

## CHAPTER 1

# THE MOVING SCHEMA OF PERCEPTION

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I AM TRYING TO WRITE the opening sentences of this chapter. I reach for my pen, which is sitting to the left of my coffee-filled cup, move the pen toward the paper, twiddle it, attempt a drawing of the cup, realize I am no artist, put the pen down on the right side of my cup, take up the cup and drink the coffee just to have something to actually do, as if emptying the cup will somehow repair the emptiness of the page.

Some of the classic questions of perception are implied in this simple experience. How do I see one cup with two eyes? How do I reconstruct a cup in depth from arrays of two-dimensional sensory data? How do I feel one pen with many fingers? How, in general, do I put together a multiplicity of sensations into one unified picture of the world? For traditional accounts these are questions about the association or synthesis of an array of sensations. But the introduction calls for a different sort of account, one that roots a labile *sens* of perception in the crossing of the body and the world. This chapter begins building that account by showing how perceptual *sens* arises in a moving schema that crosses the body and the world.

The chapter starts with a discussion of schemata and what Merleau-Ponty calls the body schema.<sup>1</sup> But a body schema that gives rise to *sens* must be conceived as arising within movement that crosses body and world. This is a subtle but perhaps vast shift in conception: the relevant schema is not, as some would suggest, to be located in an already constituted physiological or cognitive system of the body, which then serves as a standard for organizing and making sense of perception. The schema comes from movement and belongs to movement; it is dynamic through and through. More, this sort of schema is based in habit, and is thus inherently developmental and labile; and this sort of schema crosses over into the places in which we form habits, the places we inhabit. The account developed in this and the following

chapters thus foreshadows two ecstatic dimensions at the heart of spatial perception: the habitual dimension in which we are outside ourselves in our temporal being and development; and the placial dimension in which we are outside ourselves in the places, social and natural, in which we move and dwell.<sup>2</sup>

Habitual and placial dimensions pulse within a moving schema of perception, pointing us to a labile *sens* that leads us back to the social and the ethical. These points will be secured over the next chapters, which make a conceptual addition to existing discussions of perception and the body schema precisely by emphasizing that the schema of perception is a dynamic phenomenon that appears in the intersection of movement, habit, development, and place.

#### SCHEMATA AND THE BODY SCHEMA

In general a schema is a form or standard that fits changing content to an already specified framework.<sup>3</sup> There are many different conceptual variants of schema. Computer scientists who build knowledge bases for artificial intelligence systems come up with schemata for representing various bits of knowledge. These amount to data structures with ‘slots’ in them: changing content is bundled into a prespecified slot-structure that the system can always manipulate. Henry Head, who first proposed the concept of the body schema, turns to the word *schema* to capture the concept of “the combined standard, against which all subsequent changes of posture are measured before they enter consciousness” (Head 1920, 605). Kant invokes transcendental schemata in order to explain how it is possible to subsume intuitions under pure concepts, how categories that are fixed a priori can be applied to changing a posteriori appearances (Kant 1929, A138/B177–A142/B181).

In each of these conceptual variants, schemata have the role of giving order to open-ended content, of fitting changing content into already specified forms. A schema fits the contingent to the necessary, or the labile to the stable, or the a posteriori to the a priori. A schema could therefore be a crucial ingredient in giving an account of the labile *sens* of perception, since it crosses changing content with a stable organization that serves as a nucleus of meaning. But a schema that is itself entirely a priori or a posteriori, entirely contingent or entirely necessary, entirely fluid or entirely stable, would return us to the problems discussed in the introduction of the book. A many-headed Hydra of explanation springs up when we ask how changing content calls a new schema 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. What is required is a schema that is not severed from what it schematizes, but itself emerges in what it schematizes.

Merleau-Ponty’s concept of the body schema (which transforms the psychological concept) is philosophically important and innovative in this

respect, since for Merleau-Ponty the body schema emerges in the activity of the body, in the crossing of the body and the world. As I have argued elsewhere and as Dillon demonstrates, the body schema is neither a priori nor a posteriori.<sup>4</sup> If we had to locate the body schema within this conceptual division, we would have to say that it is a peculiar sort of a priori that keeps changing in light of the very a posteriori that it shapes, and we would have to add that this crossing of the a priori and a posteriori is from the start central to Merleau-Ponty's philosophy.

Merleau-Ponty, however, never quite spells out his conception of the body schema, nor does he put it at the focus of extended discussion; it is a concept that figures through its persistent background role in the *Phenomenology of Perception* and in his later philosophy as well. But if we had to pick one passage that captures Merleau-Ponty's concept of the body-schema in relation to perception, it would be this one, which is found in the bridge between parts one and two of the *Phenomenology of Perception*, in the bridge between Merleau-Ponty's study of the body and his study of the world as perceived (and even here it is only at the end of the passage that we are explicitly told that the body schema is the topic of discussion):

Every external perception is immediately synonymous with a certain perception of my body, just as every perception of my body is made explicit in the language of external perception. If, then, as we have seen to be the case, the body is not a transparent object, and is not presented to us in virtue of the law of its constitution, as the circle is to the geometer, if it is an expressive unity which we can learn to know only by actively taking it up, this structure will communicate itself to the sensible world. The theory of the body schema is, implicitly, a theory of perception. (PP 239/206)

The passage implies several things. The body schema is the bridge between the body and the perceived world—the theory of the body schema is already a theory of perception. But the body schema is to be found nowhere else than in living activity that bridges body and world: the bridge cannot be built in advance, it emerges only in actively taking up the expressive unity of the body; on the other hand, this sort of bridging activity already expresses its schema. Schema and living activity are aspects of one and the same phenomenon. And within this phenomenon the schema can be said to communicate a *sens* to body and world. Notably this *sens* crosses body and world, since perception of the external world and perception of the body are reflections of one another.

