

Commentary on David Morris'

The Sense of Space

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This is a complex and very well detailed book about our sense of space: what it is, how it develops, where it comes from, what it means to have it. Morris refers to experiences of space in everyday life, as well as scientific and philosophical literature, to elucidate the problem of the sense of space. He starts with a critique of the traditional approaches to space, then proposes his model, mainly centred on the notion of “body schema”, and finally analyzes two of the principal dimensions of space: depth and orientation. I will begin by summarizing what I consider to be the main topics of his book and then deal with the aspects that are important for studies on the conscious experience of space, as well as, more in general, for studies on consciousness.

1. Morris' critique of the traditional approaches to space

Traditional approaches conceive space as already given, as a primary datum of a ready-made world, that is, a world specified prior to, and independently of, the living activity of the subject. They account for space by presuming an already established space. For them, perceived space refers to an underlying order that is fixed in advance of perception. In their view, perception is an “inferential” or “intrinsic” exercise that consists in extracting and reconstructing the underlying order from the ready-made world .

In so doing, traditional philosophy and science introduce an insurmountable dualistic division between subject and object, whose dramatic effects appear in all their extent when one must explain how a subject can retrieve and perceive the various dimensions of space (depth, width, distance, etc.) via the sensory signals that are received. This division has some principal drawbacks that can be summarized as follows.

(A) The main drawback that traditional approaches face is undoubtedly circularity, or what has been defined more specifically in psychology as the “experience error” (Köhler, 1947), that is, when a stimulus is assigned certain characteristics that belong only to experience:

a result of our perceptual experience – the concept of space as a container that appears as independently possessing its own well defined structure – is taken to be the basis and object of spatial perception. The tradition begins with a space already understood in terms of a geometrical or objective model and looks into it to see how the body interacts with it: from space to the body via geometry or another objective model (Morris, 2004, p. 5).

Circularity is manifested in various ways and leads to various vicious consequences when one tries to explain space perception. For example, according to Descartes (1965) the perception of depth is a geometrical inference based on binocular disparity. In his account, the subject infers three-dimensional space from an array of two-dimensional images by means of geometrical triangulation based on the disparity between the two images that are projected to the two eyes. This kind of account – which Morris labels “inferential account” (Morris, 2004, p. 7) - is valid only if triangulation is the sole means of having a sense of depth. But, as Gibson (1979) pointed out, horses and chickens have a fine sense of depth despite the fact that, having eyes on opposite sides of their heads, their visual fields do not overlap, and they cannot triangulate on things in the Cartesian manner. As Morris says: “we should not presume that our geometry, which results from perception, is the appropriate framework in which to analyze depth perception” (Morris, 2004, p. 9).

Moreover, if space and its various dimensions – such as depth - can only be inferred, then the ground of this inference must already be established prior to perception: there must be some already established framework that grounds and is prior to the inference of space perception, which Morris calls “an inferential framework” (Morris, 2004, p. 8). But this inferential framework makes perception extremely limited and inflexible. If the subject is put in another environment, the inference will fail. In contrast, real perception is quite plastic and resilient. We easily learn, for example, to perceive things in new and different environments and situations, and to move at different speeds in new and different environments. Similarly, we can use bifocals, trifocals, rear-view mirrors or multiple television monitors to view a situation without losing our capacity to see it (a similar phenomenon can be observed in animal movements: when the leg of an insect is severed, it simply substitutes another leg and uses a different pattern of leg movements to continue walking. This made Merleau-Ponty (1945) observe that movement and movements are not governed by a central pre-set program, since we would

not imagine that an insect stores a special program for each type of terrain or damage to the body). As Morris observes, inferential accounts:

have a structural problem accounting for the dynamic aspect of perception, because this requires a baroque profusion of inferential frameworks that (a) specify perceptual inferences that would apply in new situations, and (b) specify when new frameworks are to be switched in, and so on (...). The inferential Hydra keeps growing new heads (Morris, 2004, p. 15).

Another problem with inferential accounts is when they have to explain how “one” thing can be seen with two eyes: how is it that we can see one cup of coffee with two eyes? Inferential accounts explain this as the result of a matching operation of points on the retinas. However, as Morris argues:

If seeing a unified thing amounts to an inferential process based on matching of binocular retinal images, there is a problem. The inference would already require some assumptions about shapes of things in the world, or at the very least the premise that the two images are different images of *one* thing; but if we are already assuming that we are seeing one thing, why the need for an inference that duplicates its own premises? (Morris, 2004, p. 41).

The claim that the unity of the seen thing is inferred from the binocular disparity of the images begs the question because it assumes the unity of the thing seen. Moreover, the “matching” explanation put forward by inferential accounts cannot account for the fact that the vision of unified objects is disturbed but then resumes when: (a) images on the retina are inverted by prisms; (b) a detached retina is reattached ninety degrees from its original position; (c) the optical distance between the eyes is effectively increased through the use of prisms; (d) the visual field of each eye is left-right reversed through the use of prisms; (e) the size and shape of objects at a given distance is distorted by the use of goggles underwater. Morris observes: “When bifocals, trifocals, mirrors, or monitors divide the visual field into multiple optical regions, we can still see one complex unified world, even though the number of *retinas* has in effect been multiplied beyond the usual two” (Morris, 2004, p. 46). Finally, the inferential, “matching” explanation can hardly account for the fact that when one eye drifts from its fixation point (a condition called strabismus), a new functionally defined relation between points on the retina comes into play.

