# HIERARCHIES: THE CORE ARGUMENT FOR A NATURALISTIC CHRISTIAN FAITH

*by Philip Clayton*

*Abstract*. This article takes on a perhaps impossible task: not only to reconstruct the core argument of Arthur Peacocke's program in science and religion but also to evaluate it in two major areas where it would seem to be vulnerable, namely, more recent developments in systems biology and the philosophy of mind. If his theory of hierarchies is to be successful, it must stand up to developments in these two areas and then be able to apply the results in a productive way to Christian theological reflection. Peacocke recognized that one's model of the mind-body relation is crucial for one's position on the God-world relation and divine action. Of the three models that he constructed, it turns out that only the third can serve as a viable model for theology if it is to be more than purely deistic or metaphorical.

*Keywords:* complexity theory; divine action; emergence theory; God-world relation; hierarchies; levels of the natural world and of explanation; mathematical biology; mind-body problem; Arthur Peacocke; philosophy of mind; reaction stoichiometry; systems biology

## Arthur Peacocke's Use of the Hierarchies Notion

Hierarchies are central to Arthur Peacocke's program. For him, the notion is rooted in biology but extends downward into biochemistry, into physical chemistry, and even into fundamental physics. He also rides the notion in the other direction—upward into the nature of mind, God's relationship to the world, and the vexing question of divine action. Arguably, the hierarchies notion forms the actual core of Peacocke's ontological vision, which interprets reality as a hierarchically ordered "system of systems." It is

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not an overstatement to say that his entire project stands or falls on the success of the concept of hierarchies.

In these pages I test and evaluate Peacocke's theory of hierarchical reality. If it is correct, it provides an indispensable framework for discussions of science and religion, of naturalism and theology. In order to provide a quick introduction to the position for those not already familiar with it, I begin with quotations from his major publications on this topic. Taken together, they provide a quick orientation into how Peacocke employs the hierarchies notion both to describe the natural world and to specify the God-world relation.

*Theology for a Scientific Age* (Peacocke 1993)

I suggest that this new perception of the way in which causality actually operates in our hierarchically complex world provides a new resource for thinking about how God could interact with that world. For it points to a way in which we could think of divine action making a difference in the world, yet not in any way contrary to those regularities and laws operative within the observed universe which are explicated by the sciences applicable to the level of complexity and organization in question. (p. 158)

*Creation and the World of Science* (Peacocke 1979)

The point here is not whether or not any particular set[s] of criteria are in themselves adequate . . . but that it is the relation of theories, concepts, terms, and (even) observations obtained with reference to the higher level of complexity to the theories, etc., obtained with reference to the lower level which is to be analysed for reducibility. (p. 115)

Corresponding to each level in the hierarchy of systems, the appropriate science employs concepts which are peculiar to it and indeed have little meaning for levels lower down (or even higher up in some cases). . . . As new forms of matter, non-living and living, emerge in the universe, new categories of description of their form and properties are necessary and these categories will be other than those of the physics and chemistry appropriate to the subnuclear, atomic, and molecular levels. . . . Every statement which is true when applied to systems earlier (or lower) in the series is true when applied to the later (or higher). (pp. 116–17)

We know [nature] is enormously complex, of multitudinous variety, basically relational, consisting of a hierarchy of levels of organization, which are not always conceptually reducible and which span from the baffling *micro*-world of the subatomic through the *macro*-world, which includes the biosphere and is within the range of our sense perceptions to the *mega*-world of inter-galactic distances, of cosmological processes unfolding over billions of years and of the gravitational fields of "black holes." (p. 62)

The aspect of God's meaning expressed by any one level in these hierarchies is limited to what it alone can itself distinctively express, hence the "meanings" so unveiled in *its various and distinctive levels* are complementary, though individually incomplete without the others. (p. 209)

The immediacy of God's creativity in and through the actual events of the hierarchal complexities of the stuff of the world is what constitutes the dimension along which hope is generated in man as he apprehends that loving, urgent, and fulfilling Presence. (pp. 355–56)

