Polkinghorne Without Chaos? A Survey of the Wider Context of Polkinghorne's Model of Divine Action

Introduction

In 1979, John Charlton Polkinghorne KBE FRS (1930 – 2021)[1] resigned his chair as professor of mathematical physics at the University of Cambridge to begin his next career as an Anglican priest. In his writings he seeks to synthesise his understanding of reality from the viewpoint of a distinguished Physicist and a person of deep faith rooted in the Anglican tradition. His writings cover large ground from natural theology to free-will and the constitution of the soul, but the topic of divine action occupies a central place in his work. Many recent commentators reduce Polkinghorne's model of divine action to a discussion on "active information" in chaotic systems. Whilst this is perhaps the most distinctive part of his work, it features as the capstone of a wider system of thought. It is the aim of this paper to investigate some of the wider context to Polkinghorne's model of divine action and explore some avenues for bringing him into conversation with more recent scholarship in the area. One note on methodology, it is worth remarking that Polkinghorne's perspective on divine action has shifted over time. What started as a rather pressing confidence in the viability of locating divine action in chaotic systems gave way to a more nuanced understanding of his model of divine action as an interesting 'thought experiment'[2] which shouldn't be taken too seriously. I will be following Polkinghorne's mature works, that is, understanding his model of divine action as a 'thought experiment' and taking his views on divine *kenosis* as central, even though this aspect of his theology arrived several years after he started writing. Ignacio Silva argues that there is a remarkable consistency to the evolution of Polkinghorne's thought and I agree.[3]

Polkinghorne's blend of orthodoxy and innovation is perhaps best seen in his appropriation of Process theology. Developed from his take on Process theology, Polkinghorne's forays into kenotic theology heavily influence his model of divine action, so it is important we follow this thread. But first we consider two models of God's interaction with the world that Polkinghorne takes to be unacceptable.

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[1] For a biographical account see Taylor, J.C. & Wilkinson, D.A. 'John Charlton Polkinghorne KBE. 16 October 1930-9 March 2021' Biogr. Mems Fell. R. Soc. (2022), 72293–72309.

[2] "In seeking to explore these possibilities, different people focused initially on different loci of intrinsic unpredictability, some looking to quantum indeterminacy and others to chaotic uncertainty. None of these attempted models should be taken with undue detailed seriousness. They are what a physicist would call 'thought experiments', attempts to explore and try out ideas in a simplified way, rather than purporting to be complete solutions to the problem of divine action." – Polkinghorne, J.C. *Theology in the Context of Science*, New Haven: Yale University Press (2009), pp.114-115.

[3] Silva, I. 'John Polkinghorne on Divine Action: a Coherent Theological Evolution', Science and Christian Belief (2012) 24, 19-30.

Supernaturalism and the Single Great Act

A common dichotomy encountered particularly in wider discussion on divine action is that God either acted once to set up the universe and remains detached or else intervenes capriciously to 'solve the occasional problem.' Polkinghorne writes that when speaking to scientists about God's action in the world many assumed the idea of "the divine clockmaker, from time to time interfering to adjust the hands of the steadily ticking cosmic clock."[4] Over and against this dichotomy Polkinghorne states two key principles. Firstly, he wishes to confirm that God does objectively impact the future of the world. Divine action goes beyond the merely therapeutic recognition of good things or a thankfulness for general providence;[5] God responds to prayer and interacts on a personal level with creation. It is for this reason that Polkinghorne rejects Maurice Wiles' Single Great Act[6] and *a fortiori* deism. In Polkinghorne's view they do not adequately do justice to the God of Israel revealed in the Old Testament, who was regularly viewed as acting personally and powerfully within the lives of individuals and in larger historical events. Secondly, he rejects supernaturalism[7] on the grounds of inconsistency; divine action must be characterized by the most profound consistency, in that all events must be able to be seen as part of continuous divine action. Supernaturalism, with its fitful character does not have this property and hence is theologically unacceptable.[8]

Polkinghorne thus concludes, "If God is not an intervener in the world's process, yet surely, if he is the Christian God, he is in continuous interaction with it."[9] One such model of continuous interaction which remains influential in Polkinghorne's work is found in Process theology, and so we turn to consider this topic in more detail now.

Process Theology and Kenotic Theology

Process theology arose in the 1960's and sought to apply the metaphysical worldview espoused by Alfred North Whitehead to traditional theological problems.[10] Whitehead framed the world in organismic terms rather than mechanical; The basic entity is an event and what

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[4] Polkinghorne, J.C. *Science and Providence*, Philadelphia: Templeton Foundation Press (2005), pp. 9.

[5] See Polkinghorne, J.C. *Belief in God in an Age of Science*, New Haven: Yale University Press (2003), pp. 49.

[6] Wiles was prepared to abandon the category of special divine acts writing that 'the primary usage for the idea of divine action should be in relation to the world as a whole rather than to particular occurrences within it'. See Wiles, M. *God's Action in the World*, London: SCM (1986), pp. 28. On this view Polkinghorne writes: "Supporters of this point of view sometimes deny that they are deists, on the grounds that the single great act of which they speak is a timeless upholding and not a mere initiation of cosmic history, but the God of their account is certainly not a personal God, able to react in particular ways to particular occurrences." – Polkinghorne, J.C. *Science and Christian Belief*, London: SPCK (1994), pp. 82.

[7] Defined by Polkinghorne as special divine action solely through acting against the laws of nature.

[8] It is important to emphasise that the main reason Polkinghorne rejects supernaturalism is on *theological* not scientific grounds. He acknowledges that the laws of science do not rule out the possibility of unique phenomena (miracles).

[9] Polkinghorne, *Science and Providence*, pp. 10.

[10] See Cobb, J.B. & Griffin, D. R. *Process Theology: an Introductory Exposition*, Belfast: Christian Journals (1977).

we consider to be objects or entities continuing in time are in fact constant concatenations of events. Each event is bipolar; in the 'prehensive' phase the entity is presented with a portfolio of possibility and a lure to go in a certain direction, yet it is in the 'concrescent' phase the entity itself actually selects what happens. This is the case for all entities right down to the subatomic scale and as such the position, whilst the term panpsychic is refused, is panexperiential.

