

NATURAL THEOLOGY IN A PLURALIST SOCIETY

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Abstract

The meanings and aims of natural theology in its historical and contemporary phases are discussed. As 'the search for God through the exercise of reason and the observation of the world', it complements the theology of revelation and constitutes the arena for the escalating dialogue between science and theology. Such dialogue is prompted by the unfolding scientific picture of cosmic history - of an expanding and evolving universe, intelligible to the human mind, remarkably fine-tuned as though designed to allow the emergence and evolution of life into its hierarchy of complexity. While this world-picture does not prove design, it seems to many to be best explained as the work of a Creator and it suggests the need for a reconsideration and renewal of the Christian doctrine of creation, as a metaphysical scheme that includes the new scientific insights and thereby seeks to provide a coherent and convincing overall explanation. Three leading scientist-theologians are introduced who differ in the degree of integration they allow between the two disciplines but who regard science and theology as providing together a unified account of the cosmic process and its meaning. Such an account could be constructed from the starting point of the kenosis at the heart of the being and activity of God - a 'Christian Cosmology' with profound implications, perhaps, for the Church's dealings with other religions.

1. Introduction

This paper deals with the meanings and aims of natural theology in its historical and contemporary phases, especially the latter. This will lead into a brief discussion of some implications for Christian belief and doctrine on one hand and for interfaith relationships on the other.

Natural theology can be described briefly as the search for God through the exercise of reason and the observation of the world, especially *scientific* observation. It is often regarded as a contradiction in terms - a false mixing of the opinions of faith with the facts of nature - but it is nevertheless the arena in which science and Christian theology enter into dialogue, seeking to understand more deeply the one world with which both are concerned. It embraces a fairly wide spectrum of relationships between the two disciplines.

New perspectives from the realm of science - especially cosmology, quantum physics, evolutionary biology, genetics and the study of consciousness - have raised metaphysical questions which invite responses from the discipline of theology. Consequently, there has arisen over the last three or four decades a fresh wave of discussion between theology and science, initiated to a large extent by scientist-theologians and scientists interested in theology but also involving a number of theologians and philosophers. The debate has ranged over such topics as: the nature of scientific and religious knowledge; the relationship of the cosmologists' picture of our finely-tuned universe to the Christian doctrine of creation; the emergence and nature of human *being* in this evolutionary world; the significance of the evolutionary nature of the universe and its life forms; and fresh aspects of the question of how God acts in the world (now perceived to be far less mechanistic than previously thought). Such discussion has been escalating rapidly in the Western world in the

form of articles, books, conferences and interdisciplinary university courses in the fast growing field of 'Science & Religion'.

In 1988 Pope John Paul II made a statement about the dialogue between science and religion. He hoped for dynamic interchange, with each discipline 'radically open to the discoveries and insights of the other'. The initiative would have to come from the theologians, he claimed, since they have in the past made so little effort to understand the findings of science. He stressed the essential mutuality thus: 'Science can purify religion from error and superstition; religion can purify science from idolatry and false absolutes' (Russell 1988: introd).

2. The nature and place of natural theology

In its philosophical mode, theology attempts to understand the nature and significance of the created order through other disciplines - arts, humanities and sciences, especially the latter - and thence to infer as far as possible the nature of the Creator. As scientist-theologian John Polkinghorne writes: 'If it is true that theology is no mere speculative system but a response to what is, then surely it will always have been in need of cool appraisal of the world it seeks to understand. Natural theology - the search for God through the exercise of reason and the inspection of the world - is then not an optional extra, for indulgence by the scientifically inclined, but rather it is an indispensable part of theological inquiry' (Polkinghorne 1988: xii).

