On the Concepts of Transaction and Intra-action

Using the two key concepts "transaction"[1] and "intra-action"[2], I will outline a dynamic relationalist perspective, which aims not so much at reconciling realism and relativism, as at transcending the realism-relativism debate. John Dewey uses the term trans-action predominantly in *Knowing and the Known*, written together with Arthur Bentley in 1949. The term intra-action is coined by the American feminist and physicist Karen Barad and is a key-concept of her agential realism as developed in *Meeting the Universe Halfway* from 2007.

Relationalism challenges the very basis for the traditional debate between realism and relativism by cutting across the alleged divide between these two perspectives. In the relationalist perspective outlined, it is the relational intra-activity that constitutes reality and defines subject and object.

Is this, then, a way to understand reality, or is it (just) a way to understand our *understanding* of reality? That is: are we dealing with ontology or epistemology? Possibly the safest route would be to restrict the claim to the epistemological (like Dewey does in *Knowing and the Known*), but with the aid of Barad's thinking, presenting the key elements of her *agential realism*, I dare to make it into an *onto-epistemological* claim.

Let us start with the problem to which a relationalist approach is a possible solution. In his *Pragmatism without Foundations* Joseph Margolis, sets out, as the subtitle tells us, to reconcile realism and relativism. What is needed, according to Margolis', to secure the possibility of objectivity and thereby the

[1] From John Dewey's *Knowing and the Known* (together with Arthur F. Bentley), Boston 1949.
[2] Karen Barad, *Meeting the Universe Halfway – Quantum Physics and the Entanglement of Matter and Meaning*, Durham & London 2007.

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reliability of science, is an integration of ontic and epistemic internalism with an ontic *externalism*, according to which there is some mind-independent reality. Margolis' calls his position "internal relativism"[3], a position that has much in common with, but also is contrasted to Putnam's internal *realism*. Margolis presents Putnam's position at length, describing it as "misleading", but at the same time "helpful", as it helps us to see "what more is required". This search for a way to secure the possibility of objectivity seems to be the main goal for efforts like Margolis' and Putnam's, and it is also an often used argument against relativism and pragmatism that these rule out this possibility of objectivity.

But there are ways of keeping the possibility of objectivity and the reliability of science without resorting to ontic externalism.

Dewey's concept of 'trans-action'

Another way of solving the problem of objectivity (although this is not what he explicitly sets out to do) is offered by John Dewey's use of the concept of 'trans-action', which opens a possibility of ensuring a minimal scientific objectivity, without having to resort to ontic externalism. In Dewey's trans-actional perspective there is no place for the idea of something mind-independent in the world of man, and still there is a possibility for knowledge and science.

Dewey contrasts the transactional perspective with the antique view of self-action and the interactional view of classical mechanics: *Self-action* means that an object is viewed as acting under its own power; *inter-action*, means that object is balanced against object in causal interconnection; while *trans-action* means that systems of description and naming are employed to deal with aspects

[3] Margolis:289.

and phases of action, without final attribution to 'elements' or other presumptively detachable or independent entities or realities.

The fundamental difference is that in the *transactional* perspective, no radical separation is made between the subject and the object of knowledge, between the observer and that which is observed – the determination of objects as themselves is trans-actional.

This means that knowing is co-operative, open and flexible in character, in a way that excludes assertions of fixity, and that knowledge is viewed as *itself* inquiry – as a goal *within* inquiry, not as a terminus outside or beyond inquiry. (97)

Dewey demands a treatment of all of man's "behavings, including his most advanced knowings, as activities not of himself alone, nor even as *primarily* his, but as processes of the full situation of organism-environment". An "object" is to be seen as an "unfractured observation", which is neither existing separately apart from any observation, nor existing only in our head "in presumed independence of what is observed" (131).