In Process theology God is intimately involved in every event, acting as the reservoir of past experience, the presenter of present possibilities and the lure towards particular future outcomes. God is party to all that happens in the universe but only as a lure; God does not determine the outcome of any event, and as such the divine power is significantly curtailed. The divine nature is also thought to be dipolar with God having both a 'primordial' and 'consequent' nature. This is not to imply a form of division in God but represents two facets of God's being as God relates to the world. The primordial nature acts as the ground of all present possibilities – apart from it nothing creative would come to be. The 'consequent' nature is the facet of God that embraces everything that occurs, for all events contribute to the character of the divine being. Process theology is often rightly associated with a wider cluster of theological ideas as William Abrahams sums up well:

[T]hey [process theology's central commitments] fit nicely with the commitment to panentheism, the denial of creation *ex nihilo*, belief in the eternity of the world, the temporality of God, the worries about the omnipotence and eternity, and the elimination of divine foreknowledge of contingent events.[11]

Many involved in the science and religion field at the time when Process theology was developing saw it as very attractive in that it seemed to mediate the conversation between theology and science by providing a hospitable metaphysical environment. It also seemed to provide an alternative to many regnant themes within western Christian theology at the time, as William Abraham expounds:

For those Christians who were looking for a metaphysical home in which to bring together commitment to God, to science, and to reason, the Process tradition looked extremely attractive compared to the impersonal static deity of "classical theism", the intellectual isolation of Barthian fideism, the vulgarity of "fundamentalism" and "supernaturalism," and the spiritual barrenness of analytic philosophy.[12]

Whilst of course this comparison is somewhat overstated, it does give us insight into what Polkinghorne was reacting against and partly establishes his attraction to Process theology.

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[11] Abraham, W. *Divine Agency and Divine Action: Volume I, Exploring and Evaluating the Debate*, Oxford: Oxford University Press (2017), pp. *135.*

[12] *ibid.*, pp. *142.* Part of the appeal of process theology also rested on its use of caricatures to dismiss the alternatives with which it was compared. See Burrell, D. 'Does Process Theology Rest on a Mistake?', Theological Studies (1982) 43, 125-35.

For instance, we see in his writings that he takes issue with the idea of God as an impersonal force rather than a personal God,[13] he follows Pannenberg in questioning the sufficiency of a Christian theology removed from the natural sciences[14] and expresses concern with ideas of 'supernaturalism'.[15] Nevertheless, Polkinghorne would never consider himself to be a Process theologian, and distances himself from it in key areas – notably eschatology. Indeed, the only constructive aspects of Process theology that Polkinghorne does embrace is the idea of a dipolar God who engages temporally with creation.[16] This he expresses as the bringing together of the God of being (eternal, static, unchanging) and the God of becoming (temporal, responsive, vulnerable). He writes: "There is great attraction in the notion of divine dipolarity, which offers us the God of both being and becoming, the reconciliation, one might say, of the God of the philosophers and the God of the Bible."[17]

Polkinghorne's main concern with Process theology is whether it is capable of being an adequate ground of hope; that is, he argues Process theology, with its focus on the immanence of God, acting in all events but only as a 'lure' towards positive outcome, has so vacated God of any power that God cannot guarantee the final reconciliation of all things. God may accompany us through life and guide us towards the best future outcome, but there is no absolute certainty that all will be well, a certainty which Polkinghorne feels is absolutely crucial to the Christian message. He quips that for Process theology it is "indeed better to travel hopefully than arrive."[18]

Nevertheless, we see aspects of process theology embraced in Polkinghorne's later work as he explores the notion of divine *kenosis* – the self-limiting of God's absolute power.[19] Polkinghorne retains the traditional attributes of God, such as God's unchanging and steadfast dimension but places them in dipolar relation with a divine kenotic nature. God's nature is proposed to be dipolar eternal/temporal. Here we see a clear inheritance from the Process tradition and the Whiteheadian distinction of God's 'primordial' and 'consequent' nature. However, Polkinghorne wishes to differentiate this move from Process theology by stressing that whilst Process theology saw God's dipolar nature as a matter "of metaphysical necessity, imposed upon [the] deity. A more orthodox open theology sees, on the contrary, God's acceptance of an engagement with time as an act of divine condescension by the Creator, who is graciously willing to share in the unfolding history of creation."[20]

Polkinghorne draws out four aspects of *kenosis*: *kenosis* of omnipotence, omniscience, simple eternity, and causal status, which we will now consider.

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[13] Polkinghorne, *Science and Providence*, pp. 7.
[14] Polkinghorne, J.C. *Faith, Science and Understanding*, New Haven: Yale University Press (2000), pp. 156.
[15] Polkinghorne, *Science and Providence*, pp. 9.
[16] Polkinghorne, *Science and Christian Belief*, pp. 65.
[17] Polkinghorne, *Science and Providence*, pp. 92.
[18] Polkinghorne, *Science and Christian Belief*, pp. 66.
[19] For more in-depth analysis see Clayton, P. 'Science-and-Theology from the Standpoint of Divine Kenosis' In Watts, F. & Knight, C.C. (eds.), *God and the Scientist: Exploring the Work of John Polkinghorne*, Farnham: Ashgate (2012), pp. 243-257.
[20] Polkinghorne, *Theology in the Context of Science*, pp. 62.

Polkinghorne's commitment to *kenosis* of omnipotence ties in with construction of his theodicy (his free-process defence).[21] He defines it as the "divine allowing of the created order to be and to act";[22] Moral and physical evil are permitted to occur because God has limited the divine power in order to allow for creation to have genuine autonomy. The integrity of creation necessitates a veiling of the providence of God. The main assumption inherent in a need for a *kenosis* of omnipotence is that divine power and human freedom are locked in a 'zero-sum' game. That is, autonomous natural causal processes are incompatible with a God who acts in those processes without qualification. This assumption need not be accepted, and we will return to this issue later.

Polkinghorne's view on *kenosis* of simple eternity and omniscience are linked and tie in with his general discussion around the nature of time. Polkinghorne compares two contrasting metaphysical views on time: the 'block-universe' and 'flowing time'. The 'block-universe' is a metaphysical position in which all events in time and space are already settled and available to the atemporal gaze of God, which Polkinghorne (rightly or wrongly) associates with the theological position of Aquinas and Augustine. It is contrasted to the view of open theism in which time is genuinely unfolding even unto the divine gaze.[23] Polkinghorne accepts the latter view and as such concludes that "the history of the universe is understood to resemble an unfolding improvisation in which the Creator is ceaselessly at work to bring about a harmonious resolution of the great multi-part fugue of creation."[24] In order for God to relate truly to this temporal creation there must be a self-limiting of both God's omniscience and God's eternal nature. Absolute omniscience (God knows all that will eventually be knowable) is replaced by current omniscience (God knows all that can be known at that moment in time) and as such it makes sense to speak of God understanding events temporally in their succession, rather than God understanding the succession of events whilst simultaneously viewing time *totum simul*. This leads Polkinghorne to reject the view that God has complete divine foreknowledge of all events. God is the Great Improviser rather than Great Composer. However, we recall that Polkinghorne utilises the notion of divine dipolarity and as such wishes to retain the eternal and steadfast nature of God. God engages truly temporally with creation through an addition to the divine nature of a temporal pole.

So where does this leave us as we consider Polkinghorne's model of divine action? We have seen that Polkinghorne understands there to be an element of vulnerability in how God relates to creation. God is affirmed to interact with creation but is not in total control of

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[21] Polkinghorne, *Science and Providence*, pp. 69-79.

[22] Polkinghorne, J.C. *The Work of Love: Creation as Kenosis*, Grand Rapids, Mich.: William B. Eerdmans; London: SPCK (2001), pp. 102.