It follows from this passage, from the role that Merleau-Ponty assigns to the body schema, that the body schema is inseparable from movement that crosses body and world. That is what he means when he links the schema with an expressive unity and when he elsewhere speaks of the schema

as an attitude, or links it to habit.<sup>5</sup> Unfortunately, it is all too easy to reify the body schema, to conceive it as an independent thing, a bridge built in advance, that is to be abstracted from the movement in which it emerges, for example, to turn it into a cognitive or neurophysiological structure that would be specified in advance of movement. Once we have an “it,” a schema, to talk about, our tendency is to turn it into a thing, because our minds and language—and the body schema itself—dispose us to lending a thingly, solid *sens* to the content of the world; Merleau-Ponty himself does not escape this tendency, and sometimes even invites misconception of the body schema as some sort of thing.<sup>6</sup> We are, as Bergson (1998) puts it, inclined to a “logic of solids,” and of course a logic of solids would be at odds with thinking about a labile crossing of body and world or a schema that is itself in movement.

Behind these claims is a difficult ontological question: just what is the body schema? What sort of entity is it? We will return to this question in the next chapter. The aim of this chapter is to begin showing how the *sens* of perception is rooted in a schema that emerges in movement itself, and to draw a connection between this moving schema and habit. This is partly as a corrective to the mistaken view that the body schema is simply a new-fangled, corporeal version of an a priori, partly in aid of arriving at an account of labile *sens* through revitalizing the concept of the body schema. This revitalizing requires a shift in the language through which we conceive the phenomenon labeled “the body schema”: a shift from discussion of the body schema to discussion of the moving schema of perception. So I am going to begin not from Merleau-Ponty and the language of the body schema, but from observations prompted by thinking about the body schema in Merleau-Ponty’s phenomenology.

## PERCEPTION AND MOVING SCHEMAS

### PERCEPTION AND MOVEMENT

A simple phenomenological experiment will show that perception involves a schema of body-world movement. By *body-world movement* I simply mean movement of body and world together, as a duo, movement that crosses body and world.

Obtain a wine cork. Lay the cork on a table so that it can roll on its long axis across the table. Rest your hand beside the cork so that your finger and thumb drape down, just grazing its circular ends. Close your eyes and relax, bracketing any assumptions or claims about the cork and what it should feel like. Hold your hand very still for a minute or two, exerting as little pressure as possible on the cork, yet touching it. Then lift your hand off the table, keeping your wrist and hand relaxed so that the cork just hangs between your fingers. Now wiggle the cork.

A classic question about perception is how it fits independent sensations together into something meaningful. What the experiment shows is that body-world movement already fits perception together. When your hand just touches the ends of the cork, and you bracket anticipations about it, you may feel two independent circular surfaces. But when you let the cork hang between your fingers, the slight squeeze inherent in this body-world configuration makes this feeling of independent surfaces less convincing. And when you wiggle the cork, you feel one unified thing between your fingers, and you will probably have a feel for the dry, stiff springiness of the middle of the cork. Within the framework of traditional questions about perceptual synthesis, this appears to be a problem, since two separate surfaces, touched by two different fingers, are perceived as belonging to one thing, and the fingers provide a sense of tangible material that is not in fact touched by the fingers.

The insight prompted by the experiment is that the unity of cork does not rest in some sort of abstract synthesis of sensations. The unity is in the wiggle. To really feel the cork as a unified thing, you need to wiggle it, and wiggling it gives a compelling feeling of its unity and its springy middle. The cork participates in this wiggling: without the cork you could not quite move your fingers in the same way. The anticipatory motions of your body also participate in this wiggle: if you did not reach for the cork so as to anticipate wiggling it between finger and thumb, you might not be able to wiggle it, you might, for example, be restricted to rolling it. The perceived *sens* of the cork's unity is neither in the world nor in the body, but in their crossing, in a specific form of moving interplay. Different movements give different sorts of *sens*: if you wiggle the cork, you feel its unity as manifest in stiff springiness; if you roll it back and forth, you feel its unity as manifest in solid lightweight cylindricality. Further, to feel separate tactile sensations you have to immobilize your fingers and touch the cork as lightly as possible; in experience itself independent sensations are derivative of perception, not the other way around. This holds of sensations of your body as well: it is only when you immobilize your fingers that you can feel fingers as independent feelers; as soon as you wiggle the cork it is very hard to attend to disjoint sensations in the body. The cork-body wiggle—living body-world movement—compels a *sens* of the unity of the cork and of your hand, a unity that moreover crosses cork and hand in the movement that gives rise to this compelling *sens*.

Psychological studies by Katz and Klatzky and Lederman confirm that tactile properties of objects are correlative to ways of exploring them, and they also show that our explorations anticipate the tactile properties we expect or wish to feel. We reach out in different ways to feel sponginess, smoothness, etc. Developmental psychologists Bushnell and Boudreau have shown that these anticipatory explorations are present in young infants (Katz 1989; Klatzky and Lederman 1985, 1987, 1999; Lederman and Klatzky 1987; Bushnell and Boudreau 1993).

This observation approaches Merleau-Ponty's point, discussed above, that external perception and perception of the body reflect one another, and that 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. But here we approach Merleau-Ponty's point through a focus on movement. Body and world discover one another's *sens* through movement that crosses the one over into the other.

