The Fold and The Body Schema in Merleau-Ponty and Dynamic Systems Theory

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Abstract:
Contemporary thought, whether it be in psychology, biology, immunology, philosophy of perception or philosophy of mind, is confronted with the breakdown of barriers between organism and environment, self and other, subject and object, perceiver and perceived. In this paper I show how Merleau-Ponty can help us think about this problem, by attending to a methodological theme in the background of his dialectical conception of embodiment. In *La structure du comportement*, Merleau-Ponty conceives life as extension folding back upon itself so as to reveal Hegel's 'hidden mind of nature.' In the *Phénoménologie de la perception*, radical reflection elucidates the body schema as an essence that reveals itself within embodied existence, *qua* shaping the natural perceptual dialogue in which the perceiver and the perceived permeate and separate from one another. In these two conceptions of embodiment, we progressively see how the dialectical principle of embodiment must reveal and conceive itself within embodiment itself. Science, on the other hand, follows the phenomena of the body to a certain point, but refuses to allow that embodiment is self-conceptual. I illustrate this using the example of dynamic systems theory, an inheritor of the tradition of J.J. Gibson's ecological psychology. In this way, I show how Merleau-Ponty's conception of the dialectic of embodiment as self-conceptual is important to problems in contemporary thought.

We, you and I, are embodied. This means that we are enmeshed in the world. At the organic level, we mesh with an environment that sustains and denies us. We incorporate clothing, tools, rituals, language, and our erotic-communicative relations to others, into the tissue of habits through which we flesh ourselves out. To an extent, contemporary science recognises that life is a meshing of organism and environment, and that mind is an embodied, perceptual, social, and historical mesh of subject and object. But for the most part science fails to explicitly comprehend this mesh-work as self-conceptual. Science may interpret living cognition as a self-organising phenomenon, but it does so in terms of laws and posits that are prior to the living individual, since it wants to test its laws by experimenting on the individual within an already fixed, controlled framework. Science, in other words, is committed to an *a priori* that is distinct from the *a posteriori*. It cannot conceive that the primordial matrix[1] of living cognition is a social embodiment that fleshes itself out through its own history, and thus stands as its own '*a priori*'.

In this paper I study dynamic systems theory, a contemporary program in science, to show how this failure to explicitly recognise self-conceptual phenomena persists, despite science's efforts to break down distinctions between organism and environment, and subject and object. This is in aid of elucidating a root divergence of science and phenomenology. (Throughout, "science" refers to contemporary experimental science, rather than philosophical *Wissenschaft*, even if they turn out to be two nodes in one wave of knowledge.)

In the main, contemporary science is anti-phenomenological, contesting the specific claims of phenomenology and, more important, phenomenological method.[2] Yet science, like phenomenology, comports itself as a return to the things themselves, as a reduction. For phenomenology, to comport oneself in this way is to grasp how one's existence already mires one in an ongoing dialogue with things; it is this dialogue that guides one's 'return.' Phenomenological method as radical just is an other-guided 'return.' But for

science, phenomenology's reliance on a pre-reflective miring in things is illegitimate, since this would put the beginning of science outside of reason's posits. Science, instead, sails clear of the call of things by chaining itself to the fixture of its method; moreover, science denies that the call of things ever compelled it. While phenomenology and science are mired in the same straits, their relation is one sided: science refuses phenomenological argument and method from the start; but phenomenology is obliged to show how things compel science (despite science's denial of this compulsion). This is because phenomenology sees that it and science are in the same boat, and both could 'be' phenomenology, since phenomenology, by its method, just is that which is transformed by the call of things.[3] Despite this closeness between phenomenology and science, phenomenology cannot force science to become phenomenology; at most, phenomenology can show science that it is on the way to phenomenology. But science could only be on the way if it is already snared by proto-phenomenological insights. To attend to science phenomenologically, then, is to show how science is already compelled by the call of things, despite its claims to have fixed on an *a priori* framework. And to show how science can be compelled by this call, yet veer away from it, will reveal a root divergence between science and phenomenology.

