

Myth, Mutual Interaction, and Poetry

with John Hedley Brooke, "Darwin and Christianity: Truth and Myth"; Andrew Robinson, "Creative Mutual Interaction in Action"; Richard Skinner, "A Sonnet for Christopher"; and Margaret Boone Rappaport and Christopher Corbally, "Tracing Origins of Twenty-First Century Ecotheology: The Poetry of Christopher Southgate."

CREATIVE MUTUAL INTERACTION IN ACTION

by Andrew Robinson

Abstract. In this article, I describe a multidisciplinary project at the interface of philosophy, science, and theology. The project is the product of an ongoing collaboration between the author and Christopher Southgate, to whom this special issue of *Zygon* is dedicated. At the philosophical core of the project is a development of C. S. Peirce's semiotics (theory of signs). The scientific branch of the project involves the application of semiotic theory to the problem of the origin of life, and to questions about human evolution and human distinctiveness. The theological branch of the project involves the articulation of a semiotic approach to the Christian concepts of Incarnation and Trinity, and to the ideas of vestiges of the Trinity in creation and of participation in God's life. The purpose of this paper is to analyze the project in terms of Robert John Russell's model of 'creative mutual interaction' between science and theology.

Keywords: evolution; incarnation; origin of life; Charles Sanders Peirce; semiotics; Trinity

In January 2007, Christopher Southgate and I attended an inaugural conference of the Science and Transcendence Advanced Research Series (STARS) program of the Center for Theology and the Natural Sciences (CTNS). The conference was held near Cancun, Mexico, which, among the many other delights of that sun-whitened, tequila-drenched coastline, offered us an opportunity to visit the Yucatán Peninsula's famous cenotes (sinkholes). Quad-biking through this geological peculiarity of the Yucatán, we were reminded of another of the peninsula's claims to geological fame: its proximity to the asteroid strike that wiped out the dinosaurs 65 million years ago. This took us back to our initial conversations about theology and evolution, which had begun more than ten years before the Mexico trip, and which had turned on some sharp disagreements between

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us on such questions as whether God might have diverted the asteroid to ensure the extinction of the dinosaurs and hence the possibility of the evolution of primates (and humans). Was the emergence of humans (or, generically, creatures capable of relationship with God) an inevitability or a freak accident? What could be said of the God who chose to create in such a risky and unreliable fashion or, alternatively, who had secretly and capriciously intervened to ensure a particular outcome would arise from an otherwise radically contingent process?

These initial conversations eventually led to a focused project (Chris became my doctoral supervisor), and by the time of the Cancun conference he and I already had several years of collaborative work behind us. When Robert Russell presented the aims of the STARS program at that conference, he explained that CTNS was looking for projects where constructive work in science and theology would be done in parallel, stimulated by exploring the philosophical assumptions behind each of the fields. He contrasted this with the more usual approach to science-and-religion, in which theology looks for potential coherence between current science and its own traditional concerns, adjusting its outlook where necessary, and without expecting science to be changed in the process. When Russell shared his vision for “creative mutual interaction” (CMI), Chris (hereafter, Southgate) and I looked at each other and thought, “Yes!, that’s what we’ve been doing.”

Thanks to the support of the CTNS-STARS program and the generosity of the John Templeton Foundation, Southgate and I have been enabled to develop our particular outworking of the CMI concept sufficiently far that it is now worth stepping back and asking how CMI has worked in practice. How closely does our experience of CMI match Russell’s theoretical model? Are there any lessons that may be generalizable to future CMI-type projects? Or is each CMI project likely to be radically contingent and *sui generis*, more like an asteroid impact than a gradual unfolding according to a predictable pattern? The purpose of this paper is to reflect on the process of creative mutual interaction *in action*, with a view to offering tentative answers to these questions.