#### MOVEMENT AND STYLES

A wiggle is a style of movement: it has a definite dynamic contour, it is different from a poke, a shake, a joggle, a swing, and so on. None of the movements I have named specifies a fixed sequence of component movements derivable from a recipe, anymore than the term *jazz* or the name of a jazz standard names a derivable sequence of musical notes. All sorts of actual movement sequences count as a wiggle. While there is no recipe, there is nonetheless something definitive of a wiggle. More, what is definitive of a wiggle is not just in the wiggler, but in the wiggled: wiggling is not really appropriate to a wine bottle, the wiggle of a glass would have a different amplitude and frequency than the wiggle of a cork, and you just cannot wiggle a house.

The vague identity of the wiggle is central to the concept of *style*. How do I know that this music, this painting, this movement is in a given style, or that so and so has a particular style of walking? The usual answer is: I know it when I see it; the style is distinctive when I experience it, even if I cannot spell out a complete recipe. A style is an open-ended yet coherent and perceptually compelling pattern of something. But the pattern of wiggling is only compellingly apparent when it crosses bodies and things in particular instances of wiggling; here too the wiggle style is like style in painting or in jazz, where the style, the compelling pattern, is only manifest in crossing over into things patterned. Styles do not exist in abstraction from stylized activities.

We are here concerned with styles of movement, and these involve a sort of resonance in the crossing of body and world. One style of resonance is suited to exploring corks, another to exploring glasses; one style of resonance is suited to feeling the springiness of a cork, another to feeling its cylindricality. These styles are necessary to perceiving the world. Rather than synthesizing an array of sensations, perception is a matter of resonant styles of movement that first bring to light phenomena that compellingly fall together: the cork falls together in hand as a compelling unified and springy thing when we resonate with it in wiggling it.

But styles of resonance weave into an ensemble of styles. Wiggling a cork is not a movement that happens independent of other movements, it

goes together with walking, reaching, moving about, and so on, with an overall way of movingly perceiving the world.

I contend that the term *body schema* refers to the ensemble of the body's styles of movement. We should thus 'locate' the body schema within movement itself, not in the body itself, nor in its neurology, nor in the world, but in movement that crosses the two—movement that is habitual, that styles itself.

#### THE DOUBLE MARBLE, HABIT, AND ANTICIPATION

Style depends on habit and anticipation. This can be shown through a discussion of the double marble phenomenon, which also ties us back to Merleau-Ponty's own discussion of the body schema and perception.

Aristotle had long ago noted that when touching a marble with crossed fingers, one might feel two marbles. As the psychologist Fabrizio Benedetti insightfully remarks, it is just as puzzling why we normally feel one marble through two fingers, given that the fingers touch two different surfaces. Indeed, we can sometimes feel two disjoint surfaces, as the cork experiment shows. Why should separate sensations on the fingers be experienced as sensations of one thing, and why should crossing the fingers make a difference to our experience of tactile unity?<sup>7</sup>

In the context of inferential accounts the illusion of the double marble thus provokes the traditional question as to how we put multiple tactile sensations together. The inferential account amounts to the claim that we have a model of where finger surfaces should be relative to one another. This gives us a way of inferring from an array of finger pressures to conclusions about the world. We need such a model, otherwise we would not know where our limbs are or how to combine sensory data from them. The latter point is what led Head and Holmes to the concept of the body schema in the first place, a schema that would representationally model or measure our body, its posture, and our postural relation to the world.

When our fingers are crossed and displaced from their usual relative locations, the inference based on this representational body schema goes awry. The pressures produced when crossed fingers probe a marble are the pressures that would be produced when uncrossed fingers touch two separate marbles pressed on the outer edges of the fingers. So we experience two separate marbles. But Merleau-Ponty cites an empirical result by Tastevin, also taken up and varied by Benedetti, that shows a curious inversion of sensations when the experiment is conducted using a teardrop-shaped object: the pointy end pressing into the middle finger is felt in the index finger, and vice versa. This result leads Merleau-Ponty to conclude that the illusion is due not to a simple spatial displacement of fingers, but to a disturbance of the exploratory possibilities of the fingers.

Like the cork-wiggle, when we roll a marble between two fingers, it is movement that gives an experience of a single marble. When the fingers are crossed, they lose their grip on the world and correlatively lose their marbles. But our bodily approach to things still anticipates this grip, hence the curious inversion, as if ghostly habit fingers that can still grip are at work beneath actual fingers. Merleau-Ponty would also point out that we experience something fishy in the case of the double marbles, that the marbles do not quite feel real. Again, this would confirm that the unified marble is correlative to the firm grip anticipated in our habitual exploratory movements, not to an inference. “[I]t is literally one and the same thing to perceive one single marble, and to use two fingers as one single organ.” (PP 237/205)

As I studied this illusion, I became adept at manipulating things with my fingers crossed, and then the illusion vanished. But after a session of crossed-finger marble manipulation, the marble would double when I touched it with *uncrossed* fingers, and the keys that I reached for on my computer keyboard seemed to twist around oddly in space, although both phenomena dissipated after a while, a process speeded up by manipulating activity. *Habit and anticipation are crucial to the phenomenon*. The linkage between anticipation, exploration, and perception is also confirmed by the results of Klatzky and Lederman, and Bushnell and Boudreau, cited above, and by other results of Benedetti.<sup>8</sup>

These phenomena emphasize that what matters to perception is not the mere position of body parts in movement, but the overall dynamic resonance between body and world over the course of movement—movement is not to be decomposed into component positions, but has a melodic character that stretches over time.<sup>9</sup> The styles that, as an ensemble, constitute a moving schema of perception are thus to be understood in terms of habit and anticipation: to give an account of the double marble in terms of movement, we cannot just be looking at what the body is doing here and now, we must think about that movement in terms of habitual ways of moving the body and engaging the world. Styles are not patterns of mere material movement in the present, but habitual patterns of anticipated body-world movements that not only cross the body with the world, but cross the body with its past and future, a point we return to below.

