
CHAPTER ONE

Robert John Russell's Contribution to the Theology & Science Dialogue

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Over the last two-and-a-half decades, a brief yet potentially groundbreaking chapter of intellectual history has been in the writing in Berkeley, California. The larger story is the history of the relationship between faith and science. The Berkeley chapter tells of new encounters, new relationships, new insights, and new breakthroughs. Leading the way across new thresholds has been my colleague and friend Robert John Russell, who founded the Center for Theology and the Natural Sciences (CTNS) at the Graduate Theological Union (GTU) in 1981. In what follows I would like to outline briefly the *Science and Religion* story; then I would like to turn specifically to the chapter in which Bob Russell is the chief character.

We will explicate the central contributions of Robert John Russell by identifying five key concepts, which we affectionately call 'Bobisms'. These key concepts comprise: (1) CMI: the 'creative mutual interaction' between science and theology; (2) NIODA: 'non-interventionist objective divine action' in nature's world; (3) ASBE: 'atoms may be small, but they're everywhere'; (4) $t > p$ – that is, 'if it's true, then it must be possible'; and (5) FINLON, according to which the Easter resurrection of Jesus is the 'first instantiation of a new law of nature'. This last one, FINLON, has a corollary, MTLT, or 'miracle today, law tomorrow'. What is distinctive and admirable about Russell's contribution to the dialogue between science and religion is his insistence that we will not have arrived at a true interaction until the day comes when the theologian provides the scientist with a prompting that leads to progressive empirical research. Such insistence takes courage. It demonstrates that the scientific spirit of raising up a possibility, formulating it into a hypothesis, and then pursuing research to confirm or disconfirm it can become a challenge to expand the horizon of science while it enriches the life of theology and, thereby, the life of faith.

Science & Religion versus Science & Theology

The flowering of dialogue between laboratory scientists and academic theologians in Berkeley belongs in a global garden of new growth. During the final third of the twentieth century something dramatic began to blossom in the world's intellectual flower bed, namely the field of *Science & Religion*. Within this apparently spontaneously growing nosegay is a new hybrid, the

field of *Science & Theology*. The soil has been enriched by a growing cultural respect for religion and the widespread sense that a conversation needs to be cultivated between the spiritual and empirical dimensions of human knowing. The dialogue between Theology & Science has blossomed within a larger garden of growing interest in Science & Religion.

What we mean by 'science' here is quite specific. By *science* we refer to natural sciences such as physics, cosmology, evolutionary biology, genetics, and the neurosciences; and it includes supporting disciplines such as history of science and philosophy of science. Although on occasion we will dip into one or another social science, for the most part the emerging field limits itself to the natural sciences.

The natural science that is relevant here is quite specifically *modern* science. Modern science is inherently and relentlessly revolutionary in spirit. Its ruthless dedication to empirically derived truth renders science brutal in its disregard for previous beliefs, even sacred beliefs. No appeal to traditional religious authority can stand in the face of repudiation by modern scientific theory or its companion, technology. This is the science which we find in a new partnership with religion.

By *religion* we refer to two regions of religious thought. The first is generically spiritual, wherein research scientists are asked to explore ways in which their understandings of nature emit evidence or lack of evidence of transcendence. The second is doctrinally conceptual, wherein Christian systematic theology, as well as the philosophical or conceptual components to traditions such as Islam, Judaism, Hinduism, Buddhism, and Chinese traditions, is placed in dialogue with the sciences to re-conceive God's relation to the world in creation, providence, moral guidance, and related interactions. Science and religion is a field of academic study that invites contributions from a variety of sciences and a variety of religious commitments. The academic field of Science & Religion is not itself a religious tradition or homogeneous school of thought.

What we know as the field of *Science & Religion* is actually the outgrowth of an originally much more specific agenda that could be called *Science & Theology* or, as the title of the CTNS journal has it, *Theology and Science*. This is the case for both conceptual and historical reasons. Conceptually, science as a human enterprise operates at the level of the human mind. Science is rational, conceptual. So also is theology. Theology is that component to the religious life that relies on the human mind to understand God's relation to the world and to ourselves. Theology is to religion what science is to nature.

In the final third of the twentieth century, it was the pioneering work of Christian theologians trained and fascinated by science that opened the door through which so many later could walk. Quite specifically, it was the trailblazing work in the mid-1960s of Ian G. Barbour, who reviewed the history of Europe's experience with scientific revolutions amidst its Jewish and Christian cultural context that provided the map of intellectual issues which needed addressing. What Barbour and his successors accomplished was the building of a conceptual bridge between reflective theology and reflective science. What would later become a broader interest in the relationship of

scientific progress to religious traditions – the field of Science & Religion – traversed this initial theological bridge.

The Emergence of the Science & Religion Dialogue

As already mentioned, what we know today as the field of *Science & Religion* gained its present definition during the 1960s. There were antecedents, of course. In 1941 the American Scientific Affiliation was founded by evangelical scientists. Since the 1960s, however, an evolution in our intellectual environment has made possible lavish advances in the dialogue between natural science and religious faith.

The intellectual environment of evolutionary adaptation has witnessed three noticeable developments. The first development was an opening within science. Questions of transcendence arose during the 1960s. The confirmation of Big Bang cosmology in 1965 was perhaps the most decisive. The history of the universe as cosmologists began to describe it looked very much like the creation history described in the Bible. With the thought that perhaps the cosmos had a beginning at a certain point in time – actually the beginning of time, when $t=0$ – provoked the question, might time have an edge, and when we peer over the edge might we be looking at eternity? Science seemed to be raising questions of transcendence and asking for religious involvement and interpretation.