The mutual interaction with which I am concerned is between the scientific, philosophical and theological branches of our project. Although I will not labor the point, I think it will be obvious that the interdisciplinary CMI that I will be analyzing in the abstract has been dependent on a certain kind of interpersonal CMI. Other papers in this *festschrift* for Southgate set out more explicitly the personal qualities that have made him such a valued friend, colleague, dialogue partner, and collaborator to so many people. For my part, I make no claim for any symmetry in our interaction. Since our accidental meeting nearly twenty-five years ago I am privileged to have been playing, if I may be permitted a jazz metaphor, something of a Billy Strayhorn to his venerable Duke Ellington.¹

INITIAL EXPLORATIONS

Reflecting on our experience of CMI in action, I need to go back to those initial conversations between Southgate and myself that I mentioned above. The first thing to say is that we didn't actually set out with the express intention of setting up a project modeled on the idea of CMI. Our starting point, in fact, was a problem and a disagreement. The problem was, how does the radical contingency of the evolutionary process fit with the notion of divine providence? The disagreement was partly about how chancy the evolutionary process is, and partly about the nature of divine providence. I was inclined to see the outcomes of evolution as fundamentally unpredictable, and I was unwilling to allow that God might have intervened to ensure certain kinds of outcomes. In contrast, Southgate was happy to articulate belief in specific divine interventions, albeit nuanced in a way that attempted to respect the integrity of the created order. Such interventions, he held, might have guaranteed a generic outcome of the evolutionary process, such as the emergence of conscious beings capable of loving their Creator.

We debated these things first in a somewhat unlikely but very congenial French café in Exeter (one of our first actual collaborations was jointly to sign a petition against its demolition). At the time I was hopeful about the possibilities offered by Alfred North Whitehead's process theology for a noninterventionist theistic approach to evolution. It was, of course, a well-worn path in the field of science-and-religion, and Southgate patiently accompanied me on my wanderings, eventually succeeding in gently instilling in me a sense that process metaphysics can never quite deliver what would be needed by any Christian theology worth its salt. To his dismay, however, on the rebound from process thought I hooked up with the later Wittgenstein and nonrealist approaches to theology (e.g., Phillips 1988, 1993). To say the least, Southgate found this development both puzzling and frustrating. It is a testament to his generosity of spirit that neither my (then) dogmatic insistence that there is nothing beyond our language games, nor the eventual demolition of the French café, put an end to our conversations.

Apart from the pleasure of recalling those halcyon days of coffee and cake, my reason for dragging up those two 'roads not taken' (to quote Southgate 2008, 18) is that they both have a bearing on the shape that our eventual CMI project would take. Whitehead famously described Christianity as "a religion seeking a metaphysic" (Whitehead [1926]1960, 50). My flirtation with process thought reflected a conviction that for Christian theology to remain coherent in the face of scientific discoveries such as evolution (not to mention in the face of the reality of ordinary human experience) it would need radically to renew its self-understanding within some new kind of metaphysical framework. Southgate persuaded me that process theology is

not up to the task, but I retained my conviction that Whitehead was right: Christianity is a religion in search of a metaphysic. It is significant that our CMI project did eventually come to revolve around a new metaphysic, a point to which I shall return at the end of this essay. My short but passionate fling with anti-realism was likewise not without relevance to our subsequent project, in that the anti-metaphysical Wittgensteinian focus on language games turned out to provide a bridge to the new metaphysic we eventually used. For C. S. Peirce's metaphysical semiotics makes language (or rather, representation, of which language is a special case) the basis of a new metaphysic. This stands in contrast to Wittgenstein (and others), for whom the contingent role of language in our various localized 'forms of life' spells the end of metaphysics.

The bridge between my antimetaphysical, nonrealist phase and my (now) lasting realist convictions appeared like a bolt from the blue, in the early days of home internet access, with one of the first 'internet searches' I ever did. Wondering how Wittgenstein's 'language games' might have evolved, I searched for 'language game + evolution', and came up not—as I had hoped—with evolutionary insights into Wittgenstein's 'forms of life' but an article by the Danish biosemioticians Claus Emmeche and Jesper Hoffmeyer on the role of language-like processes in living things (Emmeche and Hoffmeyer 1991). The path from this unanticipated 'hit' on the internet ran through much grappling with the field of 'biosemiotics', from there to engagement with Peirce's philosophy, and in the process a growing conviction that elements of traditional Christian theology had more to offer in the science–religion dialogue than I had previously reckoned on. The thesis that Southgate eventually supervised (University of Exeter, 2003) became the backbone of my later book *God and the World of Signs: Trinity, Evolution and the Metaphysical Semiotics of C. S. Peirce* (2010).