(B) Those kinds of accounts of perception that Morris calls “intrinsic accounts” (Morris, 2004, p. 10) also have the same drawbacks that characterize “inferential accounts”, and fail to give a proper explanation of space perception. Examples of intrinsic accounts are those put forward by Berkeley, Kant and Gibson. Berkeley, for example, explains depth perception as an order detected *within* the given (and not as Descartes proposes, as a geometrical inference from the given). He sees no need to

infer depth: in order to learn to perceive depth we simply need to learn the order in which sensations anticipate one another. Depth and space perception would depend on an intrinsic ordering (fixed by the author of nature, God) of the web of experience. However, as Morris observes, (Morris, 2004, p. 11), Berkeley's intrinsic order is a new variant of the ready-made world: as in an inferential framework, Berkeley's fixed, intrinsic order fails to account for the meaningful dynamics of lived depth.

Similarly, the Kantian pure intuition of space, despite taking Berkeley's account further by replacing the authority of God with the authority of the transcendental ego, and rooting the intrinsic ordering principle of experience on the side of the subject, is a new version of the ready-made world: "it is fixed in advance of perception, and would likely fail to account for the dynamic experience of depth that impresses itself upon us" (Morris, 2004, p. 11). Kant invokes transcendental schemata in order to explain how categories that are fixed a priori can be applied to changing a posteriori appearances. Transcendental schemata would have the role of giving order to open-ended content, of fitting changing content into already specified forms. However, a schema that is entirely a priori (or entirely a posteriori) would return us to a never-ending circularity when faced with the problem of explaining how changing contents call new schemata into play, "since this would require a schema for applying schema, an endless regress on the very task that a schema is meant to accomplish" (Morris, 2004, p. 34).

Moreover, the conception of a schema a priori would have another important drawback: how could it explain novel body-world interactions, such as vibrations of tendons and muscles induced by electrical massagers (see for example Craske, 1977)? "After all, these vibrations did not appear in nature until we invented electrical massagers and the like", observes Morris (2004, p. 44). Furthermore, these novel body-world interactions sometimes elicit "impossible" perceptions: for example, in some cases vibrations of tendons and muscles by means of electrical massagers induce perceived limb positions that are "impossible". Why would a schema a priori encompass representations of impossible limb positions?

Gibson's "ecological psychology" (Gibson, 1979) also offers an intrinsic account of perception. He sees this intrinsic ordering as being constituted by the body's moving interaction with the world. His central insight is that perception is the pick-up of invariants in the flow of information that is generated when the subject moves in the environment: such invariants specify reciprocal information about the body and the environment. Against Descartes, bodily movement amounts to an inference in the flesh: for example, as the subject moves closer to the object in front of him, its edge moves from the centre of his visual field toward the periphery, and the rate of this outward flow invariantly and directly specifies

a rate of motion. Gibson aims at overcoming the dualistic division between object and subject, body and environment: there are no sensations or qualities independent of the subject; the subject does not perceive naked properties of the environment, but perceives what the environment affords to his body, what he can do with, or in, it (in Gibson's terminology, the perceived features of the environment are defined "affordances"). The distinction between object and subject, primary and secondary qualities is not the starting point of perception, but a result of it.

According to Morris, "it is controversial whether Gibson's ecological psychology succeeds in overcoming the dualism of body and environment" (Morris, 2004, p. 14). Indeed, ecological psychology, despite rooting the ordering of perception in the moving body in the environment, tries to explain the intrinsic ordering of perception by appealing to basic and universal biophysical laws: that is, it appeals to a physical ready-made world fixed outside the flow of perceptual activity. In so doing, it re-introduces the dualism between body and environment, because it allows us to conceive them as independent of their interaction with one another, in terms of an overarching physics (for this reason, ecological psychology can be considered a "physical-psychology"). As Morris observes:

Given the aim of ecological psychology, this is a conceptually contradictory strategy (...) If ecological psychology (...) aims to locate the significance of perception directly within the body's ecological interaction with its environment, then it must appeal to intrinsic structures at every level, instead of bottoming out in a ready-made world (Morris, 2004, pp. 14-15).

If body and world cross one another, concludes Morris (2004, p. 16), then we cannot understand their interaction in terms of a physical psychology that would precede them, we have to understand the two as having a meaning that is constituted within their reciprocal relation.

(C) The belief in the existence of a ready-made world where everything is specified prior to, and independently of, the living activity of the subject, lies at the basis of the more general and problematic dualistic division between mind and brain/matter, and of the insurmountable problems that ensue from this dualism, such as those concerning the relationship between representation and represented.

The dualistic view of mind and brain claims that each mind-state duplicates the content of a brain-state yet duplicates it in a different, mental form. The problem with such a view, as Bergson pointed out (1896), is not that mind and brain are different, but that they are not different enough. If mind-states duplicate brain-states, how can the former differ from the latter? And what would the former add if it is a duplicate? Either the duplicate is useless, and we have failed to explain the phenomenon of experience; or it is not quite a duplicate but is something more, in which case we have to ask why

experience has a physical basis. The hypothesis of a duplicate that nonetheless differs from what it duplicates, begs the question of the relation of mind and brain/matter.

The dualism of mind and brain is at the origin of the traditional doctrine of representation. Mental representations are supposed to straddle the difference between mind and world by duplicating the represented world in a different, mental form. However, as Morris observes:

if a representation *duplicates* the represented, how is it *different* from the represented, how does it re-present it rather than present it yet again? How do we get to something more than a duplicate? The traditional doctrine of representation endlessly begs this question, that is, begs the question of how a brain-state becomes a representation, becomes something different and more than firings of neurons (Morris, 2004, p. 84).