Because of the distinctive character of different levels in the natural hierarchy of complexity, we have recognized that what God might unveil to man of the mystery of his being and purposes is distinctive for each level. (p. 230)

What we must do is set these "religious" affirmations, their ways of depicting the world, their understandings of the world and of man *alongside* the changing perspective of man in the world which the sciences engender through studying the various levels which the natural hierarchy of systems displays. (pp. 370–71)

### *Intimations of Reality* (Peacocke 1984)

I also suggested that the theological enterprise refers to the highest level in the hierarchy of the complexities that constitute reality, namely the relation nature-man-and-God, and so some, at least, of the concepts, models, and metaphors appropriate to it may well not be reducible to those applicable to lower levels in the hierarchy of natural systems. (p. 54)

There is hierarchy of order in the natural world, and if God is the reality that Christians believe he is, the ways of science and of Christian faith must always, in my view, be ultimately converging. (p. 51)

### *God and the New Biology* (Peacocke 1986)

I refer to that most complex and all-embracing of the levels in the hierarchies of "systems," namely the complex of nature-man-and-God. For when human beings are exercising themselves in their God-directed and worshipping activities they are operating at a level in the hierarchy of complexity which is more intricate and cross-related than any of those that arise in the natural and social sciences which are in the province of the humanities. (p. 30)

The aspect of God's meaning expressed by any one level in the natural hierarchy of complexity is limited to what it has the capacity to convey, but how much we perceive of this depends on our sensitivity or responsiveness to that level. (p. 100)

### *All That Is: A Naturalistic Faith for the Twenty-First Century* (Peacocke 2007a)

The hierarchy of complexity of the natural world, increasingly explicated by the sciences both in detail and through wider concepts, has made apparent how new realities emerge at higher levels of complexity, with all their interactions and ramifications, and how these higher levels of complexity can influence, and even transform, the behavior of the lower-level entities that constitute them. (p. 3)

However, what is significant about natural processes and about the relation of complex systems to their constituents is that the concepts needed to describe and understand—as indeed also the methods needed to investigate each level in that hierarchy of complexity—are specific to and distinctive of those levels. It is very often the case (but not always) that the properties, concepts, and explanations used to describe the higher-level wholes are not logically reducible to those used to describe their constituent parts, themselves often also constituted of yet smaller entities. (pp. 12–13)

> The world is a hierarchy of interlocking complex systems; and it has come to be recognized that these complex systems have a determinative effect, an exercising of causal powers, on their components—a whole-part influence. (p. 26)

> Such a proposal illustrates the general thesis of this Essay: that in theological discourse about experiences of God and of divine action there is a parallel to those processes whereby emergent realities are apprehended in the hierarchy of complex systems studied by the sciences and so are given at least tentative ontological status. (p. 34)

> The *ENP [Emergentist – Naturalistic – Panentheistic]* perspective I have been trying to expound, in conjunction with the new sciences of complexity and of self-organization, provides, it seems, a fruitful and illuminating release for theology from the oppression of excessively reductionist interpretations of the hierarchy of the sciences. (p. 55)

> For at the terminus of one of the branching lines of natural hierarchies of complexity stands the human person—that complex of the human-brain-in-the-human-body-in-society. (p. 23)

A wide variety of claims about biology, evolution, and neuroscience are made in these sentences; it would take several essays to unpack them and to fit them together into a systematic whole. Still, the excerpts do suffice to give a fairly clear sense of the position that Peacocke took on hierarchies and the relationship between brain, mind, world, and God that it entails.

## Does the Notion of Hierarchies Stand the Test of Contemporary Biology?

One of the major growth branches in recent biology, and one of the most successful, is *systems biology*. Although the term is used widely and not always consistently, it generally involves the use of rigorous scientific means to study how system properties emerge. Do these recent developments still support the sort of framework that Peacocke used to describe the biology of his day, or do they undercut it?

I will defend three claims. First, systems biology has not eliminated the hierarchies notion. But in recent complexity theory there is a tendency to speak more of "levels" or "loci of self-organization." Cliff Josslyn argues, "In evolved systems we recognize spatial scaling from subatomic particles through astronomical objects, and complexity scaling from subatomic particles through chemical systems to social organizations. Each of these threads is dominated by the same concepts: wholes and parts, insides and outsides, and alternating levels of variation and constraint" (Josslyn 2000, 67).

