

GOD AND THE SO-CALLED LAWS OF NATURE

THE UNUSUAL VIEW OF WHITEHEAD

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Abstract. This paper offers an alternative view on the relationship between God and the laws of nature, based on Alfred North Whitehead's philosophy of organism. In scientifically informed theological discourse, God's agency is most often thought of in non-interventionist terms. Consequently, there are schematically two possible *loci* where God's action in relation to the laws of nature may be located, respectively, as the creator of these laws (locus A), and as acting around them or in the space the laws leave (locus B), the latter usually based on the alleged indeterminacies that come with quantum mechanics and/or with chaos theory.

Whitehead offers a remarkably different non-interventionist position, according to which God neither imposes nature's laws (contrary to A) nor works as 'determiner' of the indeterminacies left by the laws (contrary to B); rather God is that actuality that makes the contingent and statistical laws possible.

The paper begins with a presentation and explanation of Whitehead's view, and then goes on to successively discuss two different indeterministic accounts of divine agency (the quantum-based account of Nancy Murphy, and the chaos-based account of John Polkinghorne), to compare Whitehead's view with these approaches, and to evaluate its unique theological aspects.

Keywords: adaptive dynamics, creation, deism, 'determiner of indeterminacies,' fitness landscape, God's agency, God's consequent nature, God's primordial nature, initial aim, indeterministic accounts of special divine agency, lawful regularities, laws of nature, non-interventionism, organicism, philosophy of organism, self-organization, valuation or fitness function, fitness landscape; Alfred North Whitehead, Nancy Murphy, John Polkinghorne.

1. INTRODUCTION

In scientifically informed theological discourse, God's action is most often thought of in non-interventionist terms. Consequently, there are schematically two possible *loci* where God's

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action in relation to the laws of nature may be located, respectively, as the creator of those laws (locus A), and as acting around them or in the space they leave (locus B).

The position that God is the creator of the world and is the ultimate source of its laws (locus A) may count as the default theological position. We see this not only as a pervasive feature of classical theologies (e.g. in Augustine, Thomas Aquinas, mediaeval voluntarism, John Calvin, or Newton), but also in modern non-classical theological reflection (e.g. in Hartshorne 1970; 1991; Davies 1992; Polkinghorne 1995; 1996a; Bonting 1999; to name only a few).

However, in spite of this general agreement, important differences between the various theological systems arise when it comes to the question what else God can do, besides being the lawgiver of the universe. Basically, three positions may be distinguished in answering that question.

One position is that God's *only* agency consists in *being the source of the laws*. This results in a more or less deistic picture, according to which God has imposed the laws of nature, and there is no room or need for God to intervene or otherwise act in the history of the world. This position which became important in the seventeenth century (as a reaction to Newton's mechanics) still prevails to some extent in modern times, especially in a science and theology context (e.g., Barrow and Tipler 1986; Davies 1992).

Contrary to this, there are plenty of positions giving a less deistic and more theistic picture of God's agency, where God is not limited to imposing laws, but also influences the world's course of history. Among them, a schematic distinction can be made between two main positions, correlated respectively with the opinion that the laws of nature are deterministic and the opinion that (at least some of) these laws represent ontological indeterminacies in nature. In the first - deterministic - case, the dominant view, at least traditionally, is that *God can act interventionally* (by way of miracles): God can break the laws of nature, or at least bypass them (e.g., Thomas Aquinas, John Calvin, Isaac Newton). However, this position is deeply haunted by the problem of theodicy which seems unavoidably linked to it. Moreover, modern theologians who look for consonance or compatibility with natural science, are reluctant to accept this view of God acting by miracles, something that clearly appears from most of the Science and Theology literature.

Therefore, the ontological indeterminism that allegedly comes with quantum mechanics (and according to some with chaos theory as well) has been widely welcomed, as it seems to offer the possibility of special divine non-interventionist actions. According to this – indeterministic – picture of God's action, God, in order to have real influence on the course of history of man and nature, does not need to act interventionally, but *can make use of the room left open by the inherent indeterminacies of nature* (locus B). Thus, the assumed indeterministic character of quantum mechanics (and of chaos theory) is used to provide a non-interventionist account for the way God may act in the world (e.g. Pollard 1958; Polkinghorne 1995; Murphy 1995; Russell 1997; Clayton 1997; Stoeger 2001, and many others involved in the so-called Divine Action Project (1988-2003) of the Vatican Observatory and The Center for Theology and the Natural Sciences, Berkeley, California).

Because in scientifically informed theological discourse, God's action is most often thought of in non-interventionist terms, such theological discourse would allow for only two major views on God's action in relation to the laws of nature: either God is regarded as the creator of natural laws, where being the source of the laws would be the only agency attributed to

God (deism, only locus A), or God is considered to be the creator of the laws of nature *and moreover* to be acting in the space left open by the indeterministic aspect of some of those laws (non-interventionist special divine agency: loci A and B).

However, the problem with deism is that it neglects essential aspects of christian belief (viz. God's active involvement with the course of history), whereas the problems with the indeterminacy based accounts of special divine action (SDA) are of a greater variety. It is questioned e.g., whether the account is really non-interventionist, whether it is not in the end occasionalism, whether it does not violate the law of energy conservation, whether the given picture of God's agency in the quantum 'openings' is compatible with the randomness of the quantum phenomena, whether it avoids the theodicy problem, whether God's agency can really make a difference given its being constrained by God's own laws.

Against this background, Whitehead's position is intriguing because it offers a quite different and remarkable 'third' non-interventionist account of the relationship between God and nature's lawlike regularities. Whitehead explicitly maintains that, while God is a *condition sine qua non* for the lawlike regularities of nature, God does *not* impose the natural laws (contrary to A). And, though Whitehead defends a decidedly indeterministic metaphysics, his view on God's agency is not that of God working as determiner of the indeterminacies left by the laws (contrary to B). Instead, he sees God as that entity "in virtue of which there is physical 'law'" (Whitehead, 1929, 283). In Whitehead's account, there is no deistic God, but instead, God is always interacting; the 'laws' of nature are not God-given, and are therefore neither expressing God's will nor immutable. Furthermore, the natural processes require God's agency for their very existence and for their 'law'fulness, in the sense that it is a principle of concretion – not only in special occasions, but always and everywhere – and moreover so that this divine *modus operandi* is never infringes upon the autonomy of worldly processes, but instead constitutes them as such.

So, it seems worth our while to explore this very different non-interventionist whiteheadian concept, and, more particularly, to investigate whether it can overcome the difficulties faced by the other indeterministic accounts of divine agency.

The structure of the article is as follows:

In part I Whitehead's approach is the subject matter. It starts with a brief presentation of Whitehead's philosophy of organism and its twofold concept of God (section 2). This will be followed by an exploration of Whitehead's view on the agency of God as 'primordial nature' (section 3), which will be made more intelligible by comparing the role of this primordial nature as 'principle of concretion' with the role of a so-called 'valuation or fitness function' in adaptive dynamical systems (section 4). This exploration will lead to an examination of Whitehead's claim that God as primordial nature is the condition of the possibility of natural laws, and the characteristics of these laws (section 5). In part II two examples of indeterminacy-based accounts of divine agency will be presented, and compared in their essential points with Whitehead's approach: quantum-based SDA (section 6) and chaos-based SDA (section 7). By way of conclusion, I will highlight some special characteristics of Whitehead's view on the so-called laws of nature in relation to God (section 8).

