statements by Clayton (1999:204ff) strike me as valid. Mental predicates represent a type of property, not a new form of substance; mental causation does not involve the addition of new energy to physical systems; mental processing does not occur without concurrent physical activity; mental causation is not supernatural but natural. The case for emergent mental causation is not in itself a case for the existence of God, divine action, an eternal soul or life after death.

NEUROPSYCHOLOGICAL MODELS OF RELIGIOUS EXPERIENCE

D'Aquili and Newberg propose a physicalist account of extraordinary religious experience. The amygdala, hippocampus and inferior temporal lobe appear to subserve and provide the foundations for mystical, spiritual and religious experience and the perception, or perhaps hallucination, of ghosts, demons, spirits and belief in demonic or angelic possession. According to Joseph (2001:1906) the commonality of the limbic system to all peoples might explain why belief in souls, spirits, haunted houses, angels or demons, and the capacity to have mystical experiences (including the sensation of being possessed by gods or devils, or hearing voices) are worldwide. He argues that the essence of God and of our living soul may be slumbering in the depths of the ancient limbic lobe, buried in the belly of the brain (Joseph 2001:107).

To follow the argument one has to be aware of some principles of brain organisation. It must be remembered that brain functions can be localised to a certain extent, but no one part of the brain is the site of a particular function (Newberg & D'Aquili 2000:57).[11] The brain is always creating. All the nerve and

[11] According to this view the idea of a 'God-spot' in the brain, proposed by Ramachandran and others, cannot be maintained. See also the work of Zohar and Marshall. There is no single locus for God or the soul in the brain.

nerve connections change with every new experience (Newberg & D'Aquili 2000:54). The brain receives all its input from the various sensory organs throughout the body and this input is dynamic and variable.

The two hemispheres of the brain represent two independent consciousnesses. The left hemisphere is associated with non-verbal awareness of the environment; visual-spatial perceptual functioning; facial recognition; maintenance of body image; and the mediation of most aspects of emotionality. It also governs expressive speech, linguistic knowledge and thought; mathematical and analytical reasoning; and the temporal-sequential aspects of consciousness (D'Aquili & Newberg 993:178-179).

D'Aquili and Newberg (1993:179-181) postulate four tertiary association areas: the inferior temporal lobe (ITL); the inferior parietal lobe (IPL); the posterior superior parietal lobe (PSPL); and the prefrontal cortex, which in relationship with the limbic system and under certain conditions may involve the genesis of various mystical states, a sense of the divine and subjective experience of God.

The right parietal lobe plays an important part in generalised localisation and the sense of spatial coordinates per se, whereas the left PSPL exerts an influence with regard to objects that may be directly manipulated. Some neurons in the left PSPL and other neurons respond to stimuli just beyond arm's reach. The distinction between self and world may ultimately arise from the left PSPL's ability to judge these two categories of distance (D'Aquili & Newberg 1993:182). The posterior superior temporal lobe helps us orient ourselves to the rest of the world. The inferior temporal lobe neurons scan the visual field in order to alert the organism to objects of interest which are detected and fixated upon. The inferior parietal lobe (IPL) is an association area which maintains rich interconnections with the visual, auditory and somatic association areas. The IPL is responsible for generating abstract concepts and relating them to words. It is involved in conceptual comparison; automatic ordering of conceptual opposites; the naming of objects and categories of objects; and higher-order grammatical and logical operations.

The limbic structures (hypothalamus, amygdala and hippocampus) control the sensation, modulation and expression of emotion. The hypothalamus seems to be an extension of the parasympathetic nervous system into the brain stem. It is the trophotropic (energy conserving) system involved in organismic homeostasis. By contrast, the lateral hypothalamic structures seem to be an extension of the sympathetic nervous system, called the ergotropic (energy-expending) system, involved with 'fight or flight' responses, sensations of fear or of positive emotions. The hippocampus seems to prevent emotional extremes and acts in a modulating, moderating fashion on both the amygdala and the hypothalamus. The hippocampus's primary function is quiescent in that it helps to maintain baseline body functions via the hypothalamus and quiescent system (Newberg & D'Aquili 2000:57). The amygdala (which is intimately connected with the hypothalamus) is primarily associated with arousal activities. It enables us to hear sweet sounds, recall bitter memories, and determine if something is spiritually significant, sexually enticing or good to eat. According to Joseph (2001:112) it enables us to experience the spiritually sublime, is concerned with most aspects of emotion, and allows us to store affective experiences in our memory or even re-experience them. The amygdala enables us to experience emotions such as love and religious rapture. Some individuals report communing with spirits or receiving profound knowledge from the hereafter following amygdala/temporal lobe stimulation or abnormal activation (Joseph 2001:113).

The prefrontal cortex receives afferent fibres from all sensory modes. It mediates images and complicated imaginal patterns. It provides the ability to plan and orients the individual to future behaviour. It is the seat of the will or of intentionality.

According to Joseph (2001:113), the amygdala, hippocampus and temporal lobe are richly interconnected and appear to act in concert in mystical experience, including the generation and experience of dream states and complex auditory and visual hallucinations, such as those induced by LSD. Intense activation of the temporal lobe, hippocampus and amygdala is reported to give rise to a host of sexual, religious and spiritual experiences, and chronic hyperstimulation can cause a person to become hyperreligious or to visualise and experience ghosts, demons, angels and even God, as well as to claim demonic and angelic possession or the sensation of having left his body.

A crucial aspect of the neurophysiological model of mystical states is the concept of deafferentation, which means that the neural input into a structure is 'cut off'. It can be a result of surgery, a destructive tumour or inhibitory fibres from other nervous system structures. When significant deafferentation occurs the cells in the structure begin to fire either randomly or according to the 'internal logic' of the structure. Almost all examples of functional deafferentation are located in the prefrontal cortex and are therefore 'willed' or 'intended' by the subject, as in Theravada meditation and some Zen schools (D'Aquili & Newberg1993:185-186).

Note that extraordinary or alternate states of religious experience[12] should not necessarily be elevated above 'normal' religious experiences. Although alternate states of religious experience require extraordinary conditions and involve some of the brain functions described above, theologically speaking they do not provide special access to God. They should also not be pursued for this reason. No special faculty is needed to experience religious realities. What makes an experience religious is a meaningful combination of ordinary experiences under circumstances that make it apparent that God is involved in the event in a special way (Murphy 1998a:143). The endeavour to explain extraordinary or mystical experiences of any kind in terms of brain functions should not be seen as a threat to the future of religion or belief in God's existence.

[12] Murphy (1998a:143) lists the following kinds of religious experience: interpretive, quasi-sensory, revelatory, regenerative, numinous and mystical.

RELIGION: MORE THAN JUST A BRAIN FUNCTION?

Viewed from a neuroscientific or evolutionary perspective, religion remains tremendously important to humans. Without venturing into the philosophical question of realism one can agree with Küng (quoted by Kerr 1999:31ff) that the modern history of epistemology from Descartes, Hume and Kant to Popper and Lorenz has made it clear that the existence of any reality at all, independent of our consciousness, can be accepted only in an act of trust. Consequently it is not strange to have nothing more 'substantial' than an act of trust on which to found our belief in God's existence. There is no logically conclusive proof of the reality of reality; nor is there any such proof of the reality of God. Belief in God's existence is a basic decision. We usually assume that religious experiences come from outside ourselves, from God.

Thinking about the mind-brain relationship presupposes a holistic view of human beings in their environment. Personhood cannot be explained in isolation; nor can the phenomenon of mind and consciousness.[13] Our brains evolved primarily as organs of social cooperation and understanding, involving the construction of symbolic representations and mechanisms to reach social agreement. Individual aspects of neurodynamics and neu-

[13] Arbib (1999:87, 97) uses schema theory for the integration of personhood. Schema theory is an approach to cognitive neuroscience which explains behaviour in terms of concurrent interaction of many functional units called schemas. They are composite units of action, thought and perception. Schemas are processes, internal models that guide an organism's interaction with the world. Although schemas are rather small functional units, they involve the cooperative computation of many structural units. Arbib distinguishes between basic, neural and social schema theories. Basic schema theory provides a basic language which matches mental states; neural schema theory concerns the functional level data analysis of brain localisation, neurochemistry and the downward extension of schema theory, which moves from psychology and cognitive science to cognitive neuroscience. Neural schema theory links schemas to the structural entities of neural circuits. Social schema theory reconciles the collective representations of a community with individual thought processes (Arbib 1999:87-88, 96). Our lifetime of experience might be encoded in a personal encyclopaedia of thousands of schemas. Perception is active as our current schemas determine how we act and what we take from the environment. Schemas determine our expectations of what will happen. They are closely linked to memory and the accumulated assemblage of past experiences (Arbib 1999:89-91).

rochemistry cannot be properly understood without taking societal aspects into consideration (see Teske 2001:102). Neuroscience alone cannot fully account for human nature or human spirituality, because many of the important characteristics of both mind and spirit are not only emergent properties of an individual's central nervous system but may also be social emergents, that is, properties of a number of individuals in interaction. Consequently Teske (2001:95, 103) feels that it is a mistake to look for the origin and locus of religious and spiritual functions within the individual, since the cognitive functions on which they depend are themselves socially generated. It is the culture, the community, the family and other human relationships that differentiate and constitute our individual psychology and provide the emergent capacities for transcending its limitations. The role of the environment cannot be overemphasised. The replication of human culture also depends on the storage devices of institutional religion (Teske 2001:96).

