

Things and Their Embodied Environments¹
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What Kind of Thing is That?

At an archaeological excavation in southern California two young graduate students, Chad and Bee, are working at a screen scrutinizing objects found in the dirt they have just excavated. When Ann, the senior archaeologist in charge of the excavation approaches where they are working, Chad picks up something he has found and hands it to Ann while asking “What kind of thing is that?” (line 3 in Figure 1).

¹ I am deeply indebted to Don Favareau, Candy Goodwin, Shimako Iwasaki and the other participants at the McDonald conference on the Cognitive Life of Things for most insightful and helpful comments on the analysis I am trying to develop.

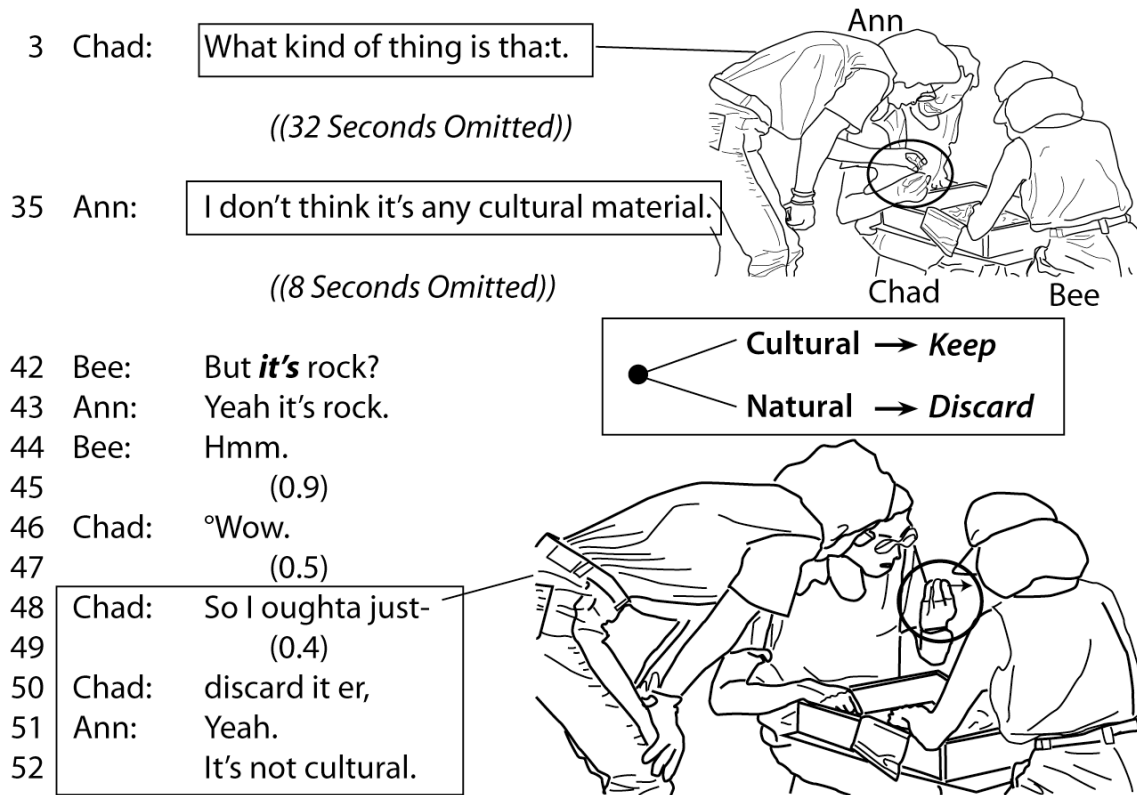


Figure 1

Such a situation, in which an actor encounters a thing in the world that is the focus of his or her scrutiny, and is faced with the task of classifying it, determining “What kind of thing is that?” (line 3), is central to the cognitive life of things. This task is by no means confined to human actors. Von Uexküll (1957) describes how a parasitic tick, faced with the task of locating nourishment in its environment, has biological structures organized to recognize and act upon just those chemicals that are secreted by an appropriate host. It is biologically structured to recognize the things that are relevant to its lifeworld, and to act upon them in distinctive, appropriate ways.

Several observations about this process are relevant. First, classification is embedded within the task of constructing an appropriate next action. The tick responds to particular chemicals by attaching itself to the entity that secreted

them, and thus constitutes that entity as its host, but takes no action in the absence of the chemical signal. Similarly, the answer Chad receives to his query — Ann’s statement that it is not “cultural material” (line 35) — leads him to toss away the stone he has been scrutinizing (line 50). However, if the thing being inquired about had been classified as cultural he would have retained the object (putting it in the plastic bag positioned on the sifting screen for just such contingencies) so that it could be brought to the lab for further analysis. In both cases the outcome of the classification process (Host/Non Host, Cultural/Natural) leads to alternative trajectories of subsequent action. Within such a framework classification of things is embedded within temporally unfolding courses of action (Goodwin 1997). Second, such encounters are structured by the reciprocal relationship between things and relevant actors who attend to and classify those things in order to accomplish the actions that make up their lifeworld. Third, in both cases the process of classifying a thing is mediated, at least in part, by biological structure in the actor, such as the receptors that allow the tick to recognize relevant chemicals, and the visual and tactile capacities of the archaeologists who are looking at, holding, and manipulating the thing they are attending to. The importance of such biological structure highlights the way in which the body, with its distinctive and varied sensory capacities, that are in turn linked to the organization of relevant action, constitutes a primordial site for the apprehension and classification of things.

There are however crucial differences between the work of classification being done by the tick and the archaeologists. First, not only embodied experience, but also human language plays an important role in the work being done by the archaeologists, both as a sedimented storehouse of relevant

classifications (for example “cultural” v. “natural”), and as a resource for organizing relevant action in concert with others (thus the whole sequence is initiated by Chad’s query to Ann in line 3). Second, not only biological structures, but also things created by humans are used as resources for the accomplishment of relevant cognitive tasks, including classification (Hutchins 1995; Norman 1988). Thus the screen through which the excavated dirt was poured eliminated anything small enough to pass through its holes, and thus provided a first classification of a set of “natural” objects that would disappear from the subsequent records of cultural material found at the excavation. Third, the classifications being performed by the tick are structured, systematic responses between actor and environment that have been wired into the tick’s biology through evolutionary processes. However, there is no such invariance in the classifications to be made by archaeologists, and humans in general, as they work with things. The texture of relevancies that shape the archaeologists’ work of classification are not the same for even a closely related group, such as geologists, who would not take the determination that “its rock” (lines 42-43) to warrant tossing the object being examined aside. Cultural anthropology has strongly demonstrated that different communities classify the environment in radically different ways. Language, the body, and the constitution of professional vision work together within the processes through which a community coordinates its work with things .

Environments for the Organization of Cognition and Action

A central locus for investigation of the cognitive life of things is actual agent-object inter-action. Rather than viewing cognition as abstract process lodged

entirely within the mental life of sentient beings, and things as mute, unmoving objects, analysis here will focus on the mutual constitution of actors, things and communities within the ongoing organization of the activities. Here cognition emerges as a consequential and practical issue, for example as a part of the process through which both the world that is the focus a community's scrutiny, and other actors, are known in just the ways that allow the work of the community to be accomplished.

When actual courses of action are examined it quickly becomes apparent that a range of quite diverse phenomena are implicated in even single instances of agents interacting with things. It will be proposed here that cognition emerges through the ongoing and systematic transformation of environments that contain a range of structurally different kinds of resources that mutually interact with each other. The resources that make up such environments include the activities that are being pursued, things of different kinds (for example objects that are the focus of explicitly cognitive work, such as classification, by actors, and other objects that both help structure such work and incorporate solutions found by the predecessors of the current actors), actors, embodied action including both gesture and posture as resource for displaying a relevant orientation, language, maps, documents, the embodied practices through which the work of a community is accomplished (for example being able to properly use a trowel to reveal relevant structure in the dirt of an archaeological excavation), etc. Elsewhere I have described the constantly changing patterns of interacting resources through which action emerges and changes as contextual configurations (Goodwin 2000).

