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The Blackness of Black: Color Categories as Situated Practice

Charles Goodwin
Applied Linguistics, UCLA
cgoodwin@humnet.ucla.edu

Abstract

In what remains one of the central accomplishments of cognitive anthropology, Berlin and Kay (1969) demonstrated that the diversity of human color systems was built on a universal infrastructure, with black and white being the most basic colors in all systems. The analytical focus of their work is a structural system divorced from the messy tasks of actually using color terms to make relevant distinctions within specific courses of action situated within the concrete settings that constitute the lifeworld of a particular society. By way of contrast, Wittgenstein's later philosophy argues that is precisely such endogenous activities that provide the necessary framework for the analysis of human language. Using as data videotape of chemists attempting to determine when to stop a reaction by deciding when the material they are working with is jet black, this chapter explores (1) the diverse practices they deploy to establish what can count as black; (2) how such a distinction is embedded within a local activity system lodged in turn within a relevant community of practice; and (3) the embodied apprenticeship required for new members to become competent in the use of such a category. For the chemists, jet black (e.g, the most prototypical example of black) is not a preformulated, context-free universal color category, but instead a problematic judgment to be artfully accomplished through the deployment of a collection of systematic work practices. This analysis contributes to the development of a practice-based theory of knowledge and action.

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Two of the central and enduring topics in the analysis of cognition are the study of *vision* (in neurophysiology, vision is the cognitive system that is best understood, and its architecture provides a point of departure for the analysis of how the brain organizes other types of representations) and *semantic categories* (which at times have formed the essential subject matter for whole fields such as cognitive anthropology) or, more generally, *processes of classification*. One crucial place where these two lines of research intersect is in the analysis of *color categories*, terms provided by language that are used to codify and structure perception of the visual field. Different languages classify the color spectrum in different ways. This has been argued to provide evidence for the Sapir-Whorf hypothesis that language structures perception of the world that a particular society inhabits (Bruner, Oliver, & Greenfield, 1966; Greenfield & Bruner, 1966). In what remains one of the central accomplishments of cognitive anthropology, however, Berlin and Kay, (1969) demonstrated that the diversity of human color systems was built on a universal infrastructure, one almost certainly linked to structures in the brain.

The focus of analysis in such work is an abstract structural system, divorced from the messy tasks of actually using color terms to make relevant distinctions within specific courses of action situated within the concrete settings that constitute the lifeworld of a particular society. In contrast, Wittgenstein's later philosophy argues that it is precisely such endogenous activities that provide the necessary framework for the analysis of human language.¹ Analysis of category use from such a perspective has been a major focus of research by ethnomethodologists and conversational analysts, (e.g., Cicourel 1964; Garfinkel, 1967; Heritage, 1984; Jefferson, 1987; Lynch, 1991; Sacks, 1992; Schegloff, 1972; Suchman, 1987). Recently, some scholars have begun to analyze *seeing* as a social process lodged within endogenous communities of practices (Goodwin, 1994; 1996; Goodwin and Goodwin, 1996; Heath, 1997, in press; Heath & Luff, in press; Säljö and Bergqvist, this volume).

epiphenomenal. Cognitive phenomena, including categories for the organization of perception, are situated analytically within the structural system of the language as a whole, and the process of constituting their meaning lies beyond the grasp of speakers.

Situated Activity Systems

Implicit in the work of Berlin and Kay and in the paradigm created by Saussure that it builds on, are crucial assumptions about the geography of human cognition, for example, specifications of *where relevant cognitive phenomena are to be found* (in the brain and structured systems of mental representation), *and where such phenomena are not located* (e.g., in actual speech, multiparty discourse, material objects, the environment around a group of human actors; see Saussure, 1959). Within this research tradition, there is a theoretical and methodological emphasis on coherent, self-contained, modular units, for example, the sound system of a language, or, in the realm of semantics, taxonomies of structurally related phenomena, such as kinship systems (Goodenough, 1956) or color terms. The tremendous advantage of restricting data to categories in a single, bounded taxonomy is that it permits analysis to focus not on the properties of individual items (e.g., a specific color term), but instead on a more basic structural system. By circumscribing a single, internally consistent domain of phenomena, the system provides for the constitution of meaning through systematic contrast within a well-defined set of possibilities.