[23] Polkinghorne, *Theology in the Context of Science*, pp. 57-62; *Science, Faith and Understanding* pp. 136-138; Polkinghorne, J.C. 'Natural Science, Temporality and Divine Action' Theology Today (1998) 55, 329-43.

[24] Polkinghorne, *Theology in the Context of Science*, pp. 63. In this respect we see considerable overlap with the work of Arthur Peacocke. See for instance Peacocke, A. R. *Creation and the World of Science the Re-Shaping of Belief*, Oxford: Oxford University Press (2004), pp. 105-107.

its processes.[25] In addition, such qualifications to the divine nature lead Polkinghorne to consider God acting as a cause amongst causes. He writes:

I am now suggesting further that divine self-emptying extends to a kenosis of the status of agency, so that special providence is exercised as a cause among causes, active within the cloudy unpredictabilities of created process. The picture of the invulnerable, all-powerful God of classical theology has given way to the picture of the God who interacts within creaturely history but does not overrule the acts of creatures.[26]

This does represent a departure from Polkinghorne's previous thought (although does not outright contradict it) and it is also a considerable departure from classical theism. Such a move is quite curious when we recall Polkinghorne's objection to Process theology on the grounds that it does not present a picture of adequate hope. In what ways is this picture of God, not in total control of processes and lacking absolute omniscience any different? Polkinghorne attempts to retain the idea that God is still a ground of future hope by emphasising the divine dipolar nature; the eternal pole represents the characteristics of God (i.e. steadfastness, absoluteness) that would make God sufficiently powerful to ensure 'all will be well', but it is hard to understand how this works in practice. Does God occasionally work within the divine *kenotic* nature to respect the integrity of creation and then occasionally not in order to actually 'get things done'? The notion of dipolarity may protect against simplistic models of divine action, but it seems that Polkinghorne is wanting to have it both ways; God safeguards a future hope but also doesn't have complete control over that same future.[27]

Critical Realism

In the previous section we reconstructed Polkinghorne's kenotic theology, which questioned the sufficiency of traditional attributes of God favouring a picture that is argued to be more responsive and vulnerable even to the point of accepting that God acts as a cause amongst causes. We now turn to survey Polkinghorne metaphysical framework beginning with a discussion of his critical realism. Critical realism is a majority position whose advocates are so divided as to appear a minority, it therefore important to understand what Polkinghorne takes it to mean.[28]

Heavily influenced by his career in theoretical physics, we see two contrasting positions Polkinghorne wishes to distance himself from: logical positivism and instrumentalism. On the logical positivist side, which aimed to cast science as the method of

[25] Polkinghorne, *Science and Christian Belief*, pp. 81.
[26] Polkinghorne, *Faith, Science and Understanding*, pp. 127.
[27] Smedes raises similar concerns in Smedes, T. *Chaos, Complexity and God: Divine Action and Scientism*, Leuven: Peeters (2004), pp. 187-204.
[28] For a useful summary on the origins of critical realism in science and theology see Losch, A. 'On the Origins of Critical Realism', Science and Theology (2009) 7(1), 85-106.

accumulating incorrigible truths, Polkinghorne drew heavily on the work of Michael Polanyi[29] whose emphasis on the 'tacit skills' of the scientific method illustrated the personal and idiosyncratic aspects to the scientific method which were largely ignored by the logical positivists. On the instrumentalist side, which cast science as the pursuit of useful explanations of the world, regardless of the actual truthfulness of the statements, we see Polkinghorne's adamance that science actually tells us something about the way reality is in itself. We see this in Polkinghorne's early work, still as a physicist, where he defends the reality of quarks as a fundamental feature of reality against the thesis that they are merely useful explanatory devices.[30] For Polkinghorne, science only works because it tells us something about the way reality is in itself.

Central to understanding Polkinghorne's critical realism is his ubiquitous phrase 'epistemology models ontology'. What we come to know represents the way reality is in itself yet does not do so in a one-to-one correspondence – our knowledge is always subject to the possibility of revision or abandonment. As such science can only ever claim verisimilitude and not truth. Whilst Polkinghorne casts the development of science as the ever-tightening grasp on reality he stresses that reality is far more subtle and supple than current science can describe. Our epistemology models certain basic features of ontology, yet its complexity can never be captured fully; the scientific theories that we hold to have proven validity in well-winnowed domains but cannot be assumed to hold equally well in all circumstances.[31] We may summarise Polkinghorne's position with the following:

Like most scientists, I believe that the advance of science is concerned not just with our ability to manipulate the physical world, but with our capacity to gain knowledge of its actual nature. In a word, I am a realist. Of course, such knowledge is to a degree partial and corrigible. Our attainment is verisimilitude, not absolute truth. Our method is the creative interpretation of experience, not rigorous deduction from it. Thus, I am a critical realist.[32]

Polkinghorne considers himself to be a "bottom-up thinker,"[33] an attitude that has a certain affinity with the Empirical tradition. This is expressed foremostly in a commitment to the empirical results of scientific experiment:

[s]cientists know that reality can have many surprises for us and consequently do not hold a high view of human powers of rational prevision. They believe that the question, 'Is it

[29] Polanyi, M. *Personal Knowledge*, London: Taylor and Francis (2012).
[30] Polkinghorne, J.C. *Rochester Roundabout: The Story of High Energy Physics,* New York: W H Freeman & Co (1989), pp. 158-176.
[31] "[Science's] established theories give reliable accounts of what is going on in a carefully delimited domain, to specified degrees of detail and accuracy." – Polkinghorne, J.C. *Beyond Science*, Cambridge: Cambridge University Press (1996), pp. 8. See also note 50.
[32] Polkinghorne, *Belief in God in an age of science*, pp. 104.
[33] Polkinghorne, *Science and Christian Belief*, pp. 4.

reasonable?' is not to be answered in a priori terms but by asking the further question, 'What is the evidence that makes you think it might be the case?'[34]

This attitude leads Polkinghorne to be more willing to admit that the unknown bits of nature are truly unknown. We this in his acceptance of the Copenhagen interpretation of quantum mechanics and an 'open' view of chaos theory. Polkinghorne's critical realism also undergirds his understanding of the laws of nature, which is central to the formulation of his model of divine action, and so we consider the topic next.

The Laws of Nature

We begin first by clarifying the terms 'laws of science' and 'laws of nature'. The laws of nature have an ontological basis such that their existence is held to be independent of the human mind. Laws of science on the other hand are the human attempt to economically capture and convey the laws of nature in such a way that they are understandable – the degree of success possible in this regard aside. It is perfectly possible for the laws of science to be subject to radical modification or abandonment without affecting the laws of nature on which they are presumably based.

