

The Unity of Knowledge and the Faithfulness of God: The Theology of Mathematical Physicist John Polkinghorne

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*O God, because without you we are not able to please you,
mercifully grant that your Holy Spirit may in all things direct and rule our hearts,
through Jesus Christ our Lord, who lives and reigns with you
and the Holy Spirit, one God, now and forever. Amen.*¹

1 Introduction

The Rev. John Polkinghorne, KBE, FRS, is arguably the greatest living Christian voice in the dialogue on science and religion, having written on “the cosmos, the nature of the universe, relativity, chaos theory, string theory, critical realism, philosophy, nature, theology, the end of the world, the Trinity, the character of God, [and] divine action... [1, p. 181],” among other things. A well-decorated mathematical physicist, Polkinghorne resigned his academic post mid-career to study for the Anglican priesthood. He has since become an influential theologian and a prolific author. Polkinghorne is widely admired by Christian academics for his thoughtful and winsome defense of the harmony between science and faith, and yet his theological views are not without controversy.

In this paper we will give a brief introduction to Polkinghorne’s life and work. We will give an introduction to Polkinghorne’s approach to philosophy and theology. We will introduce the two most significant influences on Polkinghorne’s development as a theologian and philosopher of science. We will then give a necessarily telegraphic review of some of the topics addressed in Polkinghorne’s theology, including his thoughts on science and religion, natural theology, evil, providence, prayer, resurrection, the soul and eschatology. We will then conclude with a few short examples of Polkinghorne’s thoughts on mathematics.

2 Biography

John Polkinghorne was born on October 16, 1930 Weston-super-Mare, England to George and Dorothy Polkinghorne. His dual loves of science and theology were nurtured by his schooling, in which his mathematical precociousness was recognized and encouraged, and by his church and home life, from which his lifelong Christian faith was birthed. In addition to these joys, the sadnesses of his youth helped to shape the mathematical physicist and theologian that he would become. His sister Anne died at age 6 in 1929, before John was even born. And his only other sibling, Peter, died in 1942 flying in World War II for the Royal Air Force. This close intimacy with natural and human evil, as well as the puzzlement of unanswered prayer, shaped John’s

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¹A traditional Anglican prayer from *The Book of Common Prayer* that John Polkinghorne often prays before public events [1, p. 14].

thinking on the nature of created and divine reality, as well as our understanding of it through science and theology.

After a promising start to his mathematical education in primary and secondary school, John served briefly in the military. This too shaped his future course, as one of his duties was to teach elementary mathematics to apprentices studying to be engineers. Thereafter, John was given a scholarship to Trinity College, Cambridge, from which he completed both an undergraduate degree in Mathematics and then a Ph. D. in Physics. While at Trinity John's life was significantly changed in two other ways. During one meeting of the Christian Union, John felt called by God to deepen his commitment to his faith in Christ, which he did. In addition, John met and began dating Ruth Martin, a statistics major at Girton, whom he eventually married.

After John completed his doctorate and they were married, John and Ruth moved to Pasadena, CA, where John took a Post-Doctoral position at The California Institute of Technology. There John was on a team that developed the mathematical models that predicted the eventual discovery of quarks. John then return to the UK to teach for a couple of years at Edinburgh, before returning to take a post in Mathematical Physics at Cambridge.

In 1977, having "done his bit for the subject [1, p. 54]" of physics, John did something that shocked the community of mathematical physicists. He resigned his faculty position in order to study for ordination in the Church of England. John very much enjoyed his biblical, theological and pastoral studies, approaching them as the scientist that he was.

After graduation and ordination, John entered parish ministry when he became the vicar in tiny Blean. After a few years serving the church and the people of Blean, John was called back to Cambridge once again to be the dean and chaplain at Trinity Hall. His ministerial career then rejoined his academic career when he was elected to the presidency of Queens' College, Cambridge. After administering this role for a little over a decade, John retired from any official academic positions in 1996. However, up to the present day, he has remained prolific as a writer, public speaker, consultant and advocate on issues relating and related to science and religion [1, 5, 10].

3 Publications and Honors

Since his first book, *The Analytic S-Matrix* (1966, with Eden, Landshoff and Olive), Polkinghorne has written or edited seven book on science and mathematics, including his personal best-seller, *The Quantum World* (1985). His research and writings in science were significant enough that Polkinghorne was elected as a Fellow of the Royal Society in 1974.

As impressive as it is, Polkinghorne's scientific output pales in comparison to his prolific theological output. His first theological work was *The Way the World Is* (1984), which was the beginning of a corpus that now includes over 30 theological volumes either written or edited by Polkinghorne.

Most of Polkinghorne's theological books are short, on the order of between 100 and 200 pages. Recently, some have undertaken the task of trying to gather and summarize the whole of Polkinghorne's theological writing in a way that is accessible. Oord (2010) edited for Polkinghorne selections of his writings chosen by Polkinghorne himself to represent the best of his work, and organized into twenty-two topical chapters [27]. More accessible is Giberson and Nelson's 2011 biography of Polkinghorne [1], which is both an engaging introduction to a winsome and thoughtful man, and also a succinct overview of his thought.

Polkinghorne's writings on theology and science have been so significant that he's been called by Ian Barbour, "...one of the pioneers in the field [of science and religion]." He's been described by Philip Clayton, as "...the most-read defender of the religion-science dialogue." He's also been called "...Britain's leading scientist theologian..." by Keith Ward [27]. These three are all highly significant praises, given that they are coming from some of the leading thinkers and writers in the dialogue between Christianity and science.

