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The Affordance of Practice - The Influence of Structure and Setting on Practice

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Abstract

Theories of practice are distinct from other forms of theorizing about behavior not because of the phenomena they address. Rather, theories of practice are distinguished by their rejection of three familiar dualisms that organize our field: Physical realism versus social constructionism; Voluntarism versus determinism; and Subjectivism versus objectivism. Practice theory seeks the terrain between the easier, simplistic extremes at each end of these three dimensions. Existing theories of practice, such as those based on Bourdieu's concept of habitus, have tended to give us a better understanding of how social and symbolic structures shape practice than of how the material setting, as it is socially and physically constructed, does so. We argue that Gibson's theory of affordances, offers a useful way of thinking about how practice is patterned by setting that neatly complements the understanding that Bourdieu's theory of habitus gives us of how practice is patterned by structure. Our objective in this paper is to show how affordances and habitus may be used together to provide a rich way of describing practice. We contrast the habitus-affordance approach to the most fully developed attempt to conceptualize both the social and material aspects of practice, actor-network theory to show the limitations of actor-network theory that create a conceptual space for habitus-affordance. We conclude by giving examples of how habitus and affordance can be bridged in this way.

Key words: practice, habitus, affordance

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Introduction

Theories of practice are distinct from other forms of theorizing about behavior not because of the phenomena they address. Rather, theories of practice are distinguished by their rejection of three familiar dualisms that organize our field. First, physical realism and social constructionism. Practice is embodied. It is the essence of practice that it is undertaken by physical actors in a material environment. Yet practice is a social phenomenon, laden with meaning and regulated by ideas. Thus, a theory of practice must conceptualize not only ideational elements and social constructions but also material elements and physical constructions. Second, voluntarism and determinism. Practice, in its performance, requires agency and permits discretion, but is patterned and constrained by social and physical forces. Thus, a theory of practice must not only concern itself with both the physical and social aspects of the practical environment but must also conceptualize how this environment at once enables and constrains discretionary action. Third, subjectivism and objectivism. People are not genetic robots nor are they cultural dupes. Their understandings of the practices they enact are consequential, but those understandings are incomplete because practice is powerfully shaped by factors that are taken-for-granted or misrecognized. By the same token, people enact their environment as they make sense of it, but human interpretation is never omnipotent. Though there are an infinite number of possible interpretations of any practical context, there are always many more interpretations that are made impossible by the social and physical conditions of that context. Thus, a theory of practice must explain not only how social and physical conditions enable and constrain action, but also how they enable and constrain the perceptions and interpretations of actors.

Practice theory seeks the terrain between the easier, simplistic extremes at each end of these three dimensions. If this middle ground is often treacherous, it is indicative of the fact that practice resists theorizing and that we must resist over-theorizing practice. The study of practice should remain firmly grounded in concrete description of actual practices. Where theory can help is to provide a better language for describing how particular practices are shaped and patterned by structure and setting. Organization theory is missing such a conceptual language and needs one if we are to explain practice.

The writings of Pierre Bourdieu, especially in *Outline of a Theory of Practice* (1977) and *The Logic of Practice* (1990), and specifically his notion of *habitus*, provide half of the vocabulary we need to build this language. Habitus is a way of conceptualizing how social structures influence practice without reifying those structures and without falling into the traps of voluntarism, determinism, subjectivism, and objectivism. Bourdieu's work has been influential in the study of organizational practice, and for good reason (Pentland 1992; Tsoukas 1996; Mutch 2003; Feldman 2004; Ozbilgin and Tatlli 2005; Whittington 2006). Bourdieu's theorizing, however, especially as it is cited in organization theory, takes as its focus the social and the symbolic.[1] In this, Bourdieu's concept of habitus is similar to Giddens' concept of structuration (Barley 1986; Orlikowski 1992; Orlikowski and Yates 1994). The result is that we have a better understanding of how social and symbolic structures shape practice than we do of how the material environment, as it is socially and physically constructed, does so. Bourdieu has taught us how to talk about the influence of structure, but we must turn elsewhere to understand better how to describe the influence of setting on practice.

[1] Pentland (1992) is an important exception to this, as we describe later in the paper.

The work of the ecological psychologist, James Gibson (1986), and his theory of *affordances*, offers a useful way of thinking about how practice is patterned by setting that neatly complements Bourdieu's theory of habitus. For Gibson, the concept of affordances allow us to describe how the physical and socially constructed environment govern, but do not determine, the practices that occur there in a way that escapes the false dichotomies of voluntarism versus determinism and subjectivism versus and objectivism. Our objective in this paper is to show how affordances and habitus may be used together to provide a rich way of describing practice. We contrast the habitus-affordance approach to the most fully developed attempt to conceptualize both the social and material aspects of practice, *actor-network theory* (Callon 1980; Callon 1986; Akrich 1994; Latour 1996; Law and Hassard 1999; Latour 2005), to show the limitations of actor-network theory that create a conceptual space for habitus-affordance. We argue that there are important advantages to be had from using theories of the middle range that explain well a more bounded set of phenomena—habitus explaining the influence of structure on practice and affordance explaining the influence of setting—rather than constructing one grand theory that seeks to explain everything. We conclude by giving examples of how habitus and affordance can be bridged in this way.

Affordances and Habitus

At first glance, the work of Gibson and Bourdieu may seem to have little in common. Gibson is visual psychologist whose main interest is the study of visual perception and whose main methodological tool is the laboratory experiment. Bourdieu is a sociologist and ethnographer. Certainly, the normal ontological, epistemological, and methodological assumptions underlying American psychology and French sociology could hardly be more different. Neither Gibson nor Bourdieu is

typical of his field, however, and the philosophical underpinnings they apply to their different areas of study are remarkably similar. It is this that makes habitus and affordance so compatible. There are two key elements of similarity between habitus and affordance applied to organizational practice. These have to do with the stance the two authors take to the key dualities of voluntarism and determinism—how practice is shaped—and subjectivism and objectivism—how practice is understood by those enacting it. This can be seen in the definitions of affordance and habitus and how they are put to conceptual use by Gibson and Bourdieu.