In what follows I discuss dynamic systems theory, in the context of methodological issues in the background of dialectical conceptions of embodiment in *La structure du comportement*, and *Phénoménologie de la perception*. In doing so I show how science since Merleau-Ponty's time is ever more compelled by the call of things, yet still denies them a self-conceptual status. I suggest that this denial is related to issues of temporality and the *a priori*. I thus elucidate a root divergence between science and phenomenology. Science holds off the phenomenology that lurks within it by refusing to see things in their own time.

Dynamic systems theory is a recent program in psychology. It extends the tradition of J.J. Gibson's ecological psychology, by combining Prigogine's chaos theory with various results that conceive behaviour as self-organising. For example, Nikolai Bernstein's work in the 1930's showed that there is no need to posit explicit motor programs that control limbs in terms of an external dimensional framework. A limb behaves as a spring-like mass whose intrinsic properties in an environment restrict and control its possible movements. Turvey and Carello's recent work extends this insight by formalising the relevant relations in terms of dynamic systems. They show that the limb's behaviour is specified by an 'attractor' of the system. This is to say, when various measures of the limb are plotted against one another over the course of a repeated action, certain relations between measures follow roughly the same chaotic pattern during each repetition—the pattern is not repeated exactly, but it has roughly the same shape each time, just as no one set of footprints cutting across the park falls exactly on top of the other, but together the prints nonetheless wear out a distinct path. The specificity of the attractor, its 'shape,' is, according to dynamic systems theory, to be understood in terms of the properties of the limb, and the laws that range over the limb-environment system. The attractor is not specified by an explicit program built into the limb or brain: the attractor is an *outcome* that captures or expresses the

complex identity of the limb's behaviour in an environment.

On this view, we do not control our arm by controlling angles at the joints, in which case controlling it would amount to traversing a given sequence of locations in a Cartesian co-ordinate system fixed outside the body. Rather, we tense and loosen muscles so that when we kick the arm into motion, it settles down in the right place. Tensing and loosening muscles modifies properties of the limb-environment system so as to specify the attractor that will constrain motion so as to achieve the desired behaviour. As Turvey and Carello suggest, we do not measure the location of our arm within a dimensional system external to our body; rather, doing things with our arm and tools "incurs a time-dependent tissue deformation pattern" that is constrained by the dynamics of the arm-environment system, and is "expressed in the intrinsic co-ordinate system defined by the muscles and tendons" in the arm.[4] Location and control of our arm is to be understood in terms of co-ordinates that are expressed *within* the arm-environment system *itself*, and not in terms of abstract co-ordinate systems. We thus use our bodies and the world to shape our own movements, rather than dealing with our bodies as it were from the outside. 'Just as' the tightrope walker's pole is intrinsic to her balance, damping out jitters and shakes, the weight, density, mass distribution and resilience of our limbs in our environment, which can be modified by muscle contractions, specify 'attractors' 'within' the limb-environment system that hold our motions to certain patterns.

This conception of limb movement in some ways makes the same points that Merleau-Ponty does in the *Phénoménologie*. The movement of the arm is a continuous, internally related whole that already links body and world, and I do not need to plot my arm's trajectory when I move it.[5] Dynamic systems theory, in other words, is compelled by the same sort of phenomena that Merleau-Ponty elucidates. But let us turn to *Structure* to see how dynamic systems theory fails to grasp the temporality and identity of our embodiment. The attractor that governs the arm's behaviour is a contemporary cognate of the *Gestalt*, so far as it conceives behaviour in terms of overall dynamic relations between the organism and the environment. Since the attractor is to be conceived in terms of relations that range over the entirety of the organism-environment system, dynamic systems theory seems to avoid the temptation of the Gestaltists that Merleau-Ponty so often criticises, namely, to interpret *Gestalten* in terms of component physical causes that are external to one another.