The term transaction is used early by Dewey to stress *system* more effectively than done by 'interaction'. It is introduced in the paper "Conduct and Experience" from 1930[4] (published in *Psychologies of 1930*), where he writes:

> The structure of whatever is had by way of immediate qualitative presences is found in the recurrent modes of interaction taking place between what we term organism, on one side, and environment, on the other. This interaction is the primary fact, and it constitutes a trans-action. Only by analysis and selective abstraction can we differentiate the actual occurrence into two factors, one called organism and the other, environment.(411)

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It is not enough to consider the organism-as-a-whole, what is needed is to consider the organism-*in-environment*-as-a-whole. Dewey admits that the transactional point of view may be difficult to acquire at the start:

> If we watch a hunter with his gun go into a field where he sees a small animal already known to him by name as a rabbit, then, within the framework of half an hour and an acre of land, it is easy—and for immediate purposes satisfactory enough—to report the shooting that follows in an interactional form in which rabbit and hunter and gun enter as separates and come together by way of cause and effect. If, however, we take enough of the earth and enough thousands of years, and watch the identification of rabbit gradually taking place, arising first in the subnaming processes of gesture, cry, and attentive movement, wherein both rabbit and hunter participate, and continuing on various levels of description and naming, we shall soon see the transaction account as the one that best covers the ground[5].

According to Dewey transaction represents a level in inquiry in which observation and presentation could be carried on without attribution of the aspects and phases of action to independent self-actors, or to independently inter-acting elements or relations (136). In a transactional perspective there is no basic differentiation of subject and object, no knower to confront what is known as if in a different realm of being, no 'entities' or 'realities' of any kind intruding from behind or beyond the knowing-known events, no constituent that can be adequately specified as fact apart from the specification of other constituents, and a thing is not something static, but always in action.

In *Knowing and the Known*, Dewey underlines physics increasing use of the transactional perspective and gives a brief sketch of the history of physics from

[5] Dewey 1949:141f.

Aristotle's physics built around self-acting substances, via Galileo's and later Newton's inter-acting particles, to Einstein's physics which brought time and space into the investigation, using the transactional approach, a seeing together of what earlier had been seen in separation – a physics in which "a particle by itself without the description of the whole experimental set-up is not a physical reality"[6] (Dewey quotes, with approval, Philipp Frank's *Foundations of Physics)*.

When it comes to the question of how we are to understand the concept of 'physical reality', Dewey refers to a discussion between Einstein and Bohr from the 1930s, and makes the remark that Einstein, "in contrast with his transactional […] treatment of physical phenomena […] remained strongly self-actional […] in his attitude towards man's activity in scientific enterprise". Dewey contrasts this position with Bohr's "much freer view of the world that has man as an active component within it, rather than one with man by fixed dogma set over against it". Dewey's explicit preference for Bohr's approach makes it eligible to take a closer look at Bohr and his concept of 'phenomena', which will eventually lead us to the second of the two key concepts of this paper: intra-action.

Bohr developed a philosophy-physics as a response to the enigmas accentuated by the developments in theoretical physics at the beginning of the 1920s. By then the wave-particle duality was an established quandary for physics – not only concerning the nature of light, but also concerning the nature of matter – showing that *the nature of the observed phenomenon changes with corresponding changes in the experimental apparatus*.

[6] Dewey quotes, with approval, from Philipp Frank's *Foundations of Physics*.

The wave-particle-dualism was solved in two different ways by Bohr and Heisenberg in 1927. Bohr's solution was the principle of complementarity, Heisenberg's was the uncertainty principle. The uncertainty principle is *epistemological* in character, focussing on what *knowledge* we, under specific circumstances, can have about a particle's properties; a question of being *uncertain* of a value, existing independently of, but rendered impossible to attain accurately *due* to, the measurement. Bohr's principle of complementarity, in contrast, has *ontological* implications.

To Bohr properties like 'momentum' and 'position' have no observer-independent physical reality, and "'wave' and 'particle' are classical descriptive concepts that refer to different mutually exclusive *phenomena*, not to independent physical objects"[7].