The disciplines of science and theology can readily be seen as complementary ways in which we seek our understanding of the world - its nature and processes on one hand and its meaning and purpose on the other. It is theology as a whole that seeks to formulate the fullest possible description of the meaning, purpose and destiny of the world within a theistic framework. It does so by drawing upon the insights of both *natural* and *revealed* theology, obtained from nature ('the book of God's works', *general* revelation) and Scripture ('the book of God's words', *special* revelation), respectively. It is through natural theology that the theological enterprise is encouraged to be the great integrating discipline, drawing in wide-ranging insights in the formulation of a metaphysical theory of all that is. Some physicists speak confidently of discovering one day a 'theory of everything', but it is to theology, not theoretical physics, that one should look for a genuine theory of everything!

Much clarification of the place of natural theology has come from the setting forth of the areas of competence of science and theology. Polkinghorne has summarized the differences between the two disciplines as follows, seeing them as the exploration of different aspects of human experience: one deals with our impersonal encounter with a physical world that we transcend; the other, our personal encounter with the One who transcends us. They use different methods: in the one case, the experimental procedure of putting matters to the test; in the other, the commitment of trust which must underlie all personal encounter, whether between ourselves or with the reality of God. They ask different questions: in the one case, how things happen, by what process?; in the other, why things happen, to what purpose? Though these are two different questions, yet, the ways we answer them must bear some consonant relationship to each other (Polkinghorne 1990).

Scientists and, to a large extent, theologians operate on the assumption that they are engaged in a search for aspects of *objective* reality, however much the latter are received through the filter of their cognitive powers. It is a 'critical realism' that characterizes both disciplines, rather than the 'naive realism' of past ages which laid claim to *certainty* of knowledge. Both disciplines rely on inferring reality, material or divine, from the way their

models and theories make sense of 'great swathes of physical data' on one hand, or 'great swathes of spiritual experience' on the other (Polkinghorne 1996:14).

Science claims to be achieving a tightening grasp on the nature of its subject matter; for example, it has acquired a much more profound understanding of the nature of electrons over the course of this century. It does not lay claim to absolute knowledge about any aspect of the physical world but rather to obtaining increasing verisimilitude between its theoretical models and the reality they describe - to the construction of better maps of reality (Polkinghorne 1996:16-17). Theology, likewise, perceives a pattern of divine revelation which has unfolded in human history, even if with much less consensus than in science. Anselm's classic definition of theology is 'faith seeking understanding' which he clarifies in his *Letter on the Incarnation*: 'One who does not believe, will not experience; and whoever does not experience, will not understand' (Lash 1996:155). Thus he makes it plain that, in the history of the Christian faith, it is the following of Christ in discipleship (constituting 'great swathes of spiritual experience') which 'furnishes the context in which we may gain some understanding of the mystery of God' (Lash 1996:155). Of course that understanding has constantly been challenged by the unfolding world-picture of science and the paradoxes of human experience within it.

3. Historical perspectives

Natural theology has had a long and sometimes controversial history, since the Middle Ages at least. In his *Summa Theologiae*, the great synthesis of Aristotelian natural philosophy and traditional Christian doctrine in the 13th century, Thomas Aquinas built up a cumulative philosophical case (the Five Ways) for the existence of a self-subsistent First Cause, evidence of whose intelligence and purposefulness is to be found in the superb ordering of nature. He appealed to very general facts about the world (such as its existence and its changing nature) and the emphasis was then very much upon the exercise of reason as he worked on the two great themes of *existence* (why does something exist rather than nothing?) and *design* (the suggestion of purpose rather than blind chance in the pattern and process of the world) (Polkinghorne 1988:9-10).

The second great flowering of natural theology occurred mainly in England from the late 17th to the early 19th centuries - from Robert Boyle to William Paley. In contrast to Aquinas, Boyle and others were able to draw upon much new empirical knowledge of the cosmos and the world of nature. They could therefore place a much greater emphasis on the evident design of the world, at both the cosmic and biological levels. Newton's *Principia Mathematica* (1689) had shown the universality of the force of gravity and inspired a new 'mechanical philosophy' of a cosmos that exhibits underlying mathematical design - a cosmos that Boyle likened to the famous beautifully structured clock in Strasbourg.