The recognition of Polkinghorne's work goes beyond the anecdotal. He has been invited to give several prestigious lectures, including the Gifford Lectures at the University of Edinburgh, the Terry Lectures at Yale University, and the Parchman Lectures at Baylor University. Polkinghorne was even knighted as a Knight Commander of the Order of the British Empire, although as is customary for priests in the Church of England, he is not called "Sir." Perhaps the most telling sign of Polkinghorne's significance as a leader in the dialogue between science and faith is his 2002 Templeton Prize for Progress on Science and Religion [1, 5, 10].

4 Philosophy and Method

4.1 Critical Realism

Both as a scientist and as a theologian, Polkinghorne looks through the philosophical lens of critical realism; he believes that our perceptions can constitute a reliable guide to what really is. In *One World*, Polkinghorne argues for the inadequacy of non-realist philosophies of science such as positivism, in which the aim of science is merely to arrive at theories that are intersubjectively agreed upon by scientists, and idealism, in which the perceptions of science are said to be merely the results of our observational procedures [22, pp. 21-31].

Polkinghorne instead insists that the terms of our scientific understanding "are dictated by the way things are [22, p. 2]." Polkinghorne is a realist in part because he sees the observed success of science as pointing to the fact that scientists are "gaining a tightening grasp of an actual reality [22, p. 2]."

However, Polkinghorne gives three reasons for his belief that the only defensible realism is a critical realism. The first is that science can only ever claim verisimilitude, i.e. it can only ever give adequate accounts of limited physical regimes, never a complete account of all physical reality. Second, our everyday notions of objectivity prove insufficient for regimes far removed from our familiar experience, such as the strange world of Quantum Mechanics. Finally, the judgment and discretion of scientists do play a role [22, p. 21].

For Polkinghorne, the philosophy of critical realism applies to theology as well as to science. Whereas in science he believes that what we know from nature is a trustworthy guide to what really is, in theology he believes that what we know from God's revelatory acts is a trustworthy guide to God's real nature [18, p. 101]. For science, this trust is underwritten by its fruitfulness. For theology, this trust is "directly underwritten by the faithfulness of the God so revealed, who will not be a deceiver [18, p. 101]."

4.2 Bottom-up Thinking

Derived from his critical realist philosophy, Polkinghorne uses a method of enquiry that he calls "bottom-up thinking." Instead of starting with presupposed answers, whether in science or theology, and then looking for evidence to support those answers, a bottom-up thinker looks at the evidence and then draws conclusions that the evidence suggests [24, p. 145]. Bottom up thinking, in other words, moves "from evidence to understanding [12, p. 127]."

In science, for example, Polkinghorne uses a bottom-up approach to his interpretation of Quantum Mechanics. While acknowledging that there are empirically adequate deterministic accounts of quantum uncertainty, he reads the situation "from below" as the observed unpredictability indicating real randomness [9, pp. 39-40]. Polkinghorne makes a similar move in interpreting chaotic dynamical systems. He interprets the epistemological indeterminism of a chaotic system as aligning with a true ontological indeterminacy [9, p. 41].

Polkinghorne also applies bottom-up thinking to theology. For example, in regards to the trinity, Polkinghorne is persuaded by the so-called "Rahner's Rule [28]." In this, the economic

Trinity, God as God is known through creation and salvation history, is identified with the immanent trinity, God as God in Godself [18, p. 101]. As a second example, Polkinghorne believes that our understanding of who Jesus was pivots on the critical event of his resurrection from the dead [10, p. 120]. Here he is of course following in the good company of the Apostle Paul (1 Cor. 15:14).

5 Influences

5.1 Polanyi

Perhaps the greatest influence on Polkinghorne's philosophy and method was Michael Polanyi, the Hungarian chemist and philosopher, and in particular his book, *Personal Knowledge*. Polanyi rejected the idea that scientists were purely objective, and instead believed that all knowledge is personal.

Scientists, like all other observers, cannot separate themselves from their experiences and backgrounds [1, p. 32]. Scientists attempt as a community to rise above this, and collectively, albeit imperfectly, move towards an objective description of reality. In this way, the scientific community is not altogether different from a religious community.

As Polkinghorne puts it, "All human knowing is from a particular point of view, which will offer opportunities for insight but be bounded by its inherent limits [1, p. 32]." Thus properly practiced and understood, both science and faith seek to understand ultimate realities, but recognize that they fall short of perfect understanding. Polkinghorne summarizes Polanyi's thinking into the maxim "To commit myself to what I believe to be true, knowing that it may be false [1, p. 32]."

5.2 Moltmann

While the philosophy of Polanyi had the greatest impact on Polkinghorne, the philosopher, Polkinghorne, the theologian, was most greatly influenced by the theology of Jurgann Moltmann. Moltmann, a German theologian, came to faith in Christ as a prisoner in an Allied Prison camp, and his theology is profoundly shaped by the horrors of the Holocaust.

Moltmann's theology has influenced Polkinghorne's thinking on a number of topics, including the Trinity, the incarnation, the resurrection, creation, and eschatology. However, Polkinghorne's thinking was most impacted by Moltmann's seminal work, *The Crucified God*, which shaped Polkinghorne's thinking on evil and suffering.