Affordances connect practice with perception. The affordances of an object or environment are the possibilities for action called forth by it to a perceiving subject. Thus, to humans, handles afford grasping; doors afford entry and exit; paths afford locomotion. Gibson's claim is that what we perceive when we look at an object or environment are its affordances, not its qualities. We can discriminate abstract qualities such as substance and surface, color and form if we are prompted to do so, but what we normally pay attention to—and what studies by Gibson and his colleagues show that infants pay attention to—is what the object or environment affords us practically. With conscious effort, we may perceive a scene photographically but, Gibson argues, most of the time, as we are moving about and acting in the environment, our visual system does not operate like a motion picture camera projecting a movie on the back of the retina observed by some little homunculus in our brain. Perception, having evolved to help the organism survive and thrive in its environment, is economical. Perception readies us for action. There is experimental evidence that the perception of object affordances--the handle of a cup, for example--automatically triggers the action in our mind (Tucker and Ellis 1998; Grezes and Decety 2002; Tucker and Ellis 2004).

The radical implication of this ecological approach to visual perception is that the world around us is always already imbued with meaning for the observer. We may be wrong about what an environment affords us, as when we misperceive a broken door-closer as affording automatic door closing and leave the door standing open, but our perceptions are always laden with meaning. Further, this meaning, the affordance of the environment, is relative. A door with a powerful spring mechanism may afford entry or exit and automatic door-closing to a large, strong person but not to a small person and not at all to a cat. Gibson (1986: 41) explicitly rejects the absolute duality of subjective and objective and argues that considering affordances--which are real and external to the perceiver yet relative to the perceiver—allows us to escape this philosophical duality and provides a powerful way to conceptualize the relationship between actor and environment. His theory also refutes the dichotomy between agency and determinism. Central to the concept of affordances is the claim that when actors enter a setting they perceive cues about what behaviors it affords and these perceptions shape behavior without determining it. When we see a button—think of a child in an elevator—our mind automatically readies us to push it, but whether we actually push it or not is a matter of will.

Gibson's ecological perspective, and the notion of affordances, challenges the tendency of psychologists to describe perception in terms of cognitive manipulation of abstract data, of information processing. When applied to social phenomena, affordance challenges the tendency that many social scientists have to restrict their gaze to sociological and anthropological concepts "rather than recognizing the degree to which social activities are embedded in and shaped by the material environment" (Gaver, 1996).

Habitus connects practice with social structures. Bourdieu describes habitus as an acquired system of generative schemes of perception, thought, and action that tend to guarantee the "correctness" of practices and their constancy over time (Bourdieu 1990: 53). The habitus is acquired over the lifetime of an individual by virtue of the objective economic and social conditions of his or her existence. Habitus is individual because no two people have exactly the same biography, but the habitus of people who shared a similar class of social in their lives will be homologous, though never identical. Habitus tends to generate practices that are positively sanctioned as reasonable and common-sense. Such practices are likely, Bourdieu argues, to be adjusted to the objective conditions of existence. Conversely, habitus tends to exclude, without resort to argument or violence, those practices that are negatively sanctioned, that is, those practices that are incompatible with the objective conditions. In his studies of class taste and life-styles, Bourdieu shows that habitus shapes taste in ways that make a virtue out of necessity. Working class people are not only forced, by their economic situation, to make do without luxury items but develop a taste for sensible, plain food, furnishings, and clothes and eschew fancy extravagances (Bourdieu 1984: 372-4). Thus habitus leads to what Bourdieu calls the choice of the necessary and, in so doing, tends to generate practices that ultimately reproduce the original objective conditions and thus functions as structure.

Through habitus, then, the objective economic and social conditions that positivist sociology studies have their impact. Importantly, however, social structure shapes behavior but does not determine it. Habitus regulates behavior by making "possible the free production of all the thoughts, perceptions and actions inherent in the particular conditions of its production—and only those" (Bourdieu 1990: 55). Thus, given a set of conditions, habitus affords an actor some thoughts and behaviors

and not others, and makes some thoughts and behavior seem more appropriate, attractive and authentic than others, but that actor ultimately decides what to do. Often this decision occupies no conscience thought, but Bourdieu (1990: 53) makes clear that it is "never ruled out that the responses of the habitus may be accompanied by strategic calculation tending to perform in a conscious mode." There are working class people with the same taste for luxury as their aspiring middle class counterparts, with a habitus that is inconsistent with the conditions in which is arose, but what Bourdieu (1984) shows is that they are a statistical improbability.

Habitus and affordance operate in the same way: they channel behavior in a certain direction without ever determining it. The conditions that generate them, however, are very different. Affordance arises from the encounter of a person characterized by certain physical attributes and certain social and biological needs, desires and intentions with a socially and physically constructed material environment. Habitus arises from the encounter of history embodied by a person as second nature with what Bourdieu (1992: 97) calls a field, a set of relationships between positions occupied by actors and institutions. In any given situation, then, the material environment will afford an infinite, but strictly limited, set of thoughts and behaviors as will the field. These will be the possibilities for action that show up, either consciously or unconsciously, for the actor.

A second element of similarity has to do with the extent to which people acknowledge and are aware of affordances and habitus. This question is independent of the question of how aware we are of the possibilities for action afforded by an environment or field. It has to do with the understanding the actor has about why certain thoughts and behaviors are made possible and others are not. In the theorizing both of Gibson and Bourdieu, the answer is that the understanding the actor has is

consequential—it shapes their practice—but it is not necessarily correct. Gibson (1986) is clear that an affordance exists regardless of whether it is recognized as such by the actor—or, indeed, animal, since affordance theory applies equally well to any sentient being. Bourdieu notes that not only is the operation of habitus often below the level of consciousness and language, but that talking explicitly about habitus is often incompatible with its normal functioning. To reveal, as sociologists do, the social forces that shape matters such as taste, academic research, gift-giving, and romance that are taken to be individual matters of the heart, or such as religion that are taken to be transcendental matters of the soul (Bourdieu 1977; 1984; 1988; 1990; 1991)—to demystify them—is to disrupt their working in the same way that a gymnast thinking too much about her movements will cease to be fluid (Bourdieu 1990:93).