Second, talk of emergent levels, and indeed even the language of "higher" and "lower" levels, continues to be central in the most recent work by leading systems biologists.

Third, even given the quantitative exactness of these studies, it is now more difficult to extrapolate the hierarchies notion *up* to radically different types of systems, such as homeostasis in organisms or the staggering complexity of even small ecosystems, not to mention the much looser language that one still finds in descriptions of social interactions among animals. There is a risk that the extrapolation of hierarchies language to mental properties and mental systems may now appear more as a "leap into another genus" altogether.

It turns out that the first two of these theses receive relatively strong support in the recent literature. In *Closure: Emergent Organizations and their Dynamics*, Josslyn argues:

> One crucial property entailed by closure is hierarchy, or the recognition of discrete levels in complex systems. Thus, the results of our discussion can be seen in the work of the hierarchy theorists. . . . A number of systems theorists have advanced theories that recognize distinct hierarchical levels over vast ranges of physical space. Each of these levels can, in fact, be related to a level of physical closure . . . that is, circularly flowing forces among a set of entities, for example among particles, cells, or galaxies. . . . (Josslyn 2000, 71)

Josslyn describes two types of biological systems: structural and constructivist. A *structural* system is a collection of entities greater than the sum of their parts, whereas a *constructivist* system is an "emergent system" defined over a specified space (an ecosystem, for example). Although one finds different patterns of interaction with the environment in the two types of systems, both exhibit a clearly hierarchical structure.

Naturally, theorists of biological complexity are more interested in powerful explanations than in defending an ontology of hierarchies. Yet talk of levels does seem to be a basic assumption of this research. As Jay Lemke notes, "Certainly for biological systems, and probably for many others as well, the richness of their complexity derives in part from a strategy that organizes smaller units into larger ones, and these in turn into still larger units, and so on" (Lemke 2000, 100).[1] In fact, talk of levels often supplants the vocabulary of hierarchy. And yet the net result, whether implicit or explicit, is still an assertion of the hierarchical nature of reality:

> Our sciences present the world as a hierarchical system with many branches, featuring individuals of all kinds. The individuals investigated by various sciences appear under different objective conditions. Despite the apparent independence of individuals in various levels, the hierarchy of individuals is not merely a matter of classification. It is underwritten by the composition of the individuals, although the idea of composition is tacit in many sciences. (Auyang 1998, 40)

This is clearly a compositional theory of the individual: "All individuals except the elementary particles are made up of smaller individuals, and most individuals are parts of larger individuals. Composition includes structures and is not merely aggregation" (p. 40). Individuals at a certain level of scale and complexity interact most strongly among themselves. These same-level interactions play the primary explanatory role; indeed, they may be only remotely related to individuals and phenomena on more remote levels. Most of the fruitful explanations of an individual's behavior therefore use concepts drawn from the level at which the individual is identified or defined: “Elementary-particle concepts are irrelevant to theories of solids, nuclear concepts are not pertinent in biology, and biological notions are beside the point in explaining many human actions” (p. 42).

Systems biologists use the term *emergent properties* to refer to systemic functions not reducible to their parts, but in contrast to older theories the emergent phenomena are now defined in the context of detailed mathematical models of precisely specified biological systems. A key source of this precision is *reaction stoichiometry*. Stoichiometry is the calculation of quantitative relationships among the reactants and products in chemical reactions. In the new work the focus is on the stoichiometric properties of biochemical networks, especially distributed cellular networks. These complex systems are hierarchically organized, multifaceted networks involved in a suite of overlapping biochemical processes. When these biological processes are explained primarily from the systems perspective, talk of individuals tends to be derivative or secondary. The resulting similarity to Peacocke’s description of the biosphere as a “system of systems” is unmistakable:

> It is not so much the components themselves and their state that matters, contrary to the components view, but it is the state of the whole system that counts. Any biological network will have a nominal state, which we recognize as a homeostatic state. Thus, the fluxes that reflect the interactions among the components to form the state of the network are dominant variables, and the concentrations of the individual components are “subordinate quantities.” The concentrations of the network components are determined first by the flux map, or the state of the network, and then by the kinetic properties of the links in the network. (Palsson 2006, 13–14)

Here the dominant variables are not the actions of individuals but the *fluxes* “that reflect the interactions among the components,” for these “form the state of the network”; individual components are “subordinate quantities.” For example, Palsson and others provide maps of biochemical interactions for the response to sugar in a cell. These maps analyze the kinetic constraints at each level and then integrate them mathematically, with the goal of reconstructing the interactions as a whole and expressing them as mathematical matrices.

Generally in systems biology talk of “networks,” distributed systems, and “components” replaces talk of hierarchies. Still, hierarchies remain critical because so many facets of cellular function and properties are organized hierarchically. For example, compare the linear dimension of the *E. coli* genome (about 1 mm) to the length of the cell (roughly 1 micrometer)—a thousandfold difference. The bacterial genome is thus “folded” a thousand times, a process that takes place in a hierarchically organized fashion. Such processes cannot be specified only in a bottom-up fashion but require top-down approaches as well: “we cannot construct all higher level functions from the elementary operations alone. Thus, observations and analyses of system level functions will be needed to complement the bottom-up approach. Therefore, bottom-up and top-down approaches are complementary to the analysis of the hierarchical nature of complex biological phenomena" (Palsson 2006, 22–23). This fact makes it impossible to predict or even to comprehend the outcome of selection processes at higher levels of biological complexity using only lower-level results (2006, 182). "Constraints at the lowest level must hold at all higher levels. However, there will be additional constraints and considerations that arise as we move up the hierarchy. Thus there may be measurable changes at a lower level that are inconsequential at a higher level" (2006, 284). For example, processes like diffusion across cell membranes—the central means by which intercellular processes function—thus constrain all higher-level functions, *but they do not fully determine the outcomes of these processes*. This fact offers crucial support for Peacocke's use of whole-part relations (on which more below) and for his understanding of nature as a "system of systems."

## Critical Concerns

Systems biology uses the dynamical processes that occur on the various levels of a given system to determine the information content of a specified set of interactions (for example, the informational content of proteomics or metabolanomics). In organisms, dynamical processes at different levels of the hierarchy require different explanatory approaches and frameworks. To this extent the new biology continues to support Peacocke's use of hierarchies. But is the study of these hierarchies still nonreductionistic in his sense?

Clearly systems biology is not *genetic* reductionism, for it seeks explanations that encompass both genetic and epigenetic factors. But reduction in biology is a far more complex concept than simplistic talk of a "reduction to genes" would suggest. The deeper question involves the well-known distinction between strong and weak emergence.[2] One has to understand Peacocke's hierarchies as strongly emergent when he uses them—as he does in some of the quotations above—in the context of an ontological hierarchy that extends up a series of steps from the first cell to the self-conscious mind to God. Clearly, in such a "system of systems" the steps of the hierarchy are ontologically distinct; they are not merely different manifestations of the flux of matter-energy.

The problem is that systems biology is silent on the question of the ontological status of levels. Should we assume from this silence that systems biologists are weak emergentists? After all, they generally do not describe the levels as discrete steps on a ladder but only as nodes of interaction. These nodes are not natural, ontological breaks in the natural world but merely manifest different levels of self-organization and closure, in which specific processes are involved in interactions that are not reducible to their parts. Moreover, the ability to describe these relations mathematically may seem to open up further differences with Peacocke. Has systems biology replaced Peacocke's levels, which he defines primarily in terms of existing scientific disciplines, with the very clear, precise, and empirically exact mechanisms of intra- and intercellular functioning? Indeed, could it be that the ability to express sets of biological phenomena mathematically will reduce Peacocke's talk of hierarchy, with its ontologically distinct levels, to formal, mathematically expressible similarities between any two contiguous levels of biological structure?