#### VISION AND MOVEMENT

Vision also depends on a moving schema of perception, a way of looking. On first glance, it is not surprising that we fail to notice this about vision, since vision is the distance sense *par excellence*, it is quite insular from its object. Whereas it is clear that the cork moves our fingers, vision seems to be a passive way of receiving light into the body, rather than a way of moving influenced by what we see. To put it another way, touch obviously involves movement that crosses back and forth across body and world; this is not so



obvious in the case of vision. But Gibson shows how vision depends on movement, and Merleau-Ponty shows the way that seeing depends on looking, and draws a link between movement in the case of the double marble and the case of binocular vision. The point that vision involves body-world movement is important for subsequent chapters, and emphasizes the importance of habit.

As mentioned above, Benedetti insightfully notes that when it comes to the problem of the double marble, we might as well ask why we normally feel one marble with two fingers. That question is parallel in structure to the notorious question of how we see one thing with two eyes, and in fact Benedetti coins the term *tactile diplopia* to describe the doubling of tactile objects, on the model of *diplopia*, which is the technical term for the visual doubling of objects. How is it that I see one coffee cup, one sheet of paper, and so on, with two eyes?

Merleau-Ponty's answer returns us to some points made in the introduction to this book. 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? And even if we do not explicitly know or assume that the images are of one thing, this sort of inferential process can work only if the two visual fields overlap; for example, one and the same cup must be projected on both my left and right retinas. But as J. J. Gibson points out, horses and chickens do not have overlapping visual fields, yet we would not imagine that a horse or a chicken facing a barn sees two barns (Gibson 1979). So an inference from overlapped binocular content is not even *necessary* for the experience of a unified world.

Further, we can use bifocals, trifocals, rear-view mirrors or multiple television monitors to view a situation, thus integrating multiple views into one visual world. It is as if our habits of seeing can keep on integrating new 'functional retinas' into a view that nonetheless remains unified. Overlapping content of binocular images is not necessary and is not sufficient (in and of itself) to specify the unity of the visual world; and given the plasticity of vision, the fact that habits can integrate more and more 'windows on the world,' it seems misguided to stake an account of vision on the number of retinas or the overlap of the visual field. What is at stake in vision is not the optical reconstruction of the surround, but a way of inhabiting a world at a distance.

Points of this sort lead Merleau-Ponty to some marvelously insightful conclusions about vision. He writes that "the sight of one single object is not a simple outcome of focusing the eyes, that it is anticipated in the very act of focusing, or that as has been stated, the focusing of the gaze is a 'prospective activity'." It is necessary to look in order to see, a point that is becoming

more and more apparent in recent studies of vision, for example in Churchland, Ramachandran, and Sejnowski's "Critique of Pure Vision," in which they argue that vision is inherently interactive and prospective. And this prospectivity, according to Merleau-Ponty, is a matter of bodily intentionality.<sup>10</sup> "We pass from double vision to the single object, not through an inspection of the mind, but when two eyes cease to function each on its own account and are used as a single organ by one single gaze."

The parallel between Merleau-Ponty's claims about vision and his claims about touch are obvious: in both cases the unity of the thing and the unity of the organ are replies to one another, embedded in the crossing of one's body and the world. (In drawing this parallel we must not, however, forget Merleau-Ponty's case against Descartes's conflation of vision and touch.) And this unity is due to the "prelogical unity of the body schema,"<sup>11</sup> a schema that, as I am urging, we should locate in styles of movement that cross body and world: what Merleau-Ponty calls the prelogical unity of the body schema does not rest in the body only, for things are participant in drawing the eyes together. A body raised apart from things would not know how to look at them, a claim confirmed by various experiments (for example, Held and Hein 1963).

The point that vision depends on styles of movement, and that things themselves teach us how to look at them so as to see them is easy to notice once we have twigged to the fact that the eyes are not (as traditional accounts often imply) passive receptors of the outside world. To see unified things like cups is to be drawn into a certain style of looking, and to be drawn along with things as they move about. In cases of confusing situations it may take a while before the right style of looking clicks into place. But usually one's style of looking is so pervasively defined by one's inherent patterns of eye movement, and one's eyes so strongly drawn to things, that one's style communicates an unshakable unity to the world.

#### THE MOVING SCHEMA OF PERCEPTION

Bodily movement inherently crosses body and world, and styles of this movement are at the core of perception. To feel one marble, to see one thing, to feel or see the properties of a thing, is to engage in a particular style of moving with things, even of looking 'with' things. The concept of the body schema, as we find it in Merleau-Ponty's philosophy, is a way of marking out the ensemble of all these styles as central to perception. But we would be better off, conceptually speaking, if we retained our focus on stylings that arise within movement, a focus that is deepened when we see how these stylings arise within habit. Hence I will speak of the moving schema of perception, a schema that arises in the crossing of body and world, rather than a schema that is of the body as such.