This philosophy raised the problem of how one is to think of the Creator's manner of acting in the world, for a clockwork universe did not seem to leave room for divine manoeuvre. However, the overall picture was considered to preserve the notion of God's sovereignty through the operation of *physical law*. The latter concept was first introduced into scientific thought in that century, when the universe came to be seen not so much as a spirit-filled organism as a mathematically precise mechanism. Not that there was suddenly a complete change of paradigm, away from the astrology and alchemy inherited from the Middle Ages, for the new alternative could seem very bleak. For example, Boyle and Newton themselves were privately absorbed in the clandestine work of the English alchemists who believed that 'life rather than mechanism stands at the very heart of nature' and that alchemy offered the promise of revealing the secrets of nature (Westfall

1980:20,22). Furthermore, the mechanical philosophy could easily be viewed in an anti-religious sense, prompting a warning from the French philosopher, Blaise Pascal, that it was but a short step away from the deism and then atheism that was to emerge in the European 'Enlightenment' of the eighteenth century (Brooke 1991:194).

At this time the naturalist John Ray produced one of the classics of natural theology: 'The Wisdom of God Manifested in the Works of Creation' (1691) which went to ten editions in forty-four years. This sounded a note of confidence that would persist through the philosophical criticisms of Hume and Kant and the general mood of scepticism of the Enlightenment, reaching a climax in Paley's 'Natural Theology; or Evidences of the Existence and Attributes of the Deity, collected from the Appearances of Nature' (1802). This appeared in nineteen editions in as many years and was one of the most popular works of philosophical theology in the English language (Brooke 1991:192).

Following Newton, William Paley affirmed the unity of design of the cosmos and its contents as an expression of a single creative mind, but he went beyond Newton, arguing for a God who is beneficent - for example, to the necessity of eating food, God superadded pleasure (Brooke 1991:192). Paley's chapter on the 'Argument Culmulative' opens with the sentence: 'Were there no example in the world, of contrivance, except that of the eye, it would be alone sufficient to support the conclusion which we draw from it, as to the necessity of an intelligent Creator' (Goodman 1973:319). Likewise, if there were but one watch in the world, it would not be less certain that it had a maker - and every one of a thousand machines would each point that way, with cumulative force. So it is with each superbly functional organ of every plant or animal, allowing Paley to assert confidently that 'It is a happy world after all' (Brooke 1991:193).

At the time that Paley's 'Natural Theology' made its first appearance in 1802, the discipline of geology had just begun to form, especially in England but also in Germany and in Europe generally. The layered structure of the earth's crust and the fossil contents of rock strata soon indicated, firstly, that the formation of that structure was of a vastly longer duration than the several thousand years calculated from Scripture and, secondly, that the fossil record showed a temporal progression from simpler to more complex creatures. Charles Darwin was involved in geological study and observation, and this picture of 'earth history' formed the background to his slow and cautious development of the theory of evolution by natural selection. Despite the incompleteness of his theory, when Darwin's 'Origin of Species' was published in 1859 it pulled the rug from under Paley's explanations of beneficent design for it provided an alternative plausible explanation of such 'design'. Altogether, these 'natural history' disciplines seemed to contradict the historicity of the Genesis accounts of the creation and Noah's flood and even to diminish the special status of humankind.

From the start there were a number of Christian scientists and theologians who were not perturbed by Darwin and were able to accommodate their world-views and theology to this new challenge. Since then, churches in the long-established denominations have generally combined a critical approach to Scripture with a respect for its authority in the theological and ethical realms; only thus has constructive engagement between science and Christian theology remained possible. In the early decades of this century, however, there was no particular enthusiasm for such an engagement. Karl Barth's firm stand for revelation as the sole key to any understanding of God was no doubt an inhibiting influence.