The question being begged is that of the *difference* in virtue of which a representation is a representation proper. Appealing to activation levels in a neural network or to bits in silicon processors is not enough if we cannot say how they come to be representations: how are we to locate the difference in virtue of which the bits in the silicon represent *all and only* those things that we have designed the machine and software to represent (Morris, 2004, p. 191)? We beg the question if we answer by referring to our designs or our representations, to what counts as different for us: although they represent something for us, are they representations for the machine? What is it that makes the representations represent what we have designed the machine and software to represent, and not, instead, the state of the power supply, or of the hydroelectric network, or of the water in the river that runs the generator?

(D) The insurmountable dualistic division between subject and object introduced by traditional philosophy also reveals its problematic nature when dealing with the lability of perception and with perceptual illusions. As Morris highlights (2004, pp. 17-19), many examples suggest that space perception changes in relation to our living situation, and that our sense of space is not rooted in a ready-made world independent of the various situations and circumstances of life: (i) when we are sick, for example, smells, sounds, cold, etc. infiltrate us as if they are no longer distant from us: they hurt “within” even if we know that they are “outside” us; (ii) likewise, when we are tired, we sometimes experience noises, lights, etc. in the world around us as disturbances in our body, as if things “outside” echo “within”; (iii) emotions change our perception of space in a related way: in despair, for example, there is nowhere to go, the sky closes in, actions seems pointless, the ordinary depths of the world are transformed, etc. The tight correlation between shifts in emotions and shifts in our sense of space is further demonstrated by the use that authors, painters, sculptors, filmmakers and so on make in their

works of art, for example, of the sense of depth to convey emotions, mood, and psychological focus, and to capture the aspects of characters: none of this would make sense if experienced depth were a fixed dimension independent of our activity and our relation to the world; (iv) different attitudes bring about different spatial perceptions of the same physical object or situation: a city block appears longer if you are dawdling and window-shopping, than if you are driving through the block treating it as a thoroughfare; (v) different sense-organs generate different spatial perceptions of the same object: a piece of rosemary stuck in a tooth feels enormous until it is felt with your fingers. To these examples I would also add that: (vi) the perception of space changes with age: what seemed to be big, large and high in size when we were children (for example, the house in which we were born) may appear to be small, narrow and low as adults; (vii) the perception of the dimension of the same object changes in relation to the different context in which it is placed: a piece of furniture may seem smaller when seen in a shop than when seen inside our house.

Everyday accounts of the above examples would suggest that the world objectively stays the same whilst the subjective sense of space changes: beneath our labile experience there would be a space with fixed dimensions that remain the same. The traditional hypothesis implies two stages in labile space experience. The first stage would give us an objective encounter with a space of fixed dimensions, the second stage would assign a subjective, changing value to the first stage. However, as Morris observes (2004, pp. 19-20), the traditional hypothesis raises many problems. If, in the first stage, we have some sort of access to a space of fixed, objective dimensions, why do we have so much difficulty encountering objective space? If objective space is accessible, why is it so difficult to perceive? Why do we instead experience a labile, changing sense of space? Why do particular fixed givens prompt particular changes? What is the evolutionary advantage of having a subjective perception of space that twists, and does not reflect, the objective space? Why do our attitudes, emotions, mood, etc. transform the veridical encounter with the objective space, assigning it different values in different situations? Morris states:

The point is that the organism does not first reconstruct the objective space that the scientist measures, and then gives it an organismic (subjective) valuation (...) The organism never deals in inches or meters or anything like objective measures; it deals (...) with strides, striking distances, safe removes (Morris, 2004, p. 20).

The experience of space and emotion are linked in a living being because they specify an important issue for that living being. We do not first perceive how close a tiger is coming to us and then

subjectively value it as a threat: from the start the approaching tiger is a danger, and in light of this we sense it moving closer.

According to Morris (2004, pp. 21-22), the analysis of perceptual illusion also confutes the traditional view that perception is a two-stage process in which the perceiver throws a dynamic coat of subjective meaning over a fixed, underlying object. Traditional accounts explain illusions as errors of perception. Contrary to these accounts, Morris argues that the person who is actually in error is the scientist who claims that illusions should be understood as errors of perception: illusions are not so much errors as they are conditions of perceiving. As Merleau-Ponty observed (1945), the analysis of illusions shows that perception cannot escape the “field of perception”. For example, Müller-Lyer’s illusion - in which a line segment bounded by outward-pointing arrowheads is seen as different in length from a line segment bounded by inward-pointing arrowheads, even though the segments of the two lines are the same geometrical length - is based on the fact that the eye is neither abstracting line segments nor comparing their size, but is seeing and comparing arrows that each constitute their own standard of expanse. It is as if the one line did not belong to the same universe as the other. Comparison across these different universes does not give a basis for comparing objective lengths: instead the comparison indicates differences between the “outward-pointing” and the “inward-pointing” perceptual fields. These two fields with their distorting influence are the condition for perceiving. Likewise, the fact that when wielding an object that is not visible to us, for example a cane or a tennis racket, our feeling of its length can diverge from its measured geometrical length (Carello and Turvey, 2000), is not evidence of an error or an illusion, but of the impossibility for us of escaping the influence of the field in which we perceive the object: in this case, perception is constituted within the field of “wieldness” (roughly put, if the object is easier to wield, it is shorter; if it is harder to move about, it is longer), not of geometrical length.