The claim that the *sens* of perception emerges in a moving schema has the radical implications demanded in the introduction. There is no raw data on the far side of perception; sensation in the traditional sense does not figure in perception. We *sculpt* perception from the given in the way that a sculptor sculpts a statue from the stone. To encounter what is given we must already have crossed over into a moving encounter with it, and thus we must already have shaped what it is for us. That initial shaping, which is the condition of being in the world, already vaguely outlines what we can perceive, soliciting further stylized exploratory movements that develop this anticipated outline. That perception is more like sculpting than a synthesizing reconstruction of a ready-made world is, for example, shown by the familiar phenomenon of not perceiving what is in fact there, or being unable to perceive it.<sup>12</sup>

Given that perception emerges in a moving schema that crosses body and world, when I look at my coffee cup, the problem is not, as the tradition would have it, why I see one thing with two eyes. The problem is noticing that I look with two eyes, prying my eyes away from their lock on things, pulling them from the lock that things have on my eyes, prying myself from being crossed over into the world so that I can be responsible to the world and to my way of seeing. When I am looking at the Müller-Lyer's illusion, the thing that I am looking at pulls apart my vision, and thus shows me something about my vision: I see my way of looking reflected in the thing. But everyday things hide this reflection of my look; I see the coffee cup, rather than seeing how I look at the coffee cup. To see how I look at things, to see things as looked at by me, to see how I thus shape their look, to see my impact on the things that I look at—this is the task of the artist and also of the philosopher. If I am to make a good drawing of my coffee cup, I cannot just see how *it* looks, but must see how it looks *to me*. I must see my looking appearing in the thing seen, so that I can draw another's look into my way of looking and seeing; and it is by trying to draw another into my looking, by trying to look with my own eyes as if with the eyes of another, that I become responsible to my own looking.

With these points about movement and perception in the crossing of body and world, we begin approaching the ethical within depth. If I am to grasp how depth looks to me, I must grasp how my looking, my way of crossing into the world, impacts upon the depths that I see. This is why it is important to note how vision and perception depend on movement: we notice the ethical in depth when we notice that our movement crosses over into what we perceive in depth, that things in depth reflect our responsibility for our perception of them. As opposed to illusions, everyday things may hide the reflection of my look—although artists, as Merleau-Ponty notes, often speak of things looking at them. “The object stares back,” as James Elkins puts it in a book of that title. But other people, as Sartre shows, do

not hide the reflection of my look; they hold me responsible for my look; they explicitly stare back. Other people thus expose the illusion of our neutrality, expose the illusion that depth is a neutral container upon which we are mere onlookers. They make us see our responsibility for our way of seeing them in depth.

On the other hand, if, as the next section and chapters show, our movement arises in habit and thence in our social development, then the way people look in depth reflects, to some degree, their responsibility for our way of looking at them.

#### HABIT, LABILITY, AND MEANING IN THE MOVING SCHEMA OF PERCEPTION

##### DYNAMIC SYSTEMS THEORY ON THE SCHEMA IN MOVEMENT

What has been called the body schema is inseparable from movement. This point is supported by Turvey and Carello, psychologists who have done extraordinary work giving an account of bodily movement and touch within the framework of dynamic systems theory. Critical engagement with their results (and related work) will deepen the points made so far about habit and lead us to the role of meaning in the moving schema of perception.

In a study of what Gibson called dynamic touch, cases where movement of the limbs is intrinsic to what is felt by touch, Turvey and Carello draw attention to some experiments by Lackner and Taublieb and Craske. In these experiments, tendons or muscles of the experimental subject are vibrated; this induces "errors" in perceived limb position, and in some cases the perceived position was "impossible" (Turvey and Carello 1995, 440–41). Turvey and Carello note that this result poses a problem to the traditional claim that the body schema is a representation of limb positions. We could put the problem the following way: Why would a representational schema of limb position encompass representations of *impossible* limb positions, and why would rapid vibratory movement of parts of the body encode limb positions? After all, these vibrations did not appear in nature until we invented electric massagers and the like, so why would they have any particular import in representing limb positions?

Their own investigations and experiments lead Turvey and Carello to conclude that activities such as wielding a rod determine a time-dependent tissue deformation pattern in the arm and wrist that is "(1) constrained by the rigid arm-plus-rod dynamics and (2) expressed in the intrinsic co-ordinate system defined by the muscles and tendons of the forearm." The information in this deformation pattern is available in the brain, and movement of one's own body as well as artificially induced vibrations would yield such deformation patterns (Turvey and Carello 1995, 478). Recently they have argued that perceived limb length and orientation likely refer to inertial properties

of the limbs as we move them about (Carello and Turvey 2000). There is no need to conceive the body schema as a schema for representing limb positions and measurements in some sort of abstract coordinate system (for example, a Cartesian or polar coordinate system) superimposed on the body. Information about limb position is right there in an “intrinsic coordinate system” specified by the very stuff of the body. Representational-inferential accounts of the body schema run into the problem that the schema has slots for impossible values (in which case just what is it representing?), and that novel body-world interactions such as vibrations yield experiences of strange or impossible bodily positions. But there is no such problem if, as Turvey and Carello argue, the schema is embedded in body-world movement itself, in the way that limbs move and muscles and tendons deform. There is not a central encoded representation of the body. The body schema, according to Turvey and Carello, is *in body-world movement itself*.

This echoes Rodney Brooks’s argument, mentioned in the introduction, that there is no need for a robot to model the environment, the environment is its own model. Turvey and Carello have a complementary insight: there is no need to model the body, we can conceive the body as its own ‘model’ once we realize that the body ‘represents’ its own position not in Cartesian co-ordinates, but in the flesh.

In showing that body-world movement itself specifies a schema, dynamic systems theory concurs with and strengthens the point that the body schema is in movement. But divergences arise when we notice how the schema depends not merely on movement of the body at this moment, but on movement of a habitual body, a body stretched over time via anticipation.