4. The cosmos: fine-tuned and intelligible

Over the past few decades science has developed a highly coherent 'Big Bang' model of the universe - a picture of an expanding and evolving universe that turns out to be intelligible to the human mind; roughly fifteen billion years old and correspondingly large; governed by physical laws which allow it to be exploratory in its configurations and processes; tightly knit and remarkably fine-tuned, as though designed to allow the emergence of life. This is the standard model of the universe - the only model so far that fits the three main pieces of observational data, namely, the present expansion rate, the cosmic background radiation that is spread almost uniformly through the universe, and the three to one ratio of the abundances of hydrogen and helium. The model may not be the last word on the subject, but it hangs together beautifully and allows physicists to work backwards in time and determine, stage by stage, the 'history' of the universe, at least to a couple of minutes after the Big Bang. They have produced a speculative yet coherent account of even earlier stages, back to a small fraction of a microsecond after the Big Bang (which is itself inaccessible to science).

A rough outline of the cosmic chronology is given in Table 1. Ours is the first generation to have available such a complete overview and, indeed, to be able to reflect on the fact that all the atoms in the human body (other than hydrogen) originated in the nuclear burning processes in the hot interiors of large stars - stars which are therefore, in a sense, our ancestors. Our existence has had to await the passing of the billions of years required for a stellar life-cycle.

The universe might have been a disorderly chaos rather than an orderly cosmos - or it might have had a rationality that was inaccessible to us (Polkinghorne 1988:20). In fact, between pure mathematics (which seems to be the free abstract creation of the human mind) and the basic structure of the material world there is an intimate connection that is usually taken for granted and yet is quite surprising. The theoretical physicist Eugene Wigner wrote of the 'unreasonable effectiveness of mathematics' and remarked that 'the miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics is a wonderful gift that we neither understand nor deserve' (Wigner 1960:124).

The physical constants (such as the speed of light, the strengths of the basic forces and the masses of the fundamental particles) and the Big Bang starting conditions (especially the initial expansion velocity) form a set of delicately balanced values. The whole arrangement is so tightly knit that any small change in the 'cosmic blueprint' might well have prevented the conditions for life to emerge. Another way of putting it is to say that if life is to emerge, the cosmic blueprint has to be more or less as it is. This is the uncontroversial 'weak' form of the so-called Anthropic Principle. Perhaps Paul Davies speaks for many scientists when he states that, although not attached to any conventional religion, he has come to believe that the physical universe is put together with an ingenuity so astonishing that he cannot accept it merely as brute fact (Davies 1992:16).

The idea of cosmic design is not, however, the only logically valid interpretation. An alternative hypothesis is that there are countless different universes scattered throughout space and/or time, most of them sterile, but a few of which happen to have the right conditions to support life. Here the Anthropic Principle is pointing to a choice, beyond the competence of science, between the options of a *large variety of universes* or a *single specially created universe*. Furthermore, the idea of our universe as self-subsisting, and perhaps in due course self-explanatory, has appealed to some. Nevertheless, the superbly appropriate structure and process of the universe, while not proof of design, seems to many

to be best explained as the work of a Creator. The seeming design of the universe can then form part of a metaphysical scheme aimed at providing an overall explanation.

5. Natural theology now

At the philosophical level there is a wide spectrum of interactions between science and theology, and Table 2 shows one way of summarising them. Apart from the monistic views of scientism and creationism at the extremes of the spectrum, and the dualisms of science-and-spirituality and faith-and-science, there are three central categories of active engagement in the debate; these are the concern of natural theology. Within these three categories there are scientist-theologians whose background is primarily scientific (Barbour, Peacocke, Polkinghorne and Russell for example) and others who are primarily theologians (Torrance, Pannenberg, Nebelsick, Moltmann, Hefner, Peters and Murphy for example). We shall consider and compare briefly the approaches of Ian Barbour, Arthur Peacocke and John Polkinghorne, noting from the table how they differ in the degree of 'integration' that each seeks.