Beyond the similarities of affordance and habitus, there may be a more direct link between the concepts. There is evidence from human-machine interaction (HMI) studies that the perceptual cues of affordances can be learned as social convention. While Gibson's (1986) original experiments focused on the perception of affordances via cues that he believed were innate to the species—terrain features that afford locomotion, for example, or physical properties of objects that afford grasping—research has shown that affordances, especially of man-made objects, are linked to a complex web of cultural knowledge and conventional rules regarding use (Hutchby 2001). Furthermore, once we learn associations between perceptual signals and specific affordances, we transfer that knowledge from one domain to another. Having learned the complicated set of associations between window, icon, mouse, and pointer in one computer program, for instance, users apply it to new programs they encounter and are frustrated by inconsistencies (Dix et al. 1998). In other words, the

affordances of an environment arise from its social meaning, and conventional rules regarding use—its social construction—in addition to its physical properties. Conversely, Bourdieu is clear that habitus is not merely cognitive but embodied, literally, in our movements, gestures, and posture (Bourdieu 1990: 70). Yet Bourdieu's theorizing tends to exclude the physical reality of the environment, considering the physical world primarily in terms of its symbolic meaning. Empirically, he is most interested in ideas and language— for example, studying taste, classification, time and calendar, how people talk about relationships, kinship, and gift-giving. Where physical artifacts appear in his research, it is their symbolic aspect that interests him. Thus affordance and habitus complete each other.

The Door-Closer

An important principle of actor-network theory is that there is no essential difference between human and non-human, animate and inanimate, actors. Latour (1988) refers to non-human actors—artifacts ranging from doors and walls, to microbes and diseases, to trains and blueprints—as the "missing mass" in sociology: the unstudied element that must be better understood to explain social practices. Non-human artifacts have been studied in depth, of course, by the physical and natural sciences, but these are founded on very different ontological, epistemological, and methodological assumptions than those grounding Latour's sociology. These differences of paradigm make reconciling our knowledge of non-humans and our knowledge of humans problematic. Latour solves this difficulty by positing no essential difference between human and non-human actors, such as door and diseases and machines. In so doing, he gives himself permission to apply social theories to physical objects. This is a neat move: our old theories can be extended for use in new ways simply by denying that there is any fundamental difference between humans and

non-humans and considering them both actors. We have seen this move before, of course. It is the same totalizing approach that tempts physicists to apply their theories to social settings by denying that there is any difference between humans and non-humans and considering them both objects. Or social biologists to apply their theories to human society by denying that there is any difference between humans and non-humans and considering them both animals. There are novel insights to come out of this trick of juxtaposition in its various forms. Nice unexpected similarities, or jarring reframings. But there are limits too, especially noticeable in this postmodern age where the grand narrative—the one theory that could explain everything—is discredited.

In Latour's hands, actor-network theory unites the social and physical environment of practice in a way that balances agency and determinism. He achieves this, however, by lapsing into an overly simplistic subjectivist perspective that often ignores that actual physical properties of the actors—human and non-human—whose behavior he seeks to explain. It seems that in order to be able to deny the differences between the human and non-human we are forced to abstract so much as to lose touch with the detail that we would like to explain. Fortunately, we don't need one theory that can explain everything, whether it be quantum physics, evolution, or semiotics. We can borrow from Bourdieu and from Gibson and from Latour so long as we can find a way to bring together the insights each conceptual vocabulary provides.

Latour (1988; 1994) offers a concrete example that helps reveal the important characteristics of the actor-network approach to physical artifacts and practice and how the perspective provided by affordances and habitus differs from and supplements the actor-network view. Latour asks us to consider a sign posted on a door reading, "The door-closer is on strike, for God's sake, keep the door closed."

The sign and the door do not exist. Sometimes, Latour describes the door as opening into the social history of science department at La Halle aux Cuirs at La Villette in Paris (Latour 1994), other times as opening into the sociology department at Walla Walla University in Washington (Latour 1988). Always the sign is posted on a freezing day in February. Does it matter that Latour invented the sign and the door and the department of people who created the sign and use the door, or that the only physical attributes that exist in the scene are those that he created to make his theoretical points? Latour argues not. He explains that having invented also a made-up author—and sometimes emphasizing this by writing under the pen name Jim Johnson—as well as possible readers whose reactions and beliefs he anticipates, he is showing the essentially textual nature of both humans and non-humans and demonstrating the ability of semiotics to explain them both equally well. Thus, in the very example that Latour uses to motivate the importance of studying physical artifacts—he says of the setting and the sign that "this fusion of labor relations, religion, advertisement, and technique in one single insignificant fact, is exactly the sort of thing I want to describe in order to discover the missing masses of our society"—are the physical characteristics of those artifacts held up to be essentially subjective matters of invention and interpretation.

Latour ably shows that something as seemingly simple as the spring or hydraulic mechanism used to close a door once it has been opened is a complex artifact that needs to be understood in the context of its social relationships and history. He applies social theory to the door-closer, arguing that it can be explained by the theories of the division of labor and social discrimination. Take first the division of labor. Latour claims that "the distinctions between humans and non-humans, embodied or disembodied skills, impersonation or 'machination', are less

interesting than the complete chain along which competencies and actions are distributed. Doors are actors that do work that people would otherwise have to do. Without a door, a person wanting to pass through a wall would have to break a hole in that wall and then repair the wall after herself. We delegate most of this work to the door, leaving for the human actors the work merely of gently pushing or pulling. Door-closers are similarly actors that do a job that the user of the door would otherwise have to do. It is a choice whether to discipline the people passing through the door to close it themselves or to delegate the work to a specific actor. That actor could be a human—a door-man or porter, for example—or it could be a non-human such as the spring or hydraulic mechanism.

When we include non-human actors into the division of labor, then, to study how work and competences are distributed requires us to look not just at the local scene but also at more distant scenes: where the hinges of the door were manufactured and the door provided competence for opening, for example, or of where the door-closer was made and given its distinctive pattern of slamming doors quickly, as with a powerful spring mechanism, or easing them shut slowly, as with a hydraulic door-closer. We must consider too not just the contemporaneous scene but also the historical settings where the door and door-closer were made and where people in the department learned their patterns of door opening and closing behavior. The resulting web of humans and non-humans, here and there, now and then, is what characterizes the actor-network.

