

The possible significance of the notion valuation function in self-organizing systems for a discourse on God and self

Palmyre Oomen

Paper Presented at the *Sixth International Whitehead Conference*

“The Importance of Process – System and Adventure”

Salzburg, Austria, July 3-6, 2006

[draft version]

1. Introduction

In this presentation I want to make a comparison between two things belonging to very different fields. That is to say, I want to explore the structural similarity (if any) between Whitehead’s notion of God’s primordial nature on the one hand, and on the other the notion of a mathematical function, the so called ‘fitness function,’ which is a valuation function that plays a role in self-organizing systems and has something to do with attractiveness and, therefore, with the directionality of such dynamical systems.

My thesis is that there is some degree of structural similarity (but also of dissimilarity).

In this presentation I will proceed along the following lines:

First I will give some description of these two notions (Whitehead’s concept of the divine primordial nature and the notion of fitness function from the field of self-organization/adaptive dynamics), and then I will investigate the similarities and dissimilarities. Finally, I will explore some philosophical/theological consequences of this suggested similarity.

2. Whitehead

As is well known, in Whitehead’s philosophy, God is said to have two sides or natures: the primordial and the consequent nature. Whitehead characterizes God’s primordial nature as both the *source of new possibilities* and the *atemporal valuation of all possibilities*.

As such, God’s primordial nature is an orientating instance, which provides an initial preferred *direction* to worldly occasions, and in so doing constitutes them as autonomous subjects (PR).

Thus, the creative advance of the world presupposes the divine primordial nature for its directionality, and by the same token this primordial nature constitutes the ‘self’ of worldly events (‘subjects’).

This concept of ‘self’ may be designated as ‘ex-centric’ or ‘relational.’ In other words, this ‘self’ is not something self-sufficient or independent, but only exists by virtue of its relation to something else, its being attracted to what is alien/other/not yet.

I will come back to this later on.

Though alien/other in some sense, in Whitehead’s conception this divine primordial nature is very ‘immanent’ in the sense that this primordial nature does not impose directionality from without but makes felt what *in* the worldly situation itself is present as its best possibility, and this nevertheless without coinciding with the world or coming forth from it: “[W]ith this doctrine [of the theologians of Alexandria for whom Whitehead has great sympathy] the necessity of the trend towards order does not arise from the imposed will of a transcended God. It arises from the fact, that the existents in nature are sharing in the nature of the immanent God” (AI 130).

That is to say, the divine primordial nature it is not something outside and before the World, but it is with the world (PR 343). However, it is not a product of the world, that is, it not endogenous, because it is a condition for the working of the world.

3. Self-organization, adaptive dynamics & valuation function

Self-organization is the process of the spontaneous emergence and maintenance of order in a complex dynamic system. The capacity for self-organization enables the system to develop or change its internal structure spontaneously and adaptively in relation to its environment. The term ‘spontaneous’ is meant to refer to the absence of control by an external or central agent. The ‘control’ of the organization is typically distributed over the entire system. Because of this distributed character such organization tends to be robust, resisting perturbations.

‘Adaptive (system) dynamics’ is one of the fields in which self-organization is an object of study. Adaptive self-organizing processes often involve an implicit criterion, such as a 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 in relation to the environment.

So, generally, self-organizing processes involve something that evaluates a development in one direction as more attractive than a development in a different direction, because that one is felt to be more beneficial than the other. And this difference in attractiveness comes to give an orientation to the course of the process.

Thus, in many mathematical models of self-organizing processes an important role is played by such ‘principle of preference’ or ‘valuation function’ (often called ‘fitness function’ even in non-biological contexts). This valuation or fitness function may be seen as a mathematical representation of freedom and direction because it is an algorithm / 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.

Valuation functions occur in both natural and artificial self-organizing systems such as learning robots. But whereas in artificial systems, the valuation function is externally built into the robot so as to make it self-learning, in evolutionary biological processes it seems to be given within the system itself, that is, to be part of the system itself.