CONCLUSIONS

- Although a case can be made that the mind is simply a brain product, this does not change the way humans experience themselves. We are usually unaware of the chemical processes of the brain, the influence of our limbic and glandular systems, and the sensory input we depend on to operate. By the same token we don't experience ourselves as having bodies – we are our bodies. We 'have' our brains in the mode of consciousness.

- Reality, as human reality, is a construction. Although the 'real' exists 'out there', each of us experiences it according to our own context, expectations and interpretations. While God may be part of this construction, to the believer he is not for one moment less real than any physical reality.

- We love differently and we experience God differently. Rationalising about love doesn't change its impact on us. Understanding pain doesn't take it away. Explaining religious experience in terms of brain functions will not change the way people experience God. Religion, like love, is here to stay. Religion may be explained along with human evolution. It may have developed with the growth of human consciousness to help humans make sense of life. Even if this is so, it doesn't falsify the existence of God or abolish religion. God might even have chosen it to happen this way.

- Mind-brain studies emphasise the unity of the human person. They call attention to the biological roots of human rationality, human experience and religion. They stress the complexity and marvel of the human person. This should enhance our respect for life, especially its religious dimensions as manifested in the great variety of religious experiences and interpretations of God in different cultures.

- Reductionism in any form must be avoided. Religious experience is more than just a number of brain functions. The absence of extraordinary experiences does not reflect on the integrity of one's faith. In spite of all models of brain-mind integration, life remains a mystery.

14

DESIGN, DESIGNERS AND THE DESIGNING GOD: A CRITICAL LOOK AT SOME MODELS

A PURPOSELESSLY DESIGNED UNIVERSE?

The science-religion dialogue centres on the intelligent design principle. This is what divides naturalists from supernaturalists, as stated by Ruse (2002:592):

> Embrace science and you are on the way to methodological naturalism or atheism, and that is a short step from metaphysical naturalism or atheism. Insist on religion and you must reject science, the most important and successful and powerful phenomenon in modern culture. Go with science and you are into the machine metaphor, and that leads to the end of God and the world picture associated with him. Go with God and you turn your back on the modern world and on the reality that is thrust upon you every time you drive a car or cook a meal or use a computer. You must choose, painful as that will be. The legacy of Boyle is with us today, and its problems cannot be avoided. You go with the cold comfortless integrity of Dawkins and his fellows, or you slide back into the sticky morass that is the hallmark of so much contemporary writing on the science-religion relationship.

The either/or options Ruse presents seem rather fatalistic. This article ponders both naturalist and supernaturalist views and endeavours to find a middle ground. The anthropic principle is akin to the design principle and will be discussed briefly. Among naturalists we look at Boyle, Paley, Davies and Dawkins, while on the side of the supernaturalists we consider Haught, Dembski and Shannon. Finally we deal briefly with thinkers like Gregersen, Drees and Moltmann, who take a middle position.

DESIGN AND DESIGNERS

The human mind is fascinated by design. It is as if our minds are programmed to identify and appreciate design, even if we are not involved in the actual process of creating it. *Homo faber* cannot produce anything without a plan, blueprint or some form of design. We notice it, copy it, improve on it, patent it and incorporate it into our lives. We almost invariably link designs to a designer – unplanned, authorless designs are rare and mostly confined to chance patterns with some aesthetic value. We link design to purpose, be it aesthetic, pragmatic or functional.

The Latin word *'designare'* means to mark out, like an architect marking out the lines of a building. *Designare* is implicit in any activity performed according to a plan and for a purpose. Although the concept of design implies a plan, intention and purpose, in practice that is not necessarily the case. Many patterns in nature create an impression of beauty and design, while in fact they are the consequence of brute physical laws.

Although humans view themselves as purposeful designers, design is not limited to the human world and human activities; it is present in animate and inanimate nature, although not in the same manner.[1] For many, nature – that is nonhuman nature – cannot design itself and God is seen as the Great Designer, responsible for all the magnificent designs that humans identify.

Davies (1999:122) warns us of the danger, especially in the natural sciences, of projecting onto nature categories derived from the human life world as if they are intrinsic to nature itself. Frank (2004:114) points out the circularity of the intelligent design inference. Human design principles arose from the study

1 When it came to actual science, Aristotle tended to restrict final causes to the biological sphere – it makes sense to ask about the purpose of the eye but not of a stone on the seashore (Ruse 2002:584).

(apparently since earliest times) of physical order and mechanism in nature. But to use this physical order and mechanism to support a conclusion of purposeful design in nature, analogous to human purposeful design, entails an invalidating circularity.

Are we to accept, then, that there are no purposes in nature? No, says Peterson (2003:193), all design arguments are not necessarily false. Human beings are products of nature and if humans have purposes, then at some level that purposefulness must have arisen from, and thus be inherent nature. We regularly and successfully apply design inferences to the human world; it is clearly legitimate to do so. The challenge is to generalise the design argument clearly and intelligibly.

There are aspects of the world that appear inexplicable without recourse to final causes, and that ostensibly implies design. In this sense causality is directly linked to the design argument.[2] The idea that every event has a cause is, however, not an empirical observation or a generalisation from experience, but an invariable presupposition of human thought. (This presupposition was criticised by Hume, who attacked the teleological argument that presupposes an initial Designer of a static, mechanical world.) Causality is a general form, by means of which the mind unifies the chaos of discrete data (Barbour 1997:45). Aristotle's inclusion of a final cause in his analysis of the physical and biological worlds and the Stoics' inference of the existence of God from biological complexity point to the early origins of arguments regarding purpose and design (Peterson 2002:8). Note in this regard that natural science usually deals with a *causa materialis, causa formalis* and *causa efficiens*, but never with a *causa finalis*, which represents the teleological idea of purposefulness. That was the position of Descartes (quoted in Ruse 2002:589), who held that "when dealing with natural

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2 Chance and necessity do not rule out 'purposefulness', but we do not mean purpose in the usual teleological sense of the word. This can be seen in random mutations and natural selection, which eventually proceed up the evolutionary ladder of beneficial purposefulness for the organism.

things, we will, then, never derive any explanations from the purposes which God or nature may have had in view when creating them and we shall entirely banish from our philosophy the search for final causes. For we should not be so arrogant as to suppose that we can share in God's plans."

The role design arguments play in theological arguments, both ontological and teleological, to prove God's existence is well known. Design arguments appear as early as Cicero in the 1st century BCE and were used by early theologians like Irenaeus and Origen. These arguments had their heyday in the wake of the scientific discoveries of the 16th and 17th centuries. The rather mechanistic worldview of the Renaissance envisaged God as a kind of clockmaker or engineer. To explain creation Boyle (1627-1691) – renowned for his gas law (for a fixed mass of gas, pressure is inversely proportional to volume) – replaced the Aristotelian notion that nature somehow has a being and a kind of mind or life force of its own with the metaphor of a machine or a clock. His idea was not to take soul out of the universe and replace it with a godless machine, but to indicate how God allows the universe to run. He was accused of deism but was in actual fact opposed to it. He thought that God created the universe and then continued to hold it in his hands. If God were to quit at any moment, everything would collapse (Ruse 2002:588).