Machines such as door-closers, Latour argues, are moral actors: “No human is as relentlessly moral as a machine” (Latour 1988). That is, door-closers impose behaviors on human actors. If one does not pass quickly through a door with a spring mechanism, the door will bloody one’s nose. Door-closers discriminate against

certain social groups. "Competent members of la Halle aux Cuirs [or Walla Walla University] will safely pass through the slamming door at a good distance from one another while visitors, unaware of the local cultural condition, will crowd through the door and will get bloody noses" (Latour 1988). Hydraulic door-closers avoid this form of discrimination, but impose another. Hydraulic door-closers work by capturing energy as the door is opened and using that energy to slow the closing of the door. The result is a door that requires a good deal of pulling or pushing to open and that discriminates against the very small and the very old and against furniture movers, whom they irritate, and working and lower-middle class employees who are more likely, according to Latour, to arrive at the door with packages in their hands. Non-humans take over the selective attitudes of those who engineered them—Latour invokes Winner's (1980) example of buses loaded with poor blacks that could not pass under the driveways leading to Manhattan parks.

Latour insists that there is always the possibility that human and non-human actors will fail to behave in the ways prescribed to them or expected of them. The door-closer, human or hydraulic, may break, may fail to show up to work, my go on strike, may develop an attitude and work only occasionally, may retire. Neither their design nor their position in the actor-network fully determines the behavior of door-closers. They have agency. Likewise, those discriminated against by the door-closer have options open to them about how to respond to this discrimination. Indeed, there may be general things that we can say about how people respond to any form of social discrimination. Finally, Latour notes that the reader of his paper may behave as he has expected and thought about things the way he has prescribed, but the reader equally may completely ignore his definition of him or her just as users of a traffic

light may well cross on the red. Thus, determinism is replaced by prescription, expectation, and discrimination and agency is preserved.

In summary, Latour thus describes the physical and material aspects of practice using the vocabulary of social theory: specifically, division of labor and discrimination. The result is a novel take on a seemingly well-understood scene: people passing through a door. It exposes two interrelated questions, however, that are left unexamined by Latour and that are unanswerable if we restrict ourselves to using his vocabulary because of its essential subjectivism. First, what are the objective social and physical forces that create and sustain the particular division of labor that Latour encourages us to describe? Second, what are the objective social and physical forces that create and sustain the particular forms of prescribed behavior and discrimination that Latour highlights? In other words, in what ways do social and physical forces, by constraining the interpretations available to actors and the possibilities for behavior open to them, shape practice? A promising way of answering such questions is to consider the habitus and affordances of the actor-network.

The study of doors has a pedigree among theorists developing the concept of affordances. Norman (1988; 1993), for example, one of the most influential scholars to apply affordances to design, uses the example of a door to illustrate how the design of an object impacts how people use it. We perceive the function of an object such as a door handle from visual cues in its design. Thin vertical door handles afford pulling, while flat horizontal plates afford pushing. Objects tend to be used as their designers expect when they are designed in a way that exposes their functionality. Norman's work documents myriad examples where the opposite obtains such as symmetrical door handles that may have seemed elegant to the designer but that give

no indication by their shape whether they should be pushed or pulled. In such cases, conscious thought on the part of the user, prompted by signage and other forms of explicit instruction, is required or else the unrecognized, or unremembered, functions go unused.

Actor-network theory encourages us to perceive the discrimination of door handles—against the impatient and the illiterate. Affordance theory seeks to explain the physical characteristics of the door handle that mean that its affordance is not transparent to people. Habitus theory would lead us to investigate the taste for symmetry among a certain class of designers and the social roots of a fashionable preference for impractical elegance and away from functional design. It may be, as Latour imagines in his example, that the discrimination of the door-closer mirrors the attitudes of the engineer who designed it. What an affordance perspective helps us to see, however, are the objective physical causes of this discrimination and the steps that would be necessary to change it. And what a habitus perspective forces us to examine are the social conditions that created, in that engineer, the indifference to the amount of strength required to open doors that use his door-closer.

Where the affordance and habitus perspectives diverge from actor-network theory is in their insistence on the limits of interpretability of the door handle or door-closer or any artifact. Latour (1988) writes, "There is no limit to the number of shiftings out a story may be built with" and concludes that physical artifacts are like texts in their infinite interpretability. As Hutchby (2001) notes, affordance theory diverges from strong social constructionism in its insistence that affordances are real. There are an infinite number of ways that symmetrical door handles may be interpreted, but they may not be interpreted, for example, as asymmetrical. There are an infinite number of ways that a hydraulic piston door-closer may be interpreted, but

interpretations denying the amount of force required to open a door with such a closer are not legitimate. Habitus theory diverges from subjectivism in its insistence that while the theorist may imagine that any interpretation of a scene could be possible, in practice not every interpretation obtains among the people involved in the scene and some interpretations are more likely than others. There are an infinite number of preferences people could develop in their taste for door handles, but in practice their tastes are limited and patterned and can be explained. There are an infinite number of prejudices that people could have, but in practice groups discriminate against particular types of others and these patterns can be explained.

Pasteurian Practices

The example of the door-closer illustrates how we can bring habitus and affordance together to address the issues that Latour highlights and answer questions actor-network raises but cannot answer by itself. It is a stylized and hypothetical situation, however, and the practices associated with the door and door-closing are simple. To take a richer and more complex example, we examine the practices that led to the discovery of the anthrax bacillus, and the development and diffusion of a vaccine, by Louis Pasteur. At the end of the nineteenth century, anthrax was devastating French cattle. Pasteur, one of France's most famous scientists, was able to find a cure and to persuade skeptical farmers, veterinarians and hygienists in the 1880s to adopt new practices to eradicate anthrax. Latour has analyzed the history of Pasteur's efforts in a number of articles and books (Latour 1983; 1987; 1988). His analysis of the physical and social forces at work in and around Pasteur's work, and how they influenced the acceptance of his ideas, are important because they mark Latour's divergence from the extreme constructionist position for which his studies of scientific practice were known. In his work on Pasteur, Latour claims to have

understood the limitations of social constructionism and subjectivism and he endeavors to show that actor-network theory operates outside of the dichotomies of physical realism and social constructionism, on the one hand, and objectivism and subjectivism on the other. Similar to his approach to the door-closer, Latour's strategy here is to erase distinctions—this time claiming that there is no essential difference between the microlevel phenomenon of scientific practice and the macrolevel phenomena of social and politics forces—and to claim that one approach can account equally well for everything. We claim that habitus and affordance, when brought together, allow us to understand and overcome the limitations of this totalizing approach.