Part of the confusion when interpreting Polkinghorne is that he does not distinguish between the two terms. When he writes for instance: "[t]hose regularities discerned by science as the laws of nature are, in fact, signals of God's reliability and faithfulness, made known in his creation";[35] it seems clear that Polkinghorne is talking about that which humans can understand, hold to be beautiful, and discover empirically through the scientific method – that is, the laws of science. However, Polkinghorne then goes on to write: "[w]ill the very laws of nature, thought in their rational beauty to testify to his existence, so prescribe cosmic history that God is left with no room for activity within it?"[36] Now Polkinghorne is talking about the ontology of nature, the man-made formulas of science surely cannot be held to prescribe God's actions. Polkinghorne's critical realist stance which aligns epistemology very closely to ontology, is the key to understanding this. He holds that science is a process of attaining verisimilitudinous knowledge of reality and as such the discovery of mathematically beautiful and fruitful laws of science should be held tentatively as laws of nature. He writes:

[T]he feel of scientific research is definitely the feel of discovery, rather than confabulation. As a result, scientists dismiss Humean scepticism and they are happy to talk of the laws of nature. They understand these laws not only in a descriptive sense (accounts of the

[34] Polkinghorne, J.C. *Life and Works of a Bottom-up Thinker*, Zygon (2000) 35(4), 955-962 (pp. 958).
[35] Polkinghorne, *Science and Providence*, pp. 10.
[36] *ibid.*, pp. 8.

regularities of actual happenings), but also in a prescriptive sense (as intrinsic principles active in nature, necessarily determining or constraining what can actually happen).[37]

The term 'law of nature' can be seen as a title of respect for a law of science that is particularly satisfying and in Polkinghorne's view therefore most likely to be true. "To warrant the honorific title of 'law'… a principle of regularity must offer more than mere phenomenological adequacy. It must afford the degree of economic formulation and satisfying intelligibility that persuades one that it represents the form of a fundamental element in the constitution of reality."[38] Polkinghorne gives the example of the discovery of the Balmer series of the Hydrogen atom; although there were many 'explanations' for the existence of the character of this series, Polkinghorne feels that the scientific community did not accept any of the explanations as 'law-like' until Schrödinger illustrated that the Balmer series was a consequence of his new equation governing quantum mechanics. It was only when there was a sense of "wide applicability and deep intelligibility"[39] that the dignified language of natural law seemed appropriate.

Regarding the ontology of the laws of nature, Polkinghorne adopts an implicit necessitarianism throughout his work – the laws of nature prescribe what can and cannot occur. We see this in his natural theology; take for instance Polkinghorne's use of the Anthropic Principle.[40] He contrasts an atheistic perspective that has to take the values of fundamental constants as a brute fact with that of theism, which holds that the laws of nature are grounded by God and divinely fine-tuned so as to be capable of producing a universe with complex life. This is predicated on an understanding of the laws of nature as real and prescribing reality.[41] If the laws of nature merely encode human discoveries of regularities, then the force of the Anthropic Principle argument is lost.

From a theological perspective Polkinghorne understands the laws of nature to be expressions of the divine will. "They are not the grain against which a wonder-working deity occasionally acts, but their regularities are the pale reflection of the faithfulness of the Creator."[42] The laws of nature do not have an independent will apart from God but rely on the divine presence absolutely for their existence[43] and as such there is no real distinction

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[37] Polkinghorne, J.C. 'The Character of Laws in Nature' In Welker, M. & Etzelmüller, G. (eds.), *Concepts of Law in the Sciences, Legal Studies, and Theology*, Tübingen: Mohr Siebeck (2013), pp. 11.

[38] *ibid.*, pp. 12.

[39] *ibid.*, pp. 13.

[40] Polkinghorne draws heavily on the work of Barrow and Tipler. See Barrow, J.D & Tipler, F.J. *The Anthropic Cosmological Principle*, Oxford: Oxford University Press (1986).

[41] Polkinghorne claims that the fact we live in a universe capable of evolving the complexity of life that we know of "requires the recognition of the 'fine-tuning' of the lawful necessity of the world, which has been an indispensable element in the fertility of what has been going on." Polkinghorne, J.C. *Science and the Trinity: The Christian Encounter with Reality*, New Haven: Yale University Press (2004), pp. 68.

[42] Polkinghorne, *Science and Christian Belief*, pp. 78.

[43] "The theist will also understand these laws not as being immutable necessities, but as holding simply for as long as the Creator determines they should do so." – Polkinghorne, J.C. 'Eschatological Credibility: Emergent and Teleological Processes,' In Peters T., Russell, R.J. & Welker, M. (eds.), *Resurrection: Theological and Scientific Assessments*, Grand Rapids, MI: William B. Eerdmans (2002), pp. 46.

between natural and divine processes, for the laws of nature can also be considered to be expressions of the divine will in the same way that more explicit acts of God can.[44] Polkinghorne associates the laws of nature with the divine acquiescent and economic will – terms inherited from Maximus the Confessor.[45] God's economic will is expressed through the regular processes of the universe, that which is usually referred to as General Divine Action (GDA);[46] God's acquiescent will is expressed by the divine letting-be of the processes in the universe. God could alter the course of events in the universe but does not in order to respect the integrity of creation. Nevertheless, Polkinghorne is keen to acknowledge that God's will can still be brought about partially through the laws of nature, for God has imbued them with a capacity to encourage greater complexification in the natural world. This is done through "[t]op-down information input which operates as a higher-order organizing principle[47] such as in the hypothesised existence of the 'optimistic arrow' of increasing complexification in the universe. This is God's providence expressed through the existence of holistic laws that 'push' the universe towards positive ends. God is responsible for the continued grounding of the laws of nature which are partially discovered and codified in the laws of science and the possibility of an inbuilt potentiality within the universe towards increasing complexification, which one again in principle, Polkinghorne holds, could be discovered by the sciences. With such a view there is actually considerable scope to draw Polkinghorne into conversation with other philosophical positions. We consider some potential future avenues of exploration:

- Decretalism – a term recently introduced by Alvin Platinga[48] – is the view that "the laws ha[ve] no independent standing or power to bring about anything. The laws are no more than God's choices for how physical events shall proceed."[49] Polkinghorne seems to come close to this view when he claims that the laws of nature are not to be seen as automatic processes nor acting independently of God's will. Clearly Polkinghorne feels that God is the ground of the laws of nature, but he does not distinguish whether the laws of nature can be equated with God's 'impersonal actions' or instead are embedded in the fabric of creation.

[44] Polkinghorne considers the distinction between general providence and special providence to be merely intuitive rather than representative of entirely different modes of divine action: "In the end there is no sharp separation to be made between general providence and special providence and miracle. God's relation to this world is not like ours to our bodies, where there are autonomic processes, such as the circulation of the blood, which go on without the explicit exercise of our will (and which in God's case, if the analogy were valid, would be called laws of nature or general providence), together with other, explicitly willed, acts (which in God's case would be called special providence or miracle). The discontinuities which the language of natural and miraculous suggests, or the divisions between God's types of will, are matters of human convenience, relating to the differences in our perception and not to fundamentally distinct kinds of activity in God." - Polkinghorne, *Science and Providence*, pp. 59.

[45] *ibid.*, pp. 10-13.