The question is whether a machine necessarily implies a machine maker. It may be a self-making (autopoietic) machine, in which case the watchmaker (biological evolution) is blind (Dawkins 1986) and has no purpose apart from his own existence. To stick to the machine metaphor and not move beyond it to the machine maker is to refute the Aristotelian final cause or the idea of the purposefulness of the world. William Paley's example of the watchmaker[3] was recently opposed by Dawkins's

[3] In his *Natural theology* (1802; reprint, Charlottesville: Rembrand-Lincoln, 1986) William Paley said that if we find a watch in a field, the watch's adaptation of means to end attests that it is the product of intelligence and not simply the result of undirected natural processes. So, too, the marvellous adaptations of means to ends in

idea of the blind watchmaker. Paley's argument was especially vulnerable, because it started from an observed adaptation of organic structures to useful functions. Such adaptation could now be accounted for by the impersonal process of natural selection without invoking a preconceived plan. Adaptations are found today because they were useful in the past. The species living now are here because they have survived, while thousands of others lost out in the competitive struggle (Barbour 1997:58).

Since Darwin an entirely naturalistic scenario, different from the mechanical one, has been presented. Darwin's theory of natural selection led to the demise of design arguments between the late 19th and early 20th century. Natural selection permitted the possibility of design without intelligence, and biologists began to abandon the concept of design. In philosophy design arguments were already questioned by Hume, who ridiculed claims to infer God's intentions from the nature of the world. Since the world is full of evil and suffering, one might legitimately infer a wicked designer (see Peterson 2003:189). In particular, Darwin drew attention to imperfect designs (adaptations) where nature seems to have moulded the materials at hand to fit a new environmental niche, but in which the design sometimes seems less than optimal. Gigenrich (2000:122) cites the example of the red-footed booby, a duck that nests in trees on Genovesa Island in the Galápagos. Its webbed feet make it virtually impossible to perch on a branch.

THE CASE FOR PURPOSEFUL DESIGN IN THE ANTHROPIC PRINCIPLE: THE UNIVERSE DESIGNED FOR THE ADVENT OF HUMANKIND

Design arguments were taken seriously again in the late 20th century, mainly because of the anthropic principle in the science-religion debate. This debate can be said to hinge on the argument of design, evidenced by the amount of literature deal-

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organisms, whether at the level of whole organisms or of various subsystems, attest that they are products of an intelligence.

ing with the anthropic principle, which is essentially based on design. The anthropic principle refers to coincidences that govern the growth and development of the universe, coincidences so improbable that they appear to rule out random variation. In its weak form the anthropic principle posits that, since we exist, the kind of universe we observe is necessarily one that is structured to support life. The strong anthropic principle goes further: not only is the observable universe structured to support life, but a life-supporting universe such as ours is the only possibility (Peterson 2003:190).

The anthropic principle is not all that different from the metaphor of the world as a machine or clock. While the metaphor of a clockwork nature highlights its automatic functioning, the anthropic principle stresses the complexity and fine-tuning of the universe and our world. But the anthropic principle, more than the clockwork metaphor, endeavours to accommodate God's action in the creation process.

DAVIES AND MODERATE NATURALISM: INFORMATION A DETERMINING VALUE OF THE ORIGIN OF LIFE

Life can be viewed as a chemical phenomenon, but its distinctiveness lies not so much in chemistry as in its informational properties. A living organism is a complex information processing system (Davies 1999:19). Information has a long evolutionary history. As the supreme biological value responsible for all other identified biological values, it also determines human cultural values, although on a different level.

Information is not easily acquired. It entails a protracted evolutionary process of gaining knowledge through information processing to enhance an organism's fitness (Van Huyssteen 1998:148). Although the evolutionary process of acquiring cognition is a slow upward spiral of trial and error, it leads to the emergence of new and qualitatively different forms of order.

The sole source of information in the natural world is the organism's environment, which begs the question how the information got into the environment in the first place. Although some information was present from the very start of creation, we know that the universe started out with very little information. For Davies (1999:60ff) the cardinal question is not where matter came from, but where information came from. Information and matter can be distinguished but not separated. Only a combination of matter-energy and information can explain life. Matter and energy are prerequisite for informational possibilities to emerge (see Rolston 1999:356). The formation of matter and energy *ex nihilo* is explained by gravitational processes. Through gravitation and gravitational processes, an entropy gap between actual entropy and maximum possible entropy opened up in the universe. The reason the universe can have zero energy and still contain 10^{50} tons of matter is that its gravitational field has negative entropy. All sources of free energy, including the chemical and thermal energy inside the earth, can be attributed to that gap. With matter-energy comes information. The ultimate source of biological information and order, therefore, is gravitation (Davies 1999:61, 64). Yet it does not explain the ex nihilo appearance of information and life. The environment (including the ecological and, later, the cultural environment) in which life originates is as important as matter and information. Information has downward causative power, coming from the environment which makes the interplay between chance and necessity possible (Jacques Monod). Environmental information is a seemingly infinite source. Values, which are a condensed form of information, can be considered a negative form of entropy and are comparable to symbols that encapsulate meaning. Values are a source with a wide range of applications not easily depleted.

DAWKINS'S CLOSED NATURALISM: NEITHER PURPOSEFUL NOR MERE CHANCE BUT THE OUTCOME OF CUMULATIVE SELECTION

Richard Dawkins propounds a methodological naturalism, which, being a closed system, does not allow for any transcendental or miraculous force acting on nature. In this respect he differs from Davies, who still allows for the possibility of divine action, although he does not elaborate on it and keeps his argument within naturalistic confines. Dawkins acknowledges no purposive creator designing creation. If a watchmaker exists, he is blind and devoid of any purpose. The basic idea of the blind watchmaker, according to Dawkins (1986:181), is that we do not need to postulate a designer in order to understand life or anything else in the universe. Instead, creation – with its beauty and bountiful examples of design – is the product of cumulative selection. Cumulative selection differs from single-step selection, in which entities are sorted once and for all: the successful results of one evolutionary process are fed into the next one, and so on. The end product of one generation of selection is the starting point of the next, ad infinitum. Once cumulative selection has got under way, we need to postulate only a relatively small amount of luck in the subsequent evolution of life and intelligence (Dawkins 1986:55, 179).

Participants in evolution debates have compared the idea that life on earth is the product of random selection with the chance that a monkey bashing away at a typewriter could produce Shakespeare's works. Dawkins (1986:56ff) uses this example to explain the idea of cumulative selection. If we take the phrase 'methinks it is like a weasel', the chance of getting the entire phrase of 28 characters right is 1/27 to the power of 28, that is, 1/27 multiplied by itself 28 times. The odds against single-step selection of random variation are simply too great to make it feasible. In the case of cumulative selection, we again start with 28 letters on the keyboard, we set the target phrase 'methinks it is like a weasel' and program the computer to breed from the random sequence of 28 letters just like before.[4] It duplicates it

[4] Artigas (2000:133) finds Dawkins's argument tricky, because he introduces a teleological component in his weasel computer game when he inscribes in the program the instruction to choose the one(s) which most resembles the target phrase. It is difficult to formulate a statement that is more teleological, for it includes the existence of a target and the selection of the phrase closest to it. In pure Darwinism, supported by Dawkins, natural selection is supposed to be blind and to have no purposes at all. Although the result of natural selection will be the survival of the fittest, each step towards it is unique and should not be considered to form a progressive series towards an increasingly perfect goal. Artigas consequently finds Dawkins's argument deceptive. In favour of Dawkins, one must concede that natural selection does have a purpose, but in the limited sense of preserving that which best suits the target of survival and optimal interaction with the environment.

repeatedly, but with a certain chance of random error – mutation – in the copying. The computer examines the mutant nonsense phrases, the progeny of the original phrase, and chooses the one which, however slightly, most resembles the target phrase. After 43 generations the target 'methinks it is like a weasel' was achieved. This brings Dawkins (1986:60) to the conclusion that evolutionary progress, if it had relied on single-step selection, would never have got anywhere. If, however, there was any way in which the necessary conditions for cumulative selection could have been created by the blind forces of nature, we can understand how life originated. It should be noted that Darwinian evolution is not random; chance is a minor ingredient in the Darwinian recipe.

Thus Dawkins's watchmaker is cumulative natural selection. Evolution is blind to the future and has no long-term goal, although the end product of millions of years of development is so magnificent that humans cannot but propose a mindful and intelligent architect who blueprinted it all at the very beginning. The latest product of the long history of natural selection displays such fine-tuned structures and success stories of adaptation and environmental interaction that intelligent design seems to be an obvious inference.