The Big Bang confirmation of the 1960s led to the Anthropic Principle debate in the 1970s and 1980s. The Anthropic Principle was formulated within physics, not theology; yet it has direct theological implications. Because of the appearance of complex life-forms on planet Earth, physicists have been asking the following question: what must have been the initial conditions at the moment of the Big Bang ($t=0$) to eventually make life possible, or even inevitable? Such factors as the amount of mass, energy, rate of expansion, and so on could not have been different in fractions such as one to a million, or life would have been impossible. The universe seems to be fine-tuned for the appearance of life. Fine-tuning raises questions of intelligent design. The weak Anthropic Principle asks, was the universe designed to make life possible? The strong Anthropic Principle asks, was the universe designed to make life inevitable?

The debate over determinism versus indeterminism raised by quantum physics similarly opened the door to questions of transcendence. Quantum theory affirms contingency and perhaps even indeterminism at the subatomic level, giving rise to questions regarding rationality in the universe and the possibility of non-interventionist divine action in the physical realm. Newtonian or classical physics had produced a mechanistic picture of nature wherein the universe appeared like a clockwork, as a closed nexus of cause and effect. The rational structure of a clock provided the model for the rational structure of nature. If the universe is causally closed, then God's action within the world seems forbidden. Divine action would require God to intervene as an outside cause, perhaps in the form of a miracle, and this would upset the nexus.

With the advent of quantum theory, however, natural events can now be viewed as contingent. The world no longer looks like a clockwork but more like a history of natural events. Might God be acting in these unpredictable and contingent events? In sum, physics has begun to raise philosophical and theological questions that transcend what science alone can address.

A second development was the turn taken in the field of philosophy of science. For the first two-thirds of the twentieth century, strict empiricism, positivism, and reductionism had held sway. By the late 1950s and early 1960s, this approach was being challenged by a new awareness of historical relativity and the sociology of knowledge. Philosophers including Michael Polanyi, Norwood Hanson, Thomas Kuhn, Stephen Toulmin, and Imre Lakatos placed scientific knowing into historically conditioned communities of knowing. Alleged scientific objectivity underwent challenge and revision. The result was a new picture of scientific knowledge that began to look like knowledge in the humanities. Theologians had already made their peace with historical relativity in the nineteenth century, so now they could welcome twentieth-century philosophy of science into their relativistic and perspectival home.

A third intellectual development took place within the discipline of theology, namely the rise of a new breed of theologians fascinated by science and thirsty for dialogue. The reign was coming to an end for the giants of neo-Orthodox and existentialist Protestant theology – Karl Barth, Emil Brunner, Paul Tillich, Reinhold Niebuhr, H. Richard Niebuhr, Anders Nygren, Gustaf Aulén, and others. These neo-Orthodox theologians had immunized theology from science by embracing the *Two Language* model, according to which science and faith each speak a different language. Science speaks of facts, whereas religion speaks of meaning. Because the languages are untranslatable, so it was assumed, science could have no relevance for matters of faith. Science and faith are allegedly separate realms. Even so, Langdon Gilkey, a staunch disciple of Paul Tillich and Reinhold Niebuhr, pressed the theological community during the 1960s to give attention to the cultural impact of science. Science was now a theological issue because it is a cultural issue. Gilkey did not himself establish a dialogue between theology and science, but he pointed to the canyon over which a bridge of dialogue should be built.¹

Roman Catholics were also making ready. The Second Vatican Council (1962–65) had taken *aggiornamento* as its theme – that is, opening the windows of the church so the winds of the modern world could blow through. The new mood was one of exuberant openness. This openness would soon include openness to science. With the advent of the pontificate of John Paul II in 1978, the Vatican began an aggressive program of support for dialogue between the Church and the world of natural science. ‘Can we not hope that the sciences of today, along with all forms of human knowing,’ asked the Pope rhetorically, ‘may invigorate and inform those parts of the theological enterprise that bear on the relation of nature, humanity, and God?’²

Ian Barbour: The Transitional Form

What we today see as the field of *Science & Religion* evolved in this 1960s environment. For the sake of convenience, we mark the Cambrian breakthrough with the 1966 publication of *Issues in Science and Religion* by Ian G. Barbour. Born in 1923, Barbour grew up in China with a scientist father and theologian mother, and he was present the day in 1929 when Jesuit paleontologist Pierre Teilhard de Chardin arrived with the skull of what would later be called *Sinanthropus*. Barbour went on to obtain advanced degrees in both physics and theology. His first book, *Issues in Science and Religion*, defined the nascent field for four decades to follow.³ Barbour's subsequent publications, such as *Myths, Models, and Paradigms* (1974) and *Technology, Environment, and Human Values* (1980) along with the Gifford Lectures of 1989–91, *Religion in an Age of Science* and *Ethics in an Age of Technology*, have continued to shape it.⁴

By the early 1970s centers and societies for the study of science and religion were budding around the world. At Oxford University, biologist–theologian Arthur Peacocke organized the Society of Ordained Scientists and cultivated the Ian Ramsey Centre for research in this field. The seeds for German language discussions were planted by the Karl Heim Gesellschaft, founded in 1974, which publishes an annual summary of research. At the Lutheran School of Theology in Chicago, the Zygon Center for Religion and Science was founded by Ralph Wendell Burhoe and supported by the Center for Advanced Study in Religion and Science and the Institute for Religion in an Age of Science. Philip Hefner and now Antje Jackelén succeeded Burhoe as director; and Hefner today serves as Editor of *Zygon: Journal of Religion and Science*. The European Society for the Study of Science and Theology meets biennially on the European continent. The Association of Science, Society, and Religion in India, the Australian Theological Forum, and the Center for Islam and Science in Islamabad and Edmonton are examples of centers that draw scientists and religious leaders into academic conversation and generate publications that expand the field.⁵

Since the early 1990s, the John Templeton Foundation has been granting funding to numerous individuals and organizations because its leaders believe interaction with science will facilitate 'progress in religion'. The Templeton Foundation was financial midwife at the 2002 birth of the multi-religious International Society for Science and Religion centered at Cambridge University, with physicist–theologian John Polkinghorne as its first President. The annual Templeton Prize for contributions to religion is frequently given to scholars in the field of science and religion; recipients have included physicists Charles Townes, Freeman Dyson, and Paul Davies, philosophers Seyyed Hossein Nasr and Homes Rolston III, as well as hybrid theologian–scientists Arthur Peacocke, John Polkinghorne, and Ian Barbour.