The shape of our joint project as a possible exercise in CMI is implicit in that title. First, the project involves exploring 'the world of signs', a phrase that has a deliberate double meaning. On the one hand, it means the philosophy of signs; the world opened up by those who have theorized about the nature of representation and interpretation. On the other hand, it means the way in which the natural world—from the simplest living things to the most complex sentient organisms—is full of signs (representations and interpretations). It is a project, in other words, which asks what the philosophy of signs can tell us about the world. Second, the project asks how a creator God might be related to this world of signs. We have investigated this by exploring nontrivial parallels between the idea of God as Trinity and the threefold metaphysical structure that Peirce claimed was the necessary underpinning for all semiotic processes. As I shall outline below, the potential here for 'creative mutual interaction' between philosophy, science, and theology arises because the philosophical core of the project creates generative possibilities in both the science and theology. Furthermore, the

process of confronting specific issues in both the scientific and theological branches of the project has stimulated growth in the other branch, while both branches remain in creative dialogue with philosophy.

CREATIVE MUTUAL INTERACTION IN ACTION

After what amounted to about ten years of preparatory work, sketchily outlined above, the next phase of the project was where the creative mutual interactions, in Russell's theoretical sense, really took off. The STARS program enabled us to enter into some sustained dialogues with some sparkingly creative thinkers from various fields. The paths that those interactions eventually led us along are summarized in Figure 1, with the scientific elements down the left side, the theology down the right, and the philosophical aspects in the middle.

Let's consider, then, some of our main paths of inquiry, bearing in mind of course that the diagram inevitably smooths out an awful lot of existential heartache and intellectual headache. First, we were interested in whether a semiotic approach could shed light on what it means to be alive, and hence on the science of the origins of life. On this we had a very generative dialogue with Terrence Deacon. Deacon's concept of a self-replicating 'autocell' provided us with a model for exploring the idea that a simple protobiotic entity might be capable of interpreting signs in its environment, on analogy for example with an amoeba swimming up a chemotactic gradient to find and eat a bacterium. An important step was to develop a computer model of the reaction kinetics of Deacon's autocell and of our own interpretative variant, and let the two versions compete with each other *in silico* (Lui et al. 2010). This gave us a *proof of principle* of the selective advantage of a primitive interpretative capability.

Behind that modeling lay some philosophical work on a definition of interpretation that would be applicable to simple nonconscious entities. That definitional work drew on dialogue with T. L. Short who, in my view, is the most interesting and coherent scholar of Peirce's theory of signs. It was published in the journal *Biology and Philosophy* (Robinson and Southgate 2010a), which felt a significant achievement given that *Biology and Philosophy* is not a journal previously noted for its sympathy toward biosemiotics as a field. I will not attempt a detailed discussion of our definition here, but it is important to note that the definition hinges on a particular account of teleological processes, and that the kind of teleology involved in the definition is an entirely naturalized teleology, not an effort to smuggle theological purpose into science.

Alongside our foray into modeling competition between interpretative and noninterpretative protobiotic entities *in silico* and our philosophical work on a generalized definition of interpretation, we had been gestating a notion that a single biomolecule might act as an interpretative entity.