For Moltmann, the cross of Christ is where God participates in the suffering of the world. As Polkinghorne sees it, this is a critical insight for theology, particularly as it wrestles with its deepest challenges. "The concept of a suffering God affords theology some help as it wrestles with its most difficult problems... [21, p. 22]."

In fact, for Polkinghorne this insight is not just critical for theology, it is critical for faith. "The insight of the crucified God is at the heart of my own Christian belief...and indeed of the possibility of that belief [13, p. 44]." The towering intellectual, who now wrestles with the questions of evil and suffering on a world-wide and even cosmic scale, was once the sensitive 12-year-old boy wrestling with the question of why the God that he lifted his brother, Peter, to during WWII allowed him to perish in his plane over the Atlantic Ocean. Moltmann's insight allows him to see this God not as uncaring for Peter, and for John, but as suffering with them in their loss.

6 Examples of Theological Thought

Although one may assume, since Polkinghorne was a physicist before he was a priest, that his theological concerns have to do only with issues at the obvious intersections of science and faith.

Although he does address such questions as the origin of the universe or cosmological arguments for the existence of God, his theological thought is much more wide ranging than that. He also brings the insights of science to bear on such theological issues as the question of evil, providence, prayer and the soul. Moreover, on topics for which the insights of science have no obvious input to his theologizing, such as the scriptures, the resurrection of Jesus, and Trinitarian theology, Polkinghorne brings his methodology as a scientist of bottom-up thinking to bear. Below we give very brief summaries of just a few of the many theological issues addressed by Polkinghorne in his prodigious writings.

6.1 Science and Religion

There are today many people of varying perspectives, including both atheists and Christians, who see science and religion as being in fundamental conflict. Such people might view someone, like Polkinghorne, who is both a physicist and a priest much as they would a “vegetarian butcher [21, p. 1].” By contrast, Polkinghorne quite obviously sees no conflict between his roles as scientist and Christian believer. In fact, for him it seems “a natural and harmonious combination [21, p. 1].”

To Polkinghorne, science and theology share a “cousinly relationship in their search of truth [21, p. 15].” Their focus is on different dimensions of truth, and yet they both are built on the conviction that there is truth to be sought. Thus, they are complementary, not competing, pursuits. Polkinghorne pursues both, striving to look “with both the eye of science and the eye of religion” because this binocular vision enables him “to see more than would be possible with either eye on its own [27, p. 3].”

Moreover, for Polkinghorne both science and theology deal with the surprising and counter-intuitive character of reality, which although lending itself to verisimilitudinous description, can never be exhaustively grasped. In his Terry Lectures, Polkinghorne demonstrated the cousinly relationship between science and theology by finding five points of analogy between the struggle for understanding quantum theory and the struggle for understanding Christology. In both cases, there were moments of enforced revision, a period of unresolved confusion, new synthesis and understanding, continued wrestling with unsolved problems, and finally deeper implications of the new theory. [13, p. 29].

6.2 Natural Theology

Polkinghorne defines natural theology as “the search for the knowledge of God by the exercise of reason and the inspection of the world [25, p. 8].” Unlike those who would deny the possibility of such knowledge, such as Barth for example, Polkinghorne believes in the possibility of deriving some limited knowledge of God from natural theology. On the other hand, unlike those who would derive “proofs” of God’s existence from reason or nature, such as Anselm or Aquinas for example, Polkinghorne sees the claims of natural theology as not being logically coercive demonstrations of the existence of God but rather as offering theistic belief as a credible and coherent possibility [13, p. 10].

Polkinghorne rightly eschews the possibility of theology providing answers to the questions of all the other disciplines, but rather affirms that theology must utilize the insights from the other disciplines in order to set them “within the most profound context available [25, p. 7].” Moreover, since theology views reality in its totality, Polkinghorne invites every form of human understanding to contribute to the theological task, saying somewhat cheekily that “Theology cannot just be left to the theologians... [25, p. 8].”

For Polkinghorne the two major contributions of natural theology are that the natural world, and our scientific understanding of it, point to a Divine Mind and a Divine Purpose. To Polkinghorne, the hints of such divine presence are most clearly seen in the vastness of the universe

and in humanity, those in which the universe has become aware of itself.

The Divine Mind is to Polkinghorne a most reasonable explanation for why mathematical beauty is consistently a guide to scientific truth about the created order, and moreover why humans are endowed with the capacity to appreciate this beauty. “The ‘unreasonable effectiveness of mathematics’ in uncovering the structure of the physical world (to use Eugene Wigner’s pregnant phrase) is a hint of the presence of the Creator, given to us creatures who are made in the divine image [13, p. 4].” To find hints of the Divine Purpose, Polkinghorne does not look towards the fruitfulness and diversity of life, because he believes that Darwin has abolished that form of the argument from design. Rather, fitting of a physicist, Polkinghorne sees this Divine Purpose in the anthropic fine-tuning of the universe. “What we have come to understand is that ... [the laws of nature must] take a very specific, carefully prescribed form. Any old world will not do [13, p. 6].”

6.3 Evil

Polkinghorne is charitable towards those who do not believe in God, saying that “Atheists aren’t stupid... [1, p. 158].” Like many, he understands the greatest challenge to belief, for both the skeptical and the faithful, to be a perpetual one—the problem of evil and suffering. “Of all the difficulties that hold people back from religious belief, the question of the evil and suffering in the world is surely the greatest [19, p. 138].” Polkinghorne believes that this is both a logical and an existential challenge, and it is not just the existence of evil and suffering that frame the challenge, but also their scope, particularly in light of twentieth-century atrocities, such as the Holocaust [19, pp. 145-6].