2. The body schema

If all the drawbacks of the traditional accounts of space perception stem from the insurmountable dualistic division between subject and object (and the resulting belief in a ready-made world or ready-made subject) that traditional accounts introduce, then the main way of avoiding such drawbacks is by overcoming this division, and considering, as Merleau-Ponty suggested, the traditional distinction between body and world, or subject and object as an empirical result, a phenomenon, rather than a presupposed beginning of all phenomenology (Morris, 2004, p. 59). This is precisely Morris’ strategy:

this book's study of depth and spatial perception moves beyond the division of subject and object to focus on the perceiving body; but the perceiving body is not self-contained and the perceived world is not a self-contained system. The focus is the crossing of body and world, and the aim is to show how the sense of space is rooted in that crossing (Morris, 2004, p. 5).

Traditional accounts conceive space perception as taking place wholly inside the perceiver, in the inferences of the perceiving subject, or wholly outside the perceiver in the world, in the intrinsic order of the given. For Morris, space perception takes place between the perceiver and the world: "it is neither on the side of the perceiver nor on the side of the world, it is cross between them" (Morris, 2004, p. 28). To study spatial perception, one must get rid of the dualism of subject and object, or body and the world, and focus on the crossing of body and world (Morris, 2004, p. 57). Perception arises in the crossing of body and world (Morris, 2004, p. 52).

What are the main characteristics of this crossing? How can this crossing be qualified? Morris specifies the crossing of body and world in the following way:

- (a) It is by crossing that body and world perceptually and reciprocally take form and constitute. Body and world are not two already independent things that subsequently interact: the two are inherently interdependent (Morris, 2004, p. 5). Perception of the external world and perception of the body reflect one another: "in perception, the body is not a transparent object given in advance, an already specified matrix that organizes perception, but an existence whose unity is expressed only through living engagement with the world (...) Body and world discover one another's *sens* through movement that crosses the one over into the other" (Morris, 2004, p. 38: it should be pointed out that, in his book, Morris uses the French word *sens* to refer to meaning as arising within directed movement that crosses body and world); "perception of the external world and perception of the body are reflections of one another" (Morris, 2004, p. 35). There are several kinds of evidence confirming that external perception and perception of the body reflect one another, and that the perceived quality of an object is neither in the world, nor in the body, but in their crossing, in a specific form of moving interplay: (i) Different movements give different perceptions. For example, if you lightly touch the ends of a cork, you may feel two independent circular surfaces, but if you wiggle the cork, you feel one single thing between your fingers, and you will also probably have a feel for the dry, stiff springiness of the middle of the cork; (ii) The anticipatory motions of your body strongly contribute to determine the perceptual qualities of objects: for example, we reach out in different ways to feel sponginess, smoothness, etc.; hand positions anticipate habitual

possibilities of movement and prevention of movement (Roll et al., 1991); (iii) Habits shape our perceptions. As “the double marble illusion” shows, when touching a marble with crossed fingers, one feels two marbles. But when one becomes adept at manipulating things with crossed fingers, the illusion vanishes, so much so that, when one touches the marble with uncrossed fingers after this adaptation, the marble surprisingly doubles again! (Morris, 2004, p. 40). Similar phenomena are experienced in other perceptual domains as well, such as vision (see all the examples reported by Morris, 2004, p. 47), and time (see for example the illusory reversal of action and sensation due to the recalibration of motor-sensory timing, reported by Stetson et al., 2006).

- (b) The crossing of body and world gives rise to what Morris calls the *body schema*. Drawing on the philosophies of Merleau-Ponty and Bergson, Morris specifies that the body schema, which is the bridge between the body and the perceived world, is neither a priori nor a posteriori: it is a peculiar sort of a priori that keeps changing in light of the very a posteriori that it shapes (Morris, 2004, p. 35). It is not severed from what it schematizes, but emerges in what it schematizes. The body schema is found only in the living activity that bridges body and world: the bridge cannot be built in advance. “The schema is *not* an already constituted X added to an existing system so as to control it; rather, such a schema appears in an existing system when that system *removes* some movements from itself, constrains itself” (Morris, 2004, p. 60). In dynamic systems theory’s terms, this constraint represents the collapse of a system’s degrees of freedom. Constraints are not static components contained inside the system but limitations that themselves arise in, and from, the movement that opens into the world. The collapse of degrees of freedom of movement is brought about in movement that crosses body and world: “Constraints are not relations *added* to a system from the outside by a closed framework of possibilities in which the system is installed; constraints appear in open systems, from the inside, and specify relations in virtue of *limiting* actual movement” (Morris, 2004, p. 64). It is by way of successive limitations and constraints that the body schema is produced: by resorting to the example of origami figures, Morris explains that the limits and structure of a system “are not to be understood as a new X added to the system, but as a sort of kink or crease in the system, a crease that at once is a limit and a record of a limit having been formed. The system’s recording of its own limit creates structure” (Morris, 2004, p. 71).
- (c) The body schema arising from the crossing of body and world is fundamentally based on, and made of, movement: “The body schema is inseparable from movement that crosses body and world” (Morris, 2004, p. 35). It is the self-organization of movement that crosses body and world (Morris, 2004, p. 55). “We should locate the body schema within movement itself, not in the body itself, nor

in its neurology, nor in the world, but in the movement that crosses the two” (Morris, 2004, p. 39). “The body schema is not some sort of system specified in advance of movement, but is constituted in movement itself: a schema in movement that gives a *sens* to perception” (Morris, 2004, p. 52). Movement is the basic “stuff” of the schema and of constraints: movement becomes structure by a limitation or division arising within movement, as a crease forms on a sheet of paper (Morris, 2004, p. 72).