CTNS as a New Life Form

Natural selection advances evolution by accident. Engineering advances civilization by vision and design. A clever engineer perceives a need, envisions a device to meet this need, initiates the designing process, and then musters the materials for production. Robert John Russell had already perceived the need for serious engagement of faith with science as a young person. Then, while studying theology in the MDiv and MA programs at the Pacific School of Religion from 1968 to 1972, Russell began envisioning a center for research at the Graduate Theological Union in Berkeley. He was encouraged by the GTU faculty, Durwood Foster, and Andrew J. Dufner, SJ. This was followed by a PhD in physics at the University of California at Santa Cruz, where his vision broadened and deepened. Receiving his doctorate in physics and his ordination into the ministry of the United Church of Christ on the same day in 1978, he went to Northfield, Minnesota to teach physics and conduct chapel worship at Carleton College.

The design stage of what would become the Center took place at Carleton. Russell's new colleague at Carleton was Ian Barbour, who was in the middle of his near career-long professorship. The two theologian-physicists dreamed and planned for what would eventually become CTNS. Foster and Dufner visited the pair in Northfield, and the design took shape. Russell moved from Northfield, Minnesota to Berkeley in 1981 and, along with his wife, Rev. Charlotte Russell, began a now quarter-century of CTNS activities.

The Evolution from Two Languages to Dialogue, then to Hypothetical Consonance

In 1981 the broadly assumed way to relate science with religion was to keep them peacefully separate. The still-dominant model for understanding the relationship of science to theology or religion was not warfare, as many mistakenly assume; rather, it was the *Two Languages* model. Ian Barbour refers to this as the 'independence' model.⁶ According to this paradigm, science is said to speak one language, the language of facts, and religion is said to speak a different language, the language of values. Science attends to objective knowledge about objects in the penultimate realm, whereas religion attends to subjective knowledge about transcendent dimensions of ultimate concern. Modern persons need both, according to Albert Einstein, who claimed the following: 'Science without religion is lame and religion without science is blind.'⁷ Each of us should speak both languages, that is, so that science and religion find their separate but equal places in our wider culture.

We should not confuse this Two Language model with the classic model of the Two Books, according to which the book of Scripture and the book of nature each provides an avenue of revelation for God. The difference is that the Two Books model sees science as revealing truth about God, whereas the Two Language model sees science as revealing truth solely about the created world.⁸

While gratefully respectful toward the two languages or independence model, CTNS has sought to go beyond it. The stages beyond include dialogue, hypothetical consonance, and creative mutual interaction.

Since its founding in 1981, CTNS has regularly hosted and sponsored conferences in which laboratory scientists are invited to engage directly in dialogue with theologians (accompanied by philosophers and ethicists) regarding the implications of both scientific and theological concepts. Some of these conferences have been quite open-ended; they begin without knowing in advance where the conversation might lead. I have called this 'dice shaker' research; we place scientists and theologians in a room like placing dice in a cup, shake it up, toss it out, and see what comes out of it. Our discovery is that both scientists and theologians come with a hunger and a thirst for dialogue, believing in advance that such dialogue is important even if the end product is unknown in advance.

Why might one think dialogue is important? What we found to be inchoate and just asking for articulation is the assumption of hypothetical consonance. It is the assumption that both science and theology are concerned about the truth. And, we assume, one truth cannot contradict another truth. Somewhere in the darkness of what is not-yet-known, we assume, lies a connection between the natural world as seen through scientific glasses and as seen through the eyes of faith.

We have given this set of assumptions the label *hypothetical consonance*. Notre Dame's historian and philosopher of science Ernan McMullin gave the field the term 'consonance' for use in this context.⁹ The assumption of *consonance* directs inquiry toward areas of correspondence between what can be said scientifically about the natural world and what can be said theologically about God's creation.¹⁰ Even though consonance seems to arise in some areas, such as the apparent correspondence of Big Bang cosmology with the doctrine of creation out of nothing, consonance has not been fully confirmed in all relevant shared areas. Hence, the adjective *hypothetical* applies to theology as well as science.

Russell picked up and developed the term *consonance* in several ways. His distinctive contribution is adding, without contrasting, the notion of *dissonance*. Dissonance between a scientific model and a theological model becomes a jumping-off point for further investigation and possible alteration of one, the other, or both. Russell writes,

I combined McMullin's idea with McFague's epistemic claim about the 'is and is not' structure of metaphor to include and thus to learn from both consonance and what I called 'dissonance' between scientific and theological theories. Rather than undercutting a coherent worldview, dissonance points to the dynamic character of our worldview, specifying where problems arise, shifts are required, and potentially greater coherence can be sought. Moreover, by recognizing that theories in both science and theology evolve and are eventually replaced, we can build change directly into the relation between science and theology rather than being threatened by it.¹¹

The central hypothesis of *hypothetical consonance* is that there can be only one shared domain of truth regarding the created world, and science at its best and faith at its best both humble themselves before truth. Therefore, one can trust that consonance will eventually emerge. Hypothetical consonance provides the warrant for *dialogue* between science and theology. However, it also opens the door to a still further step in the evolving relations of science to religion, namely the 'creative mutual interaction of science and theology'. This next stage is the distinctive contribution of CTNS.