#### THE MOVING SCHEMA OF PERCEPTION IS A HABITUAL SCHEMA

For the purposes of this discussion, I work with the following rough definition of habit: a habit is a style of movement not fully responsive to the world at present, that is shaped by a past history of movement; in some cases we would have to conceive a habit as a movement directed toward a future world that may not even be present. People have certain ways of walking and moving about; if you live with them long enough, you can tell who has come into the house just by their style of opening the door and walking up the stairs. This way of moving is not composed in the present, it is a condensation of a long history of moving about, it is a past acting in present bodily movement, it is a habit. Misplaced habits show that this past acting in present bodily motion is directed toward a future that does not belong to the present world: on my first night in the hotel, I bump into the wall because, in my grogginess, I am walking as if I were in my house, my steps are directed toward a doorway that will be there in my house, but is not present in the hotel.

Let us return to the case of binocular vision for a moment. The traditional question about binocular vision is how we see one thing with two eyes. The claim that this unity is inferred from the binocular disparity of the images begs the question, because it assumes the unity of the thing seen. A variant of this claim is that the inference amounts to a matching of symmetrical points on the retinas. The variant claim would not have to directly assume the unity of the thing seen, because the unity is, so to speak, built into the very anatomy of the eyes. (The unity would, however, have to be assumed if we asked why this matching mechanism evolved.)

But Richard Rojcewicz, in his discussion of depth perception as a motivated phenomenon, argues that the matching could not be specified anatomically, since in cases where one eye drifts from its fixation point (a condition called strabismus), a new, *functionally* defined relation between points on the retina comes into play (Rojcewicz 1984, 41). To this we would have to add the following: Heaton observes that when double vision occurs in the case of paralysis of an eye, the seer initially sees two images that both appear unreal, but later “one [image] appears solid and articulated in the visual world while the other, which usually corresponds to the paralysed eye, looks ‘unreal’ and ghost-like” (Heaton 1968, 241). Vision of unified objects is disturbed but then resumes: (1) when the images on the retina are inverted by prisms; (2) when a detached retina is reattached ninety degrees from its original position; (3) when the optical distance between the eyes is effectively increased through the use of prisms; (4) when the visual field of each eye is left-right reversed through the use of prisms; (5) when the size and shape of objects at a given distance is distorted by the use of goggles underwater.<sup>13</sup> 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. Give one’s moving eyes almost anything, and one learns to look so as to see a unified world. The unity is not in the anatomy of the eyes, but in the moving schema of looking, which is plastic and habitual.

Two interrelated conclusions follow:

(A) The unity of the seen has a *sens* reflective of one’s bodily style of looking at the world. When an eye is paralyzed, one may see a real, unified thing with one’s active eye and a ghostly image with the paralyzed eye. When cross-eyed, one sees two oddly doubled images of one unified thing. Through inverting lenses, as Stratton’s observations show, one sees a unified world that seems oddly related to one’s body (Stratton 1896, 1897). So the experienced unity is not a simple matter of fusing two flat images into a reconstruction of one physical object; it cannot be conceived on a geometrical, physical, or optical model. What room is there in the realm of geometrical or optical models, in the realm of pure subjectivity or pure objectivity, for a distinction between “real,” “ghostly” or “odd” images, or for a visual unity in which two or more images are seen and yet experienced as images of one thing?

(B) One's body has a *sens* reflective of different styles of looking at things. Upon getting a new pair of glasses, I feel as though I am sinking into the steps and pavement outside the optometrist's office and feel that my body is the "wrong" size. When living with lenses that optically invert the world, Stratton feels as if his head is buried into his shoulders "almost up to [his] ears," and when eating, that his mouth is on the wrong side of his eyes (Stratton 1897, 467–468). When cross-eyed, my body feels oddly ghostly or dislocated. These disturbances of *sens* do not fit into any objective model of bodily dimensions and variations: my body has not quantitatively shrunk by *N* units, it is the "wrong" size, and the wrongness inseparably reflects the experience of sinking into the pavement with rubbery legs while buildings bulge around me; and it would be odd to think that the distance between the head and shoulders or between the mouth and eyes is represented by a variable that can go into negative values. The disturbances are not objective, but neither are they purely subjective: they are not in our (cognitive) control, they go away as we move about in the world and habituate to our style of engagement with the world.

Overall, this suggests that the *sens* of the unity of the visual world and the *sens* of one's body are meaningful, correlative, labile, and habitual, that this *sens* is tied to one's habitual style of looking at the world, and is irreducible to purely subjective or purely objective terms. Styles of looking lag behind changes to our body and its prostheses: it takes a while to learn how to see the world with new glasses. This is a characteristic of labile habit. The unity of things could never be inferred, yet it is clearly anticipated by our body, and we learn to look so as to see a unified world, through a range of disturbances. This too is characteristic of habit: habits reestablish themselves, and to have a habit is to have a way of moving that is not responsive to the world as it actually is at this moment; a habit precisely anticipates the world to which we are habituated. I get into the right-hand drive car and I reach the wrong way for everything, because I am not reaching for parts of a material car at present, I am engaged in the sorts of movements that anticipate a car to be driven, and the car to be driven, to which I am habituated, is a left-hand drive car.

As Merleau-Ponty puts it:

Psychologists often say that the body schema is *dynamic*. Brought down to a precise sense, this term means that my body appears to me as an attitude directed toward a certain existing or possible task. (PP 116/100; note that Smith's translation mistranslates "*schéma corporel*" as "body image.")

The moving schema of perception is inherently dynamic; it involves movement and it moves, dynamically changes. What this means is that it is really a network of habitual attitudes directed toward existing or possible tasks.