This temptation is misguided because *Gestalten* of organisms are inseparable from the existence of the organism. We must recognise that the law of falling bodies manifests an idea, since it is only our antecedent effort to articulate ideas in the cosmos that guides us in isolating gravity as a distinct force visible in bodies that nowhere behave ideally.[6] Even more, we must recognise an idea in an organismic *Gestalt*, since it is only the organism's effort to articulate itself out of its environment that allows us to elucidate its *Gestalt*. While falling bodies never themselves exemplify the idea of a falling body, an organism just is the exemplification of its idea, although the organism is not explicitly conscious of this. Separable component physical causes precisely vanish within this living idea, only becoming explicitly distinct when the living behaviour of the organism breaks down.[7] As Merleau-Ponty writes in the *La*

structure du comportement, "*l'objet de la biologie est impensable sans les unités de signification qu'une conscience y trouve et voit s'y déployer*."[8] For this reason we must understand life as appearing when extension folds back upon itself in such a way as to internally unite causal components within an overall structure whose behaviour expresses its internal unity, its idea, in outer form, thus revealing a Hegelian '*esprit caché de la nature*.'[9] Distinct causal components vanish within this fold, and this folding of extension *qua* a living being thus specifies a structure, a "*jonction d'une idée et d'une existence indiscernables*." [10] Idea and existence are indiscernible in an organismic structure since this idea can only be found in the existence of the organism, and the existence of the organism is its outward realisation of its inner idea.

By Turvey's own account, dynamic systems theory diverges from Gestalt theory so far as it conceives the attractor as 'falling out' of ecological laws that range over the organism and the environment. It construes these ecological laws as holonomic constraints on the system, that is, as constraints specified by the totality of all levels of laws that range across the system, rather than by distinct causes that abstractly represent factors in the organism's environment.[11] A digital thermostat, for example, would, according to Turvey, be non-holonomic, since it uses its lawful substratum (the properties of silicon, etc.) to represent its environment in discrete states, where the discreteness of these states and its representational function abstracts from the physical laws of the substratum. An analog thermostat, made with a bi-metallic strip, would be holonomic, since the curvature of the strip is directly regulative of the thermostat, and the behaviour of the thermostat is thus directly specifiable in terms of the totality of laws that govern the system of which the thermostat is a part, without invoking any explicit representational function. To translate into the terminology of *Phénoménologie*, the digital thermostat measures a ready-made dimension of temperature that is logically external to the substratum in which this temperature is represented—it is not the temperature of the silicon that controls the thermostat, but electrical states that encode temperature; whereas the analog thermostat does not posit such a ready-made world, since its states are inseparable from the physical domain whose temperature they regulate. The digital thermostat buys into an outside idea of temperature, whereas by preferentially responding to its environment the analog thermostat 'expresses' the idea of a temperature that already is within that environment.

Dynamic systems theory, then, conceives attractors as an outcome that 'falls out of' holonomic laws that range over the organism-environment system. It does not posit the organism as living *in* a ready-made world that the organism represents, but as being *of* its environment. To this extent, dynamic systems theory recognises that the organism-environment relation specifies a unique idea inseparable from its existence and realisation in the organism. The relation is not reducible to more abstract terms and cannot be specified in abstraction from the existence of the organism.

Dynamic systems theory, however, proceeds to construe the ecological law of the organism in terms of more basic laws of the physical domain, and thus loses sight of the organism-environment relation as specifying an irreducible dialectic. That is, it tacitly conceives the organism as built out of more basic laws, rather than acknowledging that if the holonomic laws

that specify the dynamic system range over the organism and the environment, the organism must be conceived as building itself out of its own law, since there would be no such ecological laws without the actual existence of the organism. In the language of *Structure*, dynamic systems theory fails to recognise that the organism's law is in fact a norm, that the folding back of matter onto itself in a living unity specifies an irreducible dialectic. Dynamic systems theory puts its own *a priori* ideal posits before the self-normalising existence of the individual organism, since that is the only way it can give an account of the objective emergence of the organism. It thus fails to acknowledge that the recognition of ecological laws entails recognition of the fact that the organism is the judge of its own objective grounds, that it is, in Hegel's terms, (implicitly) a self-conceptual syllogism.