In the present paper I will use video recordings of archaeologists doing excavation to investigate specific aspects of the environments within which the cognitive life of things emerges. First, to make as clear as possible what is meant by focusing on transformations of environments to investigate the cognitive organization of things, this perspective will be contrasted with another, that of information flow from the mental states of one actor to that of another. Second, the work of archaeologists classifying color with a Munsell chart will be used to provide a hopefully clear example of how cognition is organized through transformations of environments in which things play a crucial role. Third, the part played by interacting bodies will be investigated as a first step in attempting to describe some recurrent features of such environments. What is crucial is not just a single body interacting with things, but multiple bodies carrying out courses of action together while attending to both the things that are the focus of their work, and each other. Though, not typically considered a thing, the body, by virtue of its material presence in the world, shares my crucial properties with things. It will be argued that the body in fact contains a number of quite different kinds of resources that play different roles in the organization of the environments being investigated here. Fourth, the part played by language in this process will be examined. Language is usually considered radically different from things (for example as something nonmaterial and lodged within the mental life of speakers). However, here it will be proposed that like things, language constitutes public structure sedimented into the world. It both positions other actors, and builds crucial features of the environments that constitute the point of departure for subsequent action. Finally, with these resources in place, the issue noted above of the mutual constitution of things,

actors and communities, will be returned to. Multimodal packages that bring together things, language and the bodies of interacting actors help construct the shared professional vision that is central to the ability of separate members of a community to see in common the things in their world in precisely the ways that enable them to accomplish relevant action together.

Such a perspective on cognition as a public process organized through interactive practice is compatible with contemporary analysis of distributed and embodied cognition (Clark 2001; Hutchins 1995; Norman 1988), but differs from many approaches to cognition that place primary emphasis on processes within the mental life and brain of the individual.

In order to make as clear as possible what is proposed by focusing on the transformation of multi-modal environments it is useful to briefly examine for contrast the geography of cognition vividly encapsulated is Saussure's (1966 Chapter III, §2) classic diagram of the speech exchange circuit (Figure 2).² His diagram is useful here because it presents such a clear picture of notions about communication and cognition that continue to guide work in many disciplines³.

² Saussure's diagram provides a clear and vivid example of a pervasive picture of cognition. It must be noted however, as has been emphasized by a number of scholars (Harris 1987; Thibault 1997) that Saussure's own thinking was far more subtle, sophisticated, and indeed interactive than this diagram taken in isolation would indicate.

³ It must be emphasized that Saussure was a profound thinker whose insights were crucial to twentieth century thinking about language, cognition and

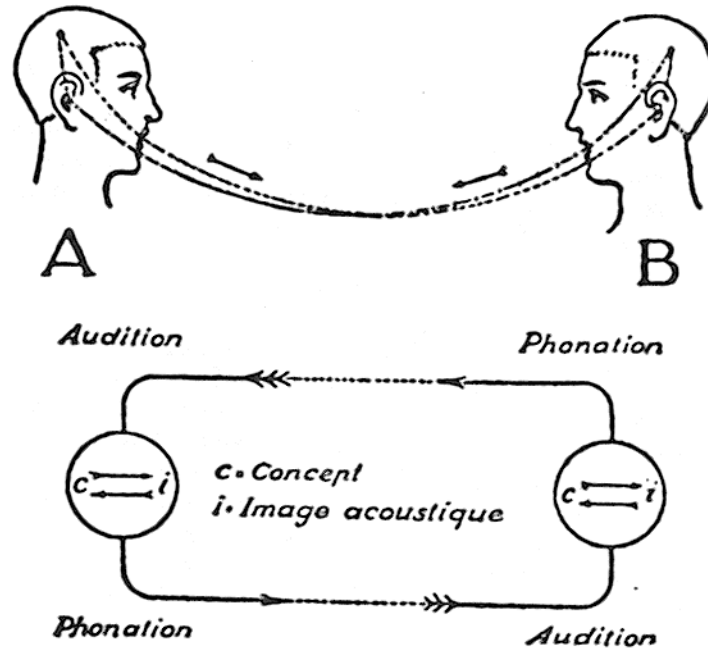


Figure 2

Saussure's image diagrams a process of **information flow** in which a concept is transferred from the mental life of one actor, the speaker, to the mental life of another, the hearer, through a structured sign system carried by the stream of speech. The points inside the actors' heads that mark the source and destination of the chain highlight the primacy of each individual's private mental experience. The task of the hearer, whom Saussure describes as passive, is decoding the speaker's signs; with success being measured in terms of how precisely B's mental images match A's.

Consider, by way of contrast, the activity of color classification in archaeology. In order to make the appropriate entries on a form used to record what happens at a field site, archaeologists must systematically classifying the

semiotics. The discussion here in no way presents an adequate, or even accurate view of Saussure's own complex and nuanced thinking (see Thibault 1997)

color of the dirt they are excavating. To do this they use a Munsell chart, a system of standard, scientifically recognized color samples. Elsewhere I have described in more detail how archaeologists use this chart to classify color, and the implications their work has for how we conceptualize human action and cognition (Goodwin 1999; Goodwin 2000; see also Latour 1995). Here I will briefly summarize what is necessary for understanding the sequence that will be examined below in Figure 4.

Figure 3 provides an overview of work with the Munsell chart. The version of the Munsell chart used by archaeologists takes the form of a small book containing the subset of the colors that archaeologists are likely to use in their work. Each page contains a set of ordered color patches (a particular color Value with a grid showing systematic variation in Hue and Chroma) with a hole adjacent to each color. To classify the color of dirt the archaeologist puts a small, wet bit of dirt on the tip of a trowel, shades the chart with the shadow of her body, and then moves the trowel with its dirt from hole to hole until the best match with an adjacent color chip is found. The grid coordinates, and name of this color, are then entered on the coding form.

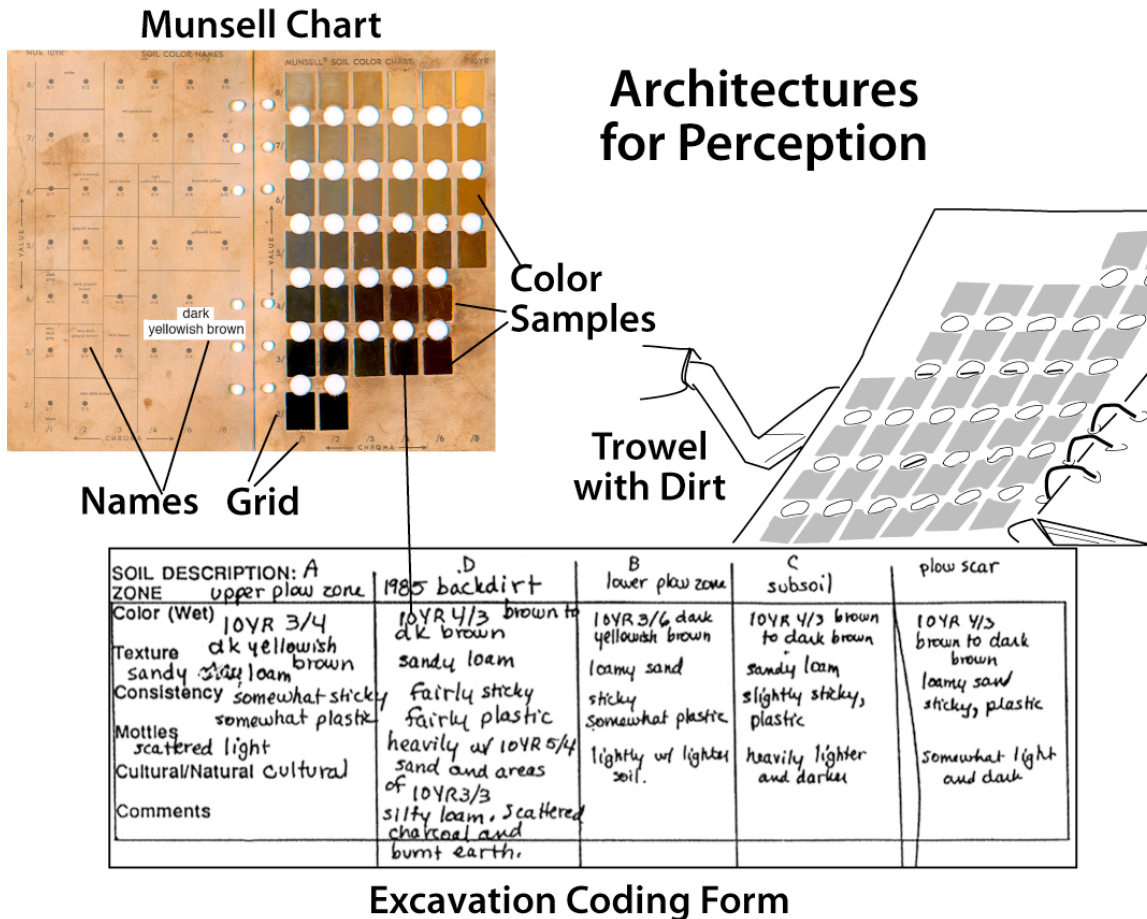


Figure 3

The Munsell chart is a scientifically constructed symbolic space, a set of color representations ordered in terms of an underlying theory about how color should be properly described. However, it is also a physical object with distinctive characteristics. Its pages contain replicable samples that can be shared among different groups and be transported to the field. Moreover these pages are pierced with holes so that both the dirt being classified and relevant color samples can be viewed simultaneously. The chart thus creates a unique, distinctively human space, in which an object in the world that is the focus of a community's scrutiny can be seen in the same visual field as the work-relevant category system being used to classify that thing. It is precisely here, as the dirt

becomes an archaeologically relevant category, that nature is transformed into culture. What makes that transformation possible in this case is the way in which the cognitive task of classification is solved by operating on one thing—that dirt that is the focus of scrutiny—with a second thing. The Munsell chart, an object simultaneously symbolic and material, is used by a community to solve some of the systematic tasks faced in its work. The chart with its holes for viewing bits of dirt that are to be classified creates an architecture for perception, a physical object that embodies a solution to a repetitive cognitive task posed in the work of the community using it (see also Hutchins 1995).