The moving schema of perception is a *habitual* style of moving the body.

## THE LABILE MEANING OF THE HABITUAL, MOVING BODY

The points mentioned above about lability and meaning are deepened by returning to Lackner, Taublieb, and Craske's experiments on the effect of vibrations on perception of limb position.

Recall that in general such vibration induces a feeling of the limb moving from its actual position. Lackner and Taublieb (1984) contrived an ingenious experiment in which the subject's right biceps was rapidly vibrated with a mechanical device, and in which the subject was asked to visually fixate on her/his finger when the entire arm was hidden from the subject, when only the index finger was visible, or visually fixate on the hand with only the hand visible, in rooms that were lit or dark (they used glow-in-the-dark paint to make fingers and hands visible in the dark). In lit situations, subjects reported a disparity between the felt location of their visible hand or finger and the rest of their arm (which was hidden), to the extent that they felt their arm moving downward further than their hand or finger, that is, *separating* from the hand or finger, yet being *continuous* with it nonetheless, which is a "physically impossible" dissociation of the perceived body. In the dark, subjects reported that they "literally see their finger or hand move in keeping with the apparent extension [of the forearm]. This is true even though eye movement recordings show that the subjects are actually maintaining steady fixation of their stationary hand." Subjects also reported sensations of having multiple limbs; this was also reported by Craske (1977). In another of Craske's experiments, vibrations were applied in such a way as to induce in subjects the experience of their limbs being extended beyond normal range; subjects reported that "'the arm is being broken,' 'it is being bent backwards,' 'my hand is going through my shoulder,' and 'it cannot be where it feels.'" Moreover, "Although no pain is involved in the procedure, subjects displayed the overt signs which often accompany pain, such as writhing, sweating, and gasping."

Craske and Lackner and Taublieb give a more or less inferential account of these results. They claim the experience is due to the suppression of the physical movement of limbs that *would* arise from the muscle contractions artificially induced by outside vibrations. But subjects do not experience the effects of the vibration as the mere addition of component movements and distances that represent the status of a physical system, as if a variable representing limb position were running off the end of a scale. The body experienced in this experiment has characteristics that do not belong to the physiological body: (A) the arm and hand can move apart from one another yet still remain an arm; (B) the arm seen can move without any visual movement across the retina; (C) limbs can double; (D) subjects can experience pain and react to pain when the perceived body is violated, even if pain sensors are not directly affected (one would have to question Craske's claim that "no pain is involved").



Neither is the experienced body some sort of subjective image or idea, since it is affected by vibrations, and it would be hard to figure out why such an intense feeling of pain would couple with a mere image or idea of the limb being extended beyond normal range. The experienced arm does not fit into either a physical/objective or ideal/subjective paradigm, rather subjective and objective poles of description are blended in a determinate manner. Also, it should be noted that the experience varies across individuals, so it is not predicted by any general constant relation between inputs and outputs.<sup>14</sup>

The phenomenological claim would be that the relation between what happens to the body and what is experienced has something to do with a *meaning* of the lived body. The arm appears as a meaningful arm, as manifesting the meaning of a corporeal organ of grasping, despite disturbances of the body, and the attributes of this meaningful organ are not identical with the attributes of the organic body, since it can do things that no organic arm could do, that is, double, stretch, move in nonvisible ways. The meaning of the body is habitual and crosses over into the world and into my past and future: I expect the wheel and controls of a car to work in a certain way in my attempts to drive, to give me a certain possibility of a moving feel for the road; similarly, I expect to get a certain possibility of grasping when I try to reach. In the phenomenon of the phantom limb, Merleau-Ponty notices that the patient is expecting the possibility afforded by the limb to still be there, and maintains that expectation, so the limb that counts as fulfilling this expectation is not governed by the rules of organic limbs, but by habitual anticipations of the patient, above all an anticipation of a meaningful way of grasping the world, anticipations the fulfilment of which is modified by what has happened to the body.<sup>15</sup>

An experiment by Roll, Roll, and Velay (1991) enforces the point that the experienced arm has to do with habits and anticipations that cross over into the world. Roll, Roll, and Velay's experiment seems to present a case of a very complex illusion, which was induced when muscles of the hand were vibrated. When the hand was free, it felt as if the hand were extended further than it really was. When subjects leaned against a wall with the arm at shoulder height and the hand pointing forward, the subject felt the whole body as leaning forward; when the position of the hand was reversed so that it pointed backward, the subject felt the whole body as leaning backward. In both cases the subject's body was, objectively speaking, upright, not leaning. Roll, Roll, and Velay are struck by the fact that a simple "change of the orientation of the subject's hand on the wall (from fingers forward to fingers backward) sufficed to reverse the whole-body illusion from forward to backward." But Merleau-Ponty's and Carello and Turvey's analyses of illusions, discussed in the introduction, caution us against interpreting this experiment as an illusion, an error of perception.

Merleau-Ponty dissuades us from a metrical comparison of the felt orientation of the everyday body and the felt orientation of the vibrated

body in this unusual position, just as he dissuades us from metrical comparison of the two lines in the Müller-Lyer's illusion. What, then, does felt orientation refer to? In his analysis of an experiment by Wertheimer, in which the subject is presented with a room that is visually tilted forty-five degrees from the vertical, Merleau-Ponty argues that "my body is wherever there is something to be done," and it is when the subject can take hold of the tilted room as a "possible habitat" that the room rights itself visually; "[t]he maximum sharpness of perception and action" that is afforded by the righted room "points clearly to a perceptual *ground*, a basis of my life, a general milieu for the coexistence of my body and the world" (PP 290/250, emphasis Merleau-Ponty's). Merleau-Ponty suggests that felt orientation correlates with possible habitat, with habitual modes of engagement with the world, not to some measure in a ready-made world external to the crossing of one's body and the world, a suggestion about orientation supported by observations of Skylab astronauts, which I discuss in chapter five.