Although the above analysis takes up the example of the human arm, it treats the arm in terms of merely vital behaviour, that is, it treats it on an organic level, in abstraction from the totality of the perceptual field and being in the world. The fact that dynamic systems theory veers away from the self-conceptuality of the phenomenon becomes clearer if we shift to a treatment of the full human dimension of motor-perceptual behaviour. So let me try and deepen the above by shifting into the world of perception, away from a discussion of the vital order in *La structure du comportement*, to a discussion of the body schema in *Phénoménologie de la perception*.

Starting from a concept of limb movement and control similar to the one discussed above, in a recent (1994) work Thelen and Smith argue that the development of reaching in infants is specified by attractors that emerge through the history of dynamic relations between the infant and the environment.[12] The methodology of dynamic systems theory leads Thelen and Smith to argue that "*the individual and his or her behavioural changes over time are the fundamental unit of study*."[13] That is, if we are to understand the attractors that shape reaching, we have to follow the development of humans as individuals, rather than thinking that the development of reaching is governed, for example, by innate motor programs that are common to all individuals in virtue of their neural makeup. Thelen and Smith therefore present a richly detailed study of the mechanics of the development of reaching in several individual infants. They show how reaching develops in quite different ways in different infants, and at the same time show how, from the point of view of science, dynamic systems theory helps explain the individual phenomena.

In a given situation, they argue, the infant has the goal of reaching for the object. Given the infant's physiognomy, its history and the physical laws that constrain the infant-environment relation, the individual infant has certain attractors that support and constrain the dynamics of her or his reaching. For each infant, reaching requires a solution to the problem posed by using her or his bodily dynamics to achieve the goal of reaching. Thelen and Smith are trying to show that the development of reaching does not depend on innate motor programs, or representations of the environment, but that development is played out within the dynamics of the infant-environment relation, and on this kinesiological count their argument is successful. But their account of development has two signal features: it ends up interpreting the behaviours of the infant in terms of lower level laws that the infant-environment

system is 'built out of,' since the 'choices' open to the infant are specified by these laws; and their account requires, as Thelen and Smith acknowledge, that the infant already be driven toward a goal. On the latter point Thelen and Smith try to show that the goal of the infant ultimately stems from the brain *qua* a dynamic neural system that evolves more refined goals from less refined goals, in the manner of Edelman's theory of neuronal group selection, albeit the brain is lodged in an embodied, situated developing infant. Nonetheless, Thelen and Smith interpret behaviours that are played out through ecological laws that range over the infant and environment in terms of lower level laws that remain distinct from each other. While they argue that the object of study must be the individual, they decompose the individual into component laws in order to explain his or her behaviour, and thus abstract from the problems posed by the world to the individual within her or his history.