The recent field of ‘adaptive dynamics’ has been derived from ‘general systems theory.’ In this new field the old idea of a valuation or fitness function implying a ‘fixed target control’ (Wright, Fisher) is transformed into the idea of a fitness function that, though in itself immutable, involves a ‘moving target control’ (Metz e.a.). The latter function means that any change within the system influences the preferred direction of that system.

A more convenient way of picturing this function and its role is offered by the image of a fitness landscape. Here the fitness value is represented as a third dimension in relation to a (for the sake of convenience) two-dimensional phase-space. This gives a landscape of hills and valleys. The higher the better, and therefore the system will be moving in the direction of the top of a hill. In a so called ‘fixed target’ control situation the hill is on a fixed place 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 influence the landscape and therewith the preferred direction of that system. It is (to help our imagination) like walking on an air mattress. You want to go to the highest place of the mattress, but by doing so the mattress will sag on that very place. And walking to the next highest place will again cause *that* place to sag under the influence of your footstep. etc. So, here we have a more sophisticated idea of a fitness function which, though in itself immutable, does *give rise to directionality but not to a fixed direction*, because the given directionality depends on the changing situation.

 Now it is time to connect this notion of a valuation or fitness function with Whitehead’s notion of the primordial nature of God. As I have pointed out, my claim (suggestion) is that there is some similarity 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. However, first I want to deal with some (apparent) dissimilarities.

4. Dissimilarities

Striving as subjective aim or as statistical effect?

In Whitehead's case, the subject constituted by the aim provided by the divine primordial nature is a subject, that is, it has an aim, is urging something and deciding etc.

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.

Self-sufficient Self or Relational Self?

Taken in combination with the idea that the fitness function in natural systems arises together with the system itself, in other words is endogenous, the term 'self' (e.g. of self-organization) seems to mean the same as 'not influenced by an external norm.' Thus, the philosophical interpretation of self-organization seems to connote a 'closed or self-sufficient self,' and in that case the fitness function is considered to be descriptive (it does not 'cause' something).

However, this idea of a 'closed self' is at odds with the idea of 'self' or 'subject' that inherently needs a reference to the outside, as it was conceived by Whitehead and in the phenomenological-hermeneutical tradition of philosophical anthropology.

We will come back to this later.

5. Similarities

Despite these dissimilarities, I will argue that there is some similarity 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. 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. SMW 151.155). See, for instance, the following passages (among many others): “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 thesis therefore is that Whitehead’s concept of the principle of concretion may be understood as to some extent similar to the above mentioned ‘valuation function’ or ‘fitness function’ (cf. Oomen 2006). Moreover, this suggestion seems to nicely concur with Whitehead’s own remark in *The Function of Reason*: “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*” (FR 89-90).

6. Exploration of consequences

Let us now turn to an exploration of some philosophical-theological consequences of this suggested similarity. If any such similarity exists, what are the philosophically-theologically interesting impulses that are generated by a discourse about God in these mathematical terms? These may touch upon issues concerning the notion of ‘self,’ and of course concerning the relationship between God and world.

Self

As we have seen above, in Whitehead’s philosophy – but also in a much broader tradition in philosophical anthropology – the ‘self’ or ‘subject’ inherently needs a relation to something else, which seems to be at variance with the idea of ‘self’ as independent from any reference to the outside, as it usually appears in scientific discourse.

However, the question is whether the ‘self’ of the self-organizing process is as closed and independent from reference to the ‘outside’ as it is made out to be. The fitness function may be part of the system itself (in natural systems), but there is no reason why this should exclude a

constitutive role *per se*.

In any experience of reality, the designation of what is outside or inside, external or internal, is determined by a choice of perspective. To draw a parallel: The engine of a car is surely part of the car, but it is also that by virtue of which the car can go/run. So it is both *part of* it, and *constitutive* of its motion. Or a heart: it is both part of my body, and constitutive of its being. Therefore, the question may be raised whether Whitehead's view of the self as constituted by the desire derived from God's primordial nature, is not more akin to what in the other language game is signified by 'a preference derived from the fitness function' than is suggested by the above distinction between the two opposite concepts of the 'self.'