CMI: Creative Mutual Interaction

Those of us who work with Robert John Russell – 'Bob' – have noticed a most charming habit. When Bob has an insight, he mulls it over and tags it with a word or a phrase. Then, he introduces it for wider conversation and consideration. His friends have labeled these words or phrases 'Bobisms'. A number of the authors in this book have decided to focus on one or another Bobism.

The central Bobism already introduced is CMI or 'Creative Mutual Interaction', sometimes rendered 'Critical Mutual Interaction'. CMI is the answer to the following questions. Can the knowledge gained from scientific study affect what one believes theologically? For genuine dialogue to be possible, we must assume the answer is 'yes'. Can the insights of religious faith and their articulation by the theologian have an effect on natural science? Again, genuine dialogue would have to assume the answer to be 'yes'. It may not yet be clear just how one field can influence the other; still, we must assume hypothetically that mutual influence is possible.

CMI sets a goal to be achieved when scientists and theologians engage one another in dialogue. CMI tries to make clear that there are some domains of knowing where science and theology share common investment. Each brings to dialogue a given language for understanding, to be sure. Yet in many instances they occupy the same domain; and this legitimizes the pursuit of consonance. Borrowing hermeneutical language, we can expect a merging of horizons between science and faith.

However, Russell wants more. He wants to see science challenge theology; and he wants to see theology challenge science. He wants science to specify the parameters within which theologians understand the world God has created and promises to redeem. Then comes the decisive innovation of CMI: Russell asks that theology prompt science to formulate a hypothesis that will lead to a progressive research program. He asks that something theologians have learned about the world – due to their understanding of the world as God's creation – be offered to researchers as a heuristic, as a guide for further investigation. The proof, so to speak, that science and theology are actually in dialogue will be that science gains insight it could not have had without a theological prompting, and vice versa.

Russell has identified eight ways in which CMI can be pursued. The first five represent traffic moving from science toward theology; the second three reverse

the direction and move from theology toward science. (1) Physical theories can provide data which place constraints on theological descriptions of the world. For example, Russell says a theology of divine action should not violate special relativity. (2) Physical theories can provide direct data to be incorporated into a theological scheme. For example, the beginning of time or $t=0$ in Big Bang cosmology might be correlated to *creation ex nihilo*. (3) Physical theories can provide indirect data for theology – that is, following philosophical critique a scientific theory could be readied for theological input. For example, after a philosophical examination of $t=0$ we might find that it would provide indirect testimony to the notion that the created world is contingent upon the act of a creator God. (4) Physical theories can provide indirect data for theology when filtered through a philosophy of nature, such as process philosophy or emergent monism. (5) Physical theories can function heuristically in the theological context of discovery by providing conceptual, experiential, moral, or aesthetic inspiration. Now, reversing direction, (6) theology has historically provided assumptions that underlay the development of science, such as the contingency and rationality of nature. (7) Theological theories about the created order can act as sources of inspiration in the scientific context of discovery. (8) Theological theories could provide criteria, alongside empirical adequacy, coherence, scope, and fertility, for theory choices in science, especially physics.¹²

At CTNS we employ the image of the bridge with two-way traffic to convey the CMI principle. Robert John Russell writes, 'I have expanded the methodology by analyzing how the insights of theology and philosophy influence scientists as they pursue their theoretical work. The combined methodology of "critical mutual interaction" represents a genuine "two-way" bridge between science and religion.'¹³

When formulating what would become the editorial policy for the CTNS journal, *Theology and Science*, we penned the following:

When scientific descriptions of the natural world begin to bear the weight of undeniable truth, then we expect theologians to consider with honesty the need to incorporate scientific knowledge into religious understanding. Similarly, when theologians draw upon venerable insights regarding God, creation, human nature, or spiritual presence, then we expect scientists to consider whether such religious insights might guide a hypothesis toward a progressive research program. These expectations lead us beyond two languages toward what we at CTNS like to term, 'the creative mutual interaction of theology and science'.¹⁴

NIODA: Non-Interventionist Objective Divine Action

When we turn to the second Bobism, NIODA, the question becomes this: in light of modern science, how can we understand God's providential action in the natural world? Since the Enlightenment, we in the West have been given a choice between two understandings of special providence. First, God acts

objectively in nature and history and we human beings respond; but these acts can only be understood as divine *interventions* into the natural and historical world, as miracles. Or, second, human subjectivity includes human action based upon God-consciousness; and what we think of as distinctively divine activity is *uniformly the same in all events* – that is, no miracles. The choice between these two is inadequate to cover the logical options, according to Russell.

'The old choice was based on classical physics and modern, reductionist philosophy', writes Russell. 'Today, because of changes in the natural sciences, including quantum physics, genetics, evolution, and the mind/brain problem, and because of changes in philosophy, including the move from reductionism to holism and the legitimacy of including whole/part and top/down analysis, *we can now understand special providence as the objective acts of God in nature and history and we can understand these acts in a non-interventionist manner consistent with science.*'¹⁵

During the Enlightenment and the period of classical or Newtonian physics, it appeared that we were living in a world closed within a causal nexus with no windows to transcendence. For God to act in this otherwise closed causal nexus, God would need to intervene. God would need to suspend or even violate the existing laws of nature. In short, divine action would consist of miraculous action.