PART I

2. WHITEHEAD'S ORGANISTIC COSMOLOGY AND ITS TWO-SIDED CONCEPT OF GOD

A discussion of Whitehead's concept of the agency of God is not possible without having some idea of the place God takes in his philosophic scheme. Basically, Whitehead is looking for a new system of general ideas in terms of which the human experience in all its dimensions can be interpreted. His need for such a system was born from a growing dissatisfaction, both scientifically and philosophically, with the dominant mechanistic paradigm—according to which the building blocks of reality are assumed to be static “things” that are related to each other in a purely external way. Instead Whitehead proposes an organistic paradigm where reality consists of inherently interrelated self-organizing events.

The first and foremost idea of this organistic paradigm is that each elementary event (Whitehead speaks of “actual occasion,” “actual entity” or sometimes more loosely of “occurrence”) creates *itself* from the world given to it: every elementary event is a process in which the many influences that are given by and appropriated from its past are unified. Like in a living organism, this unification from within is conceived as a *concrecence*, literally a growing-together or synthesizing process of these appropriations (which Whitehead calls “prehensions”), resulting in a complex unity. Thus, contrary to the mechanistic view, an event is essentially both self-creating and internally related to its given antecedent events (not unlike the act of perception that is intrinsically related to the things perceived).

Because those many influences are not simply compatible, unification occurs in various ways: it can occur trivially (by weeding out some elements) or in a more difficult and complex way that results in a ‘richer’ synthesis. The richer the synthesis, the better it is. Hence, that synthesis counts as the “best” in which the greatest possible amount of influences is combined in a harmonious way.

This is the point where Whitehead's concept of God enters. As Whitehead sees it, each nascent event derives the drive to its best possible synthesis (its “initial subjective aim”) from an atemporal valuation of all possibilities—a kind of optimization function—that for every possible initial situation distinguishes better from worse solutions. While the inherited elements (the “data” of the initial situation) are yielded by past events, this valuation itself—which is a *conditio sine qua non* for any occurrence—is characterized by Whitehead as an atemporal, abstract aspect of God. And because nothing could ever happen without this valuation, he calls it *the primordial nature of God*. In Whitehead's metaphysics, this divine primordial nature is the unconditioned envisagement and valuation of all possibilities. It is called abstract because it is abstracted from God's commerce with the particular actual world. As such, Whitehead says, “it is a mere factor in God, deficient in actuality” (PR 34). This abstract nature of God has its counterpart in *the consequent nature of God*, an expression that connotes God's fully actual nature, the concrete plenitude of God. God, as concrete, ‘prehends’ the particularities of the actual world – which explains the expression ‘consequent’ –, and in that sense God may be thought of as having consciousness, affection and knowledge (PR 345). Contrary to the primordial abstract side, God as fully actual, has some temporality - not in the sense of coming to be and passing away, but in the sense of enduring growth: all God's prehensions of the temporal world remain everlastingly present in God, woven upon

God's primordial concepts (PR 345). But in this article, our main concern will be God's primordial nature.

For Whitehead, the main function of the divine primordial nature is to give direction to the plurality of worldly processes. It explains that there is order and novelty in the world. However, it would be completely wrong to infer from this that the causality involved in God's primordial nature would render worldly causality superfluous. On the contrary. Each nascent event starts from the data of its particular worldly situation. These data are the causes of this nascent event in question. The role of God's primordial nature is to let the new event feel what should be its best shot at unifying these data of its particular situation. That is, it provides the 'initial subjective aim' as "the best for that impasse" (PR 244). By giving an aim which functions as attractive possibility, God gives direction to the worldly events. God lures, says Whitehead echoing Plato, but it is up to the worldly processes themselves to realize that possibility – or not. In Whitehead's words: "Thus the initial stage of the aim is rooted in the nature of God, and its completion depends on the self-causation of the subject-superject [the temporal concreting event]" (PR 244).

In sum, Whitehead establishes that there are three causal influences without which no event can occur: the *past* of the event, *the divine primordial nature*, and the novel event itself. The past conditions what is possible; the divine primordial nature presents what is desirable in relation to that actual past, and thereby lures towards the 'best' possibility ('aim'); but in the end, it is *the new occurrence itself* which realizes itself both in relation to what is possible and to what is aimed at.

The second of those three causal factors is the one that interests us here. The connotation of the verb "to lure" chosen by Whitehead may offer some additional illustration of Whitehead's concept of God's primordial nature and its role. When we say of someone that he lures, we do not mean to say that he takes away any of the possibilities from the object of his lure, but that he is suggesting that one option is relatively more interesting or desirable than the others. This is the sense in which Whitehead uses the word. The primordial nature of God lures by suggesting as it were the best possibility for the novel entity to concretize itself (that is the best, most rich, possibility to synthesize the many data from which the novel occasion forms itself). And because the suggestion implicitly limits the number of candidates, we can understand why Whitehead describes the primordial nature of God as a 'principle of limitation' or as the 'principle of concretion' (Whitehead [1925] 1967, 173-179; PR 244; Oomen 2006).

3. THE PRIMORDIAL NATURE OF GOD AND ITS WORKING

When Whitehead conceptualizes God's primordial nature, as a "complete valuation" of all pure possibilities (PR 31), he does not mean this as an *absolute* valuation of the different possibilities, but as a *relative* valuation. For, according to him, God's primordial nature is a valuation of the possibilities in relation to every possible set of data available for integration in a new occurrence. Thus, all possibilities have a specific valuation in relation to every possible supply of possibilities. This is why Whitehead speaks of "relative relevance" (PR 344).

If this sounds awfully theoretical, a simple illustration may be helpful. The integration of past actual occasions into the new actual occasions may be compared with something like the

self-creation of a mosaic picture out of a certain available set of mosaic pieces (or the composition of a piece of music out of a certain set of tones). This, admittedly very inadequate, comparison may give some access to what Whitehead means by a relative valuation of possibilities. For instance, given a certain supply of many mosaic stones, the best possibility of realization into a mosaic (that is that possible ‘mosaic design’ that yields the highest aesthetic intensity) is, for example: letting the little green pieces form the foreground pattern while keeping the remainder of the stones for a mixed background. But, given a different supply, the best possibility of synthesis may be, for instance: use the red and yellow little stones for the foreground, and spread all the green stones among the remaining ones diffusely into the background. Thus, a valuation is conceivable of all possibilities (the ‘mosaic stones’) in relation to every possible supply of possibilities, that is, a valuation of possibilities in relation to each other.

On a more formal level, the functioning of the divine primordial nature as principle of valuation or limitation or concretion may be presented in terms of a *mathematical function* F attaching (mapping) a specific y to every possible x , where the letters F , x and y signify respectively — *mutatis mutandis* — the divine principle of limitation or of concretion, the constellation of the available elements in the situation at hand, and the best possible corresponding synthesis of these data (the initial aim). So, F stands for the unchanging valuative ordering of all potentialities in respect of each other: if x_1 then y_1 , if x_2 then y_2 etc. The x signifies the variable possible initial situation of an actual occasion (the possible “actual world”) being composed of many data to be synthesized, and the y stands for the ‘the most valuable possibility for synthesis of these data’ (the “initial aim”). In other words, F may be seen more or less as what in mathematics is called an *optimization function*.