Viewers of the present-day outcomes find it difficult to conceptualise how all the fine-tuned prerequisites could have come about through cumulative selection. Take the human eye, for example. For the eye to function, the following minimum of perfectly coordinated processes have to take place. The eye must be clean and moist, maintained in this state by the interaction of tear glands and movable eyelids, whose eyelashes also act as a crude filter against the sun. The light then passes through a small transparent section of the protective outer coating (the cornea) and continues via a lens that focuses it on the back of the retina. Here 130 million light-sensitive rods and cones cause photochemical reactions that transform light into electrical impulses. Some 100 million of these are transmitted every second, by means that are not properly understood, to a brain which takes appropriate action (Dawkins 1986:96-102). Dawkins argues that we need not presuppose that the eye must function as a whole or not at all. Even with only five percent vision predators would be able to detect prey. Five percent is better than no vision at all. The same goes for the development of all other body parts and organs. The underlying rationale is that, if a design is good enough to evolve once, the same design principle is good enough to evolve twice, from different starting points, in different parts of the animal kingdom (Dawkins 1986:115-116).

The basic ingredient of cumulative selection is self-replication. Somehow, as a consequence of the ordinary laws of physics, self-copying entities – Dawkins (1986:158) calls them replicators – must come into being. Today this slot is filled by DNA molecules. Dawkins (1896:172-173) mentions that some see the dependence of cumulative selection on replicative machinery as the ultimate proof that there must originally have been a designer, not a blind but a far-sighted, supernatural watchmaker. This, according to Dawkins, is to explain precisely nothing, for it leaves the origin of the designer unexplained. You have to say something like 'God was always there', and if you allow yourself that kind of lazy way out, you might as well just say 'DNA was always there', or life was always there, and be done. Dawkins comments that the more we can stay away from miracles, major improbabilities, fantastic coincidences and large chance events, the more thoroughly we can break large chance events up into a cumulative series of small chance events and the more satisfying our explanations will be to rational minds. He proposes several options, within the framework of cumulative selection, of how the building blocks may have come together to form self-replicating systems. With reference to Cairns-Smith, Dawkins (1986:183) mentions the possibility that self-replicating, inorganic crystals such as silicates could have paved the way for organic replicators until eventually DNA took over.

This approach represents a closed system allowing no transcendent interference in natural processes.

THE SUPERNATURALIST APPROACH

The information concept in the intelligent design movement

The history of human culture can be divided into the matter age, the energy age and the information age, and the corresponding societies can be designated respectively the agricultural-instrumental, the industrial and the information society (Van der Lubbe & Laurent 1992:84). Considering the rapid advances in information technology over the last two decades, it is understandable that the concept of information will feature prominently in the science-religion debate.[5]

In information theory information is fundamentally related to uncertainty: it reduces uncertainty. The theory assumes an event to be a realised possibility from a well-defined set of possibilities or possible events. Before the occurrence of the event, the observer is uncertain what will occur. The actual happening of the event removes this uncertainty. Not only the number of events is important but also their probability. If some events are more probable than others, the a priori uncertainty will be smaller; if all events are equi-probable, the a priori uncertainty will be maximal. The measure of information is a function formulated in terms of probabilities.

The informational worldview, based on certain tenets of information theory, considers the world to be composed, not of objects, but of events, interrelated by way of time-space relations. Events are the result of the melting together of possibilities and factualities. The sequence of events does not comprise identical

[5] According to Van der Lubbe & Laurent (1992:87) God can be seen as the sublime *Informaticus*. He can be considered to limit the multiplicity of possibilities and to unify them in an ordered cosmos. God is related to all possibilities as well as to all events which he takes into his experience. Thus God both influences the world and is influenced by it. These ideas correspond to process theology. When applied to the world of nature, it is a postulate which cannot be verified or falsified. On the human plane believers can view God as the ultimate source of information, who creates possibilities and invites people to select that which gives rise to possibilities of harmony and order. However, this order is not given a priori. God does not know which chance humans will use (Van der Lubbe & Laurent 1992:88-89).

events – that would preclude change. On the other hand, all events have something in common, since the world and events show continuity. Looking back at the possibility of one event ensuing from another, one sees that something like a selection has been made from a number of possible events. Looking forward, there is a set of possibilities, from which it is not clear which one will be selected (Van der Lubbe & Laurent 1992:86).

Intelligent design (ID) theorists like Claude Shannon and William Dembski have sought to reintroduce the notion of divine design as a scientific hypothesis to be considered alongside and instead of naturalistic accounts of cosmic and biological origins and change. Intelligent design is said to apply to physical cosmology, biochemistry, human evolution and cryptography. Dembski (2001:224) considers intelligent design a new programme for scientific research, with the fundamental postulate that intelligent causes are necessary to explain the complex, information-rich structures of biology, and that these causes are empirically detectable. The main area of contention has been biology and evolution. ID theorists are opposed to naturalist explanations of biological complexity and offer the hypothesis of intelligent design as a superior alternative. They argue that some organisms are intelligently designed, and that they are intelligently designed by God. If ID theorists like Dembski and Michael Behe are correct, according to Peterson (see 2002:7-10, 12), it would be the most significant scientific theory ever, for it would in essence prove the existence of God.

ID theorists work predominantly with four propositions: deep time, a limited role for evolution, a method of detecting design, and the applicability of biological method. ID theory does not compete with evolutionary accounts of biological origins and the origins of species, but modifies them (Peterson 2002:15). For example, design features are ascribed to saltationism – the sudden change in the structure of organisms – which, according to ID theorists, does not result from either chance or natural selection. Peterson (2002:16, 20; 2003:195) points out that these theorists never define what exactly is supposed to count as intelligence. They do not specify what percentage of organisms exhibit intelligent design, nor whether some lines of descent display more design than others. Does God have a fondness for the millions of species of insects, or are they simply the product of natural selection? Are human pathogens such as cholera and malaria intelligently designed? Although ID theorists suggest the existence of a creator, they cannot tell us anything about his character or nature. For Peterson (2002:17) an ID theory that refuses to say anything about the designer is either confused or incoherent – which brings him to the conclusion that ID theory, lacking a theological science to complement its biological science, is limited to a negative approach that explains by not explaining. This critique seems justified, especially in view of Dembski's (2001:225) claim that intelligent design presupposes neither a creator nor miracles.

Intelligent design is theologically minimalist. It detects intelligence without speculating about the nature of the intelligence. This leads Peterson (2002:22) to conclude that ID theory is an ideological agenda masquerading as science.

HAUGHT'S MODERATE SUPERNATURALISM

Haught laments the loss of the whole in explanatory systems and stresses the importance to humans of meaning-giving purposefulness. The ID movement sets out to prove the Intelligent Designer. The designer they refuse to comment on is the theistic God of Christianity – which Haught takes as his point of departure.

Religious cosmologies embed the temporal world in an eternal, sacred reality immune to transience and death. This means that the lower levels of the cosmic hierarchy are constituted and informed by an ultimate level of meaning flowing down from the highest to the lowest level in a great chain of being. Here hierarchy must be understood literally, meaning that all things have their origin or principle (*arche*) in the domain of the sacred (*hiero*). This original meaning has been devastated, according to Haught (2000a:106; 2000b:60), by the way natural science has atomised and historicised nature. Atomism understands things solely in terms of their fundamental physical constituents. It dissolves hierarchies by blurring the boundaries and ontological discontinuities that formerly placed one level decisively above or below another. Astrophysics has historicised the cosmos, giving a picture of nature which, when joined to evolutionary accounts of life, instantly crumples what was once thought of as a vertical hierarchy of distinct levels of meaning and being (Haught 2000a:106). Lifeless and mindless matter is taken to be the metaphysical and historical source of all beings, including those now endowed with life. And since matter is taken to be metaphysically mindless, the cosmos that evolves from it must be essentially mindless, even if evolution eventually and accidentally brings forth some beings with a capacity for thought (Haught 2000b:59).

With reference to the vitalist tradition, Haught (2000b:61) points out that the claim that lifeless matter might autonomously give birth to life violates the principle of causation. Henri Bergson (1854-1941) thought that matter owes its being and meaning only to the fact that it somehow served the eventual emergence of life. The discovery of deep time, along with the atomisation of nature, has helped to obviate the intellectual need for a hierarchic cosmology. A truly mammoth time span provides sufficient opportunity for purely accidental coincidences to give rise to life. In the scientific world of today, vitalism has lost out and time itself has quietly become a key ingredient in the explanation of life (Haught 2000b:62-63). Haught sees the primary task of post-Darwinian theology as retrieving religious hierarchy and convincing natural science to accept it.

The magic wand that might make this possible is information. According to Haught (2000b:70) there is growing suspicion that more complex levels cannot be understood simply in terms of less complex ones, for something always gets lost in such a facile translation. This something is information. Information insinuates itself into the universe without in any way violating lower level laws of chemistry and physics. Information, therefore, has the capacity to bring about hierarchic discontinuity among various levels, even though, when viewed purely historically or atomistically, nature seems to be a closed, purely horizontal continuum (Haught 2000b:71).