Now, we are talking here about divine action *within* the world, not the creation of the world. We can assume that God acted to bring the world into existence in the first place. This is consistent with classical physics. Our concern here is special providence, or God's action within the existing natural world with its already-established laws of nature and causal network. 'If the physical world is a causally-closed, deterministic system, and if the behavior of the world as a whole is ultimately reducible to that of its physical parts, the action of a free agent – whether human or divine – must entail a violation of natural processes.'¹⁶

In order to avoid interventionism when describing God's action in nature's world, nineteenth-century Liberal Protestant theologians and their twentieth-century neo-Orthodox followers had turned to human subjectivity. Leaving the objective world to uniform and inviolable natural processes studied *solely* by science, they located God's presence in human consciousness. In order to see God's action in the world, a believer would need to see with the eyes of faith. Divine action became a subjective interpretation of an otherwise neutral or godless objective world. God's action became limited to action within the human perspective.

Neither of these two views is satisfying to Russell. 'Thus by and large the choice has been either to affirm objective special providence at the cost of an interventionist and, in some extreme cases, an anti-scientific theology, or abandon objective special providence at the cost of a scientifically irrelevant and, in many cases, a privatized theology. In this light, a third option is crucial.'¹⁷

The quest Russell has set out on is this: how can we conceptualize God's action in nature's world that is objective without being interventionist?

Fortunately, according to Russell, twentieth-century advances in science and the scientific worldview provide resources to aid us in this quest. During the opening decades of the twentieth century classical physics was supplemented by two new theories which drastically altered our understanding of space, time, matter, and causality. These were special relativity and quantum mechanics. In addition, revisions in thermodynamics, the arrival of chaos theory, and Big Bang cosmology with its notion of an expanding universe all present possibilities for interpreting the world as genuinely open instead of a closed causal nexus. Order is now seen as emerging from disorder. Physical reality now has an evolutionary history and a changing future. 'A case can now be made that nature, at least as understood by quantum physics and perhaps in other areas of the natural sciences, is not the closed causal mechanism of Newtonian science. Instead, it is more like an open, temporal process with the ontology of "Swiss cheese" – one in which the genuine, material effects of the human and even divine agency are at least conceivable.'¹⁸

The enterprise of conceiving of divine agency in objective terms leads Russell to consider various forms of postmodern holism. The essence of holism is the principle that a complex whole is greater than the sum of its parts. Applicable candidates for consideration are notions such as (a) *emergence* – that is, self-organizing evolutionary development over time leads to emerging new structures of unprecedented centered activity; (b) the *whole-part* dialectic, according to which God could act in the context of the whole while influencing all the parts, with divine action indiscernible as one cause among others; and (c) *top-down* causality or supervenience, according to which the context at the higher level determines the relation between a higher-level property and a lower-level property, suggesting that God's action could supervene lower-level causal networks and influence the course of events without intervention into those causal networks. These holistic approaches need not eliminate the (d) *bottom-up* approach, according to which God could act at a lower level of complexity to influence the processes and properties at a higher level. One of Russell's signature contributions to the dialogue is his hypothesis that God acts at the quantum level and in bottom-up fashion influences all levels of physical reality that depend on quantum activity.

Russell does not discount the possibility for non-interventionist divine action at higher, more complex levels in nature which might take the form of top-down or whole-part causality. According to whole-part or top-down models of causality, 'a localized, special event in the world is viewed as the indirect result of God acting directly in one of the two ways: either in a top-down way from a higher level in nature (using such analogies as 'mind/brain'), or in a whole-part way starting either at the physical boundaries or environment of the system (an analogy here is the formation of vortices in a liquid heated in a container), or, ultimately, at the boundary of the universe as a whole.

'[The] bottom-up approach, in contrast, views a special event in the macroscopic world as the indirect result of a direct act of God at the quantum mechanical level, amplified by a stream of secondary causes linked in a bottom-up way. This view presupposes that quantum uncertainty can be given an indeterministic ontological interpretation, while recognizing that other

interpretations are also possible.¹⁹ Ultimately, Russell anticipates that all these forms of non-interventionist divine action would be seen to work together harmoniously.

This proposal that we search for objective divine action at the quantum level brings us to the next in our list of Bobisms, 'Atoms may be small, but they're everywhere'.

ASBE: Atoms May Be Small, But They're Everywhere

ASBE justifies Russell's giving special attention to quantum activity at the atomic level of physical reality; and it justifies a search for reconciliation of bottom-up causation with divine action. If the quantum level of physical activity is the most basic and most primitive level, then God's action here ramifies so that it might have influence on every upper level of physical and even emergent reality.

The door has been opened to this interpretation of divine action by the debate over determinism and indeterminism in quantum physics. Russell believes that the uncertainty in our knowledge of electron passage does not arise from the incompleteness of quantum mechanics as a theory as suggested by Albert Einstein nor from the influence of non-local hidden variables as suggested by David Bohm; rather, it reflects a fundamental indeterminacy in nature itself, as is held by Werner Heisenberg. Russell and others in this camp believe that quantum indeterminacy is likely to be ontological and not simply epistemological. This means that quantum systems have multiple potentialities until a measurement is made, according to which 'measurement' refers to any irreversible interaction with another system (not merely the action of an observer in a laboratory).

Here is an opportunity for a most creative proposal. Russell proposes that we think of God as acting by actualizing one among the range of potentialities in an existing quantum system. Should God act at this microlevel, that action could not be considered an intervention. Why? Because God would not be altering any existing physical laws. Instead, it is precisely the laws of quantum mechanics which make God's action non-interventionist. According to the indeterministic interpretation of quantum mechanics, there is no sufficient efficient natural cause for what happens during a measurement interaction. Therefore, if God acts in nature to bring about the result, God's action is not interventionist: it does not violate the flow of sufficient efficient natural causes, since in these cases there is no sufficient efficient natural cause.