Amongst scientist-theologians there is strong consensus about the evolutionary nature of the world in both its cosmological and biological aspects - a world created and sustained by its Creator and given the freedom to 'make itself' through the delicate interplay of 'chance and necessity'. This phrase is the oft-quoted title of a book by Jacques Monod, renowned microbiologist and Nobel laureate, who considered the world to be the meaningless outcome of the utterly random shuffling of atoms and molecules. 'Pure chance, absolutely free but blind', he claimed, 'is at the very root of the stupendous edifice of evolution' (Polkinghorne 1991:83). In today's natural theology, however, 'chance' does not carry this negative tone. It characterizes the random sampling of variations within the regularities and constraints of natural laws and is thus the source of novelty. 'The role of chance is to explore and realise (the) potentiality present in the pattern and structure of the physical world we have no reason to suppose that it is an accident that the raw material of matter is capable of evolving, in one form or another, into conscious beings Chance signifies the vulnerability accepted by the Creator when he made room for creation; necessity reflects his steadfastness in relation to it' (Polkinghorne 1990).

Differences between Barbour, Peacocke and Polkinghorne have emerged over the question of divine action in the world. Barbour is, on the whole, sympathetic to Whitehead's system of 'process thought' and the consequent panentheist view in which God participates in the preliminary ('prehensive') sampling of possibilities in anticipation of each physical event, seeking to 'lure' its outcome in a favourable direction (Polkinghorne 1996:33). Peacocke and Polkinghorne both speak of a more active engagement of God, who is understood to be both transcendent and immanent, acting within natural process by means of a top-down input of information, perhaps analogous to the way in which the human brain initiates bodily movement. If human free will is a reality, it is a not unreasonable assumption, suggests Polkinghorne, that there is room, too, for divinely willed acts within the openness of the world's processes - acts which one expects never to be arbitrary but always to be coherent and consistent with the rationality and nature of God (Polkinghorne 1996:67-68).

The views of these three scientist-theologians diverge yet more strongly over the question of the degree to which science and theology can be integrated and, consequently, over ontological questions about the person of Jesus Christ. Barbour's strongly integrationist position leads him to a picture of Christ as 'the new emergent' in the evolution of humankind. 'I suggest then that in an evolutionary perspective we may view both the

human and divine activity in Christ as a continuation and intensification of what had been occurring previously. We can think of him as representing a stage in evolution and a new stage in God's activity' (Barbour 1990:211). Peacocke assumes a closer link between God and 'Jesus the Christ' who, though not ontologically divine, yet exemplifies the highest potential of human existence in relationship to God and expresses the nature of God as one who cares and suffers in and for the creation. Polkinghorne aligns himself with the doctrine of God as Trinity. The mystery of the incarnate Word of God - of divine and human natures in one person - cannot be abandoned, he asserts, 'in accommodation to the supposed needs of science' (Polkinghorne 1996:73). Consequently he looks not for *integration* but *consonance* between the two disciplines.

Whether or not inclined to *integration* (a term which could imply the *assimilation* of theology by science, as exhibited for example in the ideas of Christopher Knight in his critique of Peacocke and Polkinghorne (1995:38)), all three firmly regard science and theology as providing together a unified account of the cosmic process and its meaning. 'The universe that science studies is not a mere sequence but a story, a struggle upward through matter, life, thought, history, and culture. Only a narrative can really capture what is going on. And it is precisely this need of humans for meaningful narrative that allows theology to complement the causality of science' (Mooney 1991:319). Through natural theology, then, there is a need to encourage what has been nicely described as 'attentiveness to the possibility that world history is music and not merely noise' (Lash 1996:31).

George Ellis is a well known cosmologist (at the University of Cape Town) who has felt that 'the time has come for the scientific approach to be extended to a more profound synthesis that attempts to return to the broader issues' of human existence in such a universe (Ellis 1993:2; see also Murphy and Ellis 1996). In recent years he has argued for a broadening of cosmology into a world-view (or 'Cosmology') that includes the area of moral and ethical issues. His scheme is based on the axiom that God so creates and sustains the universe as to make possible high-level loving and sacrificial action by freely-acting self-conscious individuals (Ellis 1993:118). Given not only the fine-tunedness of the universe but also its particular hierarchy of levels of complexity - *physical, biological, personal, social/ecological, moral, spiritual, divine* - each level operating in terms of its own meanings and laws, Ellis argues effectively that it is just such a universe that is needed for the existence of free will and hence the possibility of *kenosis*. His scheme is an explanation or model of our multi-levelled universe up to the level of the *moral*, and immediately it raises the challenge to incorporate some such broadened Cosmology into the Christian doctrine of creation (Barrett 1996:65).