Information quietly orders things, while itself remaining irreducible. Like mathematics, it has a certain timelessness. It bides patiently in the realm of possibility, waiting to be actualised. It lies, in a sense, outside time, undevoured by the historical or horizontal scheme of physical causation. It is sufficiently real to configure nature hierarchically. Though beyond the grasp of science, information is not identifiable with sheer nothingness (Haught 2000b:71). Haught (2000b:75) suggests that a study of the way information works can help us understand how a hierarchic structure of meaning or purpose can become implanted in an evolving universe without necessarily being obvious at the level of scientific inquiry. Information works by integrating particulars into coherent wholes. We may assume, alleges Haught (2000b:76), that the origin of information and its integrating capacity resides in some other logical space than that of the atomic and historical particulars that natural science invokes in its modern ideal of explanation. Needless to say, Haught (2000b:73) believes that God could be seen as the ultimate source of the novel informational patterns available to evolution.

The hierarchy model positing the holy as the source of being is threatened only if one considers the cosmological and evolutionary model a closed system. There are models available, panentheism being one, that accept the natural scientific model without forfeiting the presence of the holy and God's action in the creation process. To limit God to information input in creation is to run the risk of rendering God redundant once other apposite explanations for information input have been proven. Dawkins's cumulative selection proposal and developments in molecular biology, together with better understanding of the development of genetic coding, make this a very real risk.

Limitation of God's action to information input is a regression to the dualistic hardware-software model. Information cannot be divorced from its manifestation in matter. Haught's philosophical use of the metaphysics of non-being to explain how things come about is not helpful either. Although the use of information as proof of God's existence has assumed ideological proportions in the intelligent design movement, it does not diminish the importance of the concept of information to explain the origin of life. It all depends on how one uses that concept.

SPACE FOR GOD IN CREATION: SOME OPTIONS

Wim Drees (1996:196ff) views the design argument as a more open approach to evolution. The emphasis is on the idea that the natural order displays evidence of design. As in creationism, the options presented are mutually exclusive: either one accepts that order is the product of purposeful design or one accepts chance, since natural selection operates on variety deriving from random mutations. Instead of creationism he proposes an intermediate approach, in which Christian beliefs are not seen as necessarily inconsistent with the evolutionary origin of species. The question of God's action in the world is answered in different ways. Some see divine action hidden in what science calls chance; others see chance as chance also from God's side. Yet others opt for God as the 'primary cause' of the evolutionary process, the laws of nature and the requisite initial conditions, while holding the evolutionary account to be self-sufficient, requiring no special divine intervention in the realm of causality. Theological positions may be reconsidered and reformulated to defend the congruence of scientific knowledge and religious convictions.

Naturalism stresses the continuity between human beings and the rest of nature. Traditionally naturalists insisted that the world of nature forms a self-contained sphere needing no outside intervention by souls or spirits, whether divine or human. Ethical naturalism, for example, does not accommodate non-natural values. Drees proposes a scientifically informed naturalistic account of religion which, he contends, is not only compatible with supernaturalist religion and theology, but provides a better account of both than either pure naturalism or pure supernaturalism. He accepts that ontological naturalism offers the best philosophical explanation of the natural world, as well as scope for a supernaturalist understanding of religion and theology. Drees (1996:212-213) views humans, their cultures, languages, aesthetic and moral codes, and their religious practices as products of a natural, evolutionary process.

William Rottschaefer's point of departure is that questions about the existence and nature of transcendent reality are empirical in the same sense that theoretical scientific questions about in-principle, unobservable physical entities are empirical. Thus, explanatory theories about ultimate reality are as justified as highlevel scientific theories. Such theories are evaluated according to the best current scientific theories, the best current empirical findings and generally accepted facts (Rottschaefer 2002:446). In fact, he proposes a naturalistic divine reality, not a supernaturalistic one! A naturalistic divine reality probably does not possess the classical, Semitic divine attributes such as personhood, omnipotence, omni-benevolence and eternality. Nor does it, more than likely, possess the classical divine attributes ascribed to it in the Indian tradition, like mind and absolute unity. A naturalistic divine reality may be in the process of becoming and may itself suffer demise (Rottschaefer 2002:447). In a sense, his God would be similar to the present understanding of the processes that created the universe.

Today, counter to the mechanistic interpretation of the world, we understand all matter, not as passive and inert, but as possessing inner dynamism. This dynamism is closely related to structure and patterns, insofar as it deploys itself according to temporal patterns and its deployment produces spatial patterns that are sources of new kinds of dynamism. As we know, subatomic particles intervene actively in processes, in which some particles are transformed into others, new particles are produced and energy transfers occur. For Artigas (2000:90-91) even a single electron, metaphorically speaking, 'knows' physics in its entirety, as it will act according to its own nature in any circumstance. Leibniz (quoted by Artigas 2000:91) already said that all natural entities possess their own dynamism. He saw divine creation as the foundation of this force.

Dynamism is closely related to patterns, which entail the idea of design and are linked to the ancient idea of form. According to Newell (Artigas 2000:92), patterns appear all over the place – in cloud formations, in sand ripples, on flat beaches and desert dunes, in the morphology of plants and animals, in chemically reacting media, on weather maps, in geological formations, in interacting laser beams, in wide gainband lasers, on the surface of thin, buckling shells and in the grid scale instabilities of numeric algorithms.

In the theological realm Moltmann looks at dynamism, with its display of design and seeming purposefulness, from the perspective of field theories, which he analogically compares to the spirit of God. God is spirit and the scientific term which, even if to some extent metaphoric, throws light on how God's work is analogous to that of a force field. For Pannenberg (1993:40), the field concept, in contrast to the mechanical doctrine of movement by push and pressure, could be hailed as inaugurating a spiritual interpretation of nature. 'Spirit' and 'field' are terms expressing how agency proceeds with respect to both natural processes and God's activity in the world (Hefner 2001:804).

Newton introduced the idea of immaterial forces causing material changes. He viewed the way they act as analogous to the action of the soul on the body. He considered gravity an expression of God's immaterial activity of moving the universe by means of space. Faraday's field concept inverted the relation between force and body. The body was but a manifestation of the force that Faraday conceived of as an independent reality. The material particle appears at the point where lines of force converge and form a 'cluster' that persists for some time. A field action is not described by the interrelationship of separate bodies, but by how those relationships emerge from the coexistence of bodies as a result of their common presence in a field. Pannenberg uses the same idea to describe the inner life of the triune God (Hefner 2001:804), with the concept of action as an alternative to ideas of causality. We cannot always infer correctly from causality that it represents the essence of that which causes. In the case of personal action the essence of the subject may be seen in the choice and achievement of goals, so that the kind of action characterises the actor rather than the cause of the action.

Field theorists from Faraday to Einstein claim priority for the whole over the parts. To Pannenberg (1993:38-39) this has theological significance, because God has to be seen as the unifying ground of the whole universe if he is to be seen as its creator and redeemer. Pannenberg (1993:41) concedes, however, that theological propositions about the field structure of the divine spirit's activity in the cosmos will remain different from field theories in physics.

CONCLUSION

The choice Ruse put before us in the introduction to this article is unacceptable and negates the efforts of the science-religion debate to harmonise our understanding of God and the world. A choice between either naturalism or supernaturalism restricts us to sterile dualism. This is reflected in Van der Lubbe and Laurent's (1992:84) notion that the close connection between people's worldview and their idea of God that existed in the past has been replaced by the present approach, in which worldview (synonymous with natural scientific worldview) and the idea of God are clearly separated.

If dualism is not an option, acceptable forms of integration must be found without compromising the integrity of either science or the human person. Human thought, and that includes its religious and spiritual aspects, is legitimately part of the human primate and can be viewed as a natural phenomenon. This does not mean that we must not critically ponder what we mean by rationality, intelligence, spirituality and the human person. Clayton (2004:188) reminds us that Kant did not anticipate the sociology and anthropology of knowledge. There is not just one categorical framework; cultural and other factors greatly influence our conceptual scheme.

Religion can be seen as an outcome of human evolution. The ubiquitous emergence of religion as a concomitant of homo sapiens indicates that it fulfils an irreplaceable function for them.