'Our approach is *noninterventionist*', writes Russell. 'God has created the universe *ex nihilo* such that some natural processes at the quantum level are insufficiently determined by prior natural events. One could say that nature is "naturally" indeterministic. Thus God does not suspend natural causality but creates and maintains it as ontologically indeterministic. God does not violate the laws of quantum physics but acts in accordance with them.'²⁰ Another way to frame non-interventionism, Russell points out, is to describe the laws of nature not as ontological realities which sometimes govern nature, but rather

as the faithful regular actions of God which underlie all natural processes. In this sense God's special action in bringing about a particular result of measurement is of a piece with God's general action of sustaining the world in its natural regularities.

Divine action at the quantum level would be amplified at the higher levels of physical activity. God's action at the quantum level within DNA (the making or breaking of hydrogen bonds) could lead to a genetic mutation and influence evolutionary history. God's action in the firing of a neuron could initiate system-wide changes in patterns of a person's brain activity. Russell suggests that once consciousness emerged within evolutionary history, then God increasingly refrained from determining outcomes, leaving room for top-down causality in emergent and conscious creatures.

God's non-interventionist bottom-up action here would be invisible to the laboratory scientist. Russell wants to protect the integrity of scientific research as a secular enterprise and to avoid reversion to the dreaded God-of-the-gaps arguments. So he affirms 'that science is characterized by methodological naturalism, and thus it abstains from viewing God as an explanation within science. Instead, God's direct action at the quantum level is hidden in principle from science, supporting the integrity of science and yet allowing science to be integrated fruitfully into constructive theology.'²¹

The constructive theology to which his theory of non-interventionist divine action would provide building-blocks has identifiable features. These features provide theological warrants for developing a non-interventionist understanding of God's activity in the natural world. Russell's first concern is this. 'He wants what he says about objective divine providence to cohere with what theologians generally assume about general providence. If, according to the doctrine of general providence, God lays down the laws of nature at the point of creation and sustains the regularities of the natural world, then these special acts at the quantum level are consistent with the primary act of creation and with general providence. Russell's second concern is to affirm that our creator God is responsible not only for the whole of creation but also for its parts. 'God as the transcendent creator *ex nihilo* of the universe as a whole is the immanent on-going creator of each part (*creatio continua*).'²² His third concern has to do with revelation, namely we ought to see God's intentions disclosed in what we know, not in what we do not know. Number four on his list deals with the problem of theological credibility in a cultural context imbued by science as the standard for human knowing. Non-interventionist objective special divine action, says Russell, 'offers a robust response to atheistic challenges to the intelligibility and credibility of Christian faith, since the presence of "chance" in nature does not imply an absent God and a "pointless" world but an ever-present God acting with purpose in the world.'²³

T > P: If It's True, Then It Must Be Possible

This Bobism may appear to be a redundancy. Yet, to say *t > p* is an important redundancy; because it helps to combat reductionism. Whenever we investigate

a natural phenomenon, we should try to explain it according to physical processes. But we should not try to explain it away. This is Russell's way of defending theology against what Alfred North Whitehead labeled the 'fallacy of misplaced concreteness'. Whitehead says, 'this fallacy consists in neglecting the degree of abstraction involved when an actual entity is considered merely so far as it exemplifies certain categories of thought. There are aspects of actualities which are simply ignored so long as we restrict thought to these categories.'²⁴

What happens in nature is not merely a collection of instances that exemplify already-existing universal laws. Nature has a history; and this history includes contingent and previously unpredictable events. Once the Newtonian clock-work cosmos has been opened up like Swiss cheese is opened up, then the uniqueness and specificity of actual occasions come to the fore. Actual natural events should be the first order of business for the scientist. Induction, not deduction, is the method of reasoning scientists should employ.

FINLON: The First Instantiation of a New Law of Nature

This recognition of contingency and openness to nature's history leads us to the next Bobism, FINLON, or 'the first instantiation of a new law of nature'. Because Christian theology posits an eschatology complete with a promised new creation yet to come, theologians can conceive of a world guided by laws of nature different from the ones we currently have. Should a new law of nature suddenly appear, it might tell us something about our creation that we could not have known previously. Anticipating a new creation, theologians are in a position to provide perspectives and suggestions that could open scientists to recognize what might be unprecedented.

The context within which Russell developed FINLON was an analysis of the concept of contingency, with special reference to the theory of the resurrection developed by Wolfhart Pannenberg.²⁵ Russell proposes a threefold typology of (1) global contingency; (2) local contingency; and (3) nomological contingency. Each of these has subtypes. The first, global contingency, yields, (1a) global ontological contingency, which asks: why does the universe exist *per se*? Why is there something and not nothing? Or, (1b) global existential contingency, which asks: why does the universe have such global characteristics as the fundamental laws of physics and the constants of nature? Or, why this particular universe and not another one? The second, local contingency, yields (2a) local ontological contingency, which asks: why does this particular thing exist and continue to exist? Or, (2b) local existential contingency, which asks: why does this particular thing have the characteristics it has? When Russell turns to the third, nomological contingency, he locates the contingency of nature's laws. He asks, could the first instance of a new natural process inaugurate a new law of nature?

An obvious example of the inauguration of a new natural process is the onset of biological processes well into the history of the cosmos. Many aeons since the Big Bang 13.7 billion years ago had to pass lifelessly before the first sign of

life on planet Earth, only 3.8 billion years ago. With the arrival of life-forms, so also came the arrival of life processes and the first instantiation of biological laws of nature. Nature has a history, and new chapters are genuinely new.