The analogy is fruitful in more ways than one. For instance, in the same way that the mathematical function F concerns the relationship between two variables, x and y , so too God’s primordial nature as “the divine principle of concretion” concerns the relationship between two possibles, the possible initial situation containing a multiplicity of data, and the best possibility for synthesis of these data. There is also some other point of using this comparison. F itself (as far as representing here God’s primordial nature as principle of concretion) is atemporal and independent of the variables it concerns, whereas the y (the initial aim) and the x (the initial situation or given actual world) are basically temporal, and are so related that the initial aim depends on the initial situation (the state of the actual world). (Oomen 2003a, 96; 2006, 213).

I suggest that the mathematical image may therefore be helpful in elucidating how God’s primordial nature as the relative valuation of all potentialities, may influence the worldly processes, so that, given a certain initial state (a certain x), God’s valuation (the function F) delivers the best combinatory possibility for that case (a particular y).

4. INTERACTIVE WORKING AND THE ANALOGY WITH A FITNESS FUNCTION

The way God’s primordial nature works is really interactive. We may get a better ‘feeling’ for this way of working by comparing (again with all the shortcomings inherent to examples) the principle of concretion with *an interactive computer program* (e.g., a computer game or a computer assisted drawing program). Such program consists of a complex but unchangeable ‘algorithm’ that allows for an infinite variety of possible paths the process may take. At any

moment of the game, the situation of the game is dependent upon the player's choices. Yet, the program, though it has no foreknowledge of that actual situation, will always provide 'the best possible option' for that specific situation. In other words, the program is a possibility structure in that: for each possible situation, it offers a correspondingly best possibility. And because the 'best possibility' it provides is contingent upon a concrete situation occasioned by the player, the efficacy of the program is clearly 'interactive.' And the structure of the interaction is such that, though the program is constantly the same, the course of the game is never determined from the outset. In this way, it is understandable, that the divine principle of concretion is, analogously to such a program, is immutable, and ignorant of what situations will happen to present themselves, and yet always offers the 'best possibility' relative to every given contingent situation. And in the same way that no game can be played without the program, so too there can be no world without the divine principle of concretion.

I would like to take a final step in the explanation of the working of Gods primordial nature as principle of concretion by comparing it with the working of a '*valuation or fitness function*' in adaptive systems or self-organizing systems (e.g., biological organisms). By an adaptive self-organizing system we mean a system that is able to develop or change its internal structure adaptively in relation to its environment. Such adaptive processes generally involve an implicit criterion, such as the criterion of minimum energy use, or of optimal mutual distance, or of maximum benefit. For instance, biological evolution involves a 'fitness function,' which expresses the different fitness values of the many possible genotypes of a species relative to the environment.

Accordingly, one might say that self-organizing processes involve 'something' that evaluates a development in a certain direction as more attractive than a development in other directions, because that one is felt to be more beneficial than the others. It is exactly this difference in the degree of attractiveness that comes to give an orientation to the course of the process. In mathematical models of self-organizing this 'something' may appear as a 'valuation function' (mostly called 'fitness function' even in non-biological contexts). It may be considered as a mathematical representation of freedom and direction in that it is an algorithm, i.e., a mapping rule, that basically assigns a *direction (attractiveness, preference)* to a set of *possibilities*, thereby enabling a process to organize itself in an adaptive way.

A rather imaginative way of picturing this function and its role is offered by the image of a fitness landscape, where the fitness value is represented as a third dimension in relation to a (for the sake of convenience) two-dimensional state space. Such representation results in a landscape of hills and valleys. The higher the system is in the landscape, the 'better' or the more 'fit' its state. Therefore, systems move to the locally highest region in the state space, 'climbing the mountain.' So, self-organization is the result the process of maximizing the fitness of the system, in which the fitness function distinguishes better from worse solutions.

In a so called 'fixed target' control situation the (local) 'hill' is located on a fixed place of the phase-space, and so the system will end up in that fixed place. However, in the situation of a 'moving target control,' the situation is much more complicated, because the changes within the situation of the system are bound to constantly influence the landscape, that is the location and height of the hill(s), and therewith the preferential orientation of that system constantly changes. One might compare such 'moving target control' situation with walking on an air mattress. Any attempt to reach the highest place of the mattress results in the sagging of the mattress at that very place. Likewise, walking to the next highest place will again cause *that* place to sag under the influence of your footstep. etc. So, in the case of moving target control

a more sophisticated idea of a fitness function is involved, which, though it may be in itself immutable, does *give rise to directionality, but not to a fixed direction*, because the given directionality is constantly dependent upon the changing situation. Here we see a mounted form of interactiveness.²

ANALOGY: SIMILARITY AND DISSIMILARITIES

In view of these insights my position is that Whitehead's concept of the principle of concretion may be seen as analogous to the above mentioned 'valuation function' or 'fitness function' (cf. Oomen 2003b, 384; Oomen 2006).

However, as analogy means the occurrence of similarity among dissimilarities, we have to change our perspective, and also pay explicit attention to some important dissimilarities between the role of the 'fitness function' in self-organizing systems as it has been formulated in recent adaptive dynamics and the role of 'God's primordial nature' with respect to the world as formulated in Whitehead's metaphysics. I will highlight two of them.

Striving as subjective aim or as statistical effect? In Whitehead's case, the occasion constituted by the aim provided by the divine primordial nature is a subject, that is, it has a subjective aim, it is urging something and deciding, and so on. But in an adaptive system like a biological population that climbs the hills of its fitness landscape there is no striving of the population in any real sense of the word. The genetic direction the population takes is the result of statistical effects. Thus, the mechanism is in some sense very different, but the structural description may be seen as rather similar.

Constitutive or Descriptive? In natural systems the fitness function arises together with the system itself, in other words it is endogenous. Moreover, in many scientific treatises this fitness function is seen as only an alternative equivalent description of the system itself, therefore not as a 'something' (endogenous or not), and surely not as something constitutive, whereas in Whitehead's view of the relationship between an actual entity and God, God is immanent but not endogenous, because God is constitutive of that occasion.

However, this difference in views about the ontological status (of the fitness function respectively God) may largely be due to the dominance of a nominalistic trend in science that is absent or less pronounced in theology. It is therefore of crucial importance in the 'translation between disciplines' to scrutinize not only the terms, but also their underlying philosophical assumptions. As a point of further research, the question arises, whether it may be plausible and adequate to conceive of God as an emergent entity, and whether such concept of God as emergent may account for a divine influence in and on the world.³

Despite these dissimilarities, I will stress the similarity, if partial, between the role of the 'fitness function' in self-organizing systems as it has been formulated in recent adaptive dynamics and the role of 'God's primordial nature' with respect to the world as formulated in

² For the concept 'fitness' in adaptive dynamics, see Metz 2008; for adaptive system walks through a changing fitness landscape, see Metz et al. 2004; for classical treatises on fixed target control, see Fisher 1930 and Wright 1949; for the idea of moving target control see Metz et al. 1996.

³ The question whether a concept of God as emergent may account for a divine influence in and on the world, is subject of current research in the Heyendaal Program on Theology and Science of the Radboud University Nijmegen. This research elaborates the suggestion that the notion of emergence may be useful for the development of a non-interventionist conception of divine agency with respect to the world (Clayton 2004), in relation to the analogy of Gods working and the working of the emergent fitness function in adaptive dynamics (Oomen project proposals 2005 and 2007).