Polkinghorne separates the problem into two parts: moral evil and natural evil. He acknowledges that there is not a clear-cut distinction between the two, for evil moral choices can exacerbate the suffering brought on by natural evil and vice-versa. However, the distinction is important in considering a theodicy. Whereas, the responsibility for moral evil lies with human beings, it seems that the responsibility for natural evil ultimately lies with God [19, p. 138].

Polkinghorne considers, and dismisses, two common approaches to theodicy. The first is to lay the blame for the natural evil in creation at the Fall of Adam and Eve. Polkinghorne believes that a literal reading of Genesis 3:14-19, as indicating that an original act of moral evil led to a curse upon creation that is the source of natural evil, is incompatible with the long history of life that includes death as a seemingly necessary component. Instead he interprets the Fall in mythical terms as a turning away and an alienation from God, the only source of hope for transcending mortality and our finite existence [19, p. 139-140].

The second approach that Polkinghorne finds lacking is to deny the absolute reality of evil. He rejects the view that evil is merely a deprivation, or absence, of the good. Here again he refers to the Holocaust as reason for not being “quick to be dismissive of the possibility that there are also non-human powers of evil loose in the world [19, p. 140].”

Polkinghorne’s preferred approach to theodicy is a variant of the greater good theodicy. In regards to moral evil, he claims the common free will-defense: “a world with freely choosing beings, however bad some of their choices may prove to be, is a better world than one populated only by perfectly programmed automata [19, p. 141].” He does, however, note that in a post-Holocaust world, this cannot be claimed without a quivering voice. His approach to natural evil is similar, and he terms it “the free-process defense [19, p. 143].” In this view, creation is a place of evolving processes, where creatures, in fact all of creation, is allowed to participate in making itself. This necessarily includes the cost of death as a prerequisite to the possibility of new life. Moreover, some things such as cancerous tumors and earthquakes just happen, not for a locally specifiable purpose, but because of “the brute fact of occurrence [19, p. 144].”

6.4 Providence

Polkinghorne's view of God's actions in the world is derived partly from scientific considerations and partly from theological considerations. Of primary significance is his view of creaturely freedom articulated in the free will defense and free process defense cited above. "I believe that God wills directly neither the act of a murderer nor the devastation wrought by an earthquake, but both are permitted to happen in a world that is more than a divine puppet theatre [24, p. 141]." However, Polkinghorne does believe that God interacts with creation in particular ways in particular circumstances, rejecting the deistic view of an uninvolved, clockmaker God [1, p. 72].

A key question for thinkers at the interface of science and theology is, how can we "speak with integrity about the notion of God's acts in the world, whilst at the same time accepting with necessary seriousness what science can say about the world's regular processes [13, p. 48]?" Towards an answer to this question, Polkinghorne assumes that human choice is real and not illusory [13, p. 49]. He also relies heavily on the recent scientific insights, both from Quantum Theory and Chaos Theory, that there are inherent unpredictabilities in the physical world [13, p. 50].

However, a key philosophical question is whether these unpredictabilities are merely epistemological or whether they are also ontological. Although Polkinghorne acknowledges that there is no logically forced decision on how closely epistemology should model ontology, he believes that the working experience of the vast majority of scientists and the cumulative success of science provide a rational defense of this position [13, pp. 52-3].

Polkinghorne examines and rejects several common approaches to understanding divine agency. He rejects a minimalist approach, in which God's acts are confined to his faithful upholding of the universe, as being an inadequate account of history and personal experience. He rejects the idea that God acts only by influencing people, partly because that leaves God without causal activity throughout the vast majority of the history of the universe. He rejects process theology, with its account of God's actions as being limited to a divine lure in each unfolding event of the universe, because it relegates God too much to the margins. Instead he favors an analogical approach, where we understand God's actions in relation to creation analogously to the way that we understand our actions in relation to our bodies [13, pp. 54-6].

This does not mean that Polkinghorne sees creation as God's body, both because that view lacks the degree of coherence and interdependence of biological organisms and because it would leave God in thrall to the changes, and even long-run cosmic futility, of the universe [13, p. 57]. Instead, Polkinghorne views our actions in our bodies as coming from top-down causality, not reducible merely to the bottom-up interactions of its constituent parts. By analogy, he believes that God also acts in creation using top-down, holistic causality [13, pp. 57-8]. However, this begs the question of where we might find possibilities for understanding the "causal joint [3]," which connects God's top-down agency to creation.

Polkinghorne admits that he is in the land of conjecture, saying that "With the nature of human agency still mysterious, we can hardly dare to aspire to more than hopeful speculation when it comes to talk of divine agency [13, pp. 59].." However, as one trying to integrate scientific and theological views of the world he believes that such conjecture is necessary. He believes that the unpredictabilities identified by Quantum Theory and Chaos Theory provide possibilities for understanding the causal joint. For various reasons, including the difficulty of understanding the relationship between the micro world and the macro world, he does not believe that Quantum Theory is the most useful place in which to look for this causal joint. Instead, he favors finding it in the structured unpredictabilities of Chaos Theory, in which negligible changes in initial conditions can radically affect long-term outcomes, but only within the confines of a strange attractor of possibilities [13, pp. 59-62]. Polkinghorne believes that God might execute his willed intentions through "top-down causality at work through 'active information [13, pp. 63].'"