However, a price is paid for that analytical clarity. The very properties that give the system its precision and coherence — its boundedness and restriction to a single kind of phenomena — make it impossible to investigate aspects of cognitive organization that cross such boundaries. Thus, although Conklin (1955) had demonstrated convincingly that color terms frequently incorporate information from other sensory modalities (e.g. among tropical forest hunters and gatherers, a term for *green* may include notions of succulence and freshness), Berlin and Kay systematically excluded such phenomena from their study. By doing this, they were able to analyze color terms as a bounded, self-contained system but could not (and did not want to) in any way take into account either how color terms might be shaped by systematic patterns of situated use, or the possibility that actors might deploy a range of different kinds of criteria in order to categorize color.

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Moreover, work in a variety of different fields has called into question the assumption that human cognition operates within such neatly bounded packages. Thus, in different ways, both Heidegger (1962) and Wittgenstein (1958) argue that human cognitive activity is inextricably lodged within the activities and settings of the lived social world, that is, that knowledge is intrinsically situated. Strong support for such a position has come from the investigation of how scientists actually do their work (Latour, 1987; Lynch & Woolgar, 1988; Pickering, 1992), studies of cognition in the workplace (Heath & Luff, *in press*; Middleton and Engeström, *in press*; Rogoff and Lave, 1984; Suchman, 1987) anthropological investigations of systems of cognition encompassing multiple, differentiated actors and tools (Hutchins, 1993), practice theory (Chaiklin and Lave, 1993), and conversation analysis (Heritage 1984; Sacks 1992; Schegloff, 1972;, 1992b). All of this work demonstrates that a diverse collection of heterogeneous phenomena and processes are implicated in human cognitive activity, for example, not only mental representations but also material tools, historically shaped and socially distributed forms of knowledge, processes of social interaction and the forms of social action they produce, and recognizable patterns of activity in a specific setting.

Restricted taxonomies provide analytical coherence by restricting research to the study of patterned variation in a single domain of possibilities: for example ways of naming colors. If one wants to move beyond single taxonomies, however, the order provided by a data set structured in terms of common underlying features is lost. The question thus arises concerning how a somewhat ad hoc collection of very different kinds of entities can be related to each other within a common analytic framework, for example, how can objects as diverse as language categories, physical tools such as the vats and sticks that will be examined later in this paper, and social distributions of knowledge and power in a specific work setting be studied as interdependent components of an integrated cognitive process? The solution chosen in this chapter is to focus on what I call a *situated activity system*,⁴ that is, the range of phenomena implicated in the systematic accomplishment of a specific activity within a relevant setting. An example of a situated activity system is provided by a game such as hopscotch (M. H. Goodwin, 1995), which integrates into a common framework of action and socially organized perception a collection of very different kinds of events, including physical inscriptions in a public, material environment (e.g., the hopscotch grid), roles for different kinds of participants, rules differentiating

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successful from unsuccessful action, game-relevant tasks of seeing and moving, specifications for how actors should hold their bodies, and systematic language practices for calling and contesting "outs."