Latour (1988: 257-8) argues that "Conservatism, Catholicism, love of law and order, fidelity to the Empress, brashness, passion—those are approximately all we get of the 'social factors' acting on Pasteur. But they are not much if we put on the other side all the scientific work to be explained." Pointing out that while there were plenty of other brash, conservative Catholic scientists in France at the time, none of them discovered the anthrax microbe, Latour argues that social forces, as they are traditionally understood, cannot explain the success of Pasteur. Yet he argues that most important elements of Pasteur's scientific work are not the discovery of the anthrax microbe or of the vaccine that stops the disease, but rather his efforts to get different groups of people interested in his work. In Latour's perspective, Pasteur's scientific success resulted from his ability to convince a set of powerful people—farmers, veterinarians, and hygienists—that he could solve their problems. Latour thus replaces one form of social constructionism for another while still avoiding, for the most part, the materiality of Pasteur's practices.

There are two important elements in Latour's explanation of Pasteur's success: the laboratory and the instruments, or inscription devices, Pasteur used. While these are both physical entities, their physical characteristics are not what interests Latour. It is inside the laboratory that Pasteur was able to isolate the anthrax bacillus and to develop and test the vaccine. Yet, to be able to identify the microbe that carries anthrax, Pasteur had to first transfer himself and his laboratory into the countryside, working in a makeshift laboratory right on the farm site where he could learn from the field conditions and the veterinarians. Pasteur and his assistants then translate veterinary science into their own terms and bring the bacillus back to their Paris laboratory and cultivate it in order make it visible and amenable to manipulation and test. The ability to reveal the disease began the Pasteur's process of persuading others of his progress. When, in 1881, Pasteur develops the vaccine, the laboratory must again be moved back outside of Paris into the countryside for the demonstration that will prove Pasteur's success. That is, the vaccine will work as promised only on the condition "that the farm chosen in the village of Pouilly le Fort for the field trial be in some crucial respects transformed according to the prescriptions of Pasteur's laboratory" (Latour 1988: 151).

The laboratory is a key element in the ability to make the anthrax visible and to manipulate it. Yet, it is difficult to locate the laboratory in Latour's description, or even to locate it. It seems that for Latour to be able to argue that the laboratory is "built to destabilize . . . the very difference between the 'inside' and the 'outside'" of the laboratory (Latour 1988: 144), he must talk in abstractions that elide the actual physical properties of the lab. While Latour insists on the importance of understanding the "material local setting, that is, laboratories" (*ibid.*: 160), and even argues that "a laboratory is never bigger than its walls" (*ibid.*: 150), he does not

describe the material setting within those walls to explain how it has the influence he attributes to it. Indeed, it is hard to reconcile these claims with his statement that "in this succession of displacements, no one can say *where the laboratory is* and *where the society is*" (*ibid.*: 154). The laboratory is anywhere and nowhere.

Despite Latour's protests to the contrary, he uses the term "laboratory" less to refer to a physical place and more to denote a set of practices. These practices are "disinfection, cleanliness, conservation, inoculation gesture, timing and recording" (*ibid.*: 152). These five principles are what define the Pasteur laboratory, and they are taught to experimenters who in a few years become known as the Pasteurians who spread the word of their importance. Latour claims that by convincing enough people that the microbes exist and that they are dangerous actors, Pasteur succeeded to transform French society into a vast laboratory and intervened in daily details of life—curbing the practice of spitting, creating the practices of boiling milk and washing hands—as well as prompting large scale projects such as the rebuilding of sewage systems and hospitals (*ibid.*: 159). Yet, by knocking down the walls of the laboratory and extending it to society, Latour leaves us with an abstract description of the influence of Pasteur's laboratory that raises as many questions as it answers.

The translation of the laboratory from Paris to the countryside is a key element in Pasteur's success. Latour contrasts the clean, controlled, Pasteurian laboratory and the noisy, smelly, 19th century animal farm, but he gives no sense of what dimensions of the laboratory must be replicated on the farm for the makeshift lab to have its intended effect. What physical elements are required to afford the laboratory practice of disinfection, cleanliness, conservation, inoculation gesture, timing and recording? Without understanding this, how can we say we know what it means for the laboratory to have been translated? Furthermore, what were the artifacts and

techniques Pasteur used to isolate the bacillus and make the anthrax disease visible? Latour says nothing about this and nor does he describe how Pasteur was able to develop the vaccine. The laboratory was required, but what did the laboratory afford Pasteur that enabled his discoveries?

These questions seem not to interest Latour, who focuses instead on the diffusion of Pasteur's ideas. He argues persuasively that Pasteur's findings could have been forgotten if not for the fact that Pasteur was an expert at fostering interest groups and persuading their members that their interests were inseparable from his own. He is at pains to show that Pasteur's great accomplishment was his cultural impact, his influence as a shaper of habitus. This is important to recognize, but need not come at the expense of understanding Pasteur's great accomplishment as a natural scientist. By conflating the physical laboratory with the practices afforded by the laboratory and the people who enact those practices, Latour is able to tell only half the story.

The second component of Latour's argument are the instruments, or inscription devices, that Pasteur used to make the anthrax disease "not only visible, but also readable" to other people, including opponents of his ideas, and thus something that could "be easily pointed at by people who by doing this dominate" (*ibid.*: 164). What are these instruments and how are they used? Latour provides very little thick description. There are references to the microscope and Petri dish, but no description of the other artifacts that were required to enact practices such as timing and recording that were required to inscribe the disease and make it visible—e.g. measuring devices or notebooks to record observations of actions and reactions. This is left to our imagination, as Latour's discussion of inscription devices is as abstract and immaterial as that of the laboratory. Latour defines an instrument as

"any set-up, no matter what its size, nature and cost, that provides a visual display of any sort in a scientist text" (Latour 1987: 68). The material properties of the instruments are immaterial to Latour who notes that the strength of this definition is the very fact that "it does not make presuppositions about what the instrument is made of" (*ibid.*). Hence, a statistical institution "that employs hundreds of pollsters, sociologists and computer scientists gathering all sorts of data on the economy is an instrument if it yields inscriptions for papers written in economic journals" (*ibid.:* 69). This very loose definition of an instrument allows Latour to define more or less anything as an instrument with the only constraint being the production of a visual display. Such a description seems at the same time too broad and too narrow. Too broad in that a category that includes both the microscope used by Pasteur and a statistical institution does not provide much explanatory power for understanding the role of the instrument in the scientific practice. Too narrow in that, by focusing only on the presence or absence of a visual display that can be used in a paper to convince others and win arguments, it excludes from consideration the influence of instruments on many of the scientific practices Latour himself claims that we need to explain.