A major point for Bohr, as for Dewey, is that we are ourselves *part* of the reality we are investigating, and that there is no definite and self-evident *cut* between ourselves as investigating subjects and the world as investigated object. According to Bohr the object and the agencies of observation constitute a whole, and he uses the term "phenomena" to denote these, what he calls, "particular instances of wholeness". The interaction between the object and the agencies of observation constitutes, according to Bohr, an inseparable part of the phenomenon, and it is to these phenomena that observations refer, not to "*objects in an independent reality*"[8]. This position is very similar to the one expressed by Dewey in "Conduct and Experience":

> There is something in the *context* of the experiment which goes beyond the stimuli and responses directly found within it. There is for example, the *problem* which the experimenter has set and his *deliberate* arrangement of apparatus and selection of conditions with a view to disclosure of facts that bear upon it.
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> (411f)

[7] Barad 2007:179 (italics in the original).
[8] Ibid:170 (italics in the original).

According to Bohr there is no given distinction between the object and the agencies of observation; each measurement or observation implies a choice of the apparatuses of observation, made for the specific occasion, that provides a constructed cut, separating 'the object' from 'the agencies of observation'. This specific cut is only applicable in a given context, it delimits and is part of a specific phenomenon. Thus, the idea of "mind-indepence" or "context-independence" is a chimera.

A property or a measurement value cannot be attributed to an observer-independent object. Neither is it possible to see the property as *created* by the measurement (which would fly in the face of any sensible meaning of the word "measurement"). What empirical properties refer to are *phenomena*, that is, in the Bohrian meaning of "particular instances of wholeness", where the measurement interaction is part of the phenomenon.

Bohr questioned Einstein's view of physical reality as something *separated* from the agencies of observation, and stressed that the agencies of observation "constitute an inherent element of the description of any phenomenon to which the term 'physical reality' can be properly attached"[9].

The Bohr – Einstein debate can be judged as a philosophical dispute concerning the truth of the intrinsic-properties theory; a theory that presupposes a clear-cut separation between the subject and the object of knowledge, that there are properties of an object there, in a fixed state, before and independently of the agencies of observation.

According to Bohr, we cannot speak of the reality of objects *apart* and *separated* from or *preceding* the interactions with the agencies of observation. Bohr renounces the idea of separability, and holds that each object we observe is given the character it has by the phenomenon in which that object is observed.

[9] Ibid:127.

Still, to Bohr, a phenomenon is "objective" in its being intersubjectively valid, and since there is no explicit reference to any *individual* observer, *not* because it reveals a pre-existent intrinsic property of the object. This *relational*-properties theory, holds properties to be *objective* but not absolute, that is, they are things-in-phenomena, not observer-independent things.

Everything hinges on the question of separateness or relatedness. Einstein never abandoned his ontology of separateness, an ontology that is very difficult to reconcile with quantum physics. The choice of separateness or relatedness seems to be *the* basic ontological divide. The position outlined in this paper is an onto-epistemology of relatedness.

While Bohr focused on physical-conceptual agencies of observation and *laboratory*-style apparatuses, Barad uses the concept of agencies of observation and apparatuses more *generally*, to denote "open-ended and dynamic material-discursive practices through which specific 'concepts' and 'things' are articulated"[10].

To Barad, phenomena are "neither individual entities, nor mental impressions, but entangled material practices"[11], a position that comes close to Dewey's view on the object (referred to earlier) as an "unfractured observation", which is neither existing separately apart from any observation, nor existing only in our head "in presumed independence of what is observed" (131).

Barad means that the concept of phenomena makes it possible to "get the referent right"; the objective referent being the *phenomenon* (in the sense here explained), and not a pre-existing object.

[10] Barad 2007: 334.
[11] Ibid:55f.