Polkinghorne derives several theological consequences from this view of God acting through

top-down information input. These include the following four observations.

1. This view is a modern, scientifically dressed translation of the long-held discussion of the hidden work of the spirit.
2. There will be in inextricable entanglement among the actions of God, the actions of human, and the unfolding process of nature. Hence, save for the eyes of faith, the divine actions in the world are necessarily hidden from view.
3. God does indeed act in large measure in the world through faithfully maintaining predictable natural processes.
4. Although God acts consistently in comparable circumstances, unprecedented circumstances provide occasion for God to act in unique ways. This then is how we may understand divine miracles in the context of this present discussion.
5. Since the physical universe is one of true becoming, where the future being formed in temporality, God does not know the future in exhaustive detail. Omniscience is self-limited in the kenotic act of creation. [20, ch. 4].

On the last point, Polkinghorne would be thus be described as an Open Theist. “Even God does not yet know the unformed future, for it is not yet there to be known though undoubtedly God sees more clearly than any creature can the general way in which history is moving [24, p. 141].”

6.5 Prayer

“Can a scientist pray?” is the question that Polkinghorne asks as the theme of his second of three Parchman Lectures at Baylor University in 2002 [17]. Of course, this might depend upon what one means by the question. Prayer can involve many different aspects, such as worship, waiting in stillness and contemplation [20, p. 80]. And Polkinghorne believes that scientists pray prayers of adoration, even if they do not know it, when they marvel at the wonder of creation as revealed through science [1, p. 72].

The question, then, brought forth by Polkinghorne above is in regards to petitionary prayer. Scientists attempt to describe the orderly and predictable nature of the world. Can a scientist pray for that which seems to go against this order? “There is a great deal at stake for Christianity... if we can answer ‘Yes’ to the question, ‘Can a scientist pray a petitionary prayer in a way that is positive, without impugning his or her scientific integrity?’” [14, p. 28]. As argued in the subsection on Providence, Polkinghorne is not a deist, rather he believes in a personal God who acts in particular as well as in general ways. Moreover, this God, through the words of Jesus, invites us in a shockingly direct way in Matthew 7:7 to ask things of him [20, p. 80].

However, Polkinghorne rejects the idea of prayer as akin to magic, in which we use spiritual or other powers to get what we want from God. [1, p. 65]. Of course, God already knows what we want and what we need. Thus, to Polkinghorne “prayer is neither the manipulation of God nor just the illumination of our perception, but it is the alignment of our wills with his.... That alignment is not just a passive acceptance of God’s will by human resignation..., but it is also a resolute determination to share in the accomplishment of that will... [20, p. 80].” Polkinghorne notes that prayer is also where God asks us to commit ourselves to what we desire, citing Mark 10:51 [20, p. 83]. In other words, prayer is genuine encounter of persons; it is a “collaborative personal encounter between man and God, to which both contribute [20, p. 80].”

Polkinghorne believes that the future is genuinely open to both human and divine agency, hence the viability of believing in petitionary prayer. Moreover, he believes that God is a good Father who is perfectly good and who desires to give the best to each of his children [20, p. 83].

Polkinghorne also acknowledges, soberly no doubt when recalling the deaths of his brother Peter and his good friend John Robinson, among other times of seemingly unanswered prayer, that when talking about prayer we must admit to the “strangeness of individual human destiny [17].”

Nevertheless, even in the face of death, such as at the deathbed of his beloved wife Ruth, Polkinghorne believes that prayer brings us into the presence of the God “to whom all hearts are open, all desires known, and from whom no secrets are hidden [2].” And being in the presence of this loving God heals our hearts, even if God does not answer a petitionary prayer by granting physical healing, but rather allows nature to take its course [1, p. 72].

6.6 Resurrection

“It is absolutely clear that something happened between Good Friday and Pentecost [10, p. 109].” So begins Polkinghorne’s argument for the historicity of the resurrection of Jesus of Nazareth within the larger context of his defense of the Nicene Creed. For Polkinghorne, as for Paul (Cf: 1 Cor. 15:14), this question is not merely one of intellectual interest. Rather, for Polkinghorne the resurrection “is the pivot point on which the Christian faith turns [10, p. 109].” Whereas Polkinghorne accepts much historical criticism of the Biblical text [26, p. 8], he finds plenty of warrant for a motivated belief in a risen Lord and Christ.

Like the bottom-up thinker that he is, Polkinghorne asserts that there is much “evidential motivation for believing that Jesus was indeed raised from the dead [26, p. 77].” The list of evidences that he gave in his Gifford Lectures included

- the transformation in the disciples,
- the exaltation of a crucified man is too paradoxical a notion to have been formed merely from a process of reflection,
- a swoon would not convince the disciples that Jesus had conquered death,
- hallucinations would not account for the variety of times and places of the resurrection appearances,
- the antiquity of the written testimony of the resurrection in the letters of Paul,
- the appeal to the witness of those still living at the time,
- the common theme in the appearances of the difficulty of recognizing Jesus,
- the emphasis on corporeality in Luke’s account,
- the empty tomb,
- the fact that women were the earliest witnesses,
- the lack of a cult associated with the burial place, and
- the lack of triumphalism—even the shock and doubt of the disciples,
- the fact that the early Christians were Jews who began to worship on the first day of the week rather than the seventh,
- the ongoing experience in the church of the living Christ, and
- the contrast between the early Christian assertion of Jesus’s resurrection and the contemporary expectations of both Jews and Gentiles in the ancient world. [10, p. 109-119].