In this chapter, I focus on the activities of a team of geochemists who are trying to figure out when to terminate a chemical reaction they are monitoring. In their work, the job of discriminating colors is posed as a consequential task. The situated activity system to be examined is the ensemble of practices and tools deployed to determine when the materials in the reaction vat are *jet black*, that being the diagnostic sign that the process being scrutinized has run its course and should be immediately quenched. As described in more detail throughout this paper, this activity system provides organization for the cognitive work occurring in this setting in a number of different ways. Thus, it sets parameters on what color shades are encompassed by an appropriate definition of *black*. By virtue of its consequences for practical projects (e.g., producing something that will work), what will count as valid instances of the color category is established within a public, socially constituted world of relevant activity, rather than in the mental processes of an isolated actor. This does not mean, however, that the cognitive operations of young chemists, trying to figure out if the material they are working with is *black* yet are irrelevant; instead, the activity creates an arena for situated apprenticeship as newcomers train both their bodies and work-relevant perceptual structures to the demands of the activity (e.g., become competent practitioners, through interaction with both more experienced chemists and the materials being manipulated). Material objects and mental representations are integrated into a common cognitive process by the situated activity system. The task of successfully bringing the reaction to completion provides a focus for the perceptual activity of the chemists and motivates them to scrutinize their material in terms of its color rather than, for example, its weight or any of a range of other equally available attributes. By virtue of the encompassing activity, chemists involved in this task are not disinterested observers; they are extremely interested actors whose perception is being shaped by orientation to a set of relevant contingencies posed by the tasks they are attempting to accomplish. Analysis of situated activity systems⁵ provides one way of investigating how cognitive phenomena, such as color categories, are constituted through the social deployment of a collection of diverse practices lodged within the lifeworld of a relevant community of practice.

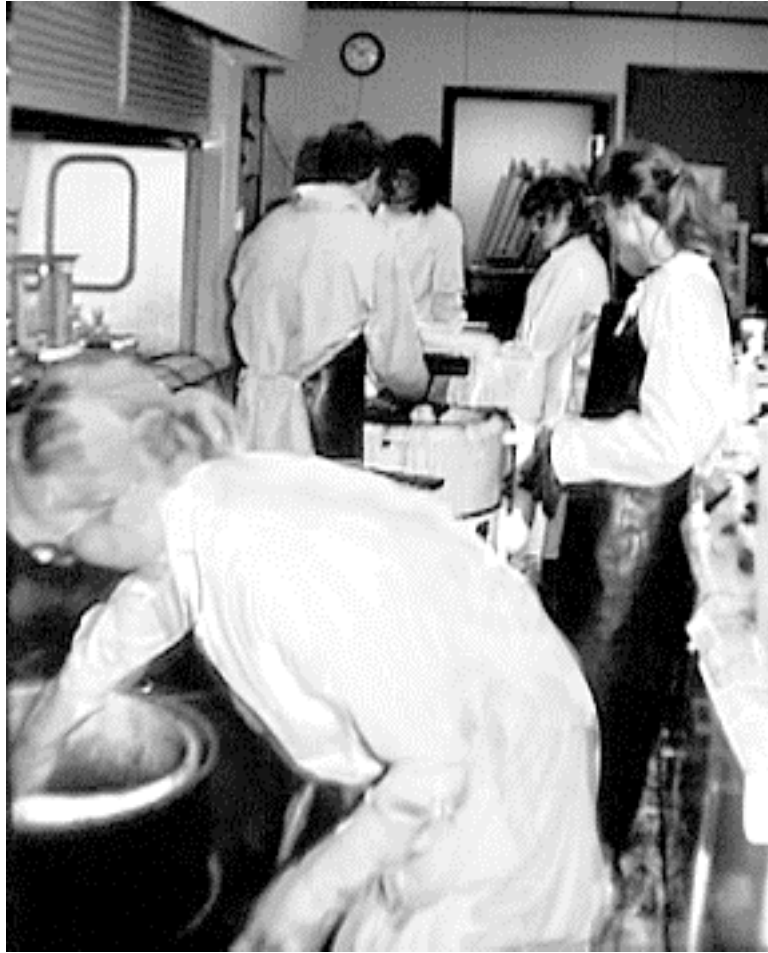
Scientific Description as Embodied, Situated Knowledge

Saussure's vision of the social nature of language as a shared system of prespecified meaning and structure that is internalized by each speaker had consequences far beyond linguistics. Thus, "the institutionalization of common meanings for symbols in advance of their use in particular situations" (Heritage 1984, p. 28) lies at the heart of Parsons' (1951) solution to the problem of how social actors can know a world in common. Like Saussure, Parsons treats the actual cognitive work engaged in by actors to build situated meaning and action as epiphenomenal.