Here we can shift to the concept of the body schema in *Phénoménologie de la perception*. I argue that we should understand the body schema as the primordial habit-matrix of the body. In virtue of the body schema, we comport ourselves toward the world in an anticipatory manner such that our explorations constitute a motor-perceptual synthesis that co-synthesises the body and the world in one act of "*co-naissance*."[14] The body schema is, in other words, the principle of the natural perceptual dialogue in which the world and body permeate and separate from one another—enmesh and 'give birth' to one another's perceptual identities—through their interpermeation.[15] This entails that the lived body is "*une unité expressive*,"[16] "*un noeud de significations vivantes et non pas la loi d'un certain nombre de termes covariants*."[17] The connection between the body schema and the lived body is not like that between the idea of a circle and a circle,[18] because the body schema inseparably *is* its expression in the lived body, it is an essence in existence. Methodologically, then, the body schema is revealed by radical reflection that discerns the *a priori* not through pure reflection, but by making explicit the tacit logic of the fact that experience is "*la communication d'un sujet fini avec un être opaque d'où il émerge mais où il reste engagé*."[19] The permeating-separation entailed by the fact of such an experience is precisely what leads us to elucidate a body schema, a pre-personal 'principle' in virtue of which this permeating-separation is always already underway as a 'co-birth' of body and world. To say that the body schema is an *a priori* of the lived body is thus precisely to say that it is self-conceptual, since the expressive unity of which the body schema is the principle gives us our experience of the lived body in the first place, and it is this expressive unity that leads us to elucidate the body schema. Finally, Merleau-Ponty's remarks about perceptual learning, for example, about the learning of new colours, suggest that such learning is an unfurling of the *a priori* of embodiment, and amounts to the formation of a new organ of the lived body.[20] Perceptual development, in other words, is not to be understood in terms of externally ordered time, but in terms of habit and personal history. The body schema, then, is a new sort of *a priori*, it is a pre-personal past of embodiment, and when radical reflection seeks this new *a priori*, it seeks the unreflective fund of its own experience, "*une passé originel, une passé qui n'a jamais été présent*."[21] This original past is the proper self-conceptual ground of the lived body, the one that phenomenology 'returns' to.

When Thelen and Smith discern an attractor in the infant-environment system *qua* accounting for the development of reaching, they are discerning a cognate of the body schema. The attractor is a principle of infant-environment relations that is irreducible, since it governs its own unfolding through the history of its individual dynamics. However, they interpret this principle in terms of lower level dynamics and laws, thus prescinding from the dynamics and temporality that this attractor itself establishes, and seeing distinct lower levels of constraint as shaping higher level unities. Instead of engaging in a radical reflection that unpacks an *a priori* intrinsic within a given self-conceptual, self-expressive unity, they give an account of it in terms of an *a priori* that belongs to a different time order, namely that posited by scientific cognition in its objective conception of physical systems. On the one hand, dynamic systems theory asks us to attend to entities that emerge within processes, and asks us to attend to individuals, thus getting past science's urge to appeal to rock-bottom posits that are 'objective' (in science's understanding of the term), that is, outside the ambit of any phenomena that present themselves as self-conceptual. But dynamic systems theory nonetheless veers away from the individual by seeking to account for it in terms of such rock-bottom posits. This tension is explicit in Thelen and Smith's account, since they acknowledge that a full account of the development of reaching would have to attend to the social dimensions of reaching, that is, to meanings that emerge within the history of the human individual as such, meanings that are irreducible to causal processes within an ahistorical time order. Yet Thelen and Smith consistently head into ahistorical time, explaining reaching in terms of muscle and tendon, nerves and senses, since perhaps they cannot see how a self-conceptual system could get itself going as always already self-conceptual. They cannot see how there could be an '*esprit caché*' of nature—if mind reveals itself in nature through a development, it is because non-mindful laws build up into mindful ones, it could not be the case that mind has always already conceived itself.

On the other hand, in another study Fogel suggests that the development of reaching must be understood in terms of the ways in which adult bodies and reaching provide 'scaffolding' for the development of reaching in infants.[22] Here we see a way in which reaching could *a priori* be self-conceptual, since the adult's reach already expresses the element that it discovers as irreducible in the full fledged self-conceptual phenomenon of infant reaching—the adult's reach grasps the infant's wanting-to-reach, and thus draws out the infant reach into a full fledged expression of reaching. Following this thought would take us into flesh.

But let us return to the methodological level. Above we have seen that dynamic systems theory encounters an irreducible unity in the phenomenon—it is called by things that demand that their essences be recognised as inseparable from their existence in their situation. Yet science denies this, since its drive is to interpret the phenomenon in terms of causal constraints that have distinct identities outside of the self-organising history of the phenomenon. We can give two interpretations of the motives for this move.