However, also being a critical realist, Polkinghorne acknowledges the “hermeneutical circle in which the significance of Jesus and the truth of his resurrection inextricably interact with each other [10, p. 120]. That is, he allows that those who would look at the evidence with a prior conviction of a completely closed and uniform universe would find in the resurrection accounts only legend, not historical fact. But such an assumption rules out *a priori* any openness to what the New Testament is trying to say, which is that there is something unique about Jesus. “If God was indeed present in Christ in a unique way, then his story may rationally be believed to contain unique elements [26, p. 78].”

Polkinghorne not only gives motivation for believing in the resurrection, he also discusses its significance. For Polkinghorne, the resurrection of Jesus is a three-fold vindication. First, it is a vindication of Jesus, and his uniquely holy life and godly character. Second, it is a vindication of God, who was not found in the end to have abandoned the one who had fully and faithfully trusted in the Father. Finally, it is a vindication of the deep-seated human intuition and hope that death and futility do not have the last word, but that in the end all will be well. Rather, referencing 1 Cor. 15:22 and Col. 1:18, Polkinghorne sees what happened to Jesus as a foretaste and a guarantee of the ultimate fulfillment of humanity and the cosmos [10, p. 121].

6.7 The Soul

What is the soul? For John Polkinghorne, the simple answer is, “My soul is the pattern that is me [18, p. 161].” In wanting to take seriously both that human beings have emerged through a long and continuous process and the qualitative difference of the novelty of their emergence, Polkinghorne believes that human beings are psychosomatic unities. He does not absolutely rule out the possibility that human beings have a spiritual soul that is separable from the body. However, he finds it more satisfying to posit that our material and our mental and spiritual aspects are complementary and inseparable. Moreover, he believes that this view accords well with Hebrew and early Christian thought [19, p. 46-7].

In this view, have we then lost the soul? Polkinghorne does not think so. He believes that his perspective is very similar to those of Aristotle and Aquinas, who taught that the soul was the form of the body, although Polkinghorne puts it in modern scientific dress. Polkinghorne locates the soul in “the almost infinitely complex *information-bearing pattern* (emphasis in the original) in which the matter of the body is at any one moment organized [19, p. 47].” This information-bearing pattern is dynamically changing and developing, and it reflects unique human capacities, experiences, and relationships [19, p. 48]. However, it carries its own unique signature, about which Polkinghorne remarks that “A mathematician would say that there were invariant characters, preserved in the course of unfolding transformations [16, p. 107].”

If indeed “human beings look more like animated bodies than like incarnated souls [16, p. 104],” then one implication is that souls do not have intrinsic immortality. If that is the case, then how are we to understand what happens to us at our physical death? To Polkinghorne’s understanding, death is a real end, it is not the ultimate end. Polkinghorne believes that the faithfulness of God provides the basis for a coherent hope in the preservation of the information bearing pattern in the divine memory after a person’s physical death. He notes the similarity of this notion to the Hebrew concept of Sheol. Moreover, he believes that the resurrection of Jesus Christ provides the basis for trusting “that God in the eschatological future will re-embody this multitude of preserved information-bearing patterns in some new environment of God’s choosing [16, p. 107].”

6.8 Eschatology

For Polkinghorne, scientific insights on the long-run futility of the universe, not to mention the obvious fact of the not-so-long-run futility of each mortal human life, provide a significant challenge

to Christian theology. This challenge, he believes, is met by the Christian virtue of hope. And this hope is eschatological. [16, p. 93] Polkinghorne agrees with Moltmann, who writes “From first to last, and not merely in the epilogue, Christianity is eschatology, is hope, forward looking and forward moving, and therefore also revolutionary and transforming the present [7, p. 16].” Moreover, according to Polkinghorne there is only one possible basis for this hope, and that is “the eternal faithfulness of the God who is the Creator and Redeemer of history [16, p. 94].” Trust in this faithfulness comes from “the knowledge that God is the One who raised Jesus from the dead [16, p. 94].”

Writing like the mathematician that he is, Polkinghorne summarizes his approach to eschatology in terms of four propositions. Indeed, in his view *any* viable approach to eschatology must be based on the following.

1. “If the universe is a creation, it must make sense everlastingly, and so ultimately it must be redeemed from transience and decay.
2. If human beings are creatures loved by their Creator, they must have a destiny beyond their deaths. Every generation must participate equally in that destiny, in which it will receive the healing of its hurts and the restoration of its integrity, thereby participating for itself in the ultimate fulfillment of the divine purpose.
3. In so far as present human imagination can articulate eschatological expectation, it has to do so within the tension between continuity and discontinuity. There must be sufficient continuity to ensure that individuals truly share in the life to come as their resurrected selves and not as new beings simply given the old names. There must be sufficient discontinuity to ensure that the life to come is free from the suffering and mortality of the old creation.
4. The only ground for such a hope lies in the steadfast love and faithfulness of God that is testified to by the resurrection of Jesus Christ [16, p. 147-8].”

Polkinghorne sees the scope of redemption to be cosmic, citing Rom. 8:18-25 and Col. 1:15-20. Just as the body of the Lord was not merely resuscitated and reconstituted, but rather transmuted and glorified, the new creation will be of matter transmuted from the transient matter of this creation [16, p. 113]. “This implies that the new creation does not arise from a radically novel creative act *ex nihilo*, but as a redemptive act *ex vetere*, out of the old [16, p. 115].”