Scientific writing is one place in which the assumptions made by both Saussure and Parsons about the location of meaning in a prespecified system of symbols can be sharply tested. For Parsons, rationality and intersubjectivity, uncontaminated by error, are possible only when the knowledge used by social actors coincides with the findings of science (Heritage 1984, pp. 24-30). More generally, in both philosophy and the social sciences, scientific writing has traditionally been treated as the prototypical example of rational description. However, recent research on the sociology of scientific knowledge has strongly and clearly demonstrated that, like other domains of activity, scientific knowledge is constituted through the deployment of a range of socially organized practices (Knorr-Cetina, <Knorr-Cetina, 1981 #1981>) Latour, 1987; Lynch, 1985; Pickering, 1992; Star, 1988a). Building on this work I focus on a particular genre of scientific writing: a description of basic laboratory procedures. If the assumptions made by Saussure and Parsons about prespecified meaning are correct, they should apply here. If knowledge is, in fact, abstract and disembodied (i.e., capable of being completely formulated in the language that appears in a journal article), anyone with access to proper equipment should be able to use that description as a recipe and to carry out the procedure themselves.⁶ Other competent scientists can use a description in this fashion, and such replicability is one of the hallmarks of science as an institution. However, the ability to translate such instructions into workable products frequently builds on an ensemble of embodied competence and tacit knowledge (Polanyi, 1966) acquired by newcomers to a profession in the labs and field settings where the work of their discipline is done.⁷

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To further explore how language is used in such a process, I examine a specific work situation:



The participants in this setting are a geochemist and his students who are making a scientific instrument. I videotaped what they were doing (from a specific location that gave me better access to some aspects of what they were doing than it did to others) but did not help in the work. By depositing manganese oxide on acrylic fibers, the participants create a tool that is capable of extracting virtually all of the radium ions present in a sample of water. Different bodies of water (e.g., different rivers) have distinctive radium signatures. By using the fiber, the geochemists can make extremely subtle measurements about the distribution of water from different sources in the world's rivers and oceans (e.g., determining how much of the water in the seas off Puerto Rico came originally from the Amazon river). Because the fiber is one of the crucial links in the chain of scientific work that leads to such findings, explicit instructions describing how the fiber is manufactured are published in the scientific literature. The following is the standard reference:

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To prepare the improved fiber, acrylic fiber (such as Monsanto 'Acrilan,' 3.0 denier, type B-16) is immersed in one fiber volume of 0.5M at 70° to 80° C. The Permanganate solution

partially oxidizes the fiber and deposits MnO_2 on it. The reaction is stopped after about 10 min. by removing the jet-black fiber and washing it in deionized water. The exothermic reaction is rapid and produces considerable heat, therefore the transfer from the reaction solution to the wash solution should be completed quickly. After washing and partially drying, the fiber is separated (fluffed) and is then ready to use. The fiber can be prepared at lower temperatures using longer contact times. At 30°C about 3 days are necessary to blacken the fiber completely. (Moore 1976, p. 647)