The relationality that the wave-particle-dualism bears witness to, does not concern a particular *aspect* or *property* of nature, but, in Barad's words: "the very nature of nature". It is a question of ontology:

> nature's lack of a fixed essence is essential to what it is. That is […] nature is an intra-active becoming (where intra-action' is not the classical comforting concept of 'interaction' but rather entails the very disruption of the metaphysics of individualism that holds that there are discrete objects with inherent characteristics).[12]

Intra-action is a neologism coined by Barad to underline the mutual constitution of subject and object, that is, that they are only *relationally* distinct and do not exist as separate individual elements.

The view that we cannot have access to an observer-independent reality, means that we must accept that our thinking lacks a solid foundation. But, according to Barad, scientific knowledge is no haphazard construction that is independent of what is 'out there', since this is not separated from us; and given a specific set of constructed cuts, some descriptive scientific concepts are well defined and can be used to reach reproducible results. But: These results cannot be decontextualized.

The possibility of objectivity does not hinge upon the belief in an observer-independent external reality. On the contrary, given that there *is* no observer-independent reality, holding *on* to the dogma that observer-independency and externality is a necessary *prerequisite* for objectivity is what threatens to undermine the idea of objectivity.

Barad's solution to the problem of objectivity lies in *her* view of referentiality, namely that the referent is not an observation-independent object, but a phenomenon; this Barad sees as "*a condition for objective knowledge*"[13]. The point, according to Barad, is that "phenomena constitutes reality". That is, reality in itself is material-cultural; it is not "built by things-

[12] Ibid:422, n15.
[13] Barad 20:198.

in-themselves or things-behind-phenomena, but of things-in-phenomena"[14]. And it is the fact "that scientific knowledge is socially constructed that leads to reliable knowledge and reproducible phenomena"[15]; science gives us no information about an independent reality.

Barad's *agential realism* is a form of constructivism that is not relativist, but *relationalist*, that is, building on the idea of an intra-active interdependence between man and reality, that makes both parties contribute to the "construction" of the other. It is *not* relativist in the sense that "anything goes", but it agrees with relativism in its repudiation of absolutist conceptions of reality, truth, and knowledge.

The inseparability of the object from the phenomena and the agencies of observation amounts to "a final renunciation of the classical ideal of causality, and a radical revision of our attitude towards the problem of physical reality"[16]. The ground for another way of looking at causality and reality lies in Dewey's, Bohr's and Barad's denial of the usual assumption that there are separately existing entities preceding a causal relation, where the one pre-existing entity causes some effect to another pre-existing entity. The concepts of trans-action and intra-action, and the view of the "agencies of observation" as part of the phenomenon, rules out a clear cut subject-object distinction.

In a relational understanding of the concept of 'phenomena', phenomena are ontologically primitive relations – relations without pre-existing relata, thus the relata are not prior to the relation, they emerge through it, and they are *in* and simultaneous *with* the phenomena.

While Margolis stresses the need for an integration of ontic and epistemic internalism with an ontic externalism, according to which there is some mind-independent reality, this idea of independency – mind-independency and/or

[14] Ibid.
[15] Barad 1996:186.
[16] Ibid:129, and Bohr 1963.

context-independency – has no place in a relationalist position. There is no independent or separate "something", "out there", because there is nothing "there" as a determinate "something", before or independently of its being intra-actively articulated in and through a phenomenon, of which the agencies of observation are an inseparable part. In my view Margolis' internal relativism (like Putnam's internal realism) is an interesting effort to reconcile realism and relativism. But a viable alternative to combat absolutism without giving up the possibility of objectivity is a relationalism that not so much reconciles as transcends the realism-relativism-debate, by renouncing the ideas of separateness and context-independency, using trans-action and intra-action as key concepts[17].

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[17] Recently the physicist John G. Cramer has developed a transactional interpretation of quantum mechanics. An interesting question, lying outside the scope of this paper, is if this interpretation lends support to Dewey's trans-actionalism, and if it, with its critique of Bohr's Principle of Complementarity, could help to detect important differences between Dewey's trans-actional perspective and the intra-actional perspective Barad has developed inspired by Bohr's philosophy-physics.