[46] "Those actions of God that pertain to the whole of creation universally and simultaneously. These include actions such as the initial creation and the maintenance of scientific regularity and the laws of nature by God." Saunders, N. *Divine Action and Modern Science*, Cambridge: Cambridge University Press (2002), pp. 21.

[47] Polkinghorne, *Science and Christian Belief*, pp. 78.

[48] Plantinga, A. 'Law, Cause, and Occasionalism.' In Bergmann, M. & Brower, J.E. (eds.), *Reason and Faith: Themes from Swinburne*, Oxford: Oxford University Press (2016), pp. 135.

[49] Koperski, J. *Divine Action, Determinism, and the Laws of Nature*, New York: Routledge (2020), pp. 99.

- Whilst Polkinghorne adopts a necessitarian perspective on the laws of nature, he does not suggest what form they take. He writes: "[p]hysical laws as we know them cannot be claimed to possess an absolute status, as if they could be taken to have literally universal validity. They have been discovered in specific regimes and all that can be asserted is that they offer reliable and insightful accounts of behavior within well-winnowed domains."[50] It is possible that this insight could be combined with recent thinking on *ceteris paribus* laws. The laws we have discovered only predict behaviour in highly controlled environments ("all other things being equal").[51]

Importantly for our later discussions, Polkinghorne concludes that the laws of science, argued to be representative of the laws of nature, do not constitute an exhaustive description of the world. This is for two reasons: Firstly, science cannot give us a complete account of the world, it merely gives us an adequate map of areas already explored and thus we cannot rule out the possibility of unforeseeable new phenomena. Secondly, Polkinghorne claims that the laws of nature that we have discovered do not rule out the possibility of human and divine action. He concludes: "Pursuit of the first point opens up the possibility for what is usually called miracle; pursuit of the second point opens up the possibility for what is usually called providence."[52] Whilst many group special providence and miracles under the same category of special divine action (SDA)[53] Polkinghorne does differentiate between the two. Special providence is by definition indiscernible in contrast to miracles which Polkinghorne holds must have a semiotic component. Special providence is Polkinghorne's solution to the question of how God can bring about the divine personal will whilst acting through the impersonal laws of nature. Miracles cannot have this quality as they are understood to be extraordinary and must subvert the ordinary operation of events. Nevertheless, miracles are not "to be interpreted as divine acts against the laws of nature… but as more profound revelations of the character of the divine relationship to creation."[54] The theological absurdity of God acting against God if God were to contravene the laws of nature to bring about a miracle drives Polkinghorne not to disregard the miraculous but to nuance our understanding of the laws of nature. Miracles convey the deeper rationality behind God's impersonal acts which our laws of science approximate but do not capture anywhere near fully – miracles can thus be surprising and extraordinary by contravening our understanding of normal occurrences however in their ontology do not break the laws of nature, for the laws of nature have sufficient flexibility so as to allow for the miraculous. For Polkinghorne, the greatest

[50] Polkinghorne, 'The Character of Laws in Nature', In Welker, M. & Etzelmüller, G. (eds.), *Concepts of Law in the Sciences, Legal Studies, and Theology*, pp. 17.

[51] See Ott, W. & Patton, L. (eds.) *Laws of Nature*, Oxford: Oxford University Press (2018); von Watcher, D. 'Miracles are not violations of the laws of nature for the laws of nature do not entail regularities', European journal for Philosophy of Religion (2015) 7(4), 37-60.

[52] Polkinghorne, *Science and Providence*, pp. 30-1.

[53] "Those actions of God that pertain to a particular time and place in creation as distinct from another. This is a broad category and includes the traditional understanding of 'miracles', the notion of particular providence, responses to intercessionary prayer, God's personal actions, and some forms of religious experience." – Saunder, *Divine Action and Modern Science*, pp. 21.

[54] Polkinghorne, J.C. *Science and Theology: an Introduction*, London: SPCK (1998), pp. 93.

issue with miracles is not scientific but theological. Miracles do not contravene our understanding of the laws of science for two reasons. Firstly, miracles are unique events and not recurrent phenomena and as such lie outside the scope of repeatable scientific experiment.[55] Secondly, our laws of science are incomplete (perhaps forever so) and cannot rule out the possibility of new novel phenomena. However, theologically the critical question for Polkinghorne is one of consistency: How can miracles be seen as signs of deeper insight into the steadfastness of God and not mere *tours de force*? Polkinghorne suggests that some miracles can be considered as providence in unusual circumstances,[56] whereas others, such as the resurrection of Jesus, due to their radical nature, need to be handled slightly differently. These are such that they cannot be said to take place within the open grain of nature (as is usually the case for special providence in Polkinghorne's model). The exact mechanics of such miracles Polkinghorne does not elaborate on. However, the critical feature of miracles such as the resurrection of Jesus is that they are capable of being reconciled within a larger framework of divine action.

Ostensibly, Polkinghorne's integration of miracles into his framework of divine action is *ad hoc*, they seem to be moments where God can do whatever God wants.[57] If Polkinghorne accepts that God can bring about the divine will in radical ways without the need of hidden special providence, then why does he go through the bother of constructing his model of special providence anyway. In order to come some way in understanding this, we must recognise that Polkinghorne feels there is a tension between the idea of God in interaction with creation, and creation being 'free'; He frames this as the "classic theological perplexity of grace and free will, written cosmically large."[58] Polkinghorne in his construction of a special divine action allows for God to have a continuous interaction with and personal response to individual circumstances (including the possibility of the miraculous) yet feels that this must be done in such a way so as to not impinge on the integrity of creation and the ability for moral agents to make free choices. The majority of divine action must therefore be hidden in the cloudiness of unpredictability except for key moments of divine disclosure – this way the divine presence is sufficiently veiled. We have considered briefly Polkinghorne's treatment of miracles and now we must turn to look at his model of special providence. That is continuous divine action hidden in the unpredictability of physical systems.

Polkinghorne On The Causal Nexus

[55] Polkinghorne comments that "claims of unique historical occurrences [miracles] lie outside science's competence to adjudicate." – Polkinghorne, *Theology in the Context of Science*, pp. 136.

[56] That is, taking place within the 'open grain' of nature.

[57] The category of miracle may be used by Polkinghorne as means of ensuring that God's action is not limited by metaphysical models. Polkinghorne wishes to assert that God's action will always remain somewhat ineffable and as such should not be curtailed in response to contemporary metaphysical thinking. In that sense perhaps they function as the divine get-out clause!

[58] Polkinghorne, *Science and Christian Belief*, pp. 80.

In the preceding section we see a pervasive commitment to the partial causal closure of the universe; Polkinghorne feels that the metaphysical postulate that the world is causally closed is unjustified. He argues: "An honest assessment of well-founded knowledge in this respect shows that the scientific account is cloudy (because of intrinsic unpredictabilities present in both quantum theory and chaos theory) and patchy (because of unresolved perplexities about how different regimes, such as the realm of quantum physics and the realm of classical physics, in fact relate to each other)… Certainly, an honest science cannot deny to theology the metaphysical picture of a created universe open towards its future."[59] We will consider both the 'cloudy' and the 'patchy'. Polkinghorne is famous for his use of chaos theory as a locus for SDA and we now move on to consider this theme.