Might the Easter resurrection of Jesus fit this paradigm? Could we think of what happened to Jesus on Easter as the first instantiation of a new natural process which we can expect to become universal at some point in the future? Within the category of nomological contingency Russell places the resurrection as a *first instantiation contingency*.

We need to place FINLON in the context of a larger discussion, the discussion of consonance versus dissonance. When it comes to the concept of resurrection, we must admit that, instead of consonance, we see dissonance between science and theology. To put it crudely, any self-respecting scientist is likely to assume that it is a law of nature that dead people stay dead. Because every dead person we have seen remains dead, we would argue by analogy that Jesus must have remained dead – that is, there was no Easter.

In addition, the divinely promised new creation anticipated by theologians seems to be dissonant with the far future of the universe anticipated by physical cosmologists. Big Bang cosmology and correlative projections into the far future of the universe predict an eventual end to life and even an end to the material world as we know it. Scientists assume that the laws of nature presently in effect will determine what will happen to our universe a hundred billion years from now, perhaps forever. This could be interpreted as dissonant with Christian eschatology, because Bible-reading theologians work with a divine promise that this world will undergo a transformation, that this creation will be renewed and redeemed. The scientific future appears irreconcilable with the theological future.

Here is why. Since the Big Bang 13.7 billion years ago, the universe has been steadily expanding. A key scientific question is, this: is the universe open or closed? If it is open – that is, if the amount of mass is insufficient to stop the process – then it will continue to expand and continue to cool following the law of entropy. All the original heat will dissipate, and any remaining matter will fall into a state of equilibrium. In short, it will freeze out of existence. However, if the universe is closed – that is, if the amount of mass is above the relevant threshold – then at some point expansion will stop. Gravity will cause its motion to reverse, and all matter will reconverge on a central point, heating up on the way toward its doom in an unfathomably hot fireball. In short, it will fry. Whether freeze or fry, the future of the cosmos is finite. Whether freeze or fry, the scientific picture does not match the biblical picture of a new creation where the 'wolf shall live with the lamb' (Isaiah 11:6) and where 'death will be no more' (Revelation 21:4).

The question leading to FINLON arises with prolepsis – that is, should one aspect of the eschatological future arrive ahead of time within our present aeon still governed by what we acknowledge as nature's laws, could we discern it? If the eschatological new creation would include the resurrection of the dead, and if a person would rise from the dead now, could we discern it? Could we understand the Easter resurrection of Jesus as the first instantiation of a new law of nature that will apply universally at the advent of the renewed creation?

In order to crack open scientific method so as to perceive and acknowledge the possibility of FINLON, Russell critically suspends two philosophical assumptions made by natural science, namely analogy, and nomological universality. According to the principle of analogy, the future will be just like the past. This means that based upon analogy from observations about the natural world we make now we can project what the universe will be like sixty-five billion years from now. This needs critique. If in the near or distant future God acts to transform and redeem this world, it would be unpredictable according to the principle of analogy.

According to the principle of nomological universality, the same laws which govern the past and present will govern the future as well. This also needs critique. Again, should God the creator re-create the world so that different laws obtain – such as wolves living with lambs and the elimination of death – then existing laws would no longer apply. The law that dead people stay dead would no longer apply. What we need to say about the Easter resurrection of Jesus, according to Russell, is that the future law that dead people will rise into the new creation has occurred ahead of time. Jesus is the 'first fruits of those having fallen asleep' (1 Corinthians 15:20). On Easter, God inaugurated a new law of nature, one that we will see become universal at some point in the future.

Russell finds distinctively theological warrant for holding this view. He claims 'on *theological* grounds that the processes of nature that science describes are the result of God's ongoing action as Creator; their regularity is the result of God's faithfulness. But God is free to act in radically new ways, not only in human history but also in the ongoing history of the universe, God's creation.'²⁶

At the moment when God raised Jesus from the grave on the first Easter Sunday, the law that dead people remain dead was still in effect. It remains in effect today. In this context, this divine act leaves us with an anomaly. It could appear to be a miracle, a violation of existing laws of nature. However, Russell wants us to view that original resurrection as the first instance of a general resurrection. The advent of the new creation complete with general resurrection will establish that resurrection is a universal law. Jesus' Easter resurrection was the first instance, the prolepsis. Yet, it looks like a miracle. This leads to a correlate Bobism, 'Miracle today, law tomorrow' (MTLT).

Conclusion

One could easily list many accomplishments on the part of Robert John Russell that would warrant a congratulatory handshake and an adulatory smile. He has distinguished himself as a teaching professor in his position of Professor of Theology and Science in Residence at the Graduate Theological Union. He founded and directed the Center for Theology and the Natural Sciences, a center of research and publications and public service that has exhibited unrivaled leadership in the growing field of Theology & Science. Along with colleagues in Berkeley and the Vatican Observatory in Rome he has provided planning and editorial guidance for a series of science-theology dialogues with

the world's leading scientists and ecumenical theologians, resulting in a six-volume series, *Scientific Perspectives on Divine Action*. He is the Co-editor of a fine academic journal, *Theology and Science*. Each of these achievements in itself is significant.

Yet, it seems to me, the single most valuable contribution of Robert John Russell to the blossoming field of Science & Religion is his conceptual contribution. Taking advantage of his training in both physics and theology, Russell has brought to the dialogue some of the most insightful and revolutionary proposals for breakthrough into a new domain of shared understanding. Beyond warfare, beyond two languages, beyond dialogue, beyond the pursuit of consonance, Russell has advanced us to the stage of creative mutual interaction between natural science and Christian theology.