The Munsell chart contains not one, but three different systems for classifying color: 1) swatches with samples of relevant colors; 2) the coordinates that place each sample within the grid on the page, and simultaneously at a particular place within the color space defined by the Munsell system; and 3) color names. Each of these different sign systems is useful for a different part of the work of color classification. Visual color samples can be compared to the dirt being classified, precisely the work that Pam and Jeff will be doing in Figure 4. However, it would be prohibitively expensive to have to recreate each color chip on the form used to record the excavation, or in the articles that publish information about it. Names and numbers keyed to samples embedded in shared objects, such as Munsell charts, available to a larger community make possible efficient recording and publication.

In Figure 4 Jeff is holding the Munsell chart in his left hand, while using his right hand to move a trowel with dirt under it as he attempts to locate the best color match. Pam, standing in front of him, is helping in this task. At line 17 Pam points to a specific color patch on the chart while saying “En this one.”

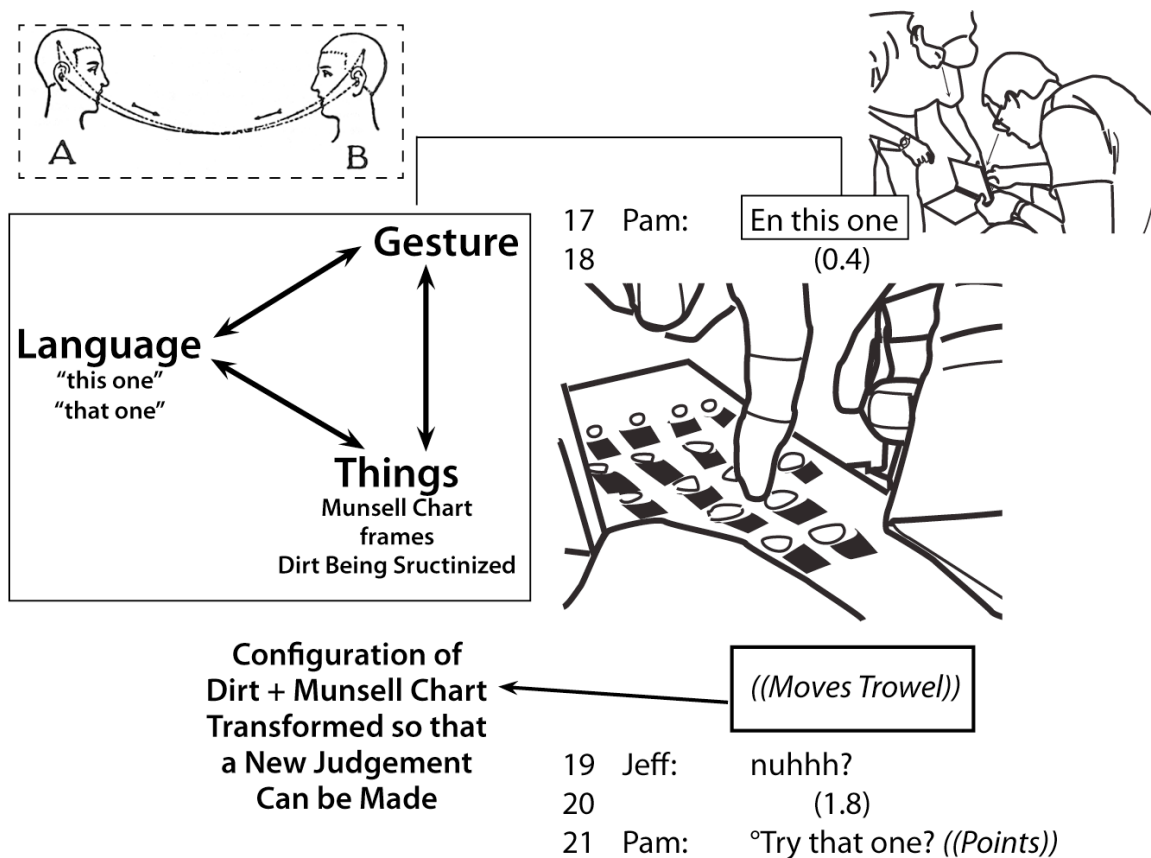


Figure 4

Jeff then moves the trowel so that the dirt is adjacent to the color patch Pam indicated. At line 19, after seeing this new arrangement, he rejects her proposal and in line 21 Pam points to another color.

What happens here can be compared with the picture of information flow in Figure 2. First, in that diagram, things played no part whatsoever in the process through which a mental image was transferred from the head of one party to that of a second. However, Pam's utterance in line 17 includes not only language but also a pointing gesture that links what she is saying to specific things (the Munsell chart and the dirt it frames) in the environment that is the focus of their attention. She constructs a multimodal sign complex (language + gesture + things), in which structurally different kinds of signs in different media mutually

elaborate each other to create a whole that is both different from, and greater than, any of its constituent parts. Things, language and the body are all equally necessary for the organization of the action that occurs here, and the cognitive work that it is performing.

Second, at line 18 Jeff responds to Pam's action by moving his trowel so that the dirt being examined is positioned in the viewing hole next to the patch Pam indicated. The environment that is the focus of their work is transformed so that a different judgment becomes possible as the dirt is placed next to the new chosen color. When the new arrangement that then becomes visible is rejected in line 19 the environment is transformed yet again (line 21).

What occurs here contrasts markedly with the information flow picture in Figure 2. There, the work of the addressee consisted in simply recovering as accurately as possible the mental image that was originally in the speaker's mind. In Figure 4, rather than being restricted to phenomena hidden within the mental life of individual actors, Pam's action leads to, and is intended to lead to, relevant changes in a public environment that encompasses work-relevant categories and things (the framing of the dirt they are classifying by a particular color patch on the Munsell chart) that both actors can scrutinize together. What is at issue is less the transfer of information and mental images from one actor to another, than the continuous transformation of a public environment so that the cognitive tasks these parties are pursuing together can be successfully accomplished.

The picture of human cognition in Figure 2, in which action is seen to emerge from a primary intention lodged within the mental life of the speaker, is pervasive not only in linguistics, but also in related fields such as pragmatics

(Searle 1970) and gesture studies (McNeill 1992). Noting how action and cognition are accomplished through the transformation of public environment is not in any way to argue that the intentions of individual actors, and an addressee's mental recognition of concepts carried by signs are not relevant to what happens in Figure 4 (Pam clearly wants to tell Jeff something). However, the very serious problem that arises from a model such as that in Figure 2 is that a primary focus on intentions and processes within the mental life of an individual actor creates an analytic boundary at that point that forestalls investigation of the larger courses of action and relevant environments that a particular act emerges from. Here Pam and Jeff, two young adults in an advanced graduate program, are devoting the full power of their minds and bodies to intently scrutinizing a tiny bit of dirt, not because of a process that has its origins within the individual skull, but instead because they have a work-relevant form they must fill out. Moreover they are doing all of this, and attending the field school where these activities occur, because they are working to become full-fledged members of a specific community: professional archaeology. The structure of intentionality that generates Pam's action in line 17 is not primarily lodged within her private mental experience, but instead within the public practices of a community.

Jeff's movement of his trowel to create a new juxtaposition of dirt being scrutinized + candidate color sample provides a simple, clear example of how the cognitive life of things (both as objects to be known and as tools for systematically knowing other things) might be organized through the dynamic transformation of a relevant environment. However the Munsell chart with its historically developed grid of color categories, each with its own hole for

viewing the world to be categorized, is unusual. Is this a special case or are environments for the dynamic organization of cognition and action pervasive? If they are in fact ubiquitous what are the general resources and practices used to construct them? Some aspects of this process will now be briefly investigated, beginning with the human body.