Chaos Theory[60]

A subset of chaos theory is the study of dynamical systems that display sensitive dependence to initial conditions (SDIC). That is the principle that two trajectories with initial conditions arbitrarily close to each other, will eventually diverge. Chaos theory is principally studied using computer simulations of systems modelled using deterministic Newtonian mechanics, yet due to SDIC, there are intrinsic limits on the ability of such models to make predictions for real-world situations. On Newtonian mechanics, Polkinghorne points to the two main areas where it have been shown to be a limiting cases to true reality - in the case of objects approaching the speed of light, where it gives way to special relativity, and when the scale length of objects approaches the sub-atomic level and it gives way to quantum mechanics – to argue that its determinism should be taken for granted to apply to the real-world.[61] He expounds:

"[T]he Newtonian equations from which the recognition of chaos first arose, and which have led many to talk solely of in terms of 'deterministic chaos', are in any case known to be no more than approximations to physical reality. Therefore the deterministic character of these equations should not be made an illegitimate excuse for closing off other metaphysical options."[62]

[59] Polkinghorne, *Theology in the Context of Science*, pp. 15.

[60] For more in-depth analysis see Smedes, *Chaos, Complexity and God*; Saunders, *Divine Action and Modern Science*. For an understanding of Polkinghorne's position see: Polkinghorne, *Theology in the Context of Science*, pp. 82-3; *Science and Theology in Quest of Truth*, pp. 40-2; 'The Character of Laws in Nature', In Welker, M. & Etzelmüller, G. (eds.), *Concepts of Law in the Sciences, Legal Studies, and Theology*, pp. 18.

[61] Polkinghorne also argues that the issues arising in relation to quantum chaology, namely the difficulty in reconciling the infinity complex fractal nature of chaos theory with the discrete nature of many physical atomic systems and quantum mechanics with its set scale length, should lead us to the same conclusion.

[62] Polkinghorne, *Theology in the Context of Science*, pp. 82.

Next, Polkinghorne claims that there are certain physical chaotic systems that are intrinsically[63] unpredictable due to SDIC (such as weather systems). Such unpredictability results either from an ignorance of the precise initial conditions of the system or else we propose that the unpredictabilities are indicative of ontological openness. Polkinghorne proposes that the use of "epistemology models ontology" should encourage one to take the latter view.[64] We cannot predict the future state of the system for that future lies open. Crucially however Polkinghorne assumes that Newtonian mechanics still provide a reasonable approximation to true behavior and represent the key features of real-world chaotic systems: "[i]t is an entirely reasonable assumption that the true theory would have properties analogous to aspects of classical chaos, such as the existence of strange attractors, but this has not been demonstrated conclusively."[65] This Polkinghorne justifies with the notion of 'downward emergence', which he takes to mean "the behaviour manifested in those special situations where a constituent picture, based on the possibility of separation of the system into smaller parts, together with the possibility of isolating and controlling environmental influences, is actually an acceptable approximation to what is happening."[66] Newtonian mechanics provides a reasonable approximation so long as wider environmental effects are ignored; this gives the impression that, because Newtonian mechanics are deterministic, reality is deterministic. Yet in fact reality is indeterministic and Newtonian mechanics are thus a downward emergent approximation. Effectively he is appealing to a new theory of chaos, hitherto undeveloped which displays many of the features of classical chaos yet is indeterministic, to explain the unpredictability in complex real-world systems.

Saunders summarizes Polkinghorne's argument in the following manner:[67]

1. mathematical chaos theory is deterministic;
2. mathematical chaos shows sensitive dependence on initial conditions and constraints due to the existence of strange attractors;
3. he then postulates that chaotic phenomena in the real world are indeterministic and the deterministic mathematical models we have are only downward-emergent approximations to this flexible reality;

[63] I.e., "They are matters of principle, and not matters of current deficiencies of investigative practice. It is not possible that the development of more exact forms of measurement, or of more precise forms of calculation, would be able to remove them." – *ibid.*, pp. 80.

[64] He cites the discovery of Heisenberg's Uncertainty Principle, which was a statement about epistemology, but soon became to be understood as indicative of ontological indeterminism in the form of the Copenhagen interpretation as precedence.

[65] Polkinghorne, J.C. *Science and Theology in Quest of Truth*, London: SPCK (2011), pp. 88. By classical chaos Polkinghorne means the studying of these systems using non-linear dynamics (Newtonian mechanics). The strange attractor is the portfolio of possible future patterns of motion in a chaotic system. See Gleick, J. *Chaos: Making a New Science*, New York: Open Road Media (2011).

[66] Polkinghorne, *Theology in the Context of Science*, pp. 82.

[67] It is important to note that this book was published in 2002 yet Polkinghorne continued to write on the topic for the next eleven years. As such, this account does not take into consideration Polkinghorne's later considerations on the subject.

4. this indeterministic and flexible reality distinct from mathematical chaos theory is a suitable locus for SDA.[68]

Later commentators, such as Taede Smedes, point out that such an argument is *ad hoc*; Polkinghorne utilizes the features of deterministic classical chaos, (e.g. SDIC) and assumes that these features accurately reflect reality.[69] Reality is the same as the mathematical model in all regards except determinism – such appeal is certainly *ad hoc*. Lydia Jaeger summarizes:

Chaos arises, as far as we know, in deterministic systems. Thus in order to speak about God's action in a chaotic system, one needs to account for how God can act in a deterministic world; but why then appeal to chaos in the first place? Polkinghorne's move to bring in critical realism is very curious indeed. Not only does it rely on a particular philosophical view of science, it also uses a result derived from a deterministic model (the long-term unpredictability of complex dynamical systems) and tries to conclude from it that the model is only an approximation to reality, and that nature is after all not really deterministic but contains "an intrinsic openness." But why first appeal to science, only to subsequently dismiss the ontological picture that the scientific model provides? Smedes rightly complains that Polkinghorne's appeal to critical realism is ad hoc."[70]

I think this argument misconstrues Polkinghorne's starting point. I feel it is more accurate to argue that he starts from the difficulties scientists have in predicting complex systems (such as the weather), of which classical chaos theory is the study of modelling these systems using deterministic non-linear dynamics (Newton's equations).[71] This is the unpredictability that Polkinghorne is talking about, rather than the long-term unpredictability that arises from classical chaos simulations. Thus I propose we may summarize Polkinghorne's position in the following way:

1. There exists physical exquisitely sensitive systems whose future behaviour is intrinsically unpredictable;
2. Classical chaos theory illustrates that there is an intrinsic limit on our ability to predict these complex systems using deterministic Newtonian mechanics;
3. He then postulates that physical systems are in fact indeterministic, and their future state is not entirely determined by the exchange of energy between constituents;
4. Newtonian mechanics is thus a downward-emergent approximation to true reality, arising from the fact it does not take into consideration the unisolable nature of

[68] Saunders, *Divine Action and Modern Science,* pp. 192.