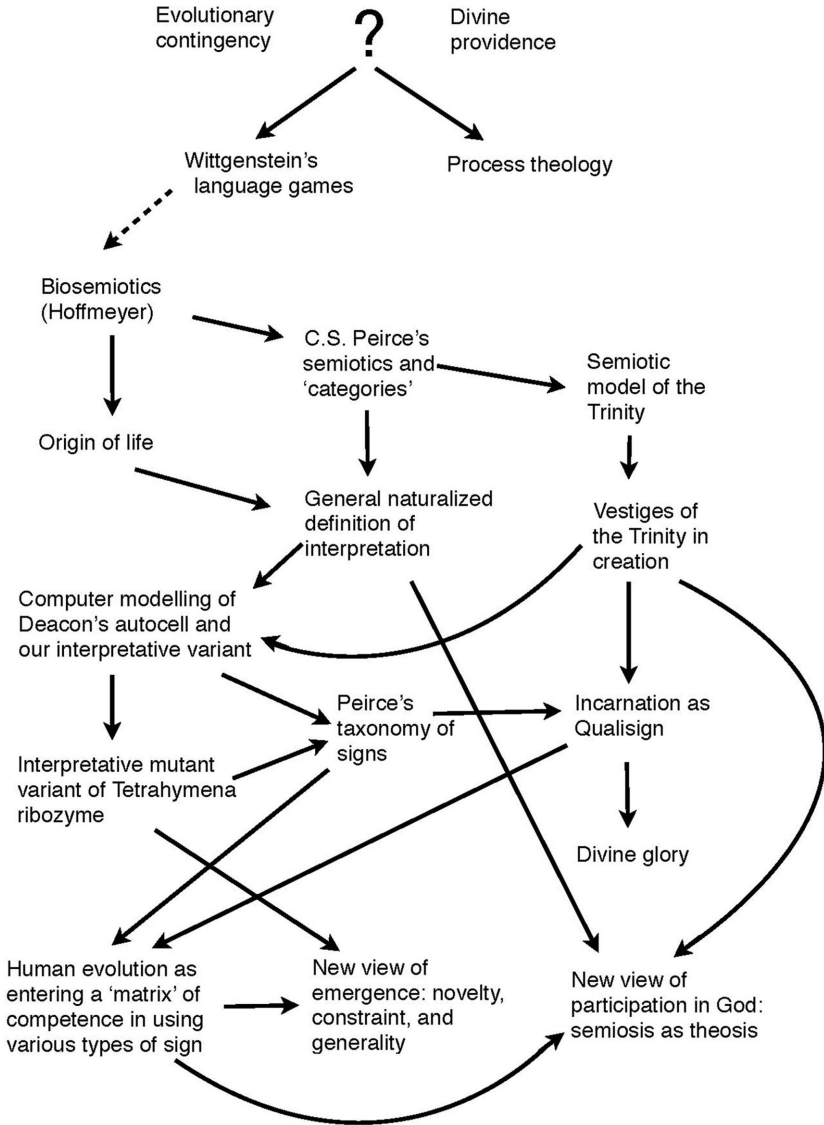


Figure 1. Pathways of Creative Mutual Interaction.

The initial STARS grant had given us an opportunity to go fishing for origin-of-life biochemists who might be prepared to think outside the usual experimental target of faithful replication of so-called informational molecules (RNA and DNA), and to consider instead the possibility of a molecular-level interpretative entity. One barrier was that some scientists

are naturally wary of how (perhaps especially in the United States with its active Creationist and Intelligent Design communities) collaboration with scientist-theologians might be perceived professionally. This was true in spite of the fact that Southgate and I are committed to seeking a fully naturalistic account of the origin of life. An additional barrier, of relevance to the CMI concept, is the way in which the practices of science so encourage the development of virtuosity in developing and exploring experimental systems directed toward particular empirical concerns. To ask scientists to open up their systems to theoretical analysis and experimental interference from an entirely unfamiliar theoretical framework is rarely an attractive option. We were fortunate, then, to hook Niles Lehman, an RNA biochemist at Portland State University in Oregon, whose own remarkable system is a set of RNA ribozyme fragments which ‘co-operate’ in their synthesis into fully functional ribozymes (Vaidya et al. 2012). Some way into our collaboration I asked Lehman why he had been willing to risk the possibility of academic prejudices arising from a collaboration with (scientifically qualified) theologians, when other researchers had eschewed our advances for that very reason. Lehman replied simply that we wanted to know how life originated and consequently he was willing to pick up and run with any good idea, wherever it came from. I suspect that anyone wishing to promote future programs of creative mutual interaction might do well to reflect on how unusual that apparently obvious sentiment might be in the actual interactions between science and theology.

A major outcome of our collaboration with Lehman was a demonstration that a mutant version of a ribozyme from the ciliated protozoan *Tetrahymena* meets the criteria of our definition of interpretation, raising the possibility that a capacity for interpreting environmental conditions could have been important to the emergence of life in an RNA world (Lehman et al. 2014). This in turn fed back into a further piece of philosophical work, which was a philosophical reframing of the concept of *emergence* in terms of Peircean categories (Robinson 2015a). Thus a piece of philosophical work (the development of a generalized and naturalized definition of interpretation) led to some empirical biochemical work (identification of an interpretative ribozyme) which in turn contributed to further philosophical developments in the form of a new approach to the concept of emergence.