Even if we accept Latour's broader argument, however, that science is not about discovering truths but rather about building and winning controversies, the material context of scientific practice matters. Latour claims that scientific practice is about how to write a paper which cannot be refuted by counter-arguments, building the right network of supporters of your ideas, of people who will fund your research projects, of companies that will build the instruments you need to build your experiments and show that you are right (Latour 1987). Thus, he devotes his attention to the social structures and power battles behind the development of scientific

theories. Such a perspective presupposes a material context that it neither describes nor takes full account of.

Consider the laboratory notebook, an artifact that is central to the practice of inscription and to what Latour (1987) sees as the obsession of scientists with papers, prints, diagrams, archives, abstracts and curves on graph paper. The laboratory notebook has been described in several studies as an important artifact in the scientific practice (Holmes 1990), and several distinctions are made that might allow us to better understand Pasteur's practice. For example: Are the notebooks private or public? Do they belong to one individual scientist or a team? What gets recorded? Hypotheses or just results? Successful tests or all results?

The work of Mackay et al. (2002)—coincidentally conducted at the Institut Pasteur in Paris—examines the affordances of laboratory notebooks and their importance for biological practice. As part of a participatory design project to create prototypes of laboratory notebooks linking paper, physical artifacts and on-line data, Mackay and her colleagues conducted a field study of how these notebooks are used by research biologists. What they found was that the notebooks were both a personal record and a public document. Biologists wrote down their research findings, described experimental procedures, and also attached printed documents, pictures, drawings, X-rays, and so on. Some scientists even included physical lab specimens or gels from their experiments. These notes were then referred to often by the scientists —when redoing experiments, developing hypotheses, and writing papers. The study found that the notebooks were considered central to the biologists' practice.

If the biologists themselves are the most obvious users of the notebooks, the study also highlighted two other groups of users: the archivists and the research managers. The notebooks are the "property of the Institut" and as such, are managed

by the archivists. They are, however, public documents, which are used as proof of discovery of ideas and as a basis for patent claims. For example, The Institut Pasteur provided a sample of the AIDS virus to an American laboratory, which proceeded to patent it. It took many years of legal battles to show that the New York researchers had "whited out or otherwise obscured" their laboratory notebooks in order to lay claim to prior discovery of the virus, and the Institut Pasteur was finally awarded patent rights.

This example brings us back to Latour's description of science as a succession of controversies where, more than truth, what matters is the ability to develop a strong argument that cannot be questioned. The affordances of the notebooks, however, are as important to how events unfolded in this case as the social forces in play. The affordance of paper and pen to be whited out but to leave physical traces of such tampering are material. This episode led to changes in the practices in The Institut concerning the notebooks in a social effort to alter their affordances. Notebook pages are now numbered and "Institut Pasteur" appears diagonally across each page. There is now a strip at the bottom which must be signed and dated by the experimenter and a witness. Biologists must use ink and should not alter the notebooks. Extra documents can no longer be added. These changes illustrate how affordances are not only material, but are also social. Affordance influences practice, but practice also shapes affordance. Furthermore, affordances are never deterministic. For example, Mackay et al. (2002) note that every biologist they interviewed admitted to having broken the rule of not adding extra documents. Because the notebooks are a personal record as well as public document, researchers resisted management attempts to alter their practices by transforming the physical and social affordances of the notebooks in a way that emphasized the public nature of the notebooks.

This example is indicative; it shows how the affordances of an artifact as simple as the laboratory notebook can be consequential in shaping scientific practice. Made of paper, the notebooks had some limitations, especially when it comes to searching for information: the biologists complained that there were times when they went to look for information, especially from a colleague's notebook, but could not find it. Characteristics that supported the biologists' practice such as the ability to quickly and easily make annotations, the ability to glue in external documents as well as specimens, create issues for the archivists who worry about storing paper-based data, since ink may spread over pages, glued-on items may become separated and media such as X-rays may decay. Thus, consideration of affordances raises important questions about how practice is shaped in ways unplanned and taken for granted by practitioners.

It is also interesting to consider the social meaning of the notebooks in the habitus of the researchers. The notebooks are part of the scientists' habitus in the original Latin sense of the word: part of their costume. Like a white lab coat, the notebooks are a sign of the research scientist, a signal of occupational identity—those with the notebooks are not veterinarians, assistants, or technicians. For today's biologists at Institut Pasteur, they also have the symbolic meaning associated to the history of Pasteur and his use of laboratory notebooks.

In his analysis of Pasteur, Latour uses actor-network theory to provide an interesting and useful understanding of the social structures involved in the scientific practice and the importance of the diffusion of the theories, one that is quite consistent with a habitus perspective. Despite his totalizing claims, however, and his move away from extreme social constructionism, Latour leaves us with no explanation of an important part of the process: the everyday socio-material practices of scientists.

Discussion

It is widely recognized that practice is embodied and there have been calls for theories of practice to include the material context (Suchman 1987; Lave 1988; Orlikowski 2002), but, aside from a discredited physical determinism, we have lacked a language for talking about how physical artifacts and the material environment impact practice. The result has been that relatively few studies examine the physical aspects of practice and those that do tend to focus on the symbolic meaning of objects, largely overlooking the material impact that objects have on everyday life (Dant 2004). An important exception has been actor-network theory, but, as we have argued, actor-network theory has done more to highlight the correct problem than to provide a solution. Although Latour (1983: 160) claims that one of the mistakes of the epistemologists was to have "ignored the material local setting," he has also, in practice, ignored the material local setting of his studies, be it the laboratory and its instruments, the department where the door needs closing, or the artifacts and environments that shape the practices of people. While he points to the importance of space, setting and artifacts, he does not study them as physical objects that constrain and afford practice, but rather as symbols, ways of convincing, means of influencing and gaining power.