[69] "Polkinghorne claims that mathematical and physical models are isomorphically related to each other, thereby implying that the two kinds of models are identical with regard to the relations between the elements" - Smedes, *Chaos, Complexity and God,* pp. 80.

[70] Jaeger, L. 'Against Physicalism-plus-God: How Creation Accounts for Divine Action in Nature's World', Faith and Philosophy (2012) 29(3), 295-312 (pp. 298-299).

[71] Indeed, Polkinghorne writes that to describe chaos theory as concerned with 'non-linear dynamics' is already to have made a metaphysical interpretation of the nature of such systems *viz.* that they are deterministic. See Polkinghorne, *Faith, Science and Understanding,* pp. 100.

physical systems. Nevertheless, true theory contains some of the features of classical chaos, *viz.* the strange attractor and SDIC.

This understanding of Polkinghorne's argument takes the empirical observation of real-world unpredictability to be the starting point, rather than the fact that deterministic models of chaos are intrinsically unpredictable. The fundamental challenge that still remains for Polkinghorne is that the only way to argue that the unpredictabilities present in complex physical systems are *intrinsic*, is by appealing to a deterministic mathematical model that displays SDIC. In that sense, he is still arguing for indeterminism after assuming the validity of a deterministic model. Nevertheless, it is consonant with our empirical observations to assert an open interpretation of chaos theory, for SDIC places an intrinsic limit on our ability to verify the validity of classical chaos in complex real-world systems. Arguably therefore Polkinghorne has succeeded in claiming that it is consonant with scientific understanding to assert a fundamentally indeterministic ontology. This exercise in "presocratic flailing around,"[72] Polkinghorne concludes, is an attempt to demonstrate that "the actual causal structure of the physical world is something more subtle and complex than current thinking is able to describe,"[73] and it is quite possible he has succeeded.

Polkinghorne's claim that science has not established the causal closure of reality on its own terms does not rely solely on the proposed indeterminism of chaotic systems but also on science's limited understanding of the nature of reality. This is the topic to which we now turn.

Patchwork Physics

Polkinghorne points out that contemporary physics has very little understanding in how different theory domains interlink. There are tremendous difficulties in uniting chaos theory with quantum mechanics and quantum mechanics with general relativity. Such an incomplete understanding of causality should thus make us wary of any claims that science has proven the causal closure of the universe. This patchy account of science is a key theme in the work of Nancy Cartwright, with whom Polkinghorne shares a number of similarities.[74] Cartwright agrees with Polkinghorne that science has not concluded on its own terms the causal closure of the world.[75] She refutes such a hypothesis through an exploration of numerous instances where the laws of science provide only a patchy account of reality, a dappled world, and urges "that the breakdown of the traditional image of the completely ordered universe

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[72] Polkinghorne, *Science and Theology in Quest of Truth*, pp. 90.

[73] Polkinghorne, 'Some responses' In Watts, F. & Knight, C.C. (eds.), *God and the Scientist: Exploring the Work of John Polkinghorne*, pp. 269.

[74] Martin, E. 'Polkinghorne and Cartwright on Pluralism and Metaphysics*',* Theology and Science (2012) 10(3), 281-290.

[75] Cartwrights' thesis is that instead of seeking universal laws we should envisage a patchwork of domain-specific tendencies. The laws we do have only explain small subsections of phenomena in highly controlled environments where the wider context of environmental effects can be ignored. A hope to reduce all phenomena to a few basic theories is naïve. See Cartwright, N. *The Dappled World: a Study of the Boundaries of Science*, Cambridge: Cambridge University Press (1999).

projected from science should be taken very seriously."[76] Polkinghorne's commitment to the 'openness' of physical systems entails a belief that it is not possible to provide a complete account of reality on the basis of energy transfer between constituents. Polkinghorne's theological viewpoint, based upon this openness of creation, thus can be seen as something of a response to Cartwrights demand. As such we briefly highlight some of the consequences for divine action that Polkinghorne expounds given his view of physical causation above. In later works Polkinghorne acknowledges that chaotic systems would not be the *only* locus through which providential activity can take place[77] – Divine action is highly complex and thus would likely take place at a number of interlocking levels of physical process. Nevertheless, chaos theory proves to be a useful thought experiment, a simplified system where Polkinghorne can test out the viability of his metaphysical proposals:

- Holism. Complex systems seem to display a holistic behaviour, as they are extremely sensitive to their environment, which in some cases needs to be considered to be the entire universe.[78] Polkinghorne presents a view where 'bottom-up' energy exchange between constituent particles does not fully determine the outcome of systems. He thus postulates the existence of "holistic laws of nature, relating to the behavior of systems considered in their totalities, that bear a complementary relationship to conventional constituent laws relating to interactions between bits and pieces."[79] These would govern the pattern of energy flow within the system as a whole via the input of top-down, non-energetic causation.[80] In a "vague but suggestive phrase," [81] Polkinghorne proposes the term "active information."[82] This notion of active information has been shown to be quite problematic in the case of chaotic systems and

[76] Cartwright, N. 'God's order, Man's order, and the order of Nature', euresis (2013) 5, 99-108 (pp. 105).

[77] Polkinghorne, 'Some responses' In Watts, F. & Knight, C.C. (eds.), *God and the Scientist: Exploring the Work of John Polkinghorne*, pp. 272.

[78] Polkinghorne draws on the example of gas molecules hitting a surface. In order to predict the behaviour of the system accurately, the impact of gravitational attraction from electrons on the opposite side of the universe needs to be considered!

[79] Polkinghorne, 'The Character of Laws in Nature', In Welker, M. & Etzelmüller, G. (eds.), *Concepts of Law in the Sciences, Legal Studies, and Theology*, pp. 21.

[80] This bears similarity to Peacocke's model of top-down causation. The key difference for Polkinghorne is that he feels causation is a 'zero-sum' game and as such top-down causation is only possible if there is a lack of complete bottom-up causation, such as in his proposed understanding of chaotic systems.

[81] Polkinghorne, J.C. 'Metaphysics of Divine Action' In Russell, R.J., Murphy, N.C & Peacocke, A.R. *Chaos and Complexity: Scientific Perspectives on Divine Action*, Vatican City State: Vatican Observatory; Berkeley, Calif.: Center for Theology and the Natural Sciences (1997), pp. 154.