(d) Through movement, the body schema not only forms but also makes perception possible.

Perception is not based on a schema *added* to the body and world from the perspective of an already established framework, a schema that would already contain rolled up within it a recipe for the division of subject and object. The schema unfolds in real time, as a limit, a constraint, immanent within body-world movement (Morris, 2004, p. 69).

Perception is the result of the constraints that emerge when the body schema appears and unfolds: it is not a collection of givens in me, but a limitation in the circuit of body-world movement. Perception is not a matter of inferentially reconstructing a ready-made world from limited aspects, “it is a matter of moving in the world in a limited way. You don’t see with your eyes, or at least not just with your eyes, you see with a moving body that crosses with the world, and what you see expresses limitations of that crossing” (Morris, 2004, p. 109). In Gibson’s (1966, 1979) terms, perception is the detection of invariants in the flow of information generated when the perceiver moves around. As Carello and Turvey (2000) show, for example, one’s feeling for the length of a wielded object such as a tennis racket has to do with one’s possibilities of moving it about, or rather the way those possibilities are constrained by the actual joint movement of body and racket: “What we are perceiving when we perceive felt length is a constraint, a limit on movement, that organizes itself and is manifest within the movement that crosses body and world” (Morris, 2004, p. 65). It is within movement that we detect the constraints that give rise to perception (Morris, 2004, p. 73).

(e) The body schema is itself moving, changing, inherently developmental. The body schema is not only composed *of* the body’s movement in the world: it is also composed *by* the movement of *development* that folds body-world movement into a constrained system manifesting a schema.

The terms *synchronic* and *diachronic* can help here: the moving schema is never a merely synchronic phenomenon (...) It is inherently diachronic – ‘the result of a process of ... self-organization’ (...) Our origami metaphor helps again. The current configuration of the sheet of paper is cognate to synchronic body-world movement, the successive folding to diachronic development. The structured figure that results from folding is made not of two things, paper and folds, but of one thing, folded paper, that exhibits two aspects (paper and folding process) implied in one another (Morris, 2004, pp. 73-74).

Morris also describes the main characteristics of the development of the moving schema: (i) Development is not the unfolding of an already stored program, but the folding of actual movement from within; (ii) In development, a new organization is folded out of, and transforms previous ones; folds upwardly modify subsequent folds, and are downwardly modified by subsequent folds; (iii) This successive folding internally differentiates and complicates the movement of the body, by way of constraint, of limitation. “In this view of development, development is not a matter of learning how to control material body parts of an already defined mechanical assemblage, but is the gradual and successive internal transformation of (synchronic) body-world movement through the (diachronic) movement of successive folding, that is, constraint formation” (Morris, 2004, p. 77).

- (f) The moving schema of perception, from which we derive - or as Morris says, “contract”, reworking a Bergsonian word (Morris, 2004, p. 88) - the *sens* of space, is constrained by a specific logic of relations between parts of the body as a spread-out place that is nonetheless a unified whole: grasping a marble or seeing with two eyes means having two fingers or two eyes work as one. The perception of anything requires that multiple zones of the body work as one. Morris calls this constraining logic “the topology of expression” (Morris, 2004, p. 101). The body has a living, phenomenal topo-logic, in which parts are not beside one another, but envelop one another in movement:

If there is to be perception, a moving engagement with a figure on a ground or a thing in a place, zones of the body cannot be independent, but must envelop one another in a complex co-implication, in the way that multiple aspects of a thing, or things and places, are co-implicated, complicit (Morris, 2004, p. 114).

The co-presence of body-parts is a logical requirement of perception, a transcendental condition of it:

The condition of spatial experience is not, as Kant would have it, a pure intuition of space that immediately allows us to intuit an A and a different B as co-present and alongside one another. The condition is rather a topo-logical envelopment of zones of the body (Morris, 2004, p. 114).

This topo-logic also constrains the structure of lived space: the geometry of the world does not reflect a mathematical geometry, but a living, phenomenal geometry of the body. This fact is well explained in an observation made by Merleau-Ponty (1945), which Morris quotes: “The thing, and the world, are given to me along with the parts of my body, not by any ‘natural geometry’, but in a living connection comparable, or rather identical with that existing between parts of my body itself” (Morris, 2004, p. 101).

(g) Our body being and moving in place, our sense of space originates from the moving interaction of body and place. This implies, according to Morris, that the topo-logic of the body extends into a larger place and stems “not only from the peculiar logic of parts and wholes in the lived body, but from the body’s relation to place (...) The phenomenal topo-logic of the body (...) runs between the body as a special place and the larger place in which the body lives” (Morris, 2004, p. 102).

3. The sense of depth and the sense of orientation

The sense of depth

Where does our sense of depth derive from? Morris observes that our experience:

belies the traditional claim that visual depth perception reconstructs, from two-dimensional arrays of data, spatial properties of a fully present solid object in space. And it belies the claim that the object of perception is a fully present solid thing. Within perception, a fully present object is mythical (...) we never perceive a thing as fully present all at once; things are present through limited perceptual aspects (Morris, 2004, p. 107).