Whitehead's metaphysics. Why? Because *both* are essentially a mapping rule assigning value to a set of eligible possibilities, with different values for respectively different possibilities, therewith enabling a process to organize itself (cf. Whitehead [1925] 1967, 151.155). See, for instance, the following passages (among many others) from Whitehead: "Transcendent decision includes God's decision. He is the actual entity in virtue of which the entire multiplicity of eternal objects obtains its graded relevance to each stage of concrescence" (PR 164), and: "In this sense God is the principle of concretion; namely, he is that actual entity from which each temporal concrescence receives that initial aim from which its self-causation starts. That aim determines the initial gradations of relevance of eternal objects for conceptual feeling" (PR 244).

My position therefore is that Whitehead's concept of the divine principle of concretion may be understood as analogous to the 'fitness function' of adaptive self-organizing systems. Indeed this position would probably meet with Whitehead's approval, given the fact that he writes: "Mere blind appetite would be the product of chance and could lead nowhere. [...] There is a discrimination of appetitions according to a rule of fitness" (Whitehead 1929a, 89-90).

Let us summarize that, analogously to a fitness function, God's primordial nature assigns for every novel event various degrees of attractiveness to the different possibilities open to that event, and it thereby initiates the pursuit of the realization of the most attractive possibility for that case (Oomen 2006). Moreover this interpretation allows for a moving target control: God's primordial nature, though in itself immutable according to Whitehead, gives rise to a directionality that is not fixed or predetermined. For the 'fitness landscape' provided by God as immutable fitness function may change dependent upon the creative advance of the world-system.

I want add only two additional remarks: The first one is that, according to Whitehead, the reception of its initial aim by the new occasion involves the very constitution or creation of this occasion. Therefore we can hear Whitehead say: "In this sense, God can be termed the creator of each of each temporal actual entity" (PR 224-225; cf. 245), however immediately followed by the warning that "the phrase is apt to be misleading by its suggestion that the ultimate creativity of the universe is to be ascribed to God's volition" (PR 225). The second remark is that the initial aim (provided by God's primordial nature) is not the actual outcome of the new event, but only its initial point "from which its self-causation starts" (PR 244). This warrants both the autonomy of the new occasion (PR 244-245) and the indeterministic character of Whitehead's cosmology.

5. THE POSSIBILITY OF NATURAL 'LAWS' AS ANCHORED IN THE DIVINE PRIMORDIAL NATURE

Now we have enough baggage to move on to the relationship between the laws of nature and God. The discussion so far did not yet make clear how Whitehead manages to avoid that the relation (F) between "situation" (x) and "best possibility" (y) is based upon God's volition or accidental will (cf. PR 225; Whitehead [1933] 1967, 168). Whatever is for a new actual occasion the best possibility of synthesis of its data in a given situation depends to a large extent upon the character of these data, that is, it depends upon the components of the given

situation itself. (PR 249, 277-278). For the aim envisaged by God concerns the maximum intensive synthesis which can be made *from the given components of the initial situation* (PR 249, 277-278). Thus, there is an *intrinsic or internal connection* between this aim and the characters of the real things that jointly make up the initial situation. For this reason Whitehead's view on natural laws represents to a considerable extent the immanence doctrine of natural laws (Oomen 2003a).

Above we explained with the help of the concept of a fitness function, that despite the immutability of God's primordial nature, its effects are dynamical. Now the same immutability of God's primordial nature provides the reason that these dynamical effects may display a pattern. For, *the immutability of the Primordial Nature*⁴ in conjunction with the *internal connection* elucidated above, can explain why similar situations are often linked to similar best possibilities of synthesis, and why events in similar situations manifest therefore an *identity of pattern* (Whitehead [1933] 1967, 112). In terms of the mathematical expression used before: the same *x* in combination with the same *F* provides the same *y*. Now we can also understand why, even though the role of the divine primordial valuation is indispensable, natural lawfulness may be called "the outcome of the character of the behaving things" (the *x*) (Whitehead [1933] 1967, 41), and why, at the same time, *Gód* (the *F*), because of its stable ordering of possibilities, may be called "that actuality in the world, in virtue of which there is physical 'law'" (PR 283).

This appears to be the right place to call attention to the apostrophes with which Whitehead indicates "laws" in the last quote (from PR 283). It expresses Whitehead's denial that the laws are for ever unchanging, that the laws are something on their own, prescribing the natural processes how to react. Indeed for Whitehead the so-called laws are not existing unchangeable 'things.' Some passages taken from Whitehead express this explicitly: "People make the mistake of talking about 'natural laws.' There *are* no natural laws. There are only temporary habits of nature"⁵; and: "The notion of the unqualified stability of particular laws of nature and of particular moral codes is a primary illusion which has vitiated much philosophy" (Whitehead [1938] 1968, 13).

The discussion up to now, with its comparison of the role of God's primordial nature to that of an fitness function, may provide now important clues to understand Whitehead's denial of immutable natural laws and his alternative. First, initial situations are never completely identical, and because the relations are internally dependent on the *relata*, any change in those *relata* results in a different favored outcome (Whitehead [1933] 1967, 41. 112-113; Whitehead [1938] 1968, 95). Secondly, each event has its own (albeit often marginal) freedom,⁶ so even if the initial aims would be identical, the outcomes of the respective events would not. Thus, if God's primordial nature is seen as a sort of valuation or fitness function, and therefore as "that actuality in the world, in virtue of which there is physical 'law'" (PR 283), it is simply bad logic to assume that the concept of God implies the immutability of natural laws (Oomen 2003a).

⁴ In order to prevent misunderstanding, though Whitehead insists that God as primordial is immutable, he explicitly states that God as fully concrete ('God's consequent nature') is *not* immutable.

⁵ This is how Lucien Price reports Whitehead's own spoken words (Price 1954, 367).

⁶ On the inorganic level, the freedom of decision is negligible for our ordinary and scientific observation so that physical causal influences appear to be purely deterministic, although the 'de-cision' ('cutting off') of an actual entity can never be reduced completely to its external influences (PR 47-48).

PART II

According to many thinkers an ontological openness and flexible structure of physical nature would offer an opportunity (or perhaps the only opportunity) for divine agency that would not involve a break or a dismissal of natural laws. An ontological indeterminism occurs in Whitehead's philosophy of organism, but also in specific theologies, notably in those who look for an opportunity of special divine actions (SDA) based on alleged indeterminacies that come from modern science.

As seen above, Whitehead offers an indeterministic cosmology or metaphysics. Though it was at least in part motivated by the shortcomings of the mechanistic (deterministic) physics, it does not explicitly refer to quantum physics, and, of course, not at all to chaos theory. Whitehead joins William James' 'organistic' thought that, instead of being the product of fully determining influences, real beings as organisms constitute themselves. And the condition for an entity to be a self-constituting organism is that there be the possibility, however limited, of alternatives, of free decision, which is a notion that contradicts the possibility of being fully determined from outside (PR 27).

This absence of total determinism allows for the possibility of describing nature in terms of organisms rather than of machines, of human action (characterized by purpose and the utilization of data), and in a special way, of God's involvement in the existence and the course of reality.