THEOLOGICAL INVESTIGATIONS

Let’s now turn to survey the theological paths that the project has followed, depicted on the right hand side of Figure 1. Our initial skirmishes with Peirce’s thought resulted in us wondering how a creator God might be related to the world of signs, and how this could be pursued by exploring nontrivial parallels between the idea of God as Trinity. Such a connection was suggested by the threefold metaphysical structure that Peirce claimed

was the necessary underpinning for all semiotic processes. The result was a 'semiotic model of the Trinity', that is, the idea that Peirce's categories of Firstness, Secondness, and Thirdness (which I find it helpful to call Quality, Otherness and Mediation) offer an analogy for the threefold relations of the persons of the Trinity (Robinson 2010, 2014). For reasons that I do not have space fully to defend here, this analogy is nontrivial in that it depends on more than the mere three-ness of the parallel. One aspect of the nontriviality of the model, for example, is that it offers a conceptually coherent account of what might be meant in traditional Trinitarian theology by the dynamic mutual interaction (*perichoresis*) of the three persons of the Trinity (Robinson 2010, 107; Robinson 2014, 32–44). The semiotic model also led to a way of reconceiving the neglected idea that there may be 'vestiges of the Trinity in creation'. That is to say, perhaps the threefold pattern that (in Peirce's thought) underlies all sign relationships is not merely analogy for the Trinity but a real imprint in the world of the creative activity of God (Robinson 2010, 256–75; Robinson 2014, 117–28). Such a hypothesis would serve to reconnect the immanent Trinity (the Trinity 'in itself') with the economic Trinity (the Trinity as active in, and experienced through, the world), which would in turn help to rescue the idea of the Trinity from its current practical irrelevance to the day-to-day issues of Christian discipleship (cf. Rahner [1967]1999, 10–11).

As a next step in our theological investigations, colleagues encouraged us to apply our scheme to the Christian concept of Incarnation; the idea that Jesus of Nazareth in some sense fully embodied God's nature and being in the world. That work is represented by the node in the right hand side of Figure 1 labeled 'Incarnation as Qualisign.' In attempting to reconstruct the relationships between the various elements of the project there is, of course, an inevitable amount of post-hoc construction of a narrative of the interactions which may oversimplify a messier and more fluid reality. This is especially so in describing the interdisciplinary cross-fertilizations that may have occurred at this point of the project, since we were simultaneously working on the concept of Incarnation, the computer simulations of an interpretative 'autocell', and thinking about how to engineer an interpretative ribozyme. That said, one way of narrating the creative mutual interaction of this phase of the project is in terms of whether different types of signs (such as the icons, indexes, and symbols of Peirce's taxonomy of signs) should be understood in terms of a hierarchy. That is a debate that we have continued with Deacon over a number of years (Robinson and Southgate 2010d). Deacon tends to regard Peirce's taxonomy as reflecting a hierarchy with icons at the base, indexes in the middle, and symbols at the top (Deacon 1997, 87). Consequently, Deacon regards the origin of semiosis as connected with the origin of iconicity, a view which informs his account of the autocell as a semiotic entity (Deacon 2006). In contrast, influenced by our semiotic model of the Trinity, which

involves a co-equal perichoresis of different sign-types as an analogy for the equality-in-difference of the Trinitarian persons, our approach to the scientific aspects of the origins of semiosis is not constrained by the thought (which we deny) that icons are more basic than indexes or symbols. Instead, we see the origins of semiosis as determined not by a hierarchy of signs but by the relationship between a protobiotic entity and its environment. The simplest kind of sign that would be available in an environment as an indicator to a protobiotic entity of the environment's state would be an index, for indexes are the sign-type characterized by a direct or causal relation between the sign and whatever it represents (in this case some state of the environment relevant to the protobiotic entity but not directly detectable by it).