Bonhoeffer's dictum that we should seek God in what is known and not in the unknown remains a guiding principle. If we look for God's action in what is known, then his work in and through millions of people who believe in him, experience him, and are guided in their conduct by their belief, represents a tremendous and visible manifestation of divine action in this world. The action of God through those who believe is visible, empirical, theoretical and falsifiable. It does not depend on flimsy evidence of a God-of-the-gaps nature. The main message of most religious books is about how the world was and is influenced by believers, who allow God to act in and through their lives in this world. The spiritual worth, existential comfort and life-giving meaning provided by religion could be interpreted as subjective. It is, however, real and non-negotiable to believers. Theology's main message of God's love and forgiveness that bring redemption through Christ need not be compromised by accepting science in the naturalistic sense of the word. The challenge is to be honest to God, to human beings and to nature. Since we are not exclusively rational beings, we have to accept the integrity of those who both accept science and embrace God in order to accommodate their will to believe.

15

WISDOM LOST AND REGAINED? THE POSSIBILITY OF REINTEGRATING A FRACTURED TECHNOSCIENTIFIC CULTURE

TECHNOSCIENCE,[1] WISDOM AND THE QUEST FOR A MEANINGFUL LIFE

The threatening side of technoscience

The challenges of technology have outstripped our wisdom. Technoscientific developments have elevated us to a godlike position where we can create and modify life. Human wisdom and ethical guidelines appear powerless to guide us in a technocentric world that has run out of control. Technology is taking on a life of its own, evolving in unforeseen directions, opening up a life that has been typified as post-human (see Fukuyama 2002). Technology is anthropomorphic and humans are technomorphic. We are our machines and we reflect the image of our technology: the creator is taking on the image of her creation. Humans have become procreators of a mechanised world. Once some 'indispensable' new technology is developed, people are sure to keep on duplicating, maintaining, guarding and improving it. Just as genes do not easily relinquish their genetic specificity, so we jealously guard our technological identity, unless a successful technological 'mutation' improves on it.

The evolution of the human species is inconceivable without the concurrent evolution of technology,[2] from stone tools, the use of

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1 The term 'technoscience' is used to express the crumbling of traditional boundaries between science and industry, between science and its applications, and between pure science and applied science.

2 Technology is not exclusive to the human world. The development of life would have been impossible without the evolutionary 'invention' of technology, which developed over millions of years and which characterises all forms of life. Many human techno-

fire, crop cultivation and hunting techniques to the art of warfare (see Diamond 1998:260ff). Civilisation is unimaginable without the support of a technological environment. The question considered in this article is whether technoscientific evolution has not overtaken the evolution of the human species, making meaningful survival impossible in a technoscientific environment of its own making.

World War II brought an avalanche of technological advances that proceeded faster than people could comprehend. Technology placed us in control of our destiny. But can we control technology? Can we control our control of technology? Certainly we appear unable to control our obsession with control.[3] Science, in the sense of technoscience, has become the most urgent problem facing personhood. Technology lures us into its life-transforming possibilities and then leaves us helpless in our transformed environment. We create technology and are enslaved by it, we are awestruck by its possibilities and often oblivious of the way it has invaded our lives. Most of all, we enjoy it and consider it an indispensable part of our lives. It is part of our self-image and self-perception. The rights and wrongs of technology seem irrelevant, since ethical considerations do not halt its evolution. We are in need of wisdom to exist meaningfully in an increasingly complex technological environment.

The question 'What is it to be human?' can no longer be isolated from the question 'What is it to possess technology?' For Geertz (2000:154), machines, tools, artefacts and instruments are too close at hand to be seen as external to what is going on – just so much apparatus, devoid of meaning and wisdom. These mere 'things' have to be incorporated into the story and, once they are, the story takes on a heteroclite form – human

logical inventions took their cue from 'technology' in nature. Its negative, harmful side relates to human applications of technology.

3 See Heidegger's *Nur noch ein Gott kan uns retten*, interview with Der Spiegel 23, 1976:193-219.

agents and nonhuman ones bound together in interpretive narratives.[4]

The anthropology of science clearly indicates the fundamental importance not of subjects, but of things (technological goods) and their defining effects on subjects. Science always deals with objects. Humans are situated differently in relation to things. The question is: how do objects/technology 'relate' to human beings? This question concerns the primitive experience in which the object itself constitutes the human subject. We usually accept that subjects build objects. We are never told about the way objects create subjects. In this sense technology has turned the traditional subject-object relationship around (see Michel Serres, quoted by De Beer 2001:205-206, 219). The history of the reception of technology has shown that new technology always passes through a phase of resistance (from certain sectors of society), but eventually it is accepted and becomes culturally integrated with society. In spite of the threatening aspects of present-day technologies, there is overwhelming optimism about the promises of, especially, information and biotechnology.

INVOKING THE WISDOM METAPHOR TO DIRECT US

The concept of wisdom is as broad as that of truth or unity, and means different things to different people. For some the quest for wisdom is a longing for lost values of a bygone era and recovery of cultural roots grounded in that wisdom, in the belief that this will restore meaning to life. I shall treat wisdom as a metaphor expressing different angles: the attempt to link values and technology; the search for unity between the different sciences and between science and life world; the restoration of values, especially in the realm of the natural sciences; how to

[4] In Heidegger's essay *Das Ding* (1971:163-186), the potter (technologist) interacts with nature (clay), moulding it into a jug. But nature in a sense always eludes us and transcends our technology. This is symbolised by the potter who actually defines 'nothingness' – the interior vacuum of the jug, which is also its worth. The mug (technological artefact) comes into its own when it becomes transparent in serving life in communion (drinking together from our mugs).

cope in a technoscientific culture; and, finally, decisions about research policies.

Ever since culture began, we have distinguished between the comfort technology provides and that which gives meaning to our lives – in other words, a distinction between knowledge and wisdom. Since human life is an integrated whole, we can distinguish between but not separate science and wisdom. The sciences in their archetypal form did not differentiate between different spheres of truth. Truth was seen as one and concerned the whole of human life: physical and metaphysical, empirical and transcendental, moral and scientific. Aristotelian metaphysics was theo-logical, including unity and totality in its construction of Being. We can distinguish science from wisdom by viewing knowledge as the accumulation of facts, and wisdom as that which transforms the individual on the basis of what is true and what really matters. The wise person is transformed by wisdom and acts under its influence: "Knowledge comes, but wisdom lingers" (Tennyson, quoted by McGrath 2002:44). Wisdom, in this sense, resembles spiritual and even religious values. It is the outcome of individual and group experience and promises to guide the person through life's intricacies. It encapsulates the values people have acquired over the ages and contributes to the identity of human societies. From the viewpoint of scientific methods and procedures these qualities of wisdom are irrelevant. Consequently wisdom was assigned a more elevated status than knowledge and science, thus separating it from them. Yet wisdom is the ethics of knowledge. It integrates what we do with what we know.

The search for wisdom is complicated by the globalisation of technoscience and its attendant values. The divides between the sciences and between science and life world are symptomatic of a fragmented culture, in which globalisation and the concomitant technologies have destroyed individuals' identification with their citizenship and their profession. Globalisation has deprived society of its role as the creator of norms, and has isolated communal wisdom and values. It has influenced the sovereignty of the state and changed the role of politics. Social life has become identified with instrumental reason. Techno-science, in the form of instrumental reason, affects all areas of life, and leads to cultural fragmentation.

This is the background against which the fragmentation of the sciences must be seen. The ideal of the democratisation of technoscience, the search for universal values, and the reality of the global market seem to integrate human responses to technoscience and to unify values. Concurrent with this there is growing protest against mass culture and against values linked to consumerism and materialism. A revival of ethnocentric values and community life now forms the background to social life.

HISTORY OF THE FRAGMENTATION OF SCIENCES AND THE DETACHMENT OF SCIENCE FROM HUMAN VALUES

Since the beginning of their history humans have linked the material with the immaterial, objects with spirits (animism), effects with magic causes, body with soul, and nature with God. To explain the movement of lifeless objects Aristotle saw the world as imbued with a world soul. When a mythically oriented worldview was replaced with an objectivist, substantialist worldview and nature was explained mechanically, the need for spirituality did not vanish. In spite of technological advances the question of values, ethics and spirituality remains. Technological advances need not suspend human values, although they undoubtedly change them. People differ as to whether this is a change for the better.