Although there are indeed differences of emphasis here, I suggest that the new biology does not in fact diverge from Peacocke's view in such a radical fashion. In systems studies, higher-level processes still evidence their own distinct causal interactions,[3] and these interactions in turn constrain lower-level processes. Systems biology is not "fundamental biology" in some sense analogous to fundamental physics, because one still needs to introduce operators specific to each given self-organizing structure. So a purely formal (hence hierarchy-transcending) systems biology is not even on the horizon.

Take just one example of unpredictability. Systems biologists hope someday to model the interactions within simple prokaryotic cells, which usually consume only one kind of medium, such as glucose. They have not begun to model cross-level relationships between two different kinds of *eukaryotic* cells, say, kidney and liver cells. It appears that the systems in question cannot be studied, even in theory, in a purely bottom-up manner. Moreover, the computational complexity of even these simple systems is staggering. A single cell type can respond to a huge range of environmental stimuli—up to 33,000 different ligand combinations, according to one estimate.[4] And that is just for one cell. Now consider the multiple receptor states of multiple cells in an organism. Then add the range of possible quantitative relationships among the reactants and products in these chemical reactions. So far we have only described the static state of the system. So now add kinematics, the calculations of movement. Now add perturbations and flux. Unfortunately, it turns out, what are called chaotic dynamics make complete predictions impossible in principle; one would need to measure the initial conditions with an accuracy of six decimal places or more, which is physically impossible. And God forbid that someone should come along and shake your petri dish!

Again, it is important to note that these are limits in principle, not just limits of current practice. Clearly there is little room for scientific triumphalism here. One encounters fundamental constraints on how far one can get when working in an exclusively bottom-up manner (and this is without even touching on the question of quantum uncertainties). As the Yale biophysicist Harold Morowitz (2002) emphasizes, we need to employ "pruning algorithms"; it is crucial to learn how to prune away information if one is to produce usable explanations. Remember that all the complexity described here emerges well before one reaches the level of behavior of even the simplest multicellular organisms. The bottom-up theorist shoulders complexities well beyond what humans can measure and calculate.

In short, in the mathematics of systems biology we face dynamic complexity beyond what can be derived in a bottom-up manner. Hence Peacocke's view is supported: We must use explanations given in terms of the structures and functions specific to each specified level of the biological world. Mathematical biology will offer us a clearer and clearer sense of the constraining factors from lower-level systems. But these will never allow us to "bootstrap" our way through the hierarchy of systems to the top. Explanations will always have to be given that are specific to each particular level—or at least to the interactions of that level with the levels immediately above and below it in the hierarchy.

## Mental Causation and Divine Action

*Three Models of Personal Agency.* In two of his final articles, both appearing in collections from Oxford University Press (Peacocke 2006; 2007b), Peacocke formulated his response to the problem of mental causation and divine action. His proposal represents one of the most sophisticated answers to this problem in the entire literature and is therefore worthy of our close attention.

In the first of these articles (Peacocke 2006), he offers an insightful analysis of three different models for conceiving the notion of mental causation. All three analyses refer to a single diagram (see Figure 1), although each defines the relation between "higher" and "lower" levels ("H" and "L") differently.

Peacocke defines the first model as "Levels *H* are states of the brain; levels *L* are individual neuronal events" (2006, 269). This view is clearly meant to exclude mental causation; all causation must therefore be neuronal, and perhaps ultimately microphysical. This is whole-part constraint, to be sure, but only at the neurological level alone.

The second model adds the language of mental causation, but only in a carefully circumscribed form: "Levels *H* are mental-with-brain states; levels *L* are individual neuronal events" (2006, 270). As Peacocke comments

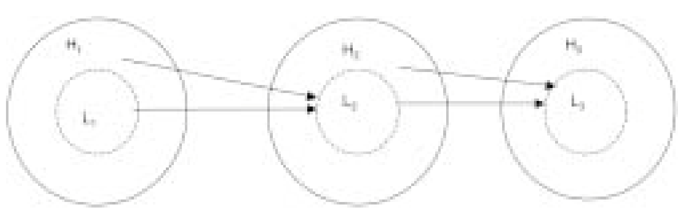

Fig. 1. The mind-body relation according to Peacocke.