Interacting Bodies as Frames for the Organization of Cognition and Action

The body constitutes the primordial site where actors encounter things. It is here that they first begin to not only know relevant things, but also use them in the ways that make possible the accomplishment of the tasks and activities that are central to their lives. Moreover, as is well known, a primary constraint on the design of things is adaptation to the bodies that will use them. While on the one hand the Munsell chart encapsulates a long history of scientific work with color, on the other hand, it, like many tools, is designed in fine detail to be used by a body with quite specific properties, one that can gaze intently at the structured view of the world it creates, and do this while holding it one hand as the other maneuvers a second tool, the trowel with the dirt being examined (it presupposes the freeing and differentiation of the hands made possible by bipedalism). The Munsell chart, and architectures for perception more generally extend the perceptual and sensory abilities of the body by making it possible for a new kind of hybrid space to be intently scrutinized and modified. However the very ability of such an object to do this relies upon a deep and continuous engagement with diverse biological properties of the body it amplifies (sight, touch, movement, etc.). Though the Munsell chart might be a quite particular tool, the body that manipulates it is thoroughly pervasive in the organization of

human cognition. The body structures humans' work with things, and is a major constraint on the structure and organization of the diverse tools it uses.

This view of the body as a primary locus for an actor's engagement with things is consistent with important work in a number of different fields that has placed renewed emphasis on the part played by the body in the organization of human cognition. However humans are deeply social animals. This raises the possibility that what might be issue is not the isolated brain and body of a single actor using an object or tool of some type, but instead multiple bodies engaged in courses of action with each other, while working with relevant phenomena in their environment. From such a perspective what is at issue is not only the actor's experience of his or her own body and the things known through it, but also the ability of each party to read and take into the body of the other, including their engagement with relevant objects, in just the ways that will make possible the accomplishment of coordinated action. Such phenomena can be investigated the organization of Pam and Jeff's bodies as they work with the Munsell chart.

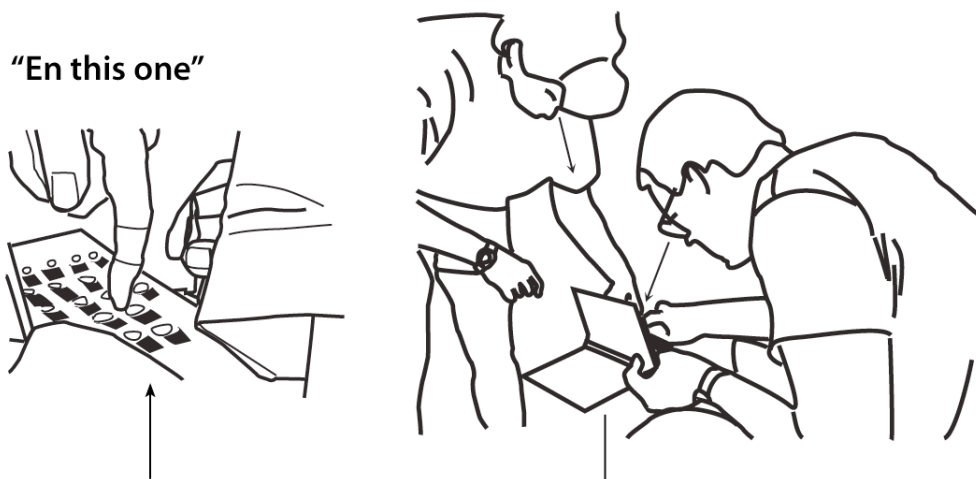
In line 18 of Figure 2, by moving the dirt being examined to the color patch that Pam has just indicated, Jeff demonstrates that he has not only seen Pam's pointing gesture, but actually used it as a major point of departure for the construction of his own action. The relevant patch could not identified from Pam's Talk alone. Her gesture linked to a specific color patch on the Munsell chart thus functions as an important communicative act.

However, it has been argued that gestures are not inherently communicative acts (blind people and people speaking over the phone gesture), but may function instead to aid the cognitive activities of the party making the gesture (Krauss, et al. 1991). In so far as the human hand is a major way in which the

world around us, and the objects within it, are known and acted upon, the notion that gestures enhance individual cognition seems quite correct. That does not, however, exclude the possibility that participants might systematically construct a class of gestures that are organized as communicative action, specifically as events that others are expected to take into account. The issue is not whether or not Pam's gesture is communicative (it clearly is), but rather what are the practices used to construct it as a communicative act.

Note that Pam places her gesture right where Jeff is gazing, and moreover gazes at her own gesturing hand herself (see both Figures 4 and 5 below). Pam's ability to place her gestures precisely where they will be seen by her co-participant is made possible in part by the way in which Pam and Jeff have positioned their bodies so that they are visibly displaying orientation toward both each other, and the dirt that is the focus of their work. Such multiparty embodied participation frameworks (Goodwin 2002; Kendon 1977; Kendon 1985) are central to the organization of action and cognition in human interaction in that they enable one party to see what another is orienting to, and multiple parties to create together a public framework that grounds shared vision and action.

Gesture & Participation Framework Different Kinds of Sign Systems



	Gesture	Participation Framework
Referential Content	Matter under Discussion	Orientation of Participants
Temporal Scope	Limited Topical Items	Extended Strips of Talk

Figure 5

More generally, the human body, though animate and possessing a reflexive capacity to rapidly adapt to the actions of others (Goodwin 2000), nonetheless shares crucial properties with things. The body is a physical presence in the world, something that occupies space and can be seen and touched. The body leaves material traces of its presence on the things it encounters. Indeed the archaeologists here use the body's ability to cast a shadow as a systematic component of their work with a Munsell chart. However, despite its material presence in the world, the body of another is treated as not simply a moving object, but also as something that displays crucial features of what can be glossed as the cognitive and mental life of actor using the body. For example gaze and posture are treated as displaying where the person inhabiting the body is

focusing his or her attention, and frequently what they are about to do. The physical body thus provides a material anchor (Hutchins 2005) for a conceptual blend (Fauconnier and Turner 2002) through which the ongoing cognitive activity of an actor is made both visible and consequential for the actions of others within the dynamic unfolding of moment-to-moment action. It is this dual structuring of the visible body as both a material object, and a place where relevant cognitive and mental activity can be systematically seen, that enables Pam to not only place her hand right where Jeff is gazing, but also expect him to attend to her gesture as consequential for the organization of his own subsequent action. The placement of the gesturing hand within the special environment created through the displayed orientation of another's body gives this gesture, but by no means all gestures, its status as a communicative act.

Both the multiparty participation framework created through the participants' mutual orientation, and Pam's gestures, are constructed through use of the human body. Participation frameworks and gestures are, however, very different kinds of sign systems. For example each has quite different referential content. Pam's gesture is about the dirt they are examining and a color patch that might properly categorize it. However, the multi-party participation framework does not concern the content of their discourse, but instead is about their mutual orientation toward each other and the environment with its objects that is the focus of their work. Gestures, and participation frameworks also have very different time scales. Like the talk they accompany, individual gestures disappear rapidly. By way of contrast participation frameworks can frame long strips of interaction within which many different kinds of talk and gesture occur. More generally a participation framework creates a public structure of shared

orientation within which other kinds of sign processes, such as gesture and talk, can flourish.

The embodied framework of mutual orientation created by Pam and Jeff's bodies, which both bounds their ecological huddle from the world outside its perimeter, and provides a visible locus for shared vision and joint action within the space it creates, has deep affinities with many physical structures in the built environment such as arenas, classrooms, lecture halls, etc. Indeed a major theme in the design of both built spaces and objects (chairs for example) is structuring the flow and arrangement of the bodies and things that will inhabit such spaces into relevant configurations for the accomplishment of the actions that will occur there (Ellis and Cuff 1989). That same structuring is seen in the arrangement of the participants' bodies around the objects they are working with in Figure 5, though on a very different time scale.

Participation frameworks are seen but unnoticed in that they are not the explicit focus of actors' attention in the ways that gesture and talk are (Kendon 1990). They are nonetheless actively attended to and constructed through systematic dynamic work by participants. Figure 6 provides an example of how the bodies of participants are dynamically reconfigured as action unfolds in order to build the embodied participation frameworks necessary for the actions of the moment.