Like a pile driver ever pounding us deeper and deeper into the bedrock of scientific knowledge and limits to that knowledge, Russell has penetrated to the questions of the ultimate nature of physical reality and its contingency or dependence upon God. This God, in whom Russell pledges his faith, brings nature's world into being from nothing, provides it with the laws of regularity and sustains these laws through faithfulness, and also introduces newness and redemption to the world as an exhibition of divine love.

Notes

- 1 See Langdon Gilkey, *Maker of Heaven and Earth* (New York: Doubleday, Anchor, 1959, 1965) and *Religion and the Scientific Future* (New York: Harper, 1970). See also Ted Peters, 'Langdon Gilkey: In Memoriam', *Dialog* 44:1 (Spring 2005): 69–80.
- 2 Pope John Paul II, 'Message of His Holiness Pope John Paul II', in *Physics, Philosophy, and Theology: A Common Quest for Understanding*, ed. by Robert John Russell, William R. Stoeger, SJ, and George V. Coyne, SJ (Vatican City State: Vatican Observatory, 1988), M12.
- 3 Ian G. Barbour, *Issues in Science and Religion* (San Francisco: Harper, 1966).
- 4 Ian G. Barbour, *Myths, Models, and Paradigms: A Comparative Study in Science and Religion* (San Francisco: Harper, 1974); *Technology, Environment, and Human Values* (New York: Praeger, 1980); *Religion in an Age of Science: The Gifford Lectures 1989–1991 Volume 1* (San Francisco: Harper & Row, 1990) and *Ethics in an Age of Technology: The Gifford Lectures 1989–1991 Volume 2* (San Francisco: Harper Collins, 1993); and *Religion and Science: Historical and Contemporary Issues* (San Francisco: HarperSanFrancisco, 1997), a revised and expanded edition of *Religion in an Age of Science*.
- 5 See Ted Peters, 'Science and Religion: An Overview', in *Encyclopedia of Religion*, 2nd edn, ed. by Lindsay Jones (14 volumes, New York: Macmillan, 2005), 12: 8180–92.
- 6 Barbour, *Religion and Science*, 82–90.
- 7 Albert Einstein, 'Science and Religion', *Nature*, 146 (1940): 605–7.
- 8 See Peter M. J. Hess, 'God's Two Books: Special Revelation and Natural Science in the Christian West', in *Bridging Science and Religion*, ed. by Ted Peters and Gaymon Bennett (London and Minneapolis, MN: SCM and Fortress, 2002), Chapter 7.
- 9 Ernan McMullin, 'How Should Cosmology Relate to Theology?', in *The Sciences and Theology in the Twentieth Century*, ed. by Arthur Peacocke (Notre Dame, IN: University of Notre Dame Press, 1981), 39.
- 10 Ted Peters (ed.), *Science and Theology: The New Consonance* (Boulder, CO: Westview, 1998), 18.

- 11 Robert John Russell, 'Ian Barbour's Methodological Breakthrough: Creating the "Bridge" between Science and Theology', in *Fifty Years in Science and Religion: Ian G. Barbour and His Legacy*, ed. by Robert John Russell (Aldershot: Ashgate, 2004), 49.
- 12 See Robert John Russell, 'The Relevance of Tillich for the Theology and Science Dialogue', *Zygon*, 36:2 (June 2001), 296–308; 'Did God Create Our Universe? Theological Reflections on the Big Bang, Inflation, and Quantum Cosmologies', in *Annals of the New York Academy of Sciences*, vol. 950, *Cosmic Questions*, ed. by J. B. Miller (New York: New York Academy of Sciences, 2001); Robert John Russell and Kirk Wegter-McNelly, 'Science and Theology: Mutual Interaction', in *Bridging Science and Religion*, 33–4.
- 13 Robert John Russell, 'Bridging Theology and Science: The CTNS Logo', *Theology and Science*, 1:1 (April 2003): 1.
- 14 Ted Peters, 'Truth in Editing', *Theology and Science*, 1:1 (April 2003): 5.
- 15 Robert John Russell, 'Does the "God Who Acts" Really Act in Nature?', in *Science and Theology*, 79, Russell's italics.
- 16 Ibid., 83.
- 17 Ibid.
- 18 Ibid.
- 19 Robert John Russell, 'Introduction', in *Quantum Mechanics: Scientific Perspectives on Divine Action*, ed. by Robert John Russell, Philip Clayton, Kirk Wegter-McNelly, and John Polkinghorne (Vatican City State and Berkeley, CA: Vatican Observatory and CTNS, 2001), v. 'A variety of scientists have supported ontological indeterminism, including such contemporaries as Chris Isham, Paul Davies, and Ian Barbour. This alone, of course, is not a warrant for adopting indeterminism, only a recommendation', Russell, 'Divine Action and Quantum Mechanics: A Fresh Assessment', *ibid.*, 297.
- 20 Ibid., 295, Russell's italics.
- 21 Ibid., 296.
- 22 Ibid., 295.
- 23 Ibid., 296.
- 24 Alfred North Whitehead, *Process and Reality: Corrected Edition*, ed. by David Ray Griffin and Donald W. Sherburne (New York and London: Collier Macmillan and Free Press, 1929, 1978), 7–8.
- 25 Robert John Russell, 'Contingency in Physics and Cosmology: A Critique of the Theology of Wolfhart Pannenberg', *Zygon*, 23:1 (March 1988): 23–43.
- 26 Robert John Russell, 'Bodily Resurrection, Eschatology, and Scientific Cosmology', in *Resurrection: Theological and Scientific Assessments*, ed. by Ted Peters, Robert John Russell, and Michael Welker (Grand Rapids, MI: Wm. B. Eerdmans, 2002), 19.