(p. 271), “This is to postulate that the higher-level now mental-with-brain states have a determinative influence, *jointly* with the lower-level neural states, on the succession of mental-with-brain states. . . .” This approach seeks to make room for the insight that the level of the mental is genuinely emergent; it is not reducible to the neuronal or microphysical level. It is right to focus on the question of mental influence because, if the case is to be made that mental phenomena are nonreducible, it must be shown that they have some effect—assuming, as we must, that to be real is to do something.

Unfortunately, however, this second model is not able to explain what *is* this “more-than-physical” causation that produces these new kinds of effects. Clearly it must involve more than the “two levels of description” model that some philosophers of mind (for example, John Searle) affirm, since Peacocke himself criticizes that view (2006, 267 n. 11). Yet to say merely that two dimensions or levels conjointly bring about some effect does not yet give an actual theory of mental causation, apart from the initial claim that something called “the mental” plays *some* role here. Surely, given only this elliptical claim, the principle of parsimony will drive theorists back to the type of causality that is better understood—the efficient causality of physical forces. In order to take the “both-and” in this position seriously, one would need to know exactly what it is that “the mental” is supposed to be doing. But the second model does not yet suffice to accomplish this task.

Thus one must turn to Peacocke’s third interpretation of mental causation for an account of intentional agency. This account holds that “Levels *H* are mental states; levels *L* are brain states,” and “mental activity—the content of our consciousness describable in first-person language—is a real emergent *from* brain activity.” For “this mental emergence is a distinctive reality which has its own determinant efficacy” (pp. 271, 272). Peacocke brings powerful arguments in defense of this third option; taken together, they strongly support the conclusion that *intentional agency requires mental causal activity*. If one rejects mental causation in this third sense, one should conclude that the language of intentional agency is illusory, admitting that the kind of causation that it requires does not occur. Only if first-person mental activity is treated as a real emergent “could [it] be causally effective on successive brain states. . . . Mental events, such as intentions—whatever they are ontologically—have determinative (‘causal’) efficacy in the physical world” (p. 272).

So we now have three approaches before us for understanding mentality. How might these three models constrain reflection on the nature of divine agency?

*Divine Agency and the* Imago Dei *Correlation*. Let us use “*imago Dei* correlation” to convey the formal connection that almost inevitably exists between one's understanding of God and humanity (Clayton forthcoming, chap. 6). The correlation may exist between views of human personhood and divine personhood, or between human and divine agency, or between God's relation to the world on the one hand and the relation of an individual's thought and consciousness to her body on the other. For panentheists, for example, it takes the form of what I have called "the panentheistic analogy" (Clayton 1997, chap. 8).

Given the *imago Dei* correlation, it is not surprising that each of Peacocke's three ways of modeling human consciousness and mentality would produce a separate understanding of the God-world relation and divine action. The first model does not exclude the existence of God, but it makes any direct influence of God-as-agent on humans conceptually problematic, because it rules out mental or spiritual causation.[5] Of course, one still may build symbolic and figurative uses of Christian language on top of this ontological platform, as it were. Consider the sometimes rich uses of Christian language found among thinkers who are de facto deists, or among naturalist, nonpersonalist theists such as Karl Peters (2002).

Something similar is true for the second model. The christological and sacramental language that Peacocke employs in his "Naturalistic Christian Faith for the Twenty-First Century" (2007a), and in most of his other publications, could still be retained under this interpretation. Of course, talk of divine effects and mental causes could no longer have the real, referential status that Peacocke apparently believed them to have. The reason is that, according to the second model, the constraining effects of the world-as-a-whole would not literally represent an intentional guidance by God; at least the model provides one with no grounds for making such a claim. Nonetheless, perhaps purely symbolic reinterpretations could take up the slack. One could always say, "I picture God to myself as something like an intentional agent who is able to exercise mental (or perhaps better, spiritual) agency. And my model also asserts that 'the universe as a whole' constrains all of its parts. So I shall speak of this highest whole-part constraint *as if* it were the expression of an underlying divine intention." One would have to admit, however, that the language of direct intentional causation is not actually supported by one's own model of mind in the world. Instead, advocates of this second view claim that a naturalistic theory of human persons warrants nothing stronger than whole-part constraint. They then supplement that conclusion—perhaps for private religious reasons—with what must now be read as purely metaphorical theological language of divine intentional agency at the level of the universe-as-a-whole.