Next to this philosophical approach, there are theological approaches that employ an indeterministic ontology. Unlike Whitehead's philosophy, these theologies are explicitly motivated by a reference to some aspect of modern physics. Thus, there are theologians who try to find a place for a special divine agency (SDA) in the purported ontological indeterminacy of quantum mechanics ("quantum-based SDA"), and some who claim that there is such an opportunity provided by chaos theory ("chaos-based SDA").

I would like to select one example of both these currents, so as to be able to compare their models of God's agency explicitly with the model suggested by Whitehead's philosophy. These two examples are Nancey Murphy for a quantum-based approach of special divine agency, and John Polkinghorne for a chaos-based special divine agency. I focus on these two authors because they have their standpoints extensively formulated, and they represent clearly the two different mainstreams of contemporary non-interventionist indeterminacy-based accounts of special divine agency.

6. QUANTUM-BASED SPECIAL DIVINE AGENCY, AND NATURAL LAWS

Quantum mechanics and its purported ontological indeterminacy is welcomed by many theologians working in the field of science and religion as offering a realistic possibility to account for special divine actions in a non-interventionist way. Those who have attempted to use the purported ontological indeterminacy of quantum mechanics to provide an account for special divine agency in a non-interventionist way include Karl Heim (1953) and William Pollard (1958). In the last decade this idea has been taken up again and explored in detail by Murphy 1995; Russell 1997; Clayton 1997; Stoeger 2001; and many others involved in the

so-called Divine Action Project (1988-2003) of the Vatican Observatory and The Center for Theology and the Natural Sciences, Berkeley, California). As motivated above, I will use Nancey Murphy's exposition of this position as an example.

For Murphy, as for Pollard, God is active in *all* alleged quantum events. She shares the majority view of the tradition that God works in all things at all times, not just on rare occasions. And, due to her ontological reductionist position, this theological claim means that God therefore works *constantly* in *all* the smallest or most basic constituents at the quantum level (or whatever turns out to be the most basic level of reality) (Murphy 1995, 329.339.343.354). The indeterminism that is inherent to a quantum event, if it is considered exclusively in relation to its physical causes, amounts to saying that the conjunction of physical causes is insufficient to uniquely determine the outcome. In other words, given the particular situation in which the quantum event occurs, there is a number of possible outcomes. Now, Murphy claims that for each quantum event, God intentionally actualizes one of these possibilities that are inherent to the event. Each basic event requires God's cooperation in order to be actualized (344)⁷. This view implies that the randomness of quantum phenomena is only apparent, not real randomness. Moreover, if God is taken into account, there is on the quantum level no longer indeterminism, but only divine determination (341.346). As Murphy writes: "To put it crudely: God is the hidden variable" (342).

In Murphys's model, when God makes a choice, his actualizations seem to be such that the overall impression of randomness is maintained (as is the case in Pollard).⁸ Thus, Murphy views "[t]he statistical laws of quantum mechanics as summaries of patterns in God's action upon quantum entities and processes" (346).

In this actualization, God respects the 'natural rights' of the events concerned, which is supposed to mean that God actualizes one single possibility among those that are open to the event, without in any way turning a completely different/foreign possibility into a reality. The effect of God's choice and actualization on the smallest constituents changes in an indirect way the world on the macro-level (342). So "God's will is assumed to be exercised by means of the macro-effects of subatomic manipulations" (329). In the results at the macro-level of God's subatomic manipulations, which are sometimes may be amplified by chaos effects, God's hand can no longer be traced unambiguously.

In this context, Murphy remarks that, causal indeterminism at higher levels of organization (excluding the human level) would not be helpful for God's purposes, indeed it would be counterproductive (329).

Next to this bottom-up agency of God, Murphy also pays attention to the fact that God also works via the human mind, and therefore via human action. Although a top-down aspect may be discerned here, ("God as the 'environment' within which the person functions" - 350), Murphy claims that, also this agency of God for its means of operation depends on a bottom-up account of God's activity, for God's stimulation of specific neurons in this way affects the brain (349-350). Here I will not pursue this venue in which God acts through human beings.

⁷ In this section, all numbers between brackets refer to pages in Murphy 1995.

⁸ Murphy (355) does not seem to have noticed or taken to heart David Bartholomew's criticism "that the presumption that God is free to act as he pleases, subject only to the need to conform to his own probability laws, is not as straightforward as Pollard seems to suppose" (Bartholomew 1984, 129). Bartholomew shows that this major problem arises only if God is thought (as by Pollard and therefore also Murphy) to determine all events. The problem disappears when God is perceived to so determine only some quantum-events – which is the case for Thomas Tracy (1995, 320).

Murphy's proposal has been subject to critical debate, both negative and positive, from which it appears that, though it is seen as internally very consistent, there are serious doubts concerning its plausibility (e.g. Clayton 1997, 219; Saunders 2002, 115-118). It has been argued that there are no quantum events such as those to which Murphy seems to refer (Saunders 2002, 139), that there is no sine cure to create a fake-random system that is indistinguishable from real randomness, that this is possible only on the basis of some other random system, and therefore would require an infinite regression (Bartholomew 1984, 127-130), that in the end this model makes it difficult to escape occasionalism (Saunders 2002, 124).

Polkinghorne raised a number of practical objections to the quantum-based SDA position. For instance, he points out that the effects on the macro-scale of the manipulations on the micro-scale would hardly exceed a significant, perceptible level, because a perceptible phenomenon requires the combination of a very large number of quantum events which, however, tend to cancel each other out" (Polkinghorne 1998b, 15). Though this problem could possibly be solved by the use of a hybrid model in which the consequences of quantum events are amplified and made apparent on macro scale through the sensitivity of chaotic systems to small fluctuations on micro scale, Polkinghorne argues that the theoretical problem of the transition from a quantum level to a macro-level is yet to be solved (1998c, 90). Moreover, Polkinghorne objects that a quantum-based model gives to God's action a curiously sporadic or discrete character, because the indeterminacies only refer to measurement events which occur only from time to time (Polkinghorne 1995, 152-153; 1998b, 15).

My intention here, however, is not to repeat, or to sharpen or to rebuff this criticism. All I want to do is to show the significant similarities and differences between Murphy's model and Whitehead's view as described above, and to evaluate them from a theological view.

Let me first mention some important similarities:

- According to both approaches God acts in all elementary events at all times.
- In Whitehead too, God's influence cannot after the fact be read back from the factual course of events.
- In Whitehead too, God's influence is of the bottom-up variety (as well as via elementary human events)
- In Whitehead too, God's influence does not break with natural lawfulness.
- For both thinkers God's action is a necessary but not sufficient condition for every event.

Nevertheless, these similarities cannot measure up to, and are erased by the fundamental dissimilarities that even are at the background of these similarities. Let me explain.

Murphy (as well as actually all theologians do who are in search of a conceivable place for God's providential agency in the world) starts from the picture that God creates the world in the beginning, including its laws, and that God sustains the world and its laws in their existence. This is what is meant by general providence or general divine agency (GDA). 'Natural' is the predicate given to whatever in the world occurs according to those (imposed) laws. Given this premise, the question is: What else than this creation and sustenance can God bring about intentionally within the created order? This question is the question of God's particular providence, that is, of special divine agency (SDA).