The insight that the self is constituted by its attraction towards what appears as 'good,' is very important for an understanding of freedom. In short: Freedom is not something despite constitutive relations, indeed freedom exists only thanks to such constitutive relations. As Whitehead states: The initial aim derived from God constitutes us as autonomous, free subjects (PR 244) (cf. Oomen 2003).

God's action seen in the perspective of a valuation function

An exploration of the suggested parallel between the role of a valuation or fitness function with respect to its dynamical system and the role of God's primordial nature to the World leads us to the following considerations.

In the representation of a valuation or fitness function God's agency is pictured as working interactively, as always in interaction, and therefore as not deistic.

In that suggested representation, God's role is pictured as not guiding from without, not imposing, and therefore as not theistic in the common sense of that word.

According to the similarity with the working of a valuation function, God's providing an initial aim does not imply predetermination (no fixed goal, no imposed direction). But it is a prerequisite for the subject's own directionality and existence.

This picture avoids the idea of one perfection of order, because the "best option" is always dependent on the actual contingent situation of the world, that is, it is "the best for that impasse" (PR 244). Compare Whitehead's saying: "The notion of one perfection of order, which is (I believe) Plato's doctrine, must go the way of the one possible geometry. The universe is more various, more Hegelian" (ESP 118).

And last but not least: God's agency as valuation function is not required in exceptional occasions, but always.

7. Concluding remark

The dominant cultural climate, as reflected for instance in public discourse, is characterized by

the fact that ‘self/autonomy’ and ‘God’ are understood as mutually exclusive antipodes. In Whiteheadian thought, however, the affirmative discourse about God does not undermine but indeed *supports* the view that man and nature are autonomous.

In my view, the partial similarity between the working of the primordial nature in the world, and the working of a fitness function in a self-organizing system may be helpful and important to both science and theology.

It offers science a more sophisticated idea of the meaning of ‘self,’ i.e., it increases the awareness that our scientific conception of ‘self’ is too poor, too one-dimensional, that a real autonomous self does not exclude constitutive relations with something ‘else.’

On the other hand the connection of Whitehead’s model of God with scientific insights of self-organization, may help a better understanding of the implications of Whitehead’s insights concerning God’s role, and help renew the theological discourse about God, freedom and directionality.

References:

Alfred North Whitehead:

AI *Adventures of Ideas*, New York: Free Press, 1967 (1e ed. 1933).

FR *Function of Reason*, Boston: Beacon Press, 1929.

PR *Process and Reality: An Essay in Cosmology*, New York: Free Press, (Corrected edition, ed. by D.R. Griffin & D.W. Sherburne), 1978 (1e ed. 1929).

SMW *Science and the Modern World*, New York: Free Press, 1967 (1e ed. 1925).

Fisher, R.A., *The genetical Theory of Natural Selection*, Oxford: Clarendon Press, 1930.

Metz, J.A.J., C. Rueffler & T.J.M. Van Dooren, ‘Adaptive walks on changing landscapes: Levins’ approach extended,’ in: *Theoretical Population Biology* 65 (2004), 165-178.

Oomen, P.M.F., ‘On Brain, Soul, Self and Freedom: An Essay in Bridging Neuroscience and Faith,’ in: *Zygon* 38 (2003) 2, 377-392.

Oomen, P.M.F., ‘No Concretion without God,’ in: F. Beets, M. Dupuis & M. Weber (eds.), *La science et le monde moderne d’Alfred North Whitehead: Actes des Journées d’étude internationales tenues à l’Université catholique de Louvain 2003*, Frankfurt / Lancaster: Ontos Verlag, 2006, 203-220. [=Chromatiques whiteheadiennes III].

Wright, S., ‘Adaptation and Selection,’ in: *Genetics, Paleontology, and Evolution*, ed. by G.L. Jepsen, E. Mayr & G.G. Simpson, Princeton, NJ: Princeton University Press, 1949, 365-389.

Prof.dr. Palmyre Oomen

Director Theology and Science Section - Heyendaal Institute - Radboud University Nijmegen,
The Netherlands, p.oomen@ru.nl, and

Professor of Philosophy - Eindhoven University of Technology