Once one has chosen to define the divine-human relation in this way, one could extend a similar status to other instances of traditional Christian language. (Again, I do not believe that Peacocke intended these consequences. But, limited to the second model, this is all one has to work with.) Having assumed that "God" is intending whatever effects follow from universal whole-part constraint, one might then speak of those effects *as if* they were an influx of divinely intended information into the system of nature. Because whole-part constraints can in some way influence every part within the system, one may then imagine this divine influence as extending also to every individual person. This move opens the door to yet further extensions of this "as if" theological language. For example, one may imagine that the divinely "intended" informational content from the universe-as-a-whole also applies to oneself and treat it as if it were a personal communication from *deus pro nobis*, "God for us." Christological and sacramental language could then be added as further imagined extensions of the content of this "divine communication."

Such a use of theological metaphors may not be explicitly ruled out by contemporary science in the way that strong miracles language is. The trouble is that, on this view, one's talk of divine agency, though not (strictly speaking) contradicted by science, would be utterly unsupported by any analog in the natural world. Earlier we saw that whole-part constraint by the brain, in the sense of Peacocke's second model, is not sufficient to count as intentional agency. On what grounds, then, could whole-part constraint justify one in treating the universe-as-a-whole as exhibiting intentional personal agency? The apparent arbitrariness of that move should lead one to give marked preference to the third of Peacocke's three models of personal agency—or else to abandon talk of specific divine action altogether.

*Personal Divine Agency*. Although the third model implicitly underlies virtually all of Peacocke's theological treatments of the God-world relation—for example, in his magnum opus, *Theology for a Scientific Age* (1993) —it is worked out explicitly in the two recent essays mentioned above. He clearly understands God to be a constraining influence on all that exists. It seems obvious that the Ground of all things would be related to the-world-as-a-whole at least as strongly as the way in which a system is related to its constituents. But Peacocke decisively supplements this minimal condition by adding the framework of panentheism—the view that the world is contained within the divine, although God is also more than the world. Panentheism offers a way to personalize the divine "whole-part constraint" without falling into pantheism, the complete identification of God and world (Clayton and Peacocke 2004).

Peacocke recognizes that his theory of whole-part influence "depend[s] on an analogy only with complex natural systems in general and on the way whole-part influence operates in them" (2001, 114). Yet, as we have seen, that particular analogy cannot do all the work in the case of the God-world relation, at least not if theism is also to involve the notion of divine personal agency. Thus he adds, "There is little doubt that [my model] needs to be rendered more cogent by the recognition that, among natural systems, the instance *par excellence* of whole-part influence in a complex system is that of personal agency" (2001, 114). Or, as he wrote in the Essay, the God-humanity interaction "evidences *a new kind of causality* of a whole-part kind" (2007a, 50).

The burning question is whether talk of this new kind of causality, the causality of personal agency, can be justified. On the third model of mental causation given above, it clearly is; under the first two models, I have argued, it is not. If this argument is sound, our options become rather more clear. Only if one is willing to endorse mental causation in the third, stronger sense (as I have done, for instance, in Clayton 2004)—and assuming that our arguments in defense of the third option hold up—could one be warranted in speaking of divine personal influence on the world. Only if mental causation is viable[6] can one make sense of the sorts of theological statements that Peacocke makes in his Essay, such as that "when God so acts in a way that can be denoted as an expression of divine grace, then there are effects on human beings that are unique and distinctive, necessitating the variety of classical descriptions of the modalities of grace that we have noted above" (2007a, 50). Divine influence of this sort cannot be merely an instance of whole-part constraint. Rather, it manifests distinctively personal causation on God's part, causation that makes a difference within the world.