6. Implications and questions

In its present phase, natural theology, as an arena for the dialogue between science and theology, has mostly been confined to specialist gatherings of scientists, theologians and philosophers, amongst whom a large degree of understanding has been achieved. Within the wider public, however, there has been a persistent widespread perception that science undermines Christian belief, and that there is a choice to be made, for example, between believing in God and accepting the theory of evolution. If natural theology is permitted to have an educational role within the Christian faith, and even beyond, its initial task will no doubt be to seek to dispel that perception and help people to appreciate both cosmic and biological evolution as part of a coherent and stimulating 'Christian Cosmology'.

Within theology the understanding of the human person as coming into existence through the processes of biological evolution has created the need to reformulate certain

traditional Christian doctrines. 'Christology, original sin, redemption, the theology of death, and the material character of the afterlife are the most obvious areas raising new questions which theologians must somehow confront' (Mooney 1991:328; also Ward 1998, in preparation). These are words of the late Jesuit theologian, Christopher Mooney, who felt that theologians and scientists would find it difficult to achieve a real meeting of minds, but that it was important for them to do so, especially on the nature and significance of the human person. Conferences on 'science and religion' have, in fact, tended to proceed from cosmological to biological topics and now, increasingly, to the mind/brain relationship and the nature of the human person.

It is at this point, within the context of a Christian metaphysics (or 'philosophical theology'), that the theology of death and the afterlife needs to be reconsidered. The idea of the human person as a psychosomatic unity that has emerged in the course of natural process has encouraged 'the full retrieval of Christian teaching on the resurrection and immortality of body and soul together', allowing matter to be taken more seriously 'when its future spiritual destiny is acknowledged' (Mooney 1991:325). For Polkinghorne, our hope lies in the understanding of the God of Scripture as one who 'makes all things new' - *creatio ex nihilo* at the beginning and *creatio ex vetere* at the end. 'I believe', he writes, 'that a credible eschatology is essential for the coherence of Christian belief' (Polkinghorne 1996:55-6) and he devotes a chapter to this topic in his Gifford Lectures on 'Science and Christian Belief' (1994).

Polkinghorne also seeks a credible approach to the doctrine of 'the Fall', aspects of which would be problematic for all three of our scientist-theologians (Polkinghorne 1991:99-104 and 1996:83). The notion of original sin does not clash with science - in fact a link is sometimes suggested between that doctrine and the self-centred struggle for survival assumed in the theory of biological evolution (Stannard 1982:23-31). What *is* problematical is the idea that the entire realm of nature was infected and distorted by the sin of Adam and Eve, for biology and palaeontology indicate that life on earth has always involved a harsh struggle for survival, before the arrival of *homo sapiens* as well as after. In response to the question of pain and suffering in a world created by a compassionate God, the case has been argued theologically that 'natural history is cruciform' - that *kenosis* is exhibited at all levels of life and is continually necessary if the forms of life are to be generated through the process of evolution, but that the axiomatic idea of infinite divine love implies that God suffers too, in and with the creation (Rolston 1994:205-229).

How may a theological 'theory of everything' be constructed today? One possibility, suggested above, would be to incorporate such a kenotically-based Cosmology into the doctrine of creation. Every theory is based on some fundamental assumption or axiom (or set of axioms) and here the assumption that suggests itself is the idea of the 'kenosis of God', not only in the redemption of the world but also in its creation and continuing existence. This phrase contains something of 'the limitlessness, the vulnerability and the precariousness of authentic love', expressing itself in a creation from which 'nothing must be withheld no unexpended reserves of divine power or potentiality' for 'the universe is the totality of being for which God gives Himself in love. From His self-giving nothing is held back: nothing remains in God unexpended' (Vanstone 1977:59).