We cannot see all the parts of an object at once: some parts are hidden from our sight; we perceive the object from the limited place of our body; as we move toward the object, it turns different faces toward us. This means that some sort of quasi-absence inheres in solidity. Solidity is manifest as an inexhaustible quasi-absence that is continually replenished during perceptual exploration. The object has hidden sides, which are quasi-absent, but are nonetheless present as the sequel to visible sides. We perceive the object as solid not because we see all of it at once, but because it inexhaustibly hides and reveals itself in a peristaltic flow that couples with our movement around it. We perceive either the outside envelope of an object’s volume or the inside envelope of an object’s volume: “and we perceive such envelopes as a flow of parts that continually unfold into and envelop one another in movement” (Morris, 2004, p. 108). It is precisely through, and by means of this flowing, voluminous envelope that we experience depth.

As we have seen in the previous section, the structure of lived space, the geometry of the world is determined and constrained by the topo-logic of our body. Depth perception is also determined and constrained by this topo-logic: “the way that parts of things envelope one another is correlative to, and constrained by the way body parts envelop one another in movement” (Morris, 2004, p. 108). In other words, our movement articulates objects in terms of the inner envelope through which we explore

them: the body couples its own enveloping movement with the enveloping surfaces of things and thus “translates” them and their characteristics into a movement pattern (Morris, 2004, p. 120). The topology of our body together with the constraint represented by the larger place in which movement occurs specify what Morris calls “the topology of envelopment”. This topology of envelopment “constrains body-world movement so that it generates envelopes, and our *sens* of depth is first of all expressed in terms of these envelopes. The native tongue of depth perception consists of envelopes of body-world movement” (Morris, 2004, p. 126): a short thing is something that is easily wielded, a small thing is something easily enveloped; when I search for my glasses in the middle of the night, they are distant until I feel my hand brushing into the region of my bedside table, and then my glasses are somewhere in the near distance: when I grasp them, they are non-distant; an objective thing in place is something that keeps on being enveloped and enveloping itself: the thing’s reality is its inexhaustibility. “Envelopment is the basic gesture of the ‘language’ of depth” (Morris, 2004, p. 125).

According to Morris (2004, p. 110), the topology of envelopment also helps to capture three important constraints that characterize any spatial experience of things, and the explanation of which has always represented a problem for traditional accounts of space perception: (1) Separation by contact: what is given in the body – say a retinal image – is perceived as an object separate from the body. Explaining this constraint is a problem when we reduce the object to the terminus of a movement entering the body, as if we could detach the object from the body-world movements that give rise to it. On the contrary, this constraint can be easily explained when we realize that perception is dependent on a primordial, moving contact with objects; (2) Unity through spreading: what is given as a multiplicity in the body is perceived as a unified object. Explaining this constraint is a problem when unity and multiplicity are abstracted from their embeddedness in the crossing of body and world. On the contrary, the constraint can be easily explained when we realize that our primordial contact with objects is given in a spread-out, but unified body that contacts objects through a multiplicity of parts and movements; (3) Relation to place: what occurs in us is perceived as placed outside us. Explaining this constraint is a problem when the object is considered as a collection of things located in us, the perceiver. On the contrary, the constraint can be easily explained when we realize that perception is a limitation in a circuit of body-world movement: a circuit in which “The ‘inside’ is already stretched outside itself, the place of the body already moves through the place of the world” (Morris, 2004, p. 111).

As Morris observes, the “relation to place” and the “separation by contact” constraints raise the problem of explaining the origin of “objective depth”, that is, how the primordial contact that crosses over with the world acquires the *sens* of a relation between an explicit inside and outside. For a body to

be detached from an object, a “larger place” is required: a place which lets the body leave the object in its place or turns about the object in its place, thus not exhausting it while enveloping it:

To perceive a solid thing unified in depth, movement I required, either of the body, or the thing, or both, and in all cases what is required for this movement is a *larger place* that holds body and thing together and yet separate, so that it is possible to not have the thing be exhausted by the enveloping movement of the body (...) the very same larger place grants the *separation* of the body from the thing, so that the thing is not encrusted into and exhausted by the body (...) Things have the *sens* of being in objective space because perception is not only folded through the enveloping movement of the body, but through movement of a body that moves around things in place (Morris, 2004, pp. 122-123).

The sense of orientation

Just as our sense of depth is not so much a matter of reconstructing a ready-made world from limited aspects as it is of moving in the world in a limited way, so too our sense of orientation is neither reducible to the objective world of things, nor purely subjective, rooted in a priori intuitions and neural structures, but is determined by, and rooted in body-world movement, in the way that we move in, and grasp the world: a way that is constrained by a functional, topological relation between our living body and the larger body where we live, the Earth. Morris calls this topological constraint in body-world movement “topology of residing” (Morris, 2004, p. 130).

The fact that our sense of orientation is neither in the world nor in the body, but in movement that crosses the two, can be seen from the results of Lackner’s experiments (Lackner 1992, Lackner and Graybiel 1979, 1983). Lackner conducted a series of experiments on subjects who were put aboard an aircraft that flew in parabolic trajectories, during which microgravity was produced, thus creating a weightless environment. Microgravity lasted for twenty-five to thirty seconds during each parabola; forty parabolas were flown during each flight. In one of these experiments, the subjects were positioned so that they floated weightless with the long axis of their bodies parallel to the long axis of the aircraft, with their arms by their sides. The subjects were tested with their bodies in a variety of postures and orientations in relation to the aircraft, specified by a combination of the following variables: a) gaze toward body/gaze forward /gaze away from body; b) face towards the ceiling/face towards the floor; c) head forward/head aft.