[82] Polkinghorne's use of active information arose in the context of his exploration of chaos theory. His idea was that, due to the stretching and folding of trajectories in a strange attractor, different trajectories become infinitesimally close to each other and as such there would be no energy difference between the trajectories. God could thus alter the trajectory of the particle in the system without any energy input. The main difficulty with this approach is whether any such zero-energy alteration is possible. Saunders points out that this notion becomes problematic at the level of Heisenberg energy uncertainties and the proposal runs afoul of the unresolved problems of quantum chaology. There are a number of other articles that explore difficulties with the specifics of active information in chaotic systems. See Wildman, W.J. 'Further Reflections on "The Divine Action Project"', Theology and Science (2005) 3(1), 71-83 (pp.71-75); Lewis, R.Q 'Petitionary Prayer—Caught in the Chaos of Strange Attractors: A Study of Divine Action in the Writings of John Polkinghorne', Theology and Science (2021) 19(3), 245-260 (pp. 255-258); Smedes, *Chaos, Complexity and God*.

in his later work Polkinghorne steps back from the specifics of this approach. Nevertheless, it can be seen as a move to expand the notion of causation beyond the exchange of energy between constituent particles and to reflect what Polkinghorne feels is the trend in modern physics towards a more relational and holistic view of reality.[83]

- Order and Chaos: In evolutionary process there must be a combination of orderly and regular processes (e.g. mutations in genetic inheritance that allow for evolution by natural selection, yet at a controlled rate). Polkinghorne's metaphysical picture of the universe is similar. Chaotic systems seem to display random behavior, yet they are still constrained yet display remarkable patterns of order (such as the strange attractor). We see this again in Polkinghorne's distinction between general providence and special modes of divine action – there is enough regularity in how God acts so as to provide a stable environment, yet God is not constrained by this regularity and is free to act in novel ways. This is a delicate balance between order and novelty (chaos).

God has not created a uniform, inflexible quilt of laws but rather they are flexible enough to allow for the miraculous and there are gaps present that allow for personal agency – both divine and human, through the form of information input. In keeping with the divine kenotic nature, God has renounced full control of events but allows space for creatures to make their own choices. Nevertheless, God interacts continuously with creation through the upholding of the laws of nature, through information input hidden in the cloudiness of unpredictability and in traditionally miraculous ways.

In Conversation With Thomism?

As we draw together a number of facets of Polkinghorne's work it is important to recognise that a particular understanding of causation undergirds his work. Perhaps not surprising given his background in physics, Polkinghorne restricts causation univocally to efficient causation.[84] This appears in several instances:

- Theophysical incompatibilism – if God is to act to bring about the divine will God must do so through physical causation and there must be a corresponding lack of causation otherwise, such as in the proposed indeterminism of complex chaotic-like systems;
- Human-divine incompatibilism – If God were to be held to be responsible for causing an event then that event cannot be attributed to a free moral agent, such as a human being;

[83] Polkinghorne draws on recent discoveries such as quantum non-locality to evidence such a view. See for instance Polkinghorne, *Science and the Trinity*, pp. 73-74.

[84] "That which acts; the primary source of change; the agent or producer of an effect (e.g., the batter who hits the ball)" – Dodds, M.J. *Unlocking Divine Action: Contemporary Science & Thomas Aquinas*, Washington, D.C.: Catholic University of America Press (2012), pp. 265.

- Kenotic theology – Consequently, God must restrict divine action in order to preserve the freedom of creation, notably human beings;[85]
- Special divine action – Consequently, God's action must mostly be hidden and take place within the "cloudiness of unpredictability."[86]

This understanding of causation makes talk between Polkinghorne's and Thomist models difficult. For instance, Polkinghorne defends his causal joint approach over and against Thomistic double agency, which utilized an expanded understanding of causality, by appealing to his notion of divine kenosis and the condescension of God to act within the grain of created reality.[87] However, Polkinghorne develops his account of kenotic theology partly as a means to allow for the existence of an all-powerful God who acts in creation and a free creation, the two of which he assumes are in tension. This tension between an omnipotent God's actions and a free creation is only based on his understanding of divine causation as univocally efficient causation – that is natural and divine causation compete. There is an inherent circularity in this position. Polkinghorne has developed a system of thought that is self-referential and as such trying to find traction with alternatives requires delicate work. Exploring the notion of causation seems to be one avenue through which Polkinghorne could be brought into dialogue with other viewpoints.[88] Yet, Polkinghorne does look to expand the notion of causality beyond the energy exchange between constituent particles through exploration of the idea of active information. As we saw earlier, such a term is vague and unproven in the cases of chaotic systems but perhaps that actually works in Polkinghorne's favour. It certainty draws him closer to Thomistic positions that regard divine causation as ineffable and entirely distinct from creaturely causation. Perhaps Polkinghorne could be moved in that direction.[89] Although Polkinghorne accepts a view of divine univocal

[85] Polkinghorne, *Science and Christian Belief*, pp. 80.

[86] Polkinghorne, *Science and the Trinity*, pp. 84.

[87] "It [the idea of God acting through primary causality] is largely motivated by a desire not to speak of providential action as if it were just another cause acting among other causes, with God an invisible Agent acting alongside creaturely agents. I would defend the causal joint approach by replying that it is another example of the kenotic nature of the act of creation that the Creator has condescended to act in this manner, choosing to operate providentially within the open grain of created reality." – Polkinghorne, *Science and Religion in Quest of Truth*, pp. 89.

[88] See Dodds, *Unlocking Divine Action;* Silva, I. 'A Cause Amongst Causes? God Acting in the Natural World', European journal for Philosophy of Religion (2015) 7(4), 99-114; Carroll, W. 'Divine agency, Contemporary physics and the Autonomy of Nature', Heythrop journal (2008) 49(4), 582-602.

[89] It must be said that Polkinghorne did not agree with such a parallel being made. See Polkinghorne, 'Some responses' In Watts, F. & Knight, C.C. (eds.), *God and the Scientist: Exploring the Work of John Polkinghorne*, pp. 272. However, in part this may be due to a general suspicion of the cluster of ideas he associates with primary causality rather than with the idea itself. "It appears that there are certain theological concepts, which though not logically locked together, tend to constellate in association with each other. In one group are a-temporality, primary causality, divine impassibility, an inclination towards determinism, and an emphasis on divine control. In the other group are temporality, top-down causality, divine vulnerability, an inclination towards openness, and a recognition of creaturely self-making." – Polkinghorne, *Belief in God in an Age of Science*, pp. 74. Polkinghorne accepts the latter cluster and as such may feel forced into a wholesale rejection of the former.

causation[90] he still wishes to retain the distinctiveness of divine action. This is done in a few ways: God acts only through pure information input (active information), God is responsible for sustaining creation and upholding the laws of nature, God can act in miraculous ways and God's purposes will always be fulfilled. Once again this could be an area to explore dialogue further.

Conclusion

In this article we have explored Polkinghorne model of divine action, paying particular attention to the theological and metaphysical framework from which he was operating. Several places where Polkinghorne can be drawn into conversation with recent scholarship have been indicated with potential avenues for future exploration highlighted.

[90] "An efficient cause that acts with another efficient cause of the same order to produce some effect. Since they belong to the same order, their effect belongs partly to each, and one may interfere with the causality of the other. When two men carry a table, for instance, they act as univocal causes. Each is only partly responsible for the motion of the table, and the causality of one may interfere with that of the other. The more weight one lifts, for instance, the less weight there is for the other to lift." – Dodds, *Unlocking Divine Action*, pp. 266.