Murphy's answer is that God's special agency (next to an influence on the human mind) consists in an actualization of all basic (quantum) events (not as their sole cause, but as that which supplements insufficient natural causes so as to afford a sufficient cause), where this actualization respects the 'natural integrity' of the entity in question.

Whitehead speaks neither of an imposition of laws, nor does he speak of God's actualization of basic events, or of God's respect for 'natural rights,' for the simple reason that there is no foregoing order of creation to which such concept would refer. In other words, for Whitehead there are no laws imposed by God, to which entities owe their naturalness and to which God would be obliged if he were to respect their integrity.

How then does Whitehead perceive the situation?

What Murphy and most other theologians perceive as twofold divine agency, viz. (1) creation plus sustenance, and in addition (2) particular providential acts whereby God gives a direction to the course of history, Whitehead perceives as one single type of act of God. God's lure to make a new event achieve the most beautiful synthesis (y) that is possible relative to its specific initial situation (x) constitutes that new event as a process verging to a synthesis. Thus, God causes in a single sweep of action the *being* of the new event (creation) and the *orientation* of this event (providence). But, this constitution does not suffice for the event to be a fact, because it is up to the emerging event to actualize itself, in some way or other. In Whitehead's words: "In this sense God is the principle of concretion; namely, he is that actual entity from which each temporal concrescence receives that initial aim from which its self-causation starts. That aim [...] constitutes the autonomous subject in its primary phase [...]."(Whitehead PR 244).

This involves moreover that the laws (or lawlike regularities) are not pre-established, but that they emerge from the behavior of the events which depends on the initial given situation (x), on the aim received from God (y) that corresponds to that initial situation (for $y=F(x)$), as well as on the autonomy of the occurring event itself. Because God, as the principle of concretion, provides that synthesis as most attractive that may yield the most beautiful synthesis from the data of the given situation, it follows that similar situations will often result in a similar behavior.

Thus, the one type of agency of God accounts for both the creation of events and the particular providence with regard to events as well as for the regularity of behavior of those events: the natural 'laws'.

Thus, for Whitehead, God's agency is of a completely different order than the agency of things in the world. Worldly entities act by converting possibilities into actuality. In contrast, God's *modus operandi* is not by actualization but by providing possibilities adapted to factuality (thereby constituting events, and making possible the regularity of those events).

It may be illustrative to have a closer look at a scheme of Murphy which represents God's agency regarding a basic event (viz. the scheme on page 343 in Murphy 1995). According to this scheme (and its explanation) the action of God (arrow of G) has no intrinsic relation to the prior state of the entity (S_1), whereas for Whitehead, the aim provided by God (y) is internally connected to the prior state of the entity (x), for $y=F(x)$. Moreover, as Murphy states: "created entities require God's cooperation to be actualized" (344), whereas in Whitehead they require God's cooperation in order to exist and to have the possibility to actualize themselves.

In short: for Whitehead, there is no actualization or manipulation by God of micro events, no imposition of laws, no peril of occasionalism or of exhausting of the freedom of worldly events.

As said both Whitehead's and Murphy's approach involve that God's influence can not be traced back from the course of events. While, for Thomas Tracy (1995), the reason for this is that God's influence as determiner of determinacies is only sporadic, and for Pollard (and Murphy), because God in his actualizations sees to it that the overall random-effect is left intact, for Whitehead the reason is that God never realizes or achieves an action alone. Every factual result involves a given past, an aim derived from God as luring possibility of synthesis of the given data, as well as the actualizing agency of the event itself.

For Murphy, whenever God performs his special actions, there is an already pre-existing nature with its laws (which God wants to respect). The laws given by nature constrain God, even though the quantum-openness gives God some room. And therefore, those laws limit God's range of action, and God, according to Murphy, acts in a way so as to leave the laws externally intact.

For Whitehead, the story is entirely different. There is no event without God. There are no 'laws' without God, for the law-like patterns result, as explained above, from the internal connection between 'initial situation' and 'aim,' and from God's immutable primordial nature. Here, general and special divine agency meet one another, but, more importantly, the laws do not hamper God's agency, they are not something in which God must seek for some space, or see to it that no law be violated by camouflaging his influence. Instead, the permanent presence of God's influence explains that lawlike regularities exist and why they exist.

7. CHAOS-BASED SPECIAL DIVINE AGENCY, NATURAL LAWS

John Polkinghorne occupies a special place among the prominent scientifically informed theologians who search for some form of ontological openness in nature so as to establish a place where God's agency could be conceived in a non-interventionist fashion. He is one of the few who bases the claim of a fundamental indeterminism in nature on the phenomena that are described by chaos theory.

As I have pointed out before, Polkinghorne too believes that the concept of an inherent indeterminism in nature offers the possibility of a non-interventionist conception of SDA. But in view of his criticism of quantum-based theories (see above), he seeks a different way, viz. based on the chaos theory. Contrary to the usual interpretation of chaotic phenomenon, he thinks the unpredictability of chaotic phenomena is not a merely epistemological, but an ontological issue, inasmuch as he considers them as a sign of genuine indeterminacy in the universe.

His preference for chaos indeterminacy (over quantum indeterminacy) as providing an opportunity for SDA appears to be (though he nowhere says so explicitly, as far as I can see) that chaotic indeterminacy manifest itself at a macro-level instead of at the micro-quantum-level. There are two reasons why this is an advantage. First, at the quantum-level there is the

danger that changes neutralize one another, and secondly, the transition from quantum-level to macro-level is, so Polkinghorne argues, still very problematic from a theoretical point of view. Starting from an ontological openness at a higher (sup-quantum) level has the advantage that the second problem automatically disappears. Furthermore, the amplification aspect that is inherent to chaotic processes does away with the problem of the mutual cancellation of changes. As he sees it, this gives him the possibility of conceiving God's agency as a top-down activity (analogous to human action).

A chaos-based SDA is sometimes represented as a view in which God somehow actually manipulates minor changes in the initial conditions of a chaotic event so as to bring about large-scale effects (cf. Peacocke 1993, 154; Russell 1994, 568; Clayton 1997, 207). Lest his own point of view be interpreted in this way, Polkinghorne refers to those descriptions as “a most unfortunate misunderstanding” of his position (1996b, 39). His suggestion is *not* that God acts bottom-up by modifying the initial conditions, but that God acts top-down through a non-energetic input of ‘active information’. Thus, he sees God's agency as top-down (rather than bottom-up), and as a non-energetic activity of ‘active information’ (in stead of as manipulation or modification – which are energetic actions). This needs to be explained.

In his model of God's influence of the world, Polkinghorne makes use of two different pictures, both of which are intended to avoid that God's agency be understood just as one more energetic action, in other words, to avoid that God's agency be reduced to a cause among causes. One picture refers to the model of human activity, the other, more technical, picture to quantum physics, and more specifically to the idea of a ‘pilot wave,’ first conceived by Louis de Broglie in 1927, and later used by David Bohm and Basil Hiley (1993).