Reconfiguring Bodies

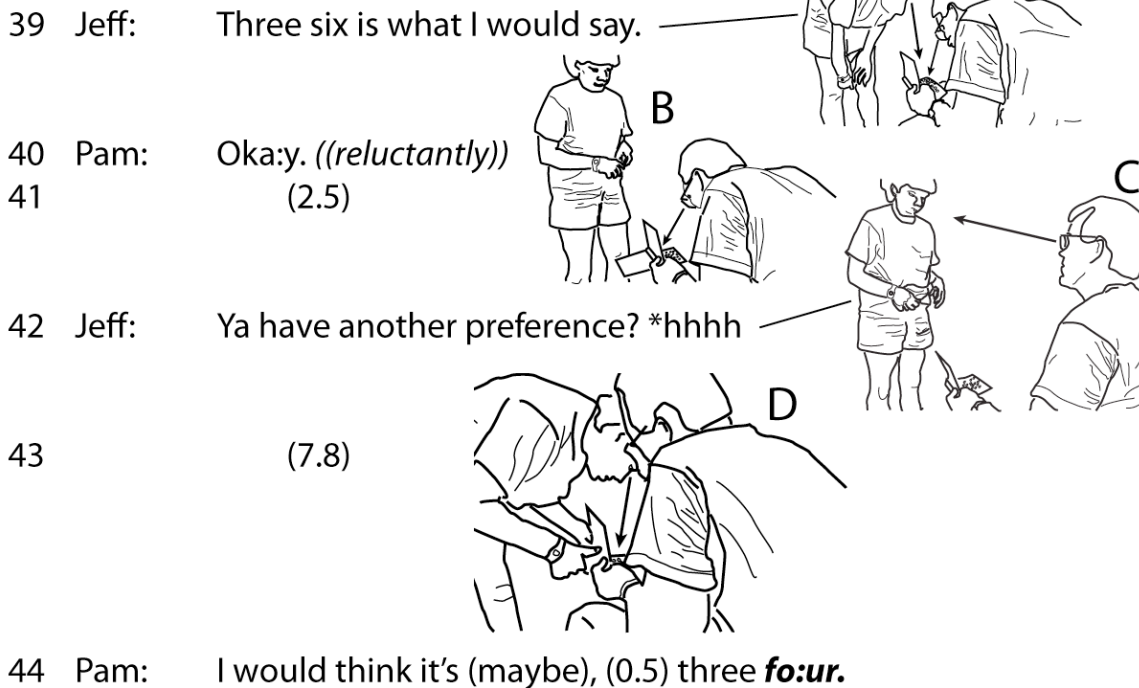


Figure 6

Pam and Jeff have been disagreeing about what Munsell patch best categorizes the dirt they are classifying. In line 39 Jeff proposes a particular color, the patch located at grid coordinates “Three six”. In line 40 Pam agrees, but the voice quality of her “Oka:y” displays reluctant acquiescence to Jeff’s choice. The epistemic basis for Pam’s position, her ability to disagree, and to be publicly seen as entitled to such disagreement, arises not from hidden mental events, but instead from how she has visibly organized her body with reference to the things that are the focus of their joint scrutiny (see A in Figure 6). By virtue of the way in which she is bending over the chart so that she can clearly see both the dirt and color sample adjacent to it, she has assumed, quite literally, an embodied position that allows her to make her own judgment about the accuracy of Jeff’s proposal, and moreover displays this to others.

As Pam reluctantly agrees in line 40 she stands up. (B in Figure 6) Her body is now no longer positioned to scrutinize the configuration of dirt next to particular colors, and thus can be seen as leaving that activity. Such a position the consistent with the closure of the activity of finding the right classification when a particular category is chosen (no matter how reluctantly). The environment created by the changing positions of her body is thus helping to structure and differentiate alternative activities.

However at line 42, responding to Pam's visible reluctance, Jeff reopens the activity of classification by turning to her (C in Figure 6) and asking if she has "another preference". A very long silence, almost eight seconds, follows before Pam replies with the grid coordinates of an alternative color "three **fo:ur**" in line 44). That silence is not, however, empty, but instead is filled with the work required for Pam to move her body into a position where it can again intently scrutinize both the Munsell chart and the dirt under it (D in Figure 6). The position she assumes provides her, as an actor, with the embodied access to the things she is evaluating that is necessary for a competent judgment, while publicly displaying to others the epistemic warrant for her claim, and specifically how what she says is the visible outcome of the embodied practices required to make such a judgment. Simultaneously, by reconfiguring her body as tasks change in just the ways required for proper work with things involved in each task, she displays to others her competence as a an archaeologist, and thus membership in a particular community.

It has been argued that the cognitive life of things is embedded within environments for the organization of action that are either in a continuous state of transformation, or which work to establish regularities for the activities and

sign exchange processes that occur within those environments (the Munsell chart or the architecture of spaces for example). A number of different components of such environments have been examined. These included objects, such as the Munsell chart, that build stable, replicable architectures for perception, which in turn organize systematic transformations of the cognitive spaces they create as they are used in practice (for example as entities to be categorized, such as the dirt the archaeologists are classifying, are moved from one of the spaces provided by the chart to another). Another, most pervasive feature of such environments is the human body. The body provides resources that can contribute to the content of the work being done in a setting. Thus in Figure 4 a pointing gesture helped specify a particular color on the Munsell chart.

However, the body can contribute to the structure of environments in a quite different way as well. Dynamically changing participation frameworks organize access to both relevant things and other actors. By creating a public framework of shared orientation within other kinds of sign processes can occur, including what was glossed as content above, participation frameworks ground crucial indexical properties of both language and action (for example providing a framework within which the deictic “this one” in Figure 4 can be concretely understood as calling for a particular next action), and demonstrate the epistemic basis for cognitive judgments about the proper classification of things that are being proposed by an actor working in a particular way with those things (Figure 6).

Another, most central feature of such environments is language. When Jeff asks Pam if she has “another preference” (line 42 of Figure 6) this transforms their current environment, including the arrangement of their bodies, their orientation to the objects they are working with, and what is expected to happen

next, by making it relevant for Pam to suddenly reposition her body for a new action. She immediately starts to bend down to the Munsell chart so that she can provide an answer to Jeff. The analytic focus here is on the ability of language, as used in human interaction, to rapidly create new environments that place not only the speaker, but also the addressee and frequently others as well (Goodwin and Goodwin 1990), in specific positions that shape what will happen next. This perspective, though well developed in fields such as Conversation Analysis (Sacks, et al. 1974), is different from many approaches to language that focus on mental phenomena within the individual actor. It is therefore useful to briefly examine the organization of language as a public environment, and thus as something with genuine relevance to how the cognitive life of things is organized.

Human Language as a Public Environment

Linguists and archaeologists posit two very different kinds of phenomena as central to what it is to be human. For linguists what defines us as human is language, while archaeologists focus on our ability to secrete structures into the environments we inhabit that organize human action both locally, and across generations and on historical time scales. Important work has been done using both archaeology and historical linguistics to study, for example, early human population movements and how such processes might be tied to crucial technological transformations such as the diffusion of agriculture (Renfrew 1990). Nonetheless in most research language and the material world are treated as radically different kinds of phenomena to be studied by entirely separate disciplines. Thus in contemporary formal linguistics language is analyzed as a

complex symbolic calculus lodged within the mental life of the speaker, possibly to be explained by hidden neural mechanisms. The core system that constitutes language is thus both internal and nonmaterial⁴ (see Figure 2). In this it is diametrically opposed to the things studied by archaeologists that are both external and material. In contrast to such a dichotomy, which, if taken seriously, permits each discipline to comfortably ignore the other, I will here briefly explore the possibility that through the use of language in talk-in-interaction human beings build temporally unfolding public environments that constrain and structure each other's actions.