The interaction described above in terms of the relation between the Trinity and a nonhierarchical view of signs is represented in Figure 1 by the curved arrow between 'vestiges of the Trinity' and the autocell modeling work. Below that is an arrow back from the autocell and *Tetrahymena* work, through the taxonomy of signs, to our work on the Incarnation as the embodiment in the person of Jesus of the very quality of God. The interaction in that science-to-theology direction arises from the fact that a hierarchical view of signs, as well as regarding icons as the most basic kind of sign, tends to regard symbols as the highest kind of sign. Such a view opens the path to regarding human uniqueness as a function of a capacity to use symbols (Deacon 1997), and thence to the idea that the aspects of human nature that may be held to characterize humans as made in the image of God are also related to symbolic capabilities. In contrast, a nonhierarchical view of signs suggests the possibility that what constitutes humans generally, and Jesus par excellence, as imaging God is a kind of sign (or combination of signs-types) other than symbols. We have suggested that the concept of the Incarnation is best understood in terms of Jesus being an iconic qualisign of God's nature (Robinson and Southgate 2010b). An icon is a sign that represents its object by some kind of resemblance (as a portrait represents its subject). A qualisign is a sign that signifies by embodying the very quality of whatever it presents, as a color-chart of paints represents the colors of paint available to buy. (The term iconic qualisign can therefore be abbreviated to qualisign as all qualisigns are icons.) The Christian claim about the person and work of Jesus, we hold, is that the totality of Jesus' life and death embodied the very quality of God's being (Robinson 2014, 45–58). Southgate has developed parallels between the idea of Jesus as the qualisign of God and the nature of divine 'glory' in his 2014 Sarum lectures and in his monograph on that subject (Southgate 2018).

At the bottom of Figure 1 three further creative mutual interactions are indicated. At bottom left, development of the qualisign concept of Incarnation gave impetus to exploring a semiotically nonhierarchical

view of human distinctiveness, in which the emergence of humanity is described in terms of entering a 'semiotic matrix' rather than climbing a 'semiotic ladder' (Robinson and Southgate 2010c; Robinson 2014, 135–40). This perspective leads to empirically testable hypotheses in neuroscience (Robinson 2017) and archaeology (Robinson forthcoming). At bottom middle, the scientific elements of the project gave rise, as mentioned earlier, to a new philosophical account of emergent properties in terms of recurrent iterations of the emergence of novelty, constraint and generality (Robinson 2015a). At bottom right, scientific, philosophical and theological considerations converged on a new theological understanding of the concept of participation in the divine life, or theosis (Robinson 2014, 67–75; Robinson 2015b).

HOW "MUTUAL" IS CREATIVE MUTUAL INTERACTION?

In the light of the various paths I have sketched from our project, how closely does our experience of CMI-in-action match Russell's theoretical account of the nature of such interactions? (cf. Russell 2012). What sort of interaction happened in our project? Specifically, I would like to ask: What is the role of philosophy in the interaction; is the relation between theology and science symmetrical or asymmetrical; and is our experience a one-off or are there lessons that are generalizable from our particular project?

Taking these questions in turn, I think it is fairly clear that the philosophy of signs has played a *mediating* role here between the theology and the science. Many of the pathways in our diagram run directly or indirectly through one or another aspect of the philosophy, and without Peirce's philosophy as the central element of the project none of the science-to-theology or theology-to-science interactions would have occurred. It is important to note, however, that what goes by the name of philosophy here comes in several different forms. Peirce's taxonomy of signs might be regarded as having some features of an a priori framework. However, the framework is testable against experience in that any actual instance of a sign can be examined in the light of the taxonomy: the taxonomy would have to be modified if a sign was found that did not fit into it. In that sense, the philosophical element of the project leans toward being a science: a science of signs. On the other hand, Peirce's metaphysical categories are more speculative and less open to empirical testing, and in that sense are perhaps more 'theological'. Certainly our semiotic model of the Trinity draws very much on that metaphysical aspect of the philosophical mediation.

Then, between the quasi-scientific and the metaphysical, there is the kind of philosophy that is concerned mainly with conceptual analysis, an example being our development of a general definition of interpretation. So although philosophy certainly plays a mediating role in our CMI project, its

role varies in different parts of the project from quasi-scientific, to critical / analytical, to speculatively metaphysical.