In his use of the analogy of human activity, Polkinghorne compares the activity of the human mind with God's agency. Whenever the human mind influences the brain, and thereby the remainder of the body so as to allow for free action in the physical world, it does so in virtue of the ontological gaps in the physical world. Similarly, God can make use of ontological gaps in order to influence the physical world. Not without irony, Polkinghorne remarks that this approach [...] “is something of an appeal from the unknown to the Unknown” (1998c, 87). The picture illustrates that the interaction between a spiritual/mental being and physical reality does not take place “by carefully calculated adjustment of the infinitesimal details of initial conditions so as to bring about the desired results. The whole trust of the proposal is expressed in terms of the complete holistic situation, not in terms of clever manipulation of bits and pieces” (Polkinghorne 1995, 154). And God's action does not break the laws of nature, any more than human activity does.

However, true absence of intervention in the sense of breaking laws requires zero energy costs, otherwise it would be a violation of the principle of the conservation of energy. In order to clarify this aspect, Polkinghorne makes use of the analogy of the ‘pilot wave’ or ‘quantum wave’ of Bohm and Hiley. The influence of such pilot wave on the smallest material particles is illustrated by Bohm and Hiley by the analogy of a ship sailing on automatic pilot, guided by radio waves. As they point out: “The essential point is that the ship is moving with its own energy, and that the *form* of the radio waves is taken up to direct the much greater energy of the ship. We may therefore propose that an electron too moves under its own energy, and that the *form* of the quantum wave directs the energy of the electron.” (Bohm & Hiley 1993, 32). By the use of the analogy of the ‘guiding wave’ of Bohm, Polkinghorne seeks to make comprehensible that God's influence can be a really guiding influence without in any way

requiring something like God's energetic causality, and therefore, without in any way requiring that the principle of the conservation of energy be violated, or that God would intervene. Thus, in stead of as 'energetic causality,' Polkinghorne conceives of God's action as 'informational causality' (Polkinghorne 1998a, 67).⁹

Now such 'active information' "might prove to be the scientific equivalent of the immanent working of the Spirit on the 'inside' of creation" (Polkinghorne 1998c, 89) which working can be described in terms of the analogy of Bohm's guiding wave. Thus, the core of Polkinghorne's argument is that God's informational causality is of an entirely different order than physical causality which always requires an energetic aspect. Only in this way can we avoid the theologically unacceptable idea that God is simply an invisible cause among physical causes.

So far the summary of Polkinghorne's position. Like Murphy's point of view, this position too has been the subject of critical debate, both negative and positive. The debate concerns primarily Polkinghorne's move from epistemological unpredictability to ontological indeterminacy (see e.g. Murphy 1995, 327-329; Clayton 1997, 207-208; Saunders 2002, 186-196, Wildman 2004, 47-50), as well as, but to a lesser extent, the relationship between chaos theory and the question of determinism. Thus, it has been argued, that it "makes little sense to appeal to chaos theory as positive evidence for metaphysical indeterminism when chaos theory is itself so useful for strengthening the hypothesis of metaphysical determinism" (Wildman and Russell 1995, 84), and that, maybe Polkinghorne's argument is itself is dependent on determinism (Saunders 2002 196). Other issues in the debate are Polkinghorne's reference to the possibility of active information without an exchange of energy (Saunders 2002, 206) and, more specifically, the concept of 'active information' changing complex systems through zero-energy alterations of particle trajectories on chaotic attractors (Peacocke 1993, 370 nt 62; Peacocke 2001, 53; Polkinghorne 2001a, 189; Saunders 2002, 206; Wildman 2004, 72 nt 57).

Here again, it is not my intention to sharpen or refute the criticisms, because all I want to do, again, is to compare the views of Polkinghorne and Whitehead regarding God's agency and its relation to natural laws, and to evaluate the similarities and differences from a theological point of view.

There are certainly some striking similarities:

⁹ Polkinghorne writes: "The word 'information' is being used...to represent the influence that brings about the formation of a structured pattern of future dynamical behaviour. This is not the same as the registration or transmission of bits of information in the sense used by telephone engineers or, more formally, by the mathematical theory of communication. A much closer analogue is provided by the 'guiding wave' of Bohm's version of quantum theory. The latter encodes information about the whole environment (it is holistic), and it influences the motion of a quantum entity by directional preferences but not by the transfer of energy (it is active in a non-energetic way). For information in the sense of the telephone engineer, there is a necessary cost in energy input, since the signal has to rise above the level of the noise of the background. For the Bohmian guiding wave there is no such energy tariff; the wave remains effective however greatly it is attenuated. I believe, therefore, that it is possible to maintain a clear distinction between energetic causality and 'informational' causality..." (Polkinghorne 1998a, 66-67).

- Like Polkinghorne, Whitehead too sees nature as non-deterministic and ontologically open so as to allow for agency, purpose, value and so on. In a nutshell, both thinkers reject a mechanistic world-view (Polkinghorne 1998b, 6).
- Similarly, like Polkinghorne, Whitehead argues in favor of two types of causality: on one level, causality pertains to facts while, on a different level, causality pertains to possibilities. This distinction may be conceived as parallel to the Aristotelian distinction between the level of matter and the level of form (cf. Polkinghorne 2000, 951).
- The most remarkable similarity concerns the role of information. Like Polkinghorne, Whitehead too conceives God's agency as a supply of information. The working of God as principle of concretion (Whitehead) and as active information understood in terms of Bohm's analogy of the guiding wave (Polkinghorne) show on many points a remarkable resemblance.
- For both thinkers God's influence through pure information input is of a quite different nature than the influence of worldly entities which always involves a mixture of energetic and informational causalities (Polkinghorne 1998b, 18). This results in both approaches in the theologically welcome consequence that God is not to be conceived of as a cause among other causes.
- For both thinkers God's informational causality provides 'directional preferences' (Polkinghorne 1998a, 66-67). Polkinghorne makes use of the picture of a strange attractor from complex system dynamics, whereas I rephrased Whitehead's concept in terms of the closely allied concept of a valuation or fitness function that generates a fitness landscape.
- Both thinkers link the idea of directional preference to the claim that there must be "an envelope of possibilities" in the bottom-up account of nature (Polkinghorne 1993, 446), which amount to saying that, though physical influences may be constraining, a becoming event is not determined by its external influences (Whitehead PR 27.47.224) (Polkinghorne 1998b, 16)
- Both Polkinghorne and Whitehead agree that everything that happens, does so in a particular context. For Whitehead, actual entities as self-organizing processes are essentially related, which explains why God's information that endows the novel process with a favorite direction is seen as an aim relative to a factual situation (y is a function of x). This seems to be similar to Polkinghorne's ideas expressed by the term "contextualism" (Polkinghorne 1996b, 36).
- Finally, both thinkers see the working of God as immanent to the world, as continuous and on the 'inside' of the world (Polkinghorne 1998c, 89).

Notwithstanding these remarkable and fundamental similarities, there remain also fundamental differences with regard to their respective views on divine agency and on the relation between God and the laws of nature.

We first look at the issue of *God's agency*. No matter how much the picture of the 'guiding wave' as providing directional preferences resembles what Whitehead calls God's primordial nature, the effect is quite different. For Polkinghorne, is *God* the one who does something through information: "active information brings about actual future behaviour" (1996b, 36). For Whitehead, on the contrary, it is the *process*, that being constituted by the God-given aim, is the actor and *realizes itself* on the basis of God's informing. If we stick to the Bohm-Hiley picture, we might say that for Polkinghorne, God influences the worldly process like the radio wave influences the automatic pilot of the ship. The automatic pilot is entirely governed by the radio wave (albeit without energy exchange, but nevertheless

passively governed), whereas for Whitehead, God’s guiding influence functions more like a gps-device (though the comparison is seriously inadequate because it fails to take into account the immanent character of purposiveness and lawfulness). Whitehead’s God-given aim provides a direction proposal as the best option, but that option has still to be realized by the car driver as actor. If, for some reason, the driver deviates from the proposed direction, the gps-device will provide a novel proposal – adjusted to the new situation – but, though going were impossible without this information, the proposed route must be actualized by the car driver.