We are not the first to suggest that Gibson's concept of affordances could provide a language for speaking about embodied practice. Dant (2004) considered the idea that affordances could allow us to seriously study the material aspects of practices but ultimately rejected affordances because of its individualism and the fact that it does not take into account cultural variation. These are important criticisms of Gibson's theory. Consistent with its psychological origins, the theory of affordances focuses on the individual perceiver and, in his writings, Gibson tends to conceptualize

social interaction in terms of the affordances of other people as perceived by an individual actor. When we perceive other people, just as when we perceive any element of our environment—space, artifacts, technology, etc.—what we perceive first are the opportunities and threats they afford: physical threat, sexual availability, cooperation, communication, and so on (Zebrowitz and Collins 1997). This is valid, insofar as it goes, and interesting. The view, however, that we can use the same theories to explain social interaction that we have developed to explain human-machine interaction or the interaction of humans and the physical environment is impoverished in the same way that Latour's actor-network theory, which makes the same claim in reverse, is self-limited.

What should be recognized is that the theory of affordances does a very good job explaining some phenomena but it cannot explain everything we need to understand about how behavior is constrained by the practical considerations of what is socially acceptable and physically possible. What has been missing in the application of affordances has been what we might call social affordances: an explanation of how the social construction of a physical environment impacts the practices afforded by that environment. It is here that Bourdieu's work fits and that the concepts of affordance and habitus come together. Brought together, we believe they provide a vocabulary that allows us to describe how structure and setting jointly govern organizational practice.

The value of such a theory of practice can be measured only by the quality of the descriptions it allows us to construct of actual practices. Two empirical examples from research in organizations help demonstrate this value. First, we will look at a study by Fayard and Weeks (2007) that describes social interactions in the context of photocopier rooms and examines how the social and physical characteristics of this

seemingly ordinary context shape the patterns of informal interaction that occur there. Second, we will look at Pentland's (1992) study of technical service interactions in which he explains how the performances of organizational knowledge enacted by technical support specialists are both socially and materially situated. In both examples we see the potential of bringing together habitus and affordance to deepen our understanding of particular practices.

Fayard and Weeks (2007) seek to understand how the socially and physically constructed environments of office settings shape informal interaction. There are two well-known physically-deterministic models of how office environments influence informal interaction. Theories of propinquity, as represented in the work by Allen (1977), for example, posit that informal interactions occur in spaces that bring people physically closer together. The more effort that is demanded of people to interact, the less informal interaction will occur (Festinger et al. 1950). Theories of privacy, on the other hand, posit that people feel most comfortable to interact informally when they can control the boundaries of their conversation (Homans 1950; Altman 1975). These two theories lead to testable conclusions, for example about the effects of open plan office layouts, that should allow us to choose between them. Theories of privacy predict that enclosed spaces foster informal interactions. Thus, walls, partitions and other forms of inaccessibility and privacy should correspond with increased levels of informal interaction. Theories of propinquity predict the opposite.

The empirical evidence of the effects of open plan offices on informal interactions, however, is contradictory, and lends support to both of these theories. Studies have found that moving to an open plan office alternatively increases (Oldham and Brass 1979; Oldham and Rotchford 1983; Hatch 1987) or decreases (Allen and Gerstberger 1973; Ives and Ferdinands 1974; Szilagyi and Holland 1980)

the informal actions among employees there. Fayard and Weeks treat these previous results as replicated finding, claiming that, viewed as affordances, privacy and propinquity are not contradictory and form only a partial explanation. Drawing upon their study of informal interactions in photocopier rooms in three different organizations, they argue that to understand why the area around a photocopier—or, traditionally, a water-cooler—fosters informal interactions, we need to understand the affordances of that environment.

In general, an explanation of the affordance of a particular social behavior by a given setting must answer two questions. The first question is what are the environmental requirements of the practice. The second question is what are the physical and social characteristics of the setting and the artifacts that may fill those environmental requirements and signal the affordance to perceiving actors. These are the questions that Fayard and Weeks's study aims to answer in the case of informal interactions. The debates in the prior literature had identified two environmental requirements for informal interactions to occur: propinquity is required for people to encounter one another and privacy for them to stop and have a meaningful interaction. Fayard and Weeks showed two things. First of all, neither the affordance of proximity nor privacy could be explained in purely physical terms. For example, propinquity depended more on the functional centrality of the photocopier room than on its physical centrality. Physical centrality is a simple matter of geography, but functional centrality has to do with the functions of the setting itself, the reasons that people have to visit the space, and the location of the space in relation to other functionally important locations in the office such as the entrance, lavatories, stairwell, or other places regularly visited by people throughout the day. All else equal, in photocopier rooms containing more shared resources in addition to the

copier machine—departmental mailboxes or bulletin boards, for example—more informal interactions were observed.

Second, they found that, even when taken together, proximity and privacy could not by themselves explain why some spaces triggered informal interactions and some did not. The theory of affordances helped them identify a third environmental requirement: legitimacy or social designation. People must feel that it is socially acceptable to stop and talk to each other in this setting. They must not be embarrassed to be seen by others lingering and interacting there. The photocopier room is ideal in this respect because photocopying is a task that requires mindless presence. People have to stand there to do their photocopying—and others have to stand and wait their turn—but the task does not require concentration and so discussion is possible. What's more, the difficulty that people tend to have when attempting complicated photocopying operations or when the machine requires routine maintenance such as having paper or toner added, creates the possibility for moves such as helping and complaining that break conversational ice. These affordances of the machine, however, depend on the social structure of the machine's users. If people don't do their own copying or the maintenance is handled by a specialist, then the affordances disappear.

Though Fayard and Weeks don't refer explicitly to Bourdieu, their idea of "social affordance"—the term they used to describe the influence of the social designation of a space—is consistent with habitus. What they found was that informal interactions were shaped by what was physically possible and socially appropriate. They show that while space has traditionally been defined in terms of its structural and geometrical properties and as a passive host for the interactions occurring in it, the social meaning of the physical environment has to be recognized.

That is, space needs to be explained as a place where certain things are expected to happen (Buttimer and Seamon 1980; Gieryn 2000). By taking affordances and adding to it the dimension of the social significance of space—the set of generative principles that govern what is appropriate to happen in a given space for a given group of people, the habitus—Fayard and Weeks (2007) are able to provide a more complete account than previous studies had of how office environments shape informal interaction.