This fiber is used by approximately 10 to 20 geochemists worldwide. The lab that was taped is that of the geochemist who invented the fiber and wrote this description. He is making a batch for upcoming cruises with a group of students who have never made it before. Although these participants were not actually working from the printed article (the students had the author himself to learn from), for purposes of the present analysis, it is useful to use the journal description as point of departure for investigating their work. First, this is the type of model (e.g., descriptions published in scientific journals) that has typically been used by philosophers and social scientists when they point to the rational, disembodied properties of science. Second, it is here that the properties of language noted by Saussure and Parsons can be most clearly examined. For clarity, analysis will focus on how the term *black* in the following sentence is interpreted by those making the fiber: “The reaction is stopped after about 10 min. by removing the jet-black fiber and washing it in deionized water.” Restricting analysis to what counts as *black* in this process has a number of advantages. For example, although some language in the description consists of esoteric craft terms (e.g. “exothermic reaction,” “0.5M potassium permanganate solution”) that require competence in chemistry for their proper understanding, the term *black* is known by everyone who speaks English. This makes one aspect of the phenomena that the participants in the lab are working with available to readers with little background in chemistry; and it also constitutes a hard case for the social construction of the entities used by scientists, by focusing not on a conceptual object (e.g., a quark) that is brought into existence and changed as theory develops (such that changes in theory can be used to demonstrate changes in the object being attended to), but instead on the description of something being worked with by the scientists (a jet-black fiber), that is apparently available to naked perception.

Seeing *Jet Black* as a Problematic, Situated Task

As indicated earlier, color terms have received extensive study in anthropological linguistics. Note that the clear and strong findings of Berlin and Kay (1967; 1969) make it extremely difficult to treat *black*, the color term used to describe the fibers, as arbitrary or idiosyncratic to the color system of a particular language or group. The contrast between *black* and *white* sits at the very apex of their hierarchy of universal terms: that is, all languages will make this basic distinction and make it before they make any others. Moreover, according to Berlin and Kay, all languages locate the focal point of a color at roughly the same place. The fiber being made by the scientists is described in the journal article as “jet-black.” This expression seems to be designed precisely to declare that the black at issue is the blackest of blacks, that is, the focal point for defining what constitutes the color, the most prototypical case. If any color term could claim the status of a context-free universal, this would seem to be it.

However, as noted by Vincent van Gogh in a letter to his brother Theo:

... we of course agree perfectly about black in nature. *Absolute black does not really exist.* But like white, it is present in almost every colour, and forms the endless variety of grays, — different in tone and strength. So that in nature one really sees nothing else but those tones or shades. (reprinted in Roskill 1983 p. 158, emphasis added by current author)

As van Gogh recognized, the existence of a term such as a *black* within the semantic space of a particular language in no way solves the problem of how what counts as black in nature is to be determined. Practitioners, such as the geochemists being investigated here, who wish to use the category to locate something relevant to their work are not given a solution to that problem by the term itself. Instead they are faced with a task: that is, how to find a specification for *black* that can distinguish tones within “the endless variety of grays” in a way that is appropriate to the activities in which they are engaged

Several general processes provide organization for the work involved in the task of determining a relevant specification for *jet black*.

Situated Activities as Frameworks for Motivation and Precision

Determining what will and will not count as a proper referent for a category in a specific setting is lodged within larger activity structures. Establishing when the fiber is *jet-black* is important to the geochemists,

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because that color is the diagnostic sign that the chemical reaction has proceeded to the point where it should be quickly stopped. If the fiber is put into the quenching bath before it exhibits the proper shade of black, it will absorb less radium ions when used later as a tool for measuring different bodies of water. The color change is the simplest measurement that can be made to indicate the progress of the reaction.⁸ The larger activity of making the fiber thus provides a motivational framework that leads those involved in the activity to make particular perceptual distinctions in the first place (i.e. it establishes a texture of relevancies, a focus for perception). The activity also establishes the parameters of what will count as a correct solution to the task of identifying black in these specific circumstances (i.e. a range of shades that will lead to usable fiber if the reaction is stopped when they appear). Clearly, other tasks would set other parameters. Moreover, different tasks will set relevant standards for accuracy and precision at different places.⁹ For some, a very wide range of shades might count as acceptable solutions, whereas, for the geochemists being investigated here, a much more limited, precise sense of what can count as an acceptable black is necessary if they are to succeed in terminating the reaction at the proper moment. This precision arises not from the status of their work as science, but rather from the specific task at issue. In other scientific tasks involving the fibers, measurement could encompass a much wider range of variation. Thus, when the fibers were used to gather data, the scientists simply loosely filled the collection tube with fiber. Because the fibers were so efficient in extracting radium from the water, in essence getting all of the radium in a given sample of water, it was not considered necessary to measure precisely the amount of fiber being used. For more extensive discussion of measurement as a situated phenomenon, see Cicourel (1964), Lynch (1991), and Sacks (1989)