In some of the fields I work in, such as Conversation Analysis (Ochs, et al. 1996; Sacks, et al. 1974), language use is analyzed as a set of public practices through which human beings build action in concert with each other. Figure 7 provides an example of what we call Format Tying (Goodwin and Goodwin 1987). The data is from an argument between a father and a son who are driving to the son's choir practice when the son says that he wants to drop out of the choir. At one point the son says "I don't have to do anything." Formal linguists would analyze this as an isolated sentence with the scope of analysis restricted to

⁴ The linguistic arguments about the nonmaterial nature of language hinge in part on a distinction first drawn by Saussure (1959) between *parole*, actual speech, and *langue*, the system that organizes the linguistic units manifest in actual speech. This dichotomy was continued by Chomsky (1965) as a contrast between *competence* and *performance*, with performance being epiphenomenal and containing only degenerate examples of a speaker's underlying competence, and thus being of little interests to linguists.

the mental life of the speaker. However, when we look at the actual exchange we see that it is a next utterance to Father's "Honey, you have to go" and that son in fact builds his utterance and action through a set of systematic operations on the structure of Father's utterance, either directly reusing structure provided by the prior utterance ("have to") or transforming that structure in systematic ways:

Build Next Utterances by Re-Using the Structure Provided by Prior Utterances

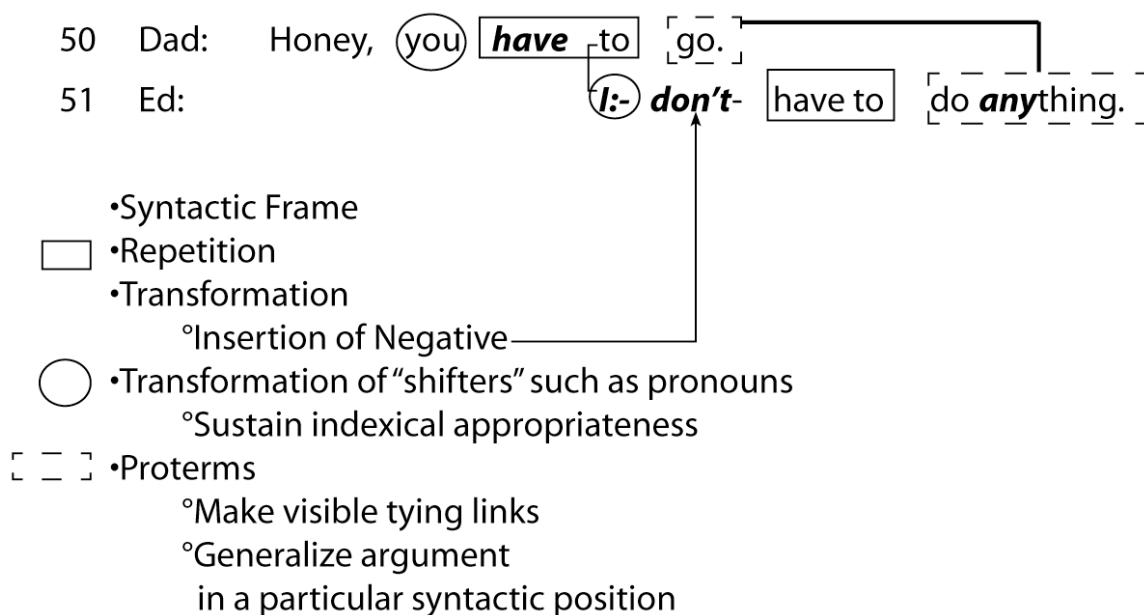


Figure 7

The utterance in line 51 is built through specific operations (repetition of structure, transformation, insertion, use of proterms to tie to prior talk while modifying what is being tied to, etc.) on the materials provided by the talk in line 50. This is structurally analogous to how the material structure of an environment, and the things being used within it, shape subsequent action. Consider for example how use of a Munsell chart to classify color provides crucial resources for archaeologists, while simultaneously structuring in quite

fine detail both the cognitive work and the embodied actions of those using it at an excavation. Similarly the physical layout of an oceanographic ship and its tools (including computer displays that render visible relevant structure in the water being probed) provide historically sedimented architectures for perception that shape the actions of those currently working on the ship (Goodwin 1995; Hutchins 1995). In Figure 19 Jeff used what Pam had just done as a framework for the organization of his own next action. In all of these situations actors build new action by using as a point of departure the structure of their current environment. This is just what Ed does in line 51 of Figure 8, only here the environment being attended to, and operated on, is the structure of the prior speaker's talk. This raises the possibility of there being deep continuity between language use and the ways in which human beings structure their material environments (which is what we might expect if both of these capacities evolved together). For example Ed's reuse of the structure of his father's talk in the example above is structurally similar to the Catholic Cathedral in Cuzco, Peru, which is built upon a foundation of Inca stones from the destroyed temple that occupied the same spot at the time of the conquest. Re-use of the Inca stones provides both a material resource for the construction of the cathedral, and a way of building a structure that publicly displays conquest. Similarly, Father's talk is not treated as purely symbolic or formless, but instead as something that provides a next actor with a range of specific and differentiated structure which can be used to build a next action that is not only visibly tied to the one that it emerges from, but elegantly uses the prior speaker's own words against him.

For simplicity and clarity I have only used a single example of talk-in-interaction here, and clearly not all utterances are built by reusing the structure

of the just prior talk in the way that Ed's is here. There is, however, a substantial and growing literature focused on the organization of talk-in-interaction (Ochs, et al. 1996; Sacks 1995; Sacks, et al. 1974; Schegloff and Sacks 1973) that demonstrates quite powerfully the contextual organization of language use. A very simple example of the pervasiveness of such organization is provided by Sacks' (1995) observation that the only way that an utterance can be recognized as an answer is through its sequential placement after a question. Such collaborative construction of joint action by separate parties through language use constitutes an elementary form of human social organization. Indeed were a disinterested ethologist to look at the human animal two of the activities that would immediately distinguish it from most other animals would be first, its extensive and varied transformation of the material world in ways that shape and organize subsequent action, and second the pervasiveness of talk as a crucial nexus for social organization between members of the species in a vast range of settings from the most consequential political debate to the activities of children playing on the street (Goodwin 1990).

In both talk and the organization of the built world, structures that have the capacity to organize subsequent action are secreted into a public environment. A major difference between these two types of phenomena is the time scales involved with language providing the possibility for constructing and reconstructing new environments very rapidly, for example at every next utterance, and indeed within individual utterances (Goodwin 1979), while the built environments investigated by archaeologists can influence action across generations. But both use as their point of departure humans who build new

action through systematic operations on the local environments that they inhabit at the moment.

The Reciprocal Constitution of Things, Actors and Communities

Sitting at the heart of the anthropological notion of culture is the observation that different social groups see and classify the environment, and the things found within it, in radically different ways. Cultural anthropology provides many rich descriptions of the varied category systems found in diverse cultures. However, the possibility of such diversity raises the question, not simply of difference, but rather of how it is possible, without some form of mind reading, for the separate individuals within a community (such as the profession of archaeology) to reliably locate the same objects within the complex perceptual environments that are the focus of their group's scrutiny, and to classify what they see in a congruent fashion. How do archaeologists not only see things like post molds and plow scars in the amorphous field of subtle color differences provided by the dirt they are examining, but also trust other archaeologists, but not outsiders, to reliably see the same thing? The proper classification of such abilities is not something that is lodged within the mental life of the individual. Rather, the task of separate individuals seeing, classifying and working with the things that are the focus of their work in a congruent fashion is posed by the necessity of accomplishing joint action in collaboration with each other.

In my own work I have found that a useful place to investigate such issues is provided by the settings of apprenticeship within which newcomers become competent members of professions such as archaeology, surgery and chemistry. I will now briefly examine some of the work done by a young archaeological

student, Sue, on one of the very first days of her first fieldschool. She is faced with the task of defining a feature by using the tip of her trowel to outline the shape of a post mold so that it can be drawn on a map. The map is a most necessary record since the post mold is only visible in the color patterning of the dirt now being worked with, and the shapes that constitute it will be destroyed as that dirt is removed to excavate deeper. Her task thus encompasses three of the mundane objects that provide the material and cognitive infrastructure of archaeology as a profession: first a feature, the material traces of the activities of an earlier human society; second, a tool, in this case a trowel, that is being used to reveal such features in the dirt that constitutes, quite literally, the primordial ground for archaeological practice; and third a map, a portable record of what was to be seen in a dirt surface that was later destroyed.