Roll, Roll, and Velay are puzzled by the fact that a simple "change of the orientation of the subject's hand on the wall (from fingers forward to fingers backward) sufficed to reverse the whole-body illusion from forward to backward," and we can see why, if we construe hand orientation and whole-body orientation as independent measures in a system for representing the body. Why would the two be connected? However, if we construe this as a holistic phenomenon of a moving, habitual schema of perception that crosses over into the world, the connection becomes apparent. We reach out in habitual ways to steady ourselves against vertical support surfaces; when we do so, the direction of our hand, forward or back, affords different possibilities of support; the hand-forward position affords leaning forward and prevention of falling forward, and conversely with the hand-backward position; the hand-forward position does not keep you from slipping backward. Hand positions anticipate habitual possibilities of movement and prevention of movement; they are not positions of the body merely, but already anticipate their crossing into the world in which the body moves.

What the vibration seems to do is bring those anticipations into play in a new way. The vibrations do not directly cause the phenomenon; they modify the crossing of the body and world, thereby modifying the way the habitual, moving schema plays out in actual activity, thereby modifying the *sens* of this perceptual situation. With respect to the feeling of limb position and bodily orientation, the vibrated body, because of its different way of crossing with the world, is a different body from the nonvibrated body, in the way that one arrow in the Müller-Lyer's figure is different from the other with respect to visual expanse, or in the way that the apple on the moon is different from the apple on the earth with respect to felt weight.

This is the phenomenological claim. What would Carello and Turvey say? Earlier I discussed their criticism of inferential/representational accounts of the body schema, and their claim that the body schema amounts to

information available to us in the body. I now simplify their point and push it a bit beyond the strict confines of their own claims, but the real issue is this. When asked what the experienced arm or body in the experiments discussed above refers to, I think that dynamic systems theorists would say: information in the body, specified by the overall dynamic interaction of the vibrating body and the environment. This, I think, is not enough, for we would have to ask why this information is experienced as a tilting forward or back of the whole body, as a doubling or impossible stretching of the arm, as a pain that supposedly has no physiological basis, and so on. I can imagine dynamic systems theory giving a very powerful account of how experienced limb position refers to dynamic factors specified by body-world interactions; indeed, dynamic systems theory does this. But I cannot imagine it being able to *predict* that unusual body-world interactions would be experienced as doublings, impossible limb positions, as painful, and so on, especially when these experiences vary across individuals, and if it cannot predict, then there is a serious question as to whether it can give a scientific explanation of the phenomenon. Such explanation bears upon a relation between ourselves and the world that seems to be beyond the proper compass of scientific explanation, so far as scientific explanation begins by already having presumed a basis in a certain relation to the world.

Further, Turvey and Carello suggest that the body schema be understood in terms of time-dependent nondimensional deformations within the tissue of the body itself, a “function of stimulation occurring at that moment” (Turvey and Carello 1995, 441). But it would seem that individual and meaningful variations would depend on habit and an anticipatory temporality that is not specified in the moment.

The above amounts to yet another demonstration that the perceiving body is a lived body, a body that is neither subject nor object, but an inherently meaningful and fleshy mix of the two, a body inherently mixed up with the world in which it lives. Merleau-Ponty’s conceptual framework, and all of the above analyses, keep returning us to a middle region between the subjective and the objective, the ideal and the physical, the body and the world. Dillon’s terms “the phenomenal world” and “phenomenal,” which he develops in his analysis of the implicit ontology of the *Phenomenology of Perception*, are helpful in designating this middle region. The phenomenal world designates the world as a domain of inherently meaningful appearances, the world in which we live.

The word *phenomenal* used on its own designates the meaning characteristic of the phenomenal world. Grammatically, to say that something is phenomenal is (in the usage that follows) much like saying it is meaningful. And just as we can speak of “*the* meaningful,” we can speak of “*the* phenomenal.” Our philosophical and scientific traditions would lead us to believe that meaning is in the head or mind, that it is subjective. The concept of the phenomenal challenges this claim, for the meaning of the phenomenal is not

in the head, it is in what appears. But this does not mean that meaning is in the purely objective sphere. The objective sphere, as we have seen, is incommensurate with the phenomenal. In Lackner and Taublieb's experiment, the experienced arm is ontologically incommensurate with either the objective or the subjective; it is neither an artifact of the subject nor an organically defined arm. It is a meaningful appearance, it is phenomenal.

Another way to put this is to say that the experienced arm is "non-ontonomic," it does not obey the laws (*nomos*) of things (*ta onta*). This coinage is so ugly and bereft of euphony that I shall use it only occasionally, to frighten us into recalling that the phenomenal body and phenomenal world are not rooted in the laws of the objective or subjective world, but in meaning and habitual anticipations.

#### CONCLUSION: THE PROBLEM OF *SENS*

What we have discovered so far is that perception arises in the crossing of body and world, that this crossing involves movement, that this movement is habitual and anticipatory, is thus styled and constitutes a moving schema of perception. This adds to existing accounts by emphasizing that 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. But so far our discovery is almost entirely descriptive in character. It leaves unanswered the question of how this schema constitutes itself, what this schema really is, and where *sens* comes from. In the next chapters I show that these questions can be answered if we take the habitual aspect of the moving schema of perception seriously, and attend to the moving schema of perception as a developmental and expressive phenomenon.