The gradual differentiation and eventual fragmentation of the sciences, as well as current interaction initiatives, must be seen as part of our cultural evolution and not as the outcome of some wicked master plan. Sociology of knowledge helps us to understand this development which, in retrospect, seems inevitable. Some of the factors responsible for the exclusiveness of science, the division between sciences, and the detachment of science from life world are the following:

- The development of mathematics as the language of science.
- The development of metaphors by the natural sciences and their influence on our intellectual culture.
- The exclusive self-image of the Christian church and the idea that the church disposes over values, wisdom and salvation.
- The inception of universities in the 13th century and the influence of epistemologies and the scientific method (see Pannenberg 1976:13ff).
- Cartesian dualism and the concomitant division between mind and body, which generated a number of dualisms such as fact versus value/wisdom, internalist versus externalist view of science, natural versus human/life sciences.
- Society's enthusiastic reception of science as a result of its technological successes. This coincided with the displacement of the clergy by scientists as authorities on knowledge and insight. The conviction that science and technology form the basis of a good life followed naturally. Values pertaining to spirituality, ethics and wisdom can be tagged on to this technological basis in accordance with existing traditions and preferences.
- The hijacking of science by the state (military) and commerce.

I shall briefly discuss some of these factors.

ROLE OF MATHEMATICS, SCIENTIFIC METHODS AND METAPHORS IN SEPARATING SCIENCE FROM LIFE WORLD

In my view technoscience does not suspend human values but changes them. How human values change depends partly on the specific cultural response to technoscience. Africa, for example, responds differently from either America or Japan. Needless to say, science, although allegedly value-free, seldom refrains from commenting on all sorts of social issues from its so-called objective perspective. Today, however, researchers are much more sensitive to the ways in which scientific texts embody social experiences and values and carry a whole host of messages, warnings and judgments to their peers and society at large (Porter 1990:42). In spite of this, the self-image of the natural sciences is that of an autonomous, reliable, neutral and value-free enterprise, which gives science its authority. Let us briefly consider the historical development of this isolation of the natural sciences.

The Copernican revolution, together with the communication revolution (printing press) and the economic revolution (16th century expansion of the marketplace), marks the beginning of a process which was to end in the detachment of science from theology and, eventually, natural science from all the other sciences (see Jacob 1997:19-20). The scientific revolution, which spanned the period between 1500 and 1700, is epitomised by the Copernican revolution, which replaced Aristotelian natural philosophy and the Ptolemaic geocentric worldview with a heliocentric worldview. For the first time in history, science was detached from wisdom, ethics and values. Scientific reason came to be interpreted as 'instrumental reason' (Touraine 2000:2-5; 34-35; 196). To function, instrumental reason is dependent on neither wisdom nor morals. The detachment of theology from science coincided with the emancipation of scientific reason from wisdom and values.

The Copernican revolution laid the foundations for classical mathematical physics, which culminated in the Newtonian laws. Mathematical physics depicted science as a self-explanatory system with its own laws, methodology and language. Science no longer needed spirits, mysticism or superstition to explain its subject. According to science the things we see and touch do not belong to different realms, governed by different rules. Matter, as the uniform, invisible substance that underlies all appearances, is governed by the same rules.

SEPARATION OF SCIENCE FROM LIFE WORLD, SCIENCE FROM WISDOM, AND NATURAL SCIENCE FROM HUMAN SCIENCE

The mathematisation of science increasingly excluded common people from understanding and participating in it. Einstein effectively placed the new science beyond the grasp of the intelligent amateur.[5] The natural sciences became disengaged from the world of culture, which was relegated to the human sciences. Natural science is said to have no significance for orienting people's conduct in their life world, or their understanding of that world (Markus, quoted by Geertz 2000:149).

The detachment of natural science from the human sciences was facilitated by the impressive success of natural philosophy. This development separated science from the life world. Scientists came to be regarded as those who really know. It meant that reality was divided between scientific fact and common human experience, which often contradicted each other. If scientific reality is the only authentic reality, common human experience must be illusory. Human beings are no longer part of nature. The world soul (animus), or life principle, was disconnected from nature. Nature became blind and mechanical (like clockwork) and consciousness shifted to the human side. One of the consequences of this development was that humans, detached from nature, came to stand over against nature. They came to confront nature as an enemy that needed either conquering or taming – through science (see Barzun 2000:195,750). The critique of Cartesianism initiated a reunification of the sciences. By the second half of the 19th century the increasing influence of physiology and physiological psychology to some extent restored mind to nature (from where physics had removed it) (Geertz 2000:151).

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5 More than a million scientific publications appear annually, which makes knowledge development incommensurable (Webster 1991:73). However, the withdrawal of the natural sciences over the last 120 years or so from general public discourse may change now that cosmology has returned as a general cultural concern and now that we have "computer-mediated sciences of complexity" (see Geertz 2000:147-148).

Although separated from the natural sciences, the human sciences followed, as far as possible, the natural scientific research and methodological programme and became increasingly detached from the life world. The terms ‘human science’ and ‘natural science’ do not mean that the human and the natural sciences are united. They refer to their respective research objects, not to disciplinary interaction and unity. The scientific community (*république des savants*) dissolved into a multitude of research communities. Interaction between the human sciences is limited and the ideal of interdisciplinary research remains difficult to reach. The multiplicity of research communities became the sole public for the relevant scientific objectification.

According to Moltmann (2002:27) the emancipation of the sciences from moral philosophy and theology was, in fact, their emancipation from wisdom. The view that science is without wisdom can be challenged in the light of the many examples of the (indirect) way in which natural science influenced wisdom and stimulated development in other spheres of thought. Hobbes’s work, for example, cannot be understood in isolation from the influence of Galileo, more especially Galileo’s introduction of motion into cosmology. Hobbes’s philosophy builds on the deductive method of geometry and on Galileo’s concept of motion. After his contact with Galileo, Hobbes became obsessed with this idea, which led to his own great innovation in the science of politics. His philosophy or ‘science of body of man’ was built on the concept of motion – “... that which is really in us, is motion, or endeavour, which consisteth in Appetite or Aversion to, or from, the object of moving” (see Hobbes 1968:19, 25, 31, 118ff). Examples of how the wisdom of science influenced other spheres of thought and culture as a whole can be multiplied. One could surmise that Einstein’s relativity theory indirectly affected postmodern thought, in that it favoured a relational rather than a substantialist ontology.

THE CHURCH'S RESPONSE TO TECHNOSCIENTIFIC DEVELOPMENT AND THE SEPARATION OF SCIENCE AND RELIGION

Augustine distinguished *sapientia* from *scientia*. *Scientia* dealt with temporal things, while *sapientia* dealt with the eternal, which is God as the supreme good. The knowledge that the sciences acquired from transitory, temporal things must be ordered in relation to the supreme good. This can be seen as the kind of dualism, typical of neo-Platonism, which divides the totality of life into eternal and temporal dimensions, locating spirituality above corporeal life. This dualism reached its climax in the work of Descartes. Augustine, however, attempted to relate the two spheres by saying that both knowledge and science must serve true wisdom. According to Augustine, Christ was the essence not only of wisdom but also of knowledge. The Augustinian concept of Christian teaching as wisdom lasted until the late Middle Ages (Pannenberg 1976:8-11).

Medieval clergy engaged in science and corporeality as earnestly as they did in theology. Theology remained the point of reference and, as *regina scientiae*, was the ordering force in the scientific cosmos. The clergy controlled all the early universities, the pulpits and, in many cases, the right to publish. They controlled the very language of natural philosophy. The scientific revolution was to change all of this.

Galileo, in order not to offend the church by his support for the Copernican heliocentric worldview, proclaimed that religion and science belong to two different spheres, and represent different approaches to the same reality. His ideas, expressed in his *Dialogue concerning the two chief world systems* (1632), inadvertently encouraged the detachment of the human from the natural sciences. Kepler (1571-1630), following Galileo's example, viewed geometry and mathematics as part of the divine mind. According to Kepler, geometry had been transmitted to humankind along with the image of God.

Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and read the letters in which it is composed. It is written in the language of mathematics (Frege 1996:128-129).

The identification of science with mathematics culminated in the work of Newton and contributed to the detachment of natural science from the life world. Mathematics is, however, no longer the shibboleth it was for dividing the natural and human sciences. Traditional human sciences are increasingly using methods regarded as belonging to the natural sciences to pursue 'historical investigations'. Social science, psychology and modern structural linguistics relate closely to structural approaches, which at least 'flirt' with mathematics (see Pannenberg 1976:116,120).

The church, by focusing almost exclusively on revelation theology, inadvertently relegated natural theology to the sphere of the natural sciences (Moltmann 2002:27). While theology pondered human beings as the image of God, the sciences studied human beings as the image of natural processes which developed over millions of years. Wisdom, values and ethics became increasingly limited to the religious and personal sphere.