Thus, creation is a two-step process. This world, with its evolving history and transience, is one that, although sustained by a faithful Creator, is held at some metaphysical distance from the Creator, who in a kenotic act makes way for the creation. The world to come, however, will attain eschatological *theosis*, in which creation will be wholly sacramental and share fully in the divine life. In other words, although Polkinghorne rejects panentheism as the reality of the present world, he does believe in a form of eschatological panentheism (Cf: 1 Cor. 15:28) [16, p. 113-4].

In much of the Christian tradition, the Four Last Things—Death, Judgment, Heaven, and Hell—have been the main topics of eschatological thought [16, p. 124]. Some of Polkinghorne’s reflections on death have already been offered above in the subsections on Evil and The Soul. Here we will merely add that because of Polkinghorne’s unswerving conviction that the love of God is everlasting, he does not see death as fixing a person’s eternal destiny. He believes that God, like the father in the parable of the Prodigal, will always stand ready to greet the wanderer who returns. In addition, he believes that because of the mercy of God, those who never had a chance to hear and respond to the gospel in this life will not be denied that opportunity *post mortem* [16, p. 127].

Moreover, Polkinghorne believes that the judgment to come is not a fearful thing, but a hopeful thing. Although it will be “a painful encounter with reality, in which all masks of illusion are swept away [16, p. 131],” it is a necessary process in completing the work of salvation. For

Polkinghorne, the idea of the cleansing fire of God (Cf: 1 Cor. 3:11-15) approaches a purgatorial concept, and so he believes in “some revalued and re-expressed concept of purgatory [16, p. 133]” that prepares us for life in the face of a holy God. Polkinghorne conceives of judgment as “the divine antidote to human sin, just as resurrection is the divine antidote to human mortality [16, p. 131].”

We have already addressed some of Polkinghorne’s ideas about the new creation, and its life with God, above. Here we will merely add that Polkinghorne subverts the concern that somehow everlasting life will be boring. Rather, reminded of 1 Cor. 2:9 (derived from Isaiah 64:4), Polkinghorne looks forward to “the unending exploration of the inexhaustible riches of God, a pilgrim journey into deepest reality that will always be thrilling and life-enhancing [16, p. 135].”

Although Polkinghorne does not believe that God ever withdraws his offer of mercy and forgiveness, even post mortem, he also does not believe that anyone “will be carried into the kingdom of heaven against their will by an overpowering act of divine power [16, p. 136].” Finding his imaginative depiction of hell not in Dante but in Lewis [6], Polkinghorne sees hell as a place that is deliberately absent of divine life. He finds the notion of annihilationism (or conditional immortality) somewhat persuasive, but he thinks that it would signal a defeat of the purposes of God’s love. Rather, he is a hopeful universalist. He is open to the idea “that in the end and in every life, God’s love will always be victorious [16, p. 137].” However, he is reluctant to claim *certainty* of universal salvation, because of the danger of moral indifference and cheap grace [16, p. 137].

While bringing the full powers of his thought to bear on the scriptural, theological, philosophical and scientific issues surrounding questions of eschatology, at the end of the day he admits of the difficulty of reaching definite conclusions on much of what awaits us at The End. Rather he encourages a hopeful waiting, demurring that “in many cases, the appropriate answer must be ‘Wait and see.’ Yet we may so wait in confident hope, because that hope is grounded in the everlasting faithfulness of God, the One who raised our Lord Jesus Christ from the dead [16, p. 138].”

7 Some thoughts on Mathematics

Polkinghorne makes frequent reference to mathematics—the subject that he had found to be “entrancing” as a precocious youth [1, p. 38]—throughout his writings. Sometimes he draws theological implications from general observations about mathematics, such as its role as the language of science or the experience of mathematical beauty. At other times he relies on specific results from mathematics—such as Chaos Theory, Gödel’s Theorems, or non-Euclidean geometry—to provide grist for his theological mill. A full examination of Polkinghorne’s thinking on mathematics would be a good follow-up project to this brief overview of his theology. In fact, in one of his books his thoughts on mathematics get their own chapter [13, Ch. 6]. Here we will merely note three observations that Polkinghorne derives from mathematics.

First, Polkinghorne believes that mathematical truths provide evidence of the existence of a non-physical realm. He notes that most mathematicians, himself included, are intuitive Platonists, who believe that they are discovering, and not inventing, mathematics. Thus, most mathematicians “believe that the object of their study is an everlasting noetic world which contains the rationally beautiful structures that they investigate [19, p. 5].”

Second, Polkinghorne sees mathematics as pointing to a Cosmic Mind. In particular, as the language of science, mathematics is “unreasonably effective [29]” at describing the physical world. Moreover, mathematicians often have a sense for mathematical beauty. “There is a thrill in encountering a beautiful equation which I believe is a genuine, if rather specialized, form of aesthetic experience [1, p. 37].” In fact, this sense of mathematical beauty is regularly used

by scientists as a guide to truth. Together these observations contribute to the mystery of the universe's intelligibility, which to Polkinghorne is best explained by the fact that humanity is created in the image of a rational and aesthetically-minded Creator [18, pp. 63-65].