The most striking result is that the orientation perceived by the subject did not always coincide with the subject’s actual orientation in the aircraft. For example, with the face towards the floor and the gaze towards the body, subjects felt vertically upside down in a vertically-oriented aircraft, although the aircraft was actually horizontal. Moreover, in this case, when the subject’s head was aft, the subject felt

as if the aircraft was tail down; with his head forward, the subject felt as if the aircraft was nose diving. According to Morris, the main outcomes of Lacker's experiment can be thus summarized:

- 1) Mere posture does not determine orientation: the movement of the gaze away from the body results in an experience of being upright only when the face is looking towards the ceiling, not when it is looking towards the floor. The different experience can only be ascribed to the meaning of the architecture that the subject is looking at.
- 2) However, visible architecture does not determine orientation on its own, since, with the same architecture, different orientations are felt when gazing up, down, or ahead.
- 3) The known orientation of the aircraft relative to the earth does not determine orientation either: there is no uniform correlation between the felt orientation of the body and the felt orientation of the aircraft.
- 4) The subject's experience of orientation does not obey the "physical" law of things, rather it is phenomenal: (i) changes in orientation were felt not as abrupt transitions, but as a fading from one orientation to another. Some subjects described this transition as a telescoping motion in which the feet moved down and the head moved up internally through the body, which is physically impossible; (ii) in some cases there was a compelling visual illusion of the elongation of the aircraft; (iii) in some cases, subjects reported a dissociation of the visual field in which parts of the visual field were upright and others upside down: for example, when reading a dial, the numbers on the dial seemed upright and the rest of the instrument upside down.
- 5) On the other hand, there was strong evidence that the phenomenon was not merely intellectual or subjective. The reaction was the same for all the subjects in most respects and orientation was experienced as beyond the control of the subject.

Therefore, orientation is not something objective, given in itself. It never has a simple, absolute, objective referent: which way is "up" depends, at least to some extent, on the way one becomes involved with things. Neither is orientation some sort of subjective image or idea, determined by static neurological or cognitive structures, such as a representation or model of an objective body. Orientation is in that middle region where body and world cross: it depends on "movement that crosses a postured body with the world" (Morris, 2004, p. 136), on postures of residing that are determined by habitual bodily movement on the Earth, by body and Earth moving against one another.

The experiment, decoupling orientation from the gravitational field, also shows that: “In the absence of Earth, which holds one down, one’s moving postural attitudes nonetheless ‘adopt’ certain surfaces and regions as earth, as affording moving, residing, and orientation. The body (...) earths itself” (Morris, 2004, p. 132). That is, postures of residing acquired on Earth are the referent of orientation perception: as such they carried over, by habit, in the body cut off from Earth. In fact, the topology of residing originates from a body evolved in, and to cross, the Earth: a body that carries its relation to earth along with it. Earth is not simply a thing outside our body: the Earth is an integral part of the circuit of body-world movement. Our body depends on the Earth, because the latter allows the former to move in the outside. Conversely, the Earth “is determined not so much by what something outside one’s body *is*, as by the movement that the outside world *affords*” (Morris, 2004, p. 132).

4. Some critical considerations

Morris’ work highlights some important aspects of the perception of space, and more in general of the theory of knowledge. In my opinion, there is no doubt that the main aspects are represented by its appeal to overcome and get rid of the traditional dualistic division between subject and object, which involves believing in a ready-made world where space as well as other qualities are already given, and to take into account the active role we play in constituting the sense of space:

In traditional approaches, the primary datum is an already given space, characterized apart from the living activity of the body (...) This book works in the reverse direction, beginning within the crossing of body and world, and seeing how our sense of space emerges from it (Morris, 2004, p. 5).

This appeal is certainly not new in the history of thought – see, for example, Ceccato (1972) and Vaccarino (1988) –, and the solutions Morris offers seem – at least sometimes, as we will see - to be partially contradictory. However, it is undeniable that his critique of the traditional accounts of space perception and of the conception of a world where everything is given prior to, and independently of, the living activity of the subject, reveals in a detailed way the main drawbacks they imply.

Moreover, Morris’ work has the merit of showing the non-aprioristic nature of space not only by proposing how the sense of space emerges from the active interaction of the person with the world, but also by supplying clear evidence of how the perception of space varies according to the situations and circumstances in which the person finds himself or herself (for a similar treatment of the sense of time, see Marchetti 2009).

Additionally, Morris' work approaches depth, space and more in general perception from a developmental point of view (which I have not dealt with in this commentary in detail), which certainly helps to offer a more comprehensive and complete account of the issues in question.

In my view, however, there are – at least apparently, and if I do not misunderstand Morris' thought - three major problems in his work, which I will call “the issue of perception”, “the issue of place” and “the issue of movement” respectively.

The issue of perception

As we have seen, Morris states that perception is made possible thanks to the constraints that emerge when moving: perception “is a matter of moving in the world in a limited way” (Morris, 2004, p. 109). In my view, this statement is completely correct if one considers these constraints as *the basic elements* of perception, that is, the elements *constituting and giving origin to* perception. However, the statement is only partially correct if one considers these constraints as *the result* of perception; and this seems to be the way Morris conceives constraints: “What we are perceiving when we perceive felt length is a constraint, a limit on movement” (Morris, 2004, p. 65); see also the following passage: “it is within this movement that we detect the constraints that give rise to perception” (Morris, 2004, p. 73), which is quite problematic, because on the one hand it presents perception as a result of constraints, but on the other hand, it states that constraints are “detected”, which is tantamount to stating that they are perceived, that is, they are a result of perception.