First, in its aim for objectivity and the third person perspective, science must give its accounts in terms of absolute *a priori* posits that stand outside the first person perspective. Science cannot grasp Merleau-Ponty's conception of an *a priori*

that belongs to living existence itself, prior to scientific reflection, prior to all reflection. Science takes the *a priori* posited by science as first in the conceptual order of explanation, whereas phenomenology grasps the *a priori* intrinsic to the existence of self-conceptual phenomena as first in the conceptual order of description. However, insofar as science recognises that self-conceptual, dynamically self-organising phenomena are to be explained, science has implicitly made the move toward phenomenology. It has been snared by the call of things, become mired in them. Science has to follow through on this by seeing that this recognition already tacitly conceives a new sort of *a priori*, the *a priori* of self-conceptual phenomena.

Second, I would like to suggest that we can interpret this in terms of time. Dynamic systems theory makes its main advances over prior science by attending to the dynamic dimension of living phenomena. Indeed, if we trace the history of dynamic systems theory back to the work of Bernstein, we find that Bernstein's advances depended on his techniques for measuring the living body, rather than the corpse, and for measuring the body in motion, that is, for measuring the body in its own time. Thelen and Smith take this one step further by asking us to attend to various time scales of development within the individual's history. Yet they consistently turn from the internally unified temporality of the individual to the extrinsically ordered time of physiology and physics, they turn from the body's own time to exterior time. This leads to my concluding suggestion that to truly attend to the longitudinal development of the individual requires a conception of an *a priori* intrinsic to that development, within the lived body's own time. This is precisely the sort of *a priori* that Merleau-Ponty discovers within the lived body and in the self-articulation of fleshy being. To return to the call of things is to be guided by one's existence in the flesh, and this is to dwell in the spread and gather of its time and place.

Notes

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[1] My use of the word "matrix" is taken from Casey's work (cf. Casey 1993; Casey 1997).

[2] Cf., e.g., Dennett's discussion of heterophenomenology in Dennett 1991, which is notably inaccurate about phenomenology. (See Thompson 1995 and Pessoa, Thompson, and Noë (Forthcoming) for a criticism.)

[3] Cf. Leder's argument that phenomenology must show why bodily phenomena motivate Cartesian dualism, even if phenomenology puts Cartesian dualism into question (Leder 1990).

[4] Turvey and Carello 1995, p 478. Here I am generalising from Turvey and Carello's point.

[5] Cf., e.g., Merleau-Ponty 1945 (hereafter *PdlP*), 162-166; Merleau-Ponty 1962 (hereafter *PP*), 135-142.

[6] Cf. Merleau-Ponty 1942 (hereafter *SdC*), 147-157; Merleau-Ponty 1965 (hereafter *SB*), 137-145.

[7] Cf. *SdC*, 157-173; *SB* 145-160. On these issues about the organism, also see Goldstein 1995, the earlier discussions in Russon 1997, and Varela 1991.

[8] *SdC*, 175*SB*, 161.

[9] *SdC*, 175; *SB*, 161-162.

[10] *SdC*, 223; *SB*, 206.

[11] Turvey 1992, 110-111.

[12] Thelen and Smith 1994.

[13] Thelen and Smith 1994, 33, their italics.

[14] Cf. Merleau-Ponty's argument that the subject of sensation is "*une puissance qui* **co-naît** *à un certain milieu d'existence ou se syncronise avec lui*" (*PdlP*, 245; *PP*, 211, emphasis mine); compare the same word play in *SdC* 213, where Merleau-Ponty attributes the play to Claudel.

[15] On this role of the body schema in perception see Lingis's excellent but enigmatic "The Body Postured and Dissolute," in Lingis 1996.

[16] *PdlP*, 239; *PP*, 206.

[17] *PdlP*, 177; *PP*, 151.

[18] Cf. *PdlP* 175, 239; *PP* 150, 206.

[19] *PdlP*, 253; *PP*, 219.

[20] Cf. *PdlP*, 38, 179; *PP*, 29-30, 153.

[21] *PdlP* 280, *PP* 242.

[22] Fogel 1993.

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