Third, Polkinghorne finds in mathematics reasons for epistemic humility and some basis for contentment with less than a fully developed understanding of reality. Seeing the search for truth as an adventure not a procedure, Polkinghorne notes that circularity of thinking is involved even in mathematics. "We have too long been bewitched by Euclid. A linear view of knowledge, as if it arose from building upon an unchallengeable foundation, does not work even in mathematics, as the nineteenth-century discovery of alternative geometries, and the twentieth century recognition of the Gödelian incompleteness of axiomatized systems, make only too clear [10, p. 32]." Indeed, we should be circumspect about what we expect that we can prove about God. "If we can't prove the consistency of arithmetic, it seems a bit much to hope that God's existence is easier to deal with [10, p. 57]."

8 Conclusion

Throughout Polkinghorne's prolific writings, many themes emerge. These include

- the compatibility of science and faith,
- the unity of knowledge,
- the possibility of motivated belief,
- the importance of Trinitarian and incarnational theology,
- freedom and openness in creation,
- the everlasting faithfulness of God,
- God's love for all creation, and
- the supremacy and centrality of Christ.

Polkinghorne's efforts in thinking and writing could be characterized by the injunction from 1 Thessalonians 5:21, "Test everything: hold fast to what is good (ESV) [4]," which is one of his favorite Scripture verses [1, p. 180]. In so doing, he necessarily thinks like the scientist and mathematician that he is. However, he recognizes the limits of science in theology, writing that the "scientific avenue into theological thinking will seek to give due weight to science, but it would be fatal to allow it to become a scientific take-over bid, affording no more than a religious gloss on a basically naturalistic account [13, p. 86]." He emphatically affirms that the god of Spinoza and Einstein, which is little more than a cypher for the rationality and order of the universe—is not the God and Father of our Lord Jesus Christ, nor of John Polkinghorne [13, p. 86].

Polkinghorne holds some beliefs that may run afoul of much American, Protestant, Evangelical thought. For example, although he believes that Scripture uniquely bears witness to the incarnate Word, he calls the notion of an inerrant text "idolatrous [26]." Although he believes that God is actively and intimately involved in creation, he is an open theist who believes that God does not exhaustively know the future. Although he affirms that all human hope is founded in the particularity of the death and resurrection of Jesus, he believes that there is no question "that God is truly experienced in other faiths [23, p. 105-6]." And although he believes in judgment, he is hopeful that in the end love will win and hell will be found to eventually be empty.

Nevertheless, thinking Christians who may disagree with Polkinghorne on some points should still find his work helpful for testing everything and holding onto what is good. Polkinghorne may

be particularly helpful with finding ways to take with due seriousness the historic, orthodox claims of the Christian faith and the more recent, scientific observations about the age of the universe and the evolving character of life. He may be helpful for those faithful who doubt—those who seek a motivated and hopeful belief without being able to claim absolute certainty. He is in many ways and on many topics a guide to a middle path—neither entirely conservative nor entirely liberal. Finally, and perhaps most importantly, he can help his readers maintain an unswerving focus on the love of God for all humanity and all creation, as demonstrated and vindicated through the death and resurrection of Jesus Christ. For through all his life as a mathematician, scientist, priest, college president, theologian and family man, John Polkinghorne has been guided by his “heart’s desire, [which is] to know the love of God [11, p. 105].”

9 Books by Polkinghorne on Science and Mathematics

1. The Analytic S-Matrix (1966, jointly with RJ Eden, PV Landshoff and DI Olive)
2. The Particle Play (1979)
3. Models of High Energy Processes (1980)
4. The Quantum World (1985)
5. Rochester Roundabout: The Story of High Energy Physics (1989)
6. Quantum Theory: A Very Short Introduction (2002)
7. Meaning in Mathematics (2011, edited, with contributions from Timothy Gowers, Roger Penrose, Marcus du Sautoy and others)

10 Books by Polkinghorne on Theology

1. The Way the World is : The Christian Perspective of a Scientist (1984)
2. One World (1987)
3. Science and Creation (1989)
4. Science and Providence (1989)
5. Reason and Reality: The Relationship Between Science and Theology (1991)
6. Quarks, Chaos and Christianity (1994)
7. The Faith of a Physicist: Reflections of a Bottom-Up Thinker (1994)
8. Serious Talk: Science and Religion in Dialogue (1996)
9. Scientists as Theologians (1996)
10. Beyond Science: The wider human context (1996)
11. Searching for Truth: Lenten Meditations on Science and Faith (1996)
12. Belief in God in an Age of Science (1998)
13. Science and Theology: An Introduction (1998)
14. The End of the World and the Ends of God (2000, edited with Michael Welker)

15. Traffic in Truth: Exchanges Between Sciences and Theology (2000)
16. Faith, Science and Understanding (2000)
17. The Work of Love: Creation as Kenosis (2001, editor)
18. The God of Hope and the End of the World (2002)
19. The Archbishop's School of Christianity and Science (2003)
20. Living with Hope: A Scientist Looks at Advent, Christmas, and Epiphany (2003)
21. Science and the Trinity: The Christian Encounter With Reality (2004)
22. Exploring Reality: The Intertwining of Science and Religion (2005)
23. Science and Providence: God's Interaction with the World (2005)
24. Quantum Physics and Theology: An Unexpected Kinship (2007)
25. From Physicist to Priest, an Autobiography (2008)
26. Theology in the Context of Science (2008)
27. Questions of Truth: Fifty-one Responses to Questions about God, Science and Belief (2009, with Nicholas Beale)
28. Testing Scripture: A Scientist Explores the Bible (2010)
29. Reason and Reality: The Relationship Between Science and Theology (2011)
30. Science and Religion in Quest of Truth (2011)

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