What of the question of the symmetry or asymmetry of the interaction between the science and the theology in our outworking of CMI? On the face of it, at least as a theologian, my instinct would be to expect that there *would* be an asymmetry in the relationship. After all, science deals with the contingent ordering of causes and events in the world, whereas theology deals with the necessary and unfathomable being of God. Similarly, as a scientist, I am going to be reluctant to hold to theological propositions that seem empirically implausible or conceptually incoherent. The paths from science to theology or theology to science are unlikely, it would seem, to be similar to one another. Such asymmetry is an explicit feature of Russell's scheme, in which none of the eight pathways that Russell envisages between science and theology appear to be directly symmetrical or reversible (Russell 2012, 74–75). Five out of Russell's eight pathways run from science to theology. His three pathways from theology to science mostly imply general influences rather than a specific transfer of ideas: path 6 is the relation between the theology of creation *ex nihilo* and the contingencies investigated by science; path 7, theological theories as inspiration for the construction of scientific theories; and path 8, theological influence on selection rules for theory choice in science. Russell himself describes the eight pathways as asymmetrical (2012, 75). However, I would venture to suggest that this expected asymmetry has turned out not to be confirmed in our work (though this observation does not tell against the accuracy of Russell's scheme as a general description of the relations between theology and science). In our project, in contrast to Russell's scheme, there are direct and specific pathways from theology to science as well as from science to theology. Furthermore, I do not see any clear difference in kind between the arrows that go in the two different directions. In fact, many of these arrows could, in other circumstances, have been followed in the opposite direction; the stepping stones from one element of the project to another could have been traversed in a different order and direction to that which we happen to have followed.

As an example of this potential reversibility of the pathways, consider the connections in Figure 1 between our interest in the origin of life, the need to develop a formal definition of interpretation to explore the semiotic aspects of life's emergence, and the development of a new view of participation in God's life. The connecting link was Peirce's insight that an interpretation is a *purposeful response to a sign*, and our framing of this in terms of an interpretation as involving a change of state of an entity (Robinson and Southgate 2010a). Our attempt to develop a definition of interpretation that would have some scientific traction was subsequently transposed into a theological key by developing the idea that in responding to the Word of God we are adopted, by the operation of the Holy Spirit, into the place

of that same Spirit, the eternal interpreter of the Word. We are thereby transformed in the process, “from one degree of glory to another,” as St. Paul put it (2 Corinthians 3: 18). However, it would seem to be a matter of personal and historical contingency that the project unfolded in that particular direction. It would have been logically just as possible to have been thinking initially in semiotic terms about what it means to participate in God, to move from that to a conceptual clarification of the nature of interpretation as the purposeful response of an agent, and from there to the application of such a concept in the field of protobiology.

This apparent symmetry and reversibility in the CMI process might not have been expected. As indicated above, as a theologian I might have expected that a theological framework might determine the relation between the science and the philosophy. On the other hand, a dyed-in-the-wool scientist might expect that a scientific framework would constrain the philosophical and theological possibilities. On reflection, though, perhaps there are good philosophical and theological reasons why such asymmetries should *not* be predominant. On the philosophical side, if the role of the philosophy is partly that of conceptual clarification, there is no reason to suppose that mutually relevant conceptual clarification could not run in both directions. And this in spite of the fact that what lies at either end of CMI pathways (the arrows in Figure 1) is quite different: scientific investigation of empirical realities on one side and theological conceptions of the transcendent deity on the other.

In addition, a theological perspective on this might be as follows. The idea that one would expect an asymmetry in the relation derives, perhaps, from an analogy with the hierarchy of sciences. The interaction between, say, physics and chemistry, or between chemistry and biology, is going to be different if one is moving from the lower to the higher level than in the opposite direction. If theology is regarded as the highest level in a hierarchy of domains of inquiry, then that asymmetry is expected to be retained.

