Commentary on O'Regan

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Virtual Action: O'Regan & Noë, Meet Bergson

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Abstract

Bergson, writing in 1896, anticipated "sensorimotor contingencies" under the concept that perception is "virtual action." But to explain the external image, he embedded this concept in a holographic framework where time-motion is an indivisible and the relation of subject/object is in terms of time. The target article's account of qualitative visual experience falls short for lack of this larger framework.

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> [Objects] send back, then, to my body, as would a mirror, their eventual influence; they take rank in an order corresponding to the growing or decreasing powers of my body. The objects which surround my body reflect its possible action upon them. (Bergson, 1896/1912, pp. 6-7)

So Henri Bergson would initiate his thesis that perception is *virtual action*. It is a more succinct phrase for the important theme of O'Regan & Noë wherein sensorimotor contingencies underlie vision, though the latter concept as developed, I believe, lacks an appreciation of the power of Gibson's invariance laws in specifying events and as input to the action systems. But the primary point here is this: O'Regan & Noë lack the framework in which Bergson embedded this concept, and for this reason, their attempt to use it to explain visual experience suffers.

What does the "world as external memory store" look like? If a fly is moving by in the external field, is it the buzzing being of our normal scale, is it flapping its wings heron-like, is it a whirling mass of electrons, a continuously transforming ensemble of quarks, a local pool of pulses in a vast universal sea? The external world as we know it is not simply there to be sampled. The brain imposes a scale of time. It is itself a dynamical system integrating multiple scales, from quark, through electron, through chemical flows, through neuronal patterns. It can be asked, as did Hoaglund (1966), if, *in principle*, the process velocity underlying this global dynamics can be changed, if, for example, the "buzzing" fly of our normal scale could become a heron-like fly, barely flapping his wings, i.e., a new specification of scale?

Scale implies *quality*. The "buzzing" fly is a certain quality, the heron-like fly another. Our normal "red" is one quality, the far more vibrant red of the heron-like scale, nearer the individual oscillations of the electromagnetic field, another. That the underlying dynamics impose a scale already takes us beyond the origin of quality as simply the interrelation of actions – beyond "sensorimotor contingencies at play" (sect. 6.3). Scale also implies *extent*. The buzzing fly defines a certain time-extent - a multiplicity of *past* events, e.g., wing oscillations, summed in a blurred visual display. The heron-like fly defines a much lesser extent, the quark-fly far less.

On the one side, we see the brain with its dynamics inherently incorporating the motor systems via their re-entrant connections to visual areas, and thus supporting the sensorimotor contingencies. This dynamics, characterized perhaps by an attractor, looks nothing like the world of experience. On the other, we have the world-out-there as experienced - two completely different terms - the gap. O'Regan & Noë would have us stop here. We need only the external memory store, waiting to be sampled, virtually acted upon. But action upon what? The external field looks nothing like the world as experienced. What is the 4-D extent of this field? At the null scale of time, it is, in the root sense, a non-imaginable field. Sensorimotor contingency, in and of itself, cannot explain the origin of our normal *image* of this field.

Bergson, 50 years before Gabor's discovery, 85 before Bohm (1980), saw this field as a holographic field. He visualized it as a vast field of *real* actions where every object is obliged "to transmit the whole of what it receives, to oppose every action with an equal and contrary reaction, to be, in short, merely the road by which pass, in every direction the modifications, or what can be termed *real actions* propagated throughout the immensity of the entire universe" (1896/1950, p. 28). Discarding the concept, as do O'Regan & Noë, that the brain develops a photograph or representation of the external world, he argued in holographic terms:

> But is it not obvious that the photograph, if photograph there be, is already taken, already developed in the very heart of things and at all points in space… Build up the universe with atoms: Each of them is subject to the action, variable in quantity and quality according to the distance, exerted on it by all material atoms. Bring in Faraday's centers of force: The lines of force emitted in every direction from every center bring to bear upon each the influence of the whole material world. (1896/1912, p. 31)

Individual perception, he argued, is *virtual action*. An organism is a system of field elements organized for action. Embedded in the vast (holographic) field of real actions, those influences to which its action systems can respond are reflected as it were as virtual action, the rest simply pass through.

> Only if when we consider any other given place in the universe we can regard the action of all matter as passing through it without resistance and without loss, and

> the photograph of the whole as translucent: Here there is wanting behind the plate the black screen on which the image could be shown. Our "zones of indetermination" [organisms] play in some sort the part of that screen. They add nothing to what is there; they effect merely this: That the real action passes through, the virtual action remains. (1896/1912, pp. 31-32)

Put in holographic terms, the brain is now seen as a modulated reconstructive wave in a holographic field. The re-entrant architecture, the resonant feedback loops, the "scales" of neural dynamics all ultimately support this modulated wave. As a wave traveling through a hologram is specific to a virtual image, this wave is specific to a time-scaled, virtual subset of the field related to the body's action.

There is no homunculus here viewing a re-projected wave front (image). Firstly, due to the holographic nature of the field, wherein each point carries the information for the whole, there is an elementary or "pure perception" in Bergson's terms defined across the field at the null scale. This is reinforced by the time-motion or evolution of the field, a motion which must be treated, not as a series of discrete states or "instants," but as indivisible. As does Nottale (1996) now, Bergson rejected the differentiability of the space-time continuum. It is this indivisible, or non-differentiable motion that fundamentally supports the qualitative aspect of the world with its time-extents - "buzzing" flies or "mellow" violins (Robbins, 2004). Secondly, the modulated wave supported by the body/brain is not spatially distinct from the field. The crucial principle of Bergson was this: "*Questions relating to subject and object, to their distinction and their union, must be put in terms of time rather than of space*" (1896/1912, p. 77). The buzzing fly and the transforming brain are phases of the same dynamically transforming field. At the null scale of time there is no spatial differentiation between body/brain and fly. But gradually raise the ratio of events in the matter-field relative to events at the highest scale or level (neural) of the brain – from a vaguely outlined ensemble of whirling "particles," the form of the fly begins to coalesce, then barely move its wings, then becomes the heron-fly, then becomes the buzzing being of our normal scale. The dynamical state of the brain is specific to a 4-D extent, a time-scaled subset of the *past*, i.e., *it is specific to a time-scaled subset of the elementary perception defined over the field.* Symmetrically, it is specific to the possibility of *future* action.

This is Bergson's framework for the relation of sensorimotor contingencies to external field, and therefore the origin of the "external" image, i.e., how we take "the perceived detail to be out there in the world." (sect. 6.7) The indivisible time-motion of this field underlying (scaled) 4-D extents is the true support for quality. Within this framework, implicit in sensorimotor contingencies, is another, relativistic implication (Robbins, 2000; 2001; 2002). If perception is the display of virtual action, it is the display of capability of action, e.g., for the buzzing fly, his wing-beats a-blur, of the modulation of the hand-arm necessary to grasp the fly. But if the dynamics underlying this can be changed, e.g., if the chemical velocities underlying this global dynamics were increased, then perception must change. The fly perhaps becomes the heron-like fly – precisely because it is a new specification of the possibility of action, perhaps now showing the possibility of removing the fly from the air by his wing-tip. This must be so if perception is to be ecologically valid. Albeit unclear practically how today, this is a testable consequence.

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