Why is conceiving constraints as the result of perception only partially correct? Because, in my view, it brings forth a circular explanation of perception. Conceiving constraints as a result of perception implies conceiving perception as a process independent of, and preceding any form of constraints. But if we analyze perception, we realize that there cannot be perception without constraints, and that perception is based on constraints. As I have tried to show elsewhere (Marchetti 2001, 2009), in order for a person to be able to perceive and more in general have conscious experiences, he needs to use his nervous energy by applying his attention - whether on the sense-organs, the somatosensory organs, working memory, or attention itself; in this way, the results of his attentional activity modulate, that is, “constrain”, the flow of his nervous energy. As suggested by Paul Valéry (1973), conscious perception is a temporary variation of the state of energy of a closed system: a variation which is brought about through the use of the very energy of the closed system. It is precisely this variation which constitutes the phenomenal aspect of consciousness.

In this view, constraints:

- a) originate from, and are produced by the person's use of his attention, and they *consist precisely of* the interruption, hindrance, slowing down, facilitation, stimulation, acceleration, and so on, of the nervous energy flow (and consequently of his attentional activity). Every time the person finds an obstacle or cannot extend his limbs beyond a certain extent or cannot make a movement, his attentional activity, and along with it, all his being, slows down or even temporarily stops, so much so that the person must either apply his nervous energy in a new way or redirect it to something else, if he wants to unblock the situation;
- b) are the basic element that makes conscious experience possible. They are the way the flow of nervous energy varies: as such, they *are* the conscious experience; they do not need to be perceived, because they are the ground on which perception is based.

The person has no other means of directly “feeling” and experiencing what he is doing, or what is happening to him. It is by using and applying his attention that the person can produce constraints in the flow of his nervous energy, thus generating conscious experience. Whoever conceives perception as being a process independent of, and preceding constraints, is unavoidably led to account for how one can perceive in general without resorting to constraints as the explaining element: which is simply a way of pushing the problem of perception (and more in general of conscious experience) back into a deeper hiding place, making one resort to circular solutions such as the one of an internal homunculus.

The issue of place

In more than one passage, Morris seems to assign an ontological and privileged status to the category of “place” making it irreducible to the sense of space (or at least, the way he presents the category of place seems to lend itself to such an interpretation): a kind of *prius* independent of, and given prior to, the activity the subject performs in building the sense of space:

Place, as Casey argues, is radically irreducible, unique (...) Space, as Casey argues, does not have the irreducible uniqueness that place does (...) place is a limit since it is irreducible, it is an irreducible *il y a* in the most basic sense of the term (Morris, 2004, p. 179).

The sense of depth and space depends on perceiving things in places: "...perceiving things in places (which is requisite to a sense of depth and space)..." (Morris, 2004, p. 114), and the topo-logic of the body stems not only from the peculiar logic of parts and wholes in the lived body, but from the body's relation to place: "the body is, in Casey's term, inherently 'implaced': to be is to be in place (...). The phenomenal topo-logic of the body (...) runs between the body as a special place and the larger place in which the body lives" (Morris, 2004, p. 102).

This way of conceiving place as something independent from the subject's activity, given prior to, and necessary to the constitution of the sense of space, clearly re-introduces the dualistic division between subject and object that Morris' work was originally intended to expunge. Indeed, the categories of place and space are strongly associated and related, and one most probably derives from the other. Whichever of the two is the most original and primitive, considering it as independent of the subject's activity is tantamount to accepting the existence of a ready-made world containing it.

The issue of movement

In Morris' work, movement certainly plays a central role in the construction of the sense of space: The body schema is composed *of* the body's movement in the world, it is fundamentally based on, and made of, movement; spatial perception is a particular kind of body-world movement. In my opinion, there is no doubt that movement is central to the experience of space, as well as of many other kinds of experiences. However, movement alone is not sufficient to build up such an experience. Something else is needed: a working memory that keeps present in consciousness, in an incremental way, the single perceptions experienced during the movement. It is by means of this operation of the working memory that a sequence or succession of perceptions can take shape, which is the basis for the formation of two-dimensional constructs, such as "path", "line" and "distance". You can become aware of the difference between the conscious experience of a movement and of a line or path, for example, by slowly moving your index finger. Now, look at the tip of the finger while the finger moves, and consider it as a moving object; then, repeat the movement and consider the path or line drawn by the tip of the finger. You will notice that in the former case you will simply follow the tip of the finger, maybe anticipating its direction, but without keeping track of the positions previously occupied by it; on the contrary, in the latter case you will follow the tip of the finger by constantly keeping track of the positions it occupied, moment after moment, since it started moving. In my opinion, the difference between movement and space (or one of the constructs related to it, such as distance, depth, etc.) and

the mechanism responsible for it, albeit being implicitly suggested by the metaphor of “envelopment”, are not sufficiently and openly highlighted by Morris’ work.

5. Conclusion

On the whole, I consider Morris’ book a very detailed and well documented account of our experience of space. Both his references to empirical psychological research, philosophical works and daily experience, and his criticism of the traditional accounts of space and more in general of the traditional theory of knowledge, make it a valuable work, which should be considered and studied by whoever is interested in understanding the origin of our sense of space. Equally appreciable is Morris’ effort in devising the theoretical concept and methodological tools to develop an alternative and more appropriate and viable explanation of the sense of space. Yet some aspects still need to be further analyzed, refined and developed.

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