Pentland (1992) studied software support hot lines in two different organizations to understand how organizational knowledge—in this case, the answers and solutions to the question and problems posed by customers—is enacted in the practices of technical support specialists. The question of how mentalist concepts such as knowledge, memory, and learning can be applied to organizations is a perennial one, and the traditional responses have been influenced by the classic mind-body dualism that pervades Western thought. Thus, there are cognitive approaches to organizational knowledge that equate knowledge with abstract representations (e.g., Jackson and Dutton 1988; Porac and Thomas 1990) and there are structural approaches that equate knowledge with the capability to act (e.g., Nelson and Winter 1982; Levitt and March 1988). Pentland proposes the view of organizational knowledge as situated practice that characterizes people as knowledgeable agents without resorting to purely cognitive or purely structural explanations of behavior. Turning to practice allows him to escape the familiar dichotomies of subjectivism and objectivism, voluntarism and determinism.

Pentland examines the *moves* that the technical support people make when dealing with customer calls. These moves, he argues, are discretionary but are always shaped by the situation in which the actors find themselves. Pentland identifies three

types of constraint that define the situation: the physical structure, the ritual structure, and the competence structure. Drawing upon ethnographic data collected by participant-observation at two different sites, he shows how "in their efforts to resolve customer problems, support specialists are constrained by what is socially appropriate and what is physically possible" (*ibid.*: 545). He explicitly describes the physical structure in terms of the affordances of the available channels of communication. Some moves, such as Quick Question required the ability for an engineer to quickly address a colleague to get an immediate answer. This was possible at the site where engineers were in cubicles, but not at the site where engineers had their own offices. Another move, Take A Look, required the co-presence of a support engineer and a development engineer. In one site, the support and development engineers were housed in separate buildings and so Take A Look happened only at formal meetings. At the other site, where support and development engineers were co-located and interacted informally, it was fairly common for development engineers to work with support specialists in response to such requests.

Because his interest is specifically about knowledge, Pentland distinguishes between two elements of habitus and refers to them as the ritual structure and the competence structure. He invokes Bourdieu (1977; 1990), as well as Goffman (1967) and Collins (1981), to define the ritual structure as the "cultural constraints and affordances on social interaction" (Pentland 1992: 532). For example, he found that when seeking the answers to quick questions, some support engineers had more access to potential helpers than others, and even those with access were careful not to ask for help too often. While there were no physical barriers preventing technical specialists dropping by a software developer's office each time they had a question, they did not because "such an action would so violate cultural norms as to be ground

for dismissal if repeated to often" (*ibid.*: 533). Thus, even when the physical structures afforded Quick Question, there were ritual constraints that shaped behavior. In Take A Look moves that involved a request by a support engineer for more time and help from a colleague to solve a problem, there were norms about how the request had to be justified for it to be accepted.

The term *competence structure* was coined by Pentland to refer to the distribution of tacit and explicit knowledge among members of the organization. What Pentland found was that when solving a problem required esoteric knowledge, certain moves required not only physical communication and ritual appropriateness but also some form ratified technical competence. When managers would assign calls, or when engineers would transfer calls to someone in another specialty, the existing competence structure would be reinforced as problems were funneled to those individuals who were already the most competent at solving them. Similarly, procedures governing which calls could be escalated to development engineers reproduced the division of competence between support and development. This notion of competence structure, while useful for the purpose for which Pentland specifically created it, fits neatly within the boundaries of habitus. Pentland's description of how the competence structure shapes practices such as Transfer and Escalation in such a way as to tend to reproduce itself parallels Bourdieu's theorizing very closely. Bourdieu (1990: 95) argues that structures get reproduced by practices that are shaped by habitus that was conditioned in the first place by the structures. In other words, there is a cyclical quality. Overall, by considering the physical affordances of technical support practices and the ritual and competence dimensions of the habitus that shapes those practices, Pentland is able to develop a rich and novel

theory of organizational knowledge that focuses on the organization's capacity to perform knowledgably.

Conclusion

The examples of Fayard and Weeks (2007) and Pentland (1992) illustrate how Gibson's (1986) theory of affordances offers a useful way of talking about how practice is patterned by *setting* that complements Bourdieu's (1990) theory of habitus, which provides a useful way of thinking about how practice is patterned by *structure.* Habitus and affordance can be used together to provide a more complete understanding of practice without the need to resort to a grand theory that attempts to explain everything. Habitus and affordance fit together for the same reason that they are so appropriate to the study of practice. At their root lies the rejection of the traditional dichotomies of voluntarism and determinism on the one hand, and subjectivism and objectivism on the other hand. It is this rejection, not a focus on a particular phenomena, that distinguishes theories of practice from other theories of behavior. Together, habitus and affordance allow an approach to practice that takes seriously the notion that practice is embodied and that it is shaped by the material environment and physical artifacts that avoids the traps of both physical realism and social constructionism.

The simplifying temptation to extend habitus to encompass affordances, or to extend affordances to encompass habitus, should be resisted. Let each tool do best what it was designed for. There is power in theories of the middle range. It is true that Bourdieu highlights the importance of the body and the role of the environment. He argues that habitus does take the objective conditions of existence directly into account. However, what he has in mind are structural issues, objective conditions of society such as status, power, wealth, etc. Physical conditions, as opposed to the

symbolic importance of physical objects, fit uneasily within the concept of habitus which was designed to describe social structures. It is also true that the idea of affordances can be stretched to include social affordances, such as the affordance of social designation that Fayard and Weeks (2007) identify. However, while it is important to examine how social and cultural factors impact the affordances of physical environments and objects, other concepts, such as habitus, are better designed to help us describe how the broader field—in Bourdieu's terms the network of relationships and structures in the group and society that create the conditions that condition habitus (Bourdieu and Wacquant 1992)—shapes practice. In other words, the complementarity of affordance and habitus is not so much that one is about the physical and the other about the social. It is that affordance helps us talk about how the setting shapes practice while habitus helps us talk about structure, or the field, shapes practice. Together, setting and structure, via affordances and habitus, shape the possibilities for action that show up, either consciously or unconsciously, for the actor.

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