Sue has reached a place in the dirt where it is difficult to see the shape of the post mold she is attempting to outline. Ann, a senior Archaeologist who is directing the field school, traces her finger along a section of the post mold while saying "This is just a real nasty part of it" and then a moment later moves her hand over a long stripe in the dirt that she describes as a "disturbance." As is seen in the top of Figure 8 the thumb and fingers of Ann's hand, which are held in an inverted U shape, delineate the width of the stripe while her moving hand traces its length:

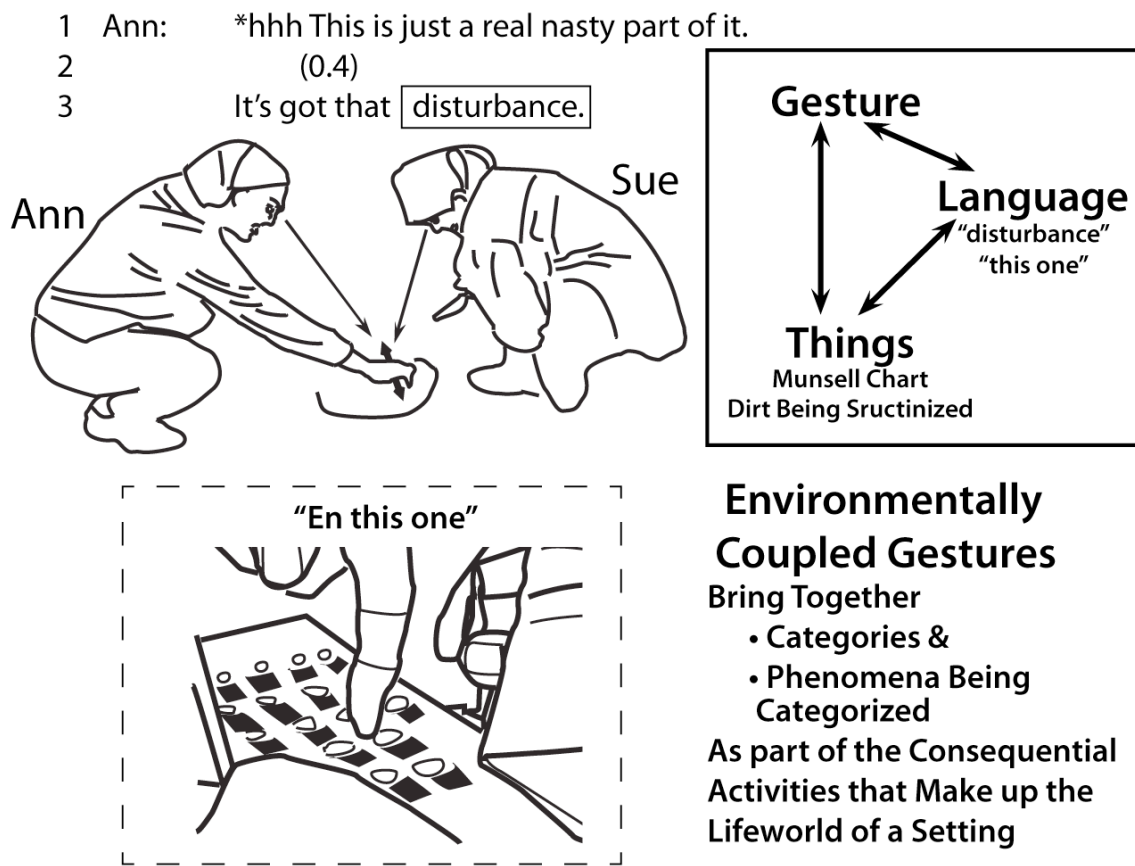


Figure 8

Ann builds her actions here through a triad of structurally different kinds of sign resources — language, her gesturing hand, and the dirt with its color patterning — that mutually elaborate each other to create a whole that is not only greater than, but different from, any of its component parts. Sue could not appropriately grasp what Ann is telling her about how to do her work if she attended to any component of this triad in isolation, for example, if she simply listened to Ann’s talk or focused only on the dirt. Such environmentally coupled gestures (Goodwin in press), which link things in the world to embodied action and classifications of those things in ways that are relevant to local participants (a “disturbance” that obscures a feature being mapped), are common, and indeed pervasive in some settings, such as archaeological excavations (the point to the

Munsell chart in Figure 4, reproduced at the bottom of Figure 8, provides another example). Why might this be the case? Note that a purely symbolic understanding of work relevant categories, such as “disturbance” or “post mold” is completely inadequate for a practicing archaeologist. Knowing in the abstract that a disturbance is something that deforms stratigraphy or features in no way provides a working archaeologist with the skills and professional vision required to competently locate disturbances with their rich physical variety — material traces of plows, burrowing rodents, etc. — in the actual dirt that it is her job to excavate. However, environmentally coupled gestures bring together in a single action package relevant categories and the actual things being categorized as part of the consequential activities that make up the lifeworld of a setting. They thus help negotiate through situated practice the gap noted by Wittgenstein (1958) between a rule (in this case a category) and its application, here the things in environment that are to be seen as instantiations of that category. Simultaneously, in instructional settings such as fieldschools, they provide resources for constituting through endogenous social practice both the things, such as post molds and maps, that are the focus of a community’s work, and the community’s embodied actors who can be trusted to appropriately recognize and work with those things in precisely the ways that are relevant to the concerns of the community (locating and mapping features for example).

The ongoing transformation of environments such as those found in Figure 8 provide crucial resources for calibrating through public practice the professional vision required to see, recognize and properly work with the things that are the focus of the work of a community. Drawing the line that outlines a feature transduces into the dirt being excavated, that is into a public arena where it can

be inspected by others, the precise way in which the person drawing the outline has seen the feature, where exactly she has located its boundaries. This construction of the humanly made shape that will be later transferred to the map constitutes an act of categorization, specifically the creation of an iconic sign representing crucial aspects of the thing being attended to in the dirt. Indeed the activity of defining a feature is one central place where the raw material provided by the dirt that is the focus of archaeological scrutiny is transformed into the relevant objects, such as shapes on maps, that animate the distinctive discourse of archaeology. It is here that a natural thing, a color stain in a patch of dirt, is transformed into a cultural object that is consequential in the cognitive work of a specific community.

However, unlike the identically shaped figure on the map that will be carried away from the field site, the sign created by the outline in the dirt is situated in the midst of the same visual and material field as the feature it depicts. It has not yet been removed from the very color patterning in the dirt that it is representing. The liminal position of this sign, the way it is positioned simultaneously within the messy particulars of the dirt being coded as well as in the world of clean, humanly made iconic representations of archaeologically relevant objects, provides crucial resources for the calibration of professional vision and practice. Thus another archaeologist can systematically judge the accuracy and skill of the work practices of a newcomer by comparing the outline drawn with the shape that the competent practitioner sees in the dirt itself. Note that such a comparison becomes impossible once the figure is removed from the dirt and only the map can be scrutinized.

By making additional marks in the dirt the skilled archaeologist can use these same resources to make public the precise details of how she, in contrast to the newcomer, sees the shape. The sequence in Figure 9 occurred when Ann, the senior archaeologist, inspected an outline that Sue had drawn.

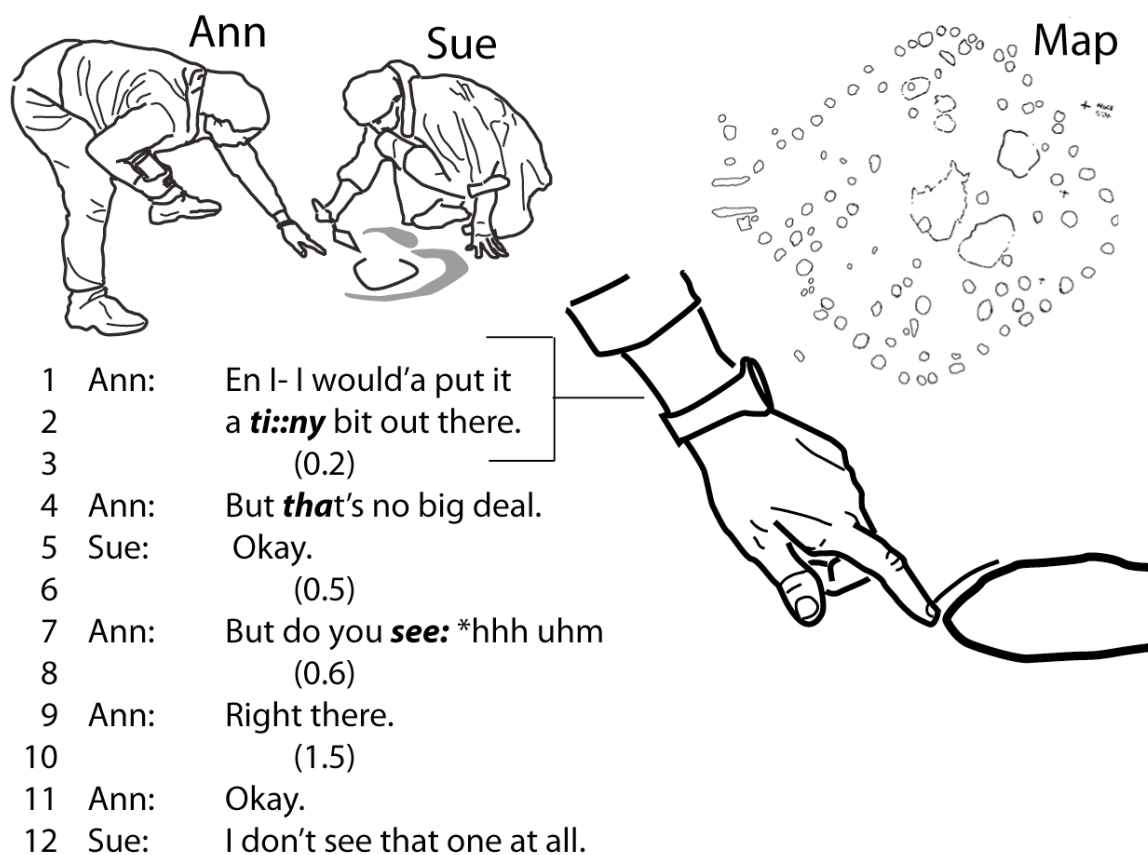


Figure 9

In lines 1-2, Ann uses her finger to show precisely where she would have drawn the outline differently, making a moving pointing gesture that leaves a slight mark in the dirt just outside Sue's circle. The work relevant seeing of the post mold being worked with is calibrated across multiple actors through systematic practices that leave visible traces in a public arena, indeed the field that contains the actual object being worked with. Such practices provide systematic resources for accomplishing the intergenerational transmission of just

those ways of recognizing relevant objects and using tools to work with them (in this case rendering the object visible through the skilled use of a trowel) that constitute the cognitive infrastructure of a profession.