This detachment of the natural from the human sciences has been described in the scientific world as the difference between the internalist and externalist positions. The internalist position refers to scientists who are concerned with the intellectual contents of science – its concepts, theories and ideas. The externalist position refers to those concerned with noncognitive, social, economic and institutional conditions, the causes and determinants of scientific practice and theory[6] (Schuster 1990:218-219).

6 Hobbes (1968:148) distinguished natural history from civil history: the former does not depend in the least on the human will (history of metals, plants, animals, regions). Civil history, on the other hand, is the history of the voluntary action of human beings in commonwealths. The former obviously cannot include values; the latter is based on values.

The division of the sciences did not really matter while technology held only limited sway over society. The situation changed, however, when the commercial and military advantages of technoscience became indisputable. This greatly increased the distance between science and values. With the increasing commercial and military advantages of technoscience the question of control of scientific research became paramount.

'SECULARISATION' OF THE NATURAL SCIENCES: LOSS OF FREEDOM AND IDENTITY TO THE MARKET THROUGH COMMERCIALISATION OF TECHNOSCIENCE

Science and scientists have been separated from the managers of science. The managers of science (i.e. the state and large corporations) determine the direction scientific research takes by funding certain selected fields of research. The natural sciences have been 'secularised' and are predominantly 'used' to serve the market. The detachment of the natural sciences from values, ethics and the life world must not be seen in isolation. This process simply reflects the present-day detachment of the market (including technoscience) from individual and social life. Two worlds are being dissociated: the world of technoscience and markets and the world of cultures, the world of instrumental reason and that of collective meaning, the world of signs and that of meanings (see Touraine 2000:25).

The positive view of scientists, as created co-creators of God's continuous creation, contrasts with the view that they are, in fact, hired co-workers serving the research policies of multinational corporations and government interests. The 'freedom of the sciences' is increasingly challenged by the fact that only a few people are in control of research policies, and these people sponsor carefully selected research programmes that serve their vested interests.

In the past the freedom of the sciences was not in question. Some of the most important technological inventions were incidental and were often the result of the work of a few individuals. Most inventions relied heavily on work done by predecessors and colleagues. We can 'manage' scientific programmes and develop research policies, but we cannot 'manage' invention. Inventions often happen when least expected. In the case of many significant inventions, their uses and applicability only emerge much later. Technology develops cumulatively rather than in isolated, heroic acts, and its uses are discovered afterwards; technological invention does not occur in response to some foreseen need (Diamond 1997:242-246).

The barriers between 'basic' and 'applied' science have been demolished and researchers must rapidly move from invention to innovation and from the laboratory to the marketplace (Webster 1991:43, 56). For Bernal (quoted by Webster 1991:141; also see Porter 1990:45) the growth of scientific knowledge is stunted by the economics of capitalism, so that science is applied when, and only when, it pays. The commercialisation of public sector science inhibits curiosity-driven research and calls into question the autonomy of science. In this context researchers have to be responsive to research priorities originating elsewhere in the political and economic sectors. This explains the entrepreneurial focus among academics and the organisational changes made by universities to meet commercial needs. Scientific information becomes a commodity. Team research becomes important in order to speed up the pace of discovery; grants become more focused and short-term; the science citation index – measuring productivity, quality of research, frequency of citations – becomes an important indicator of new trends with lucrative potential for multinational corporations that sponsor scientific research (Webster 1991:72, 90).

State-sponsored research focuses on strategic sciences, which are economics- and military- related. In the United Kingdom expenditure on military research and development amounted to 50 per cent of total research funding. In 1988 almost 50 quoted British companies were involved in major nuclear weapons activity (Webster 1991:69, 75). Military research and development receive the biggest share of government funding, while at the same time posing the biggest potential threat to the future of humankind. In the words of Moltmann (2002:146), "The modern sciences have been said to take the form of power." Consequently the modern discussion about nuclear research and the biosciences is based on two different, often contradictory orientations: on the one hand, progress and the acquisition of power; on the other, the ethos of human dignity.

In order to take responsibility for our world science and technology need to be democratised. This accords with the socially negotiated nature of scientific knowledge. There is an increasing social demand for the regulation or steering of science (Webster 1991:34). In a situation where information has become 'unmanageable' the question is who is to unlock, select and interpret the information that influences our lives. We are collectively responsible for the technology we produce. The field of biotechnology in particular (for some a scientific Pandora's box) is of concern to each individual. The fact that the state depends solely on the wisdom of scientific experts to formulate science and research policies is problematic. There are rarely objective criteria to make objective evaluations possible. Scientists are biased and valuations are socially contingent, that is, perceived, evaluated and rewarded according to the audience and the context in which they appear (Webster 1991:39, 49-57).[7] The electorate and consumer public give governments and multinational corporations their power (Fukuyama 2002:186). The humanities, as 'wisdom' sciences, must interact with the natural sciences in a truly interdisciplinary way.

CONCLUSION: REINTEGRATING A FRACTURED CULTURE

We need a wisdom that grows out of our technoscientific culture. Scientific progress is irreversible. It may be reductionistic to restrict knowledge to science and its methods, to deprive the sciences of values and wisdom, to envision wisdom as the sole solution to the harmful side-effects of a technoscientific culture, and to regard the human sciences as embodied wisdom. Such an approach perpetuates a Cartesian mind-body dualism. Wisdom and knowledge, science and values, natural science and

7 For a discussion of the ideological abuse of science, see Porter (1990:40-42).

human science, the body of science and the life world are all interdependent. Wisdom, too, should not be romanticised. It is not only knowledge that can fall prey to power misuse; the same is true of wisdom. The sage often invokes the authority of wisdom to manipulate and conserve her values.[8]

Even if one succeeds in linking value-free science to wisdom, ethics and values, there is no guaranteed outcome. The wisdom we possess does not translate into a clear set of redemptive ethical guidelines for technoscientific problems. In any case, values cannot be forced upon people; they are acknowledged and adhered to out of conviction. The wisdom we need is more than culture-specific, contingent, contemporary ethics and values, since the challenges of technoscience confront humankind on a universal level. The wisdom under discussion requires more than finding a common denominator (e.g. the biological roots of rationality) to unify the sciences. That certain technologies have negative side-effects cannot necessarily be blamed on a lack of wisdom. The abuse of technology is a reflection of human beings, not of the technology itself. Wisdom is the meaningful response to the harmful side-effects and abuse of technology.

The efforts at a conciliation of the sciences (see Wilson 1998:137) indicate a will to interdisciplinary collaboration. Scholars such as Condorcet, Bacon, Schelling, Polanyi and others have already envisaged a harmony of method over the whole range of knowledge, which will promote rationality and universal intent (see Wilson 1998:15-48; Barbour 1997:94).

Mathematics, natural laws, scientific method and epistemological models cannot be meaningfully linked to values. It is unfair to expect the scientist, as a Christian, to practise a 'Christian' mathematics or science. It is untrue that scientists practising a

[8] Traditionally wisdom was best expressed in proverbs. Proverbs can be seen as a subtle form of social control. They are based on experience, which is regarded by all as authoritative. This is why proverbs do not invite but conclude argument. The point of proverb usage is, through verbal adroitness, to manipulate the behaviour or attitudes of people, thus bringing argument to a close (see Du Toit 1995:231ff).

value-free physics are value-free in their personal lives. Heidegger considers a Christian philosophy or a Christian science, that is a value-laden science, to be an oxymoron. Some degree of basic separation between our value systems and research methods is inevitable. Not all natural scientists are unwilling to discuss the ethical implications of applied science.

The wisdom we need is not a grand, unifying narrative that will overcome all dualisms between the sciences, or a final wisdom ending the plurality of value systems. It is an enquiring wisdom that engages in societal critique, interacting with the powers that determine the development of science and technology. It is a wisdom that helps us on a personal, individual and communal level to make sense of our technological environment, and promote those values that make us human.

A vision (quoted by Geertz 2000:153) by a mathematical physicist puts it in a nutshell:

> Which end is nearer to God; if I may use a religious metaphor, beauty and hope, or the fundamental laws? I think that … we have to look at … the whole structural interconnection of the thing; and that all the sciences, and not just the sciences but all the efforts of intellectual kinds are an endeavour to see the connections of the hierarchies, to connect beauty to history, to connect history to man's physiology, man's physiology to the working of the brain, the brain to the neural impulse, the neural impulse to the chemistry, and so forth, up and down, both ways … And I do not think either end is nearer to God."

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