If such costliness is acknowledged, this could surely have a profound effect on attitudes towards every aspect of the world around us, including its plurality of religious traditions. Much of the Church's stance towards other religions has been bedevilled by a too readily adopted position of 'exclusivism' concerning salvation. On the other hand this has been described as a time of fluidity and openness in the discipline of theology - a time in which

'there is greater ecumenicity than ever before and traditions outside Christianity are taken more seriously than they once were' (Hodgson and King 1985:1) as theologians turn to the development of 'comparative theology' (Ward 1994 and 1996) and religious studies generally. Here there is likely to be sympathy for a far more 'pluralist' stance in which there are seen to be as many paths to salvation as there are religions; this is in tune with the healthy postmodern distrust of absolute explanations.

In between these two positions there is an 'inclusivist' stance which holds to the main well-winnowed doctrines of Christianity but does not claim any special status for Christians. It does not view religions as paths to the same goal for they have different theologies, different cosmologies and different anthropologies, and are 'different paths to different tradition-specific goals' (John Clayton, quoted in Lash 1996:19). But insofar as they carry the twofold aim of 'weaning us from our idolatry and purifying our desire' and represent profound aspects of human existence - 'traditions of narrative and devotion, of proclamation and repentance, of celebration and compassion, of speech and silence, of structure and slavery and liberation' (Lash 1996:21, 19) - they are seen to be a valuable part of the story of costly creation.

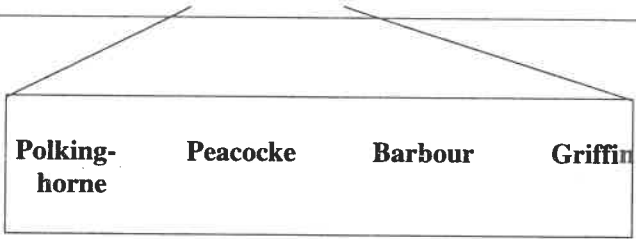
Christian reflection resonates to the image of *kenosis* - self-emptying compassion, not only in the incarnation but at the very heart of God who is 'the Lamb slain from the foundation of the world', within space-time and beyond. There is a deep hope in the Christian Church that *ultimately* 'tantus labor non sit cassus', may so great a labour be not in vain.

Table 1 Chronology of the Universe

<i>time after big bang</i>	<i>temperature of universe</i>	<i>occurrence</i>
0	?	big bang
10^{-43} secs	10^{32} K	forces all equal matter = antimatter
10^{-33} secs	10^{27} K	matter > antimatter gravity weakens
10^{-9} secs	10^{15} K	weak force weakens
10^{-2} secs	10^{11} K	quarks begin to cluster
10^2 secs	10^9 K	lightest nuclei form
10^5 years	10^3 K	atoms form, light travels freely
much later		stars and galaxies form, then chemical elements in stars some of which explode in due course as supernovas
10^{10} years	3 K	earth and other planets form, eventually development of life
continued expansion and cooling		more and more complex forms

Table 2 Spectrum of relationships between Science and Theology *

non-theistic science	science & spirituality	science & theology	conceptual synthesis	theology & science	faith & science	non-scientific theism
scientism (monism)	dualism	partial integr	integration	partial integr	dualism	creationism (monism)
Monod Dawkins Dennett	Davies Barrow Zohar	Polk'horne Peacocke Barbour	Cobb Griffin	Torrance Moltmann Pannenberg		Bryan Gish Morris



'Neo-Trinitarian
Theology' (science
+ revelation)

'New Theology'
(metaphysical,
e.g. process theol)

consonance

assimilation

* This table is a modified and expanded form of the typology of the theology/science dialogue, given in John Webster's paper, 'The new dialogue between physics and theology: a traveller's guide', published in the Proceedings of the SASRF seminar on 'Theology and the New Physics' which was held at Unisa on 7 May 1993.

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