What is central to this process is not only the visible, material presence of the objects being worked with, and the possibility of manipulating, classifying and annotating relevant phenomena within a field of action that enables public, multi-party scrutiny, but also the organization of collaborative action within interaction. By virtue of their embodied co-presence in a relevant setting Ann is able to see not only the actual environment that is the distinctive focus of her profession's scrutiny (the dirt floor of an emerging excavation), but also the operations that a newcomer is performing on that environment as she attempts to locate and work with the things that any competent member should see there. Moreover, since Ann is not simply an observer, but someone engaged in collaborative interaction with Sue, she can and does use what Sue has done as the point of departure for her own next actions. The mark she makes with her finger indicating where she would have located the boundary of the feature does not stand alone as an isolated action, but is, instead, a visible next action to Sue's line right next to it. Ann's new mark, and the talk accompanying the gesture, critique and correct what Sue has done by offering an alternative to where she has visibly located the feature.

Retrospectively Ann uses what Sue has done as an organizing framework for the construction of her own action. Prospectively, Ann's new mark, and the accompanying talk that categorizes that mark as, unlike Sue's, a correct delineation of the feature, creates a transformed environment for new work-relevant seeing that Sue should now perform (comparing Ann's mark with the

color patterning in the dirt, “Do you **see:**” in line 7), and makes relevant a reply from Sue. In line 12, after noticeably failing to see the patterning that Ann is indicating, Sue says “I don’t see that one at all.” What is crucial here is not Sue’s honest admission that she can’t see what Ann wants her to see, but rather the way in which the sequential organization of action in interaction (Heritage 1984; Sacks, et al. 1974; Schegloff 1968) creates continuously updated public contexts within which actors use the present state of the environment as the point of departure for building a next action (for example Ann’s placement of her mark adjacent to Sue’s line) and in so doing create a new or modified context that shapes what can happen after that. This architecture for intersubjectivity, lodged within ongoing interaction with both other actors and a consequential material world, provides the resources that enable calibration of the professional vision required for members of a community to recognize in common the things they trust each other to see in the environment that is the focus of their work, and to master the practices required to properly work with those things (for example recognize a post mold and transfer its shape to a map). Acquisition of the practices required to construct a map simultaneously constructs the relevant cognitive architecture of the archaeologists who use such maps to do their work.

The Reciprocal Constitution of Things, Actors and Communities

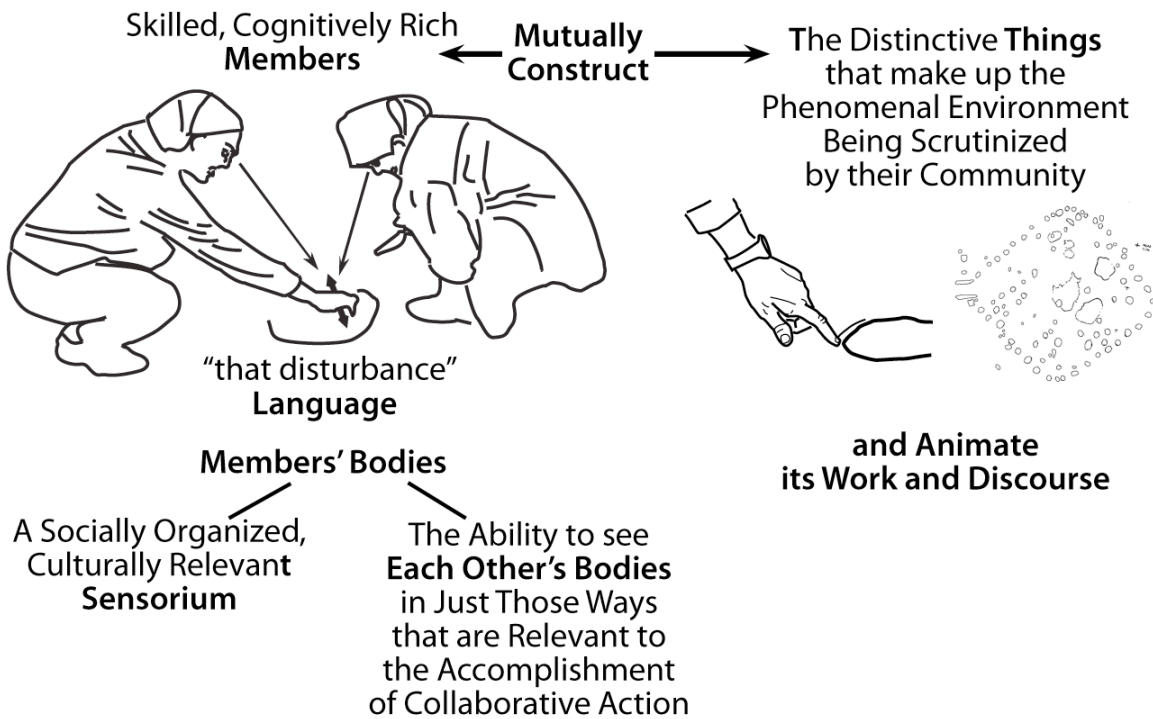


Figure 10

Conclusion

This paper has attempted to investigate cognition as actual agent-object interaction. It has focused analysis on actual courses of action within which actors and things mutually constitute each as part of the process through which the activities that define the work and lifeworld of a community are accomplished. As soon as such actions are examined it immediately becomes apparent that many different kinds of phenomena are implicated in the organization of even the most mundane work with things. In order to try and investigate such complexity in a systematic fashion it was proposed that both action and cognition are accomplished through the continuous, systematic transformation of structured multi-modal environments. Within this process things are both the

focus of particular kinds of cognitive activity, such as classification, and help organize other cognitive activity.

Such a framework was contrasted with a common, more simple model of information flow. Videotapes of archaeologists working with both each other, and the things that animate the discourse of their profession, were used to investigate a range of quite different kinds of resources implicated in the organization of such environments, all which interact with each other to accomplish the actions that define the work, cognitive activity, and professional vision of a specific community. The practices through which color is classified by using a particular kind of thing, a Munsell chart, was used to try and demonstrate how cognition might be organized through the systematic transformation of structured environments. Analysis then turned to the crucial framing provided by the bodies of actors interacting with each other, and with things. Most centrally, it was argued that the most relevant unit for the analysis of the forms of cognition being investigated here is not an isolated body acting with the things in the world around it, but instead a social unit constituted through the ongoing interaction of multiple bodies working together, and having to know, not individually, but in common, a relevant world in order to successfully accomplish their work. Though dynamic, animate and reflexive, the body, through its material presence in the world, shares many crucial properties with things. Its visibility enables others to use a co-participants' body as a material anchor (Hutchins 2005) in order to make systematic inferences about what is being attended to, and what can be expected to happen next, phenomena that are central to the ongoing organization of action. Shifting configurations of bodies shape the cognitive organization of things by providing different kinds of

access to the things that are the focus of scrutiny, and the structure of the activities through which they are being known and used. Another, most important component of these environments, at least for human beings, is language. Language and things are typically analyzed by completely separate disciplines, with language being considered nonmaterial and located primarily within the mental life of individual speakers (what Marvin Harris used to call *emic*), while things are part of the dense, physical structure of the world, something, unlike language, that we can hold in our hands and even walk upon. However it was argued here that like things, language secretes structure into the world that creates environments that position actors, and serve as the point of departure for subsequent action. Finally, the interlocking properties of these environments were found to be crucial to the practices of apprenticeship through which actors, things and communities mutually constitute each other by making possible forms of interaction that produce both cognitively rich, competent members of a community, and the things are both the focus of the work of the community, and animate its discourse.

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