If we consider that for Polkinghorne, God’s active information in fact produces the actual changes, the difference with Murphy’s approach is far smaller than Polkinghorne had hoped for. For both of them, worldly events *are* changed (passively) by God. Or to say it the other way around: God is conceived of as being capable to change actively world events. It may be clear that Murphy’s and Polkinghorne’s approaches, though they are not interventionistic in the strict sense of the term, yet reintroduce the old theodicy question (and after all as insolvable as in interventionism, I fear).

Though Polkinghorne claims, with Charles Kingsley, that God did something cleverer than producing a ready-made creation, in “making a world that can ‘make itself’” (Polkinghorne 2000, 946) and speaks of creation as “exploring divinely granted potentiality” (ibid), he never clearly explains how the actualizing divine information leaves the creation free to explore the various possibilities of making itself. Here Whitehead’s conception is useful in that it provides the necessary conceptual underpinning of such freedom and autonomy, to the extent that God’s informational influence as such cannot *actualize* itself one of the possibilities. Actualization means de-cision, cutting off of possibilities. And, precisely because God is an infinite *conceptual* realization (PR 343.346), God cannot provide a *physical* limitation (Oomen [1998] 2004, 189).

Let us finally explore the crucial difference between Polkinghorne and Whitehead concerning the relation between *God and the laws of nature*, which is in this article the focus of interest. Like Murphy, Polkinghorne too makes use of a twofold construction: God’s creation and sustenance of the world with its laws precedes God’s special actions. In the words of Polkinghorne: “[A]ny scientific theory that tries to tell us about what happened very near the origin of the universe is going to assume that the laws of nature already exist. I ask where those laws of nature come from, and my answer is God. I think the will of the Creator allowed the history of the world to unfold.” (Polkinghorne 2001b, 1/3). Thus, Polkinghorne too defends an imposition view of the laws of nature. Active information, as seen by Polkinghorne, therefore influences a world which is already created with its own laws. This influence is consistent to the extent that it never violates those laws. But it determines the course of the world.

For Whitehead, on the other hand, God stands for that in virtue of which lawlike regularities may derive from the behavior of worldly entities. As I have already pointed out, Whitehead never is confronted with the problem of having to explain how God’s agency can find some leeway in the framework of existing laws, nor does Whitehead have to restrict God’s agency to the openings left by the laws. In Whitehead’s view, God is in no way limited by the laws of nature, for the simple reason that there are no laws of nature that exist of their own, because the ‘laws’ arise together with the by God constituted and guided events and their directionality. All this is fully explained in terms of the single one agency of the

primordial nature of God, as ascribed above. God’s primordial nature is the *conditio sine qua non* of all these aspects, in the same way that the fitness function of a complex self-organizing system explains that it exists and that it is dynamic and that it displays regularity in its dynamic behavior.

Far from being a “Marginal Persuader” (Polkinghorne 1996b, 38) is God (more specifically: God’s primordial nature) in Whitehead’s view a necessary requirement for the existence of the world, for the directionality of worldly entities, and for the regularity of their dynamic behavior, where that regularity itself can change in relation to the changes that occur in the world (see the above description of moving target control). And in all this, he does conceptual justice to the freedom and autonomy of those entities.

8. CONCLUSION

At the end of this article I will give a short recapitulation.

Differences with the view that God wants/makes/imposes the laws. In Whitehead’s conception, God works like a fitness function by which regularity can emerge. This, however, does absolutely not imply that God has wanted or preordained the particular emerging regularities. Whitehead’s conception of God as ground of lawfulness involves two peculiarities that make it radically different from the view that God imposes the laws: God’s will *cannot* be derived from the factual ordering of nature, and ‘laws’ are *not* immutable. These features yield important consequences for the debate concerning God’s guiding role in relation to the course of history (e.g. evolution).

Differences with the view that God acts in the openings the laws leave. Whitehead’s view differs fundamentally from views that find room for divine action in the the indeterminacies based on quantum mechanics and /or chaos theory. First, and most importantly, Whitehead does not regard God’s action as a kind of actualization. God actualizes no events at all—neither on a macro scale, nor on a quantum scale (*contra* Pollard, Murphy, Russell and others). Rather, God works in *every event* (as Murphy also states, *contra* Russell, Tracy)—not, however, as one who actualizes but as the object of desire. This may sound too weak to be adequate to the Christian belief (Polkinghorne on many places, e.g. 1998c, 87), but then it is overlooked that this attraction to the best possibility constitutes individual events, according to Whitehead. Whitehead does not see God operating in the space left by chance, but considers God to be *the very ground of (statistical) lawfulness*. So God is required for every event, and without God there would be no laws and no world.

At first glance, Polkinghorne’s view of God as “communicator of information” looks very similar to Whitehead’s view. But Polkinghorne also states that the factual laws of nature are God-given (locus A) (Polkinghorne 1994). And it may be instructive to see how pervasive position A (God as imposer of natural laws) is. Even Hartshorne, notwithstanding his close relationship to Whitehead, writes as follows: “[O]ne of the chief merits of a theistic philosophy [is], that it can explain the outlines of the world-order, the laws of nature, as *divine decrees*” (Hartshorne, 1970, 125; emphasis added), and again: “God as orderer of the

world, the type of order differing in diverse cosmic epochs, *determines the laws* which, however, are not classical deterministic laws but are statistical, or somehow allow for change and probability” (Hartshorne 1991, 646; emphasis added). These differences between Whitehead’s view and these views may be recognized as remarkable.

Let me conclude with *some characteristics of Whitehead’s view on the so-called laws of nature in relation to God*. Whitehead’s perception of the so-called laws of nature may be characterized as an immanence view, spiced with “some notion of imposed law” (Whitehead [1933] 1967, 115) (Oomen 2003a). Whitehead does not view natural laws as eternal necessities in the mind of God imposed upon the world by a divine choice (as in deism), nor does he view them as mere descriptions or conventional interpretations, and in stead of being constraints for God’s action (as is the case in most indeterministic theologies) they arise – due to God – from the factual occurrence of the actual processes (Oomen 2003a). Even though God is seen as the *conditio sine qua non* for the possibility of natural ‘laws’ (as valuation or fitness function), the natural ‘laws’ are not in any sense a direct expression of God’s will. And even though there is no question of complete reducibility, there is an internal relationship, as we have seen, between the aim (y) and the given situation (x). Thus, the most characteristic aspects of immanent lawfulness apply. This has two important consequences. The first is that the scientific belief that we can *understand* the behavior of worldly events has a *fundamentum in re*. The second consequence is that the natural ‘laws’ may be seen as neither fixed nor deterministic, but as to some extent variable and statistical. If we look for genuine openness, this is the place where it really is to be found, not as a prerequisite for the possibility of God’s action in the world, but as a consequence of the way God works in and with the world.

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