If, in contrast, God is understood as completely transcendent to the world, being God in God’s-self rather than the highest level of an epistemological hierarchy, then there can be no direct connection between God and the world as there is between chemistry and physics. The connection, rather, must be *analogical* in some way. In that case, rather than making theology the Queen of the Sciences, the top of the hierarchy, CMI can acknowledge the utter Otherness of God from creation but still allow that conceptual clarifications from philosophy can be relevant to both science and theology. That is the understanding of CMI that I think our particular outworking of it supports, perhaps in part because of the central role that philosophy plays in our science–theology interactions. Interestingly, although three of Russell’s eight pathways are mediated via scientific or theological influences on theological assumptions, his schematic representation of the pathways does not place philosophy as a distinct domain

standing alongside, or between, science and theology (Russell 2012, Figure A.4). In contrast, in his 2007 presentation of the ethos of the STARS program (see Introduction above), I recall Russell outlining a process in which generative work in both science and theology would be stimulated by questioning the underlying philosophical assumptions of both. In other words, I take it that his scheme of eight pathways is not intended to diminish or underplay the role of philosophy as a mediator between science and theology.

Finally, then, the third question: whether the lessons from our own particular outworking of CMI are generalizable in any useful way. In some ways our actual experience of 'doing CMI' might suggest otherwise, in the sense that, like any human activity, its actual course seems so contingent and chancy to the participant that it is difficult to see beyond the messy actualities to some wider perspective. Southgate and I might never have got chatting in the French café; Niles Lehman might not have drifted past our poster presentation in one of the least frequented corners of the poster hall of the 2007 meeting of the International Society for the Study of the Origin of Life, and so on.

Of course low-level contingencies can be the source of higher-level patterns, and I've already outlined such possible patterns in the power of philosophical mediation and the perhaps surprising symmetry of the science–theology interactions. I suppose that, just like the question of whether evolution is radically contingent or predictably convergent, one's view probably depends largely on one's presuppositions. Naturally, I'd like to be able to say that I think the lessons from our experience are generalizable, because that might enhance the significance of our work. But I'll finish by offering a very speculative thought that might actually make our version of CMI less generalizable than one might hope. The thought is this: If CMI is often going to be philosophically mediated, then really significant examples of CMI may depend on finding aspects of the science–theology interaction where a particularly important piece of philosophy has been missing from the jigsaw. I think that's what we stumbled over when my otherwise dead-end thinking about Wittgensteinian language games brought us into contact with the field of biosemiotics and thus led us to Peirce. Semiotics, it turns out, is a big missing piece of the picture in science-and-religion discussions. But of course Peirce, and semiotics in general, are perfectly visible, if rather neglected features of the philosophical landscape. I suggest that the reason this philosophical piece hasn't found its proper place in the dialogue is not that it isn't *visible* but because both science and theology have positive reasons for ignoring its implications.

On the scientific side, semiotics has a whiff of teleology and subjectivity about it; it's about purposes and decisions, meanings and interpretations: just the sort of thing that post-Darwinian biologists would like to steer clear of precisely to distance themselves from any appearance of dubious

theological influence. Similarly, on the theological side, the idea of a *naturalized* account of purpose and meaning, things that we might like to think of as special attributes of the creature who is made in the image of God being extended right across the biosphere, may appear equally threatening to an anthropocentrically minded theologian.

So I speculate that perhaps there may be some very contingent reasons why science and theology would both have a vested interest in passing Peircean semiotics by on the other side of the road. Southgate and I, initially more by luck than judgment, benefiting greatly from the support that has come via the John Templeton Foundation and CTNS, and pursuing Russell's model of creative mutual interaction, have happened to have been able to show what can happen in the way of CMI if you put an important philosophical jigsaw piece into its rightful place. There may be other equally big bits of philosophy that have been excluded from the dialogue for reasons parallel to the shared suspicions that I hypothesize science and theology to hold about semiotics. But, on the other hand, the philosophy of purpose and meaning may be unique in this respect, and there may not be an unlimited number of other major but neglected philosophical substrates for the CMI model to work around.

I tentatively conclude, therefore, that CMI does have some generalizable features; that some of these are not exactly as Russell envisaged; and good luck to you if you want to try to find another big bit of philosophy to start some CMI from because good candidates for new philosophical mediators of the process may be rare.

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NOTE

1. Billy Strayhorn was a composer and arranger who collaborated with the jazz great Duke Ellington. When Ellington first invited Strayhorn to meet him at his Harlem home, Ellington wrote directions on a piece of paper, beginning with the instruction, "Take the A-train" Strayhorn subsequently used that as the starting point for one of his best-known compositions, the song of that title. I am sure I will not be the only mentee of Chris's to have had the experience of having the 'song within' drawn out of them under his direction.

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