Whole-part constraint probably suffices for the "ground-of-being theism" that, for example, Wesley Wildman (2004) defends. But if Peacocke's position aims at some form of personal theism, as it appears, it must supplement whole-part constraint (model 2) with a theory of personal causation (model 3). One is required to defend some form of mental causality, as Peacocke himself attempted to do: "Persons as such experience themselves as *inter alia* determinative agents with respect to their own bodies and the surrounding world (including other persons), so that the exercise of personal *agency* by individuals transpires to be a paradigm case and supreme exemplar of whole-part influence" (2006, 273–74). Only then can one extend the analogy to argue that God could cause particular events and patterns of events to occur that express God's intentions. These would then be the result of "divine action," as distinct from the divine holding in existence of all-that-is, and would not otherwise have happened had God not so intended (Peacocke 2007b).

## Conclusion

It turns out to be *possible* to use Christian theological language with some level of coherence on any of the three models of mental causation that Peacocke identified. A deep religious and devotional attitude, serious moral commitment, and transformative religious experience can occur within each of the three models. The task is thus not merely to determine whether

Christian language *can* be used consistently within a vastly more naturalized context than traditional theology accepted. The harder task is to evaluate what is the best overall balance of naturalism and theism—a burning question for our day that I have only begun to address here.

In these pages I did begin the process of evaluation, however. I first looked at one of the most fruitful new areas of research in contemporary biology, systems biology. Although it involves important new data and theories, which bring with them important differences of emphasis, these do not fundamentally undercut Peacocke's theory, and indeed in some ways they work to corroborate it. Next, among the myriad methods for evaluating theological proposals, I focused on the issue of coherence, specifically on the quest for a deeper coherence between one's view of personal agency and one's theory of divine agency, a type of coherence that I labeled the *imago Dei* correlation. Of the three models of mental causation that Peacocke has analyzed, we found that only the third—"mental events, such as intentions . . . have determinative ('causal') efficacy in the physical world"—could do justice to the notion of divine personal agency. It is indeed true that personal agency represents the "paradigm case and supreme exemplar of whole-part influence" (2006, 273–74). This third type of model must therefore undergird any adequate theory of agency, whether it be a case of personal agency or the attempt to understand what might be involved in divine agency.

## Notes

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1. Cf. the biosemiotics school (including Jesper Hoffmeyer and Carl Emmeche in Copenhagen): emergent levels hierarchically interpret the levels below them and emit signs of their own, which can be interpreted across hierarchically emergent levels. See esp. Hoffmeyer 1996.
2. I develop this distinction in depth in Clayton 2004. Roughly, a system is strongly emergent only if the emergent entities exhibit causal powers that are not merely the result of the causal powers of its parts but are causal agents in their own right.
3. This does not mean that they introduce new forms of energy into the world in the sense of vitalism or dualism. Whatever causal powers organisms exhibit must still be consistent with the understanding of matter and energy in fundamental physics.
4. See Palsson 2006, 79–81. Coordinating this developmental process, and the homeostatic mechanisms in the living organism, are *signaling networks*. As Palsson notes, the signaling network in a human includes genes for 1,543 signaling receptors, 518 protein kinases (enzymes that modify other proteins by chemically adding phosphate groups to them), and approximately 150 protein phosphatases (enzymes that dephosphorylate their substrate, that is, the opposite of kinases). These components of the human signaling network result in the activa-

tion (or inhibition) of no less than 1,850 transcription factors in the nucleus, which in turn make up the transcriptional regulatory network.

5. An indirect influence might still be possible. For example, God may bring about direct changes at the microphysical level, which may then be augmented by some mechanism until they induce changes in human thought.

6. This "only if" phrase demands one qualification. Throughout this response I assume—as I think Peacocke did also—that one needs to give some sort of an account of what one means by divine-action language. This claim may be, and often is, disputed by authors on this topic. Some have argued that no conceptual account is necessary because all language about God is symbolic, apophatic, regulative, pragmatically useful, or internal to the practice of faith. Any one of these models may allow one to speak of divine "acts" in the world (the scare quotes now become crucial!) or to label various events as "expressions of divine grace."

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