The Social Organization of Practice and Apprenticeship Within Situated Processes of Human Interaction

Although the encompassing activity sets constraints on what can count as a solution to the perceptual tasks it makes relevant, it does not specify the solution. Finding what will count as the proper black must be discovered by the participants as they engage in the activity. This might be accomplished in a number of different ways. For example, someone not yet familiar with the process might withdraw fibers colored in slightly different ways and then see which ones did and did not work. More typically, learning what will count as a proper solution to a problem such as this is embedded within organized processes of social interaction. In the lab examined here, one of those present (the senior professor) had already successfully made the fiber (he had

p. 122 invented it). His memory (as the sedimented product of prior practical engagement in the process) can be used to shape not only his own actions but also those of the newcomers he is supervising. In the lab, this is formalized into an organized system of apprenticeship (e.g., a professor guiding the work of his students). In the lab process examined here, the professor let his students carry out the tasks involved in making the fiber (and also helped himself), while monitoring what they were doing and evaluating their decisions.

Let us examine several examples of their interaction. Talk is transcribed using the system developed by Gail Jefferson (Sacks, Schegloff and Jefferson 1974). Talk receiving some form of emphasis (e.g., talk that would be underlined in a typewritten transcript using the Jefferson system) is marked with *bold italics*. Punctuation is used to transcribe intonation: a *period* indicates *falling pitch*, a **question mark** *rising pitch*, and **comma a falling rising contour**, such as would be found after a nonterminal item in a list. Comments (e.g., descriptions of relevant nonvocal behavior) are printed in italics. Numbers in parentheses mark silences in seconds and tenths of a second. To make it easier for the reader to find a place in the larger transcript that is being discussed in the current analysis, I have sometimes highlighted that talk by drawing a box around it.

In example 1 Billy notices that one of his students, Gina, is about to check the color of the fiber in the batch she is working on. He shakes his head from side to side (i.e., *No*) (line 2) and says, “It's not-” (line 3). She interprets this as an evaluation of the current state of the fiber and asks (line 6) “It's not even clo:se?” Before she has completed the word *clo:se* he overlaps with a *No*, affirming that the fiber is not yet ready:

Example 1

1		<i>(Gina positions squirt bottle over Vat</i>
2		<i>Billy Shakes head "no" from side to side)</i>
3	Billy:	It's not-
4		<i>(Shakes head "no" from side to side again)</i>
5		(1.5)
6	Gina:	It's not even close?
7	Billy:	No::
8		<i>(Billy turns and picks up thermometer)</i>
9		(1.0)
10	Billy:	(Maybe we'd better take another one)
11		<i>(Gina sprays water on fiber)</i>
12		(1.9)
13	Gina:	I don't know
14		it's not lookin that far ()
15		How is it.
16	Billy:	(An: : : d)
17		It still has that <i>ti</i> :nge.
18	Gina:	(Ya mean ta)
19		Ye(h)a(h)h.
20		(1.7)
21	Gina:	But it's gettin a little- <i>(points with stick)</i>
22		the <i>lumpy</i> texture.
23		(1.2)
24	Billy:	We:ll,
25		(0.9)
26	Billy:	The <i>temper</i> ature is doin we:ll.

Here judgments about what constitutes the proper shade of black are calibrated within the work group. The participants treat applying the category to the fiber as something to be artfully accomplished, a topic for discussion in its own right. Note that, although the view of the professor prevails, his word is not blindly accepted. In lines 13-14, Gina offers a mild challenge to his assessment of the situation (“I don know. It's not looking that far...”). He counters this proposal by noting that the fiber “still has that *ti*:nge” (line 17). Through

this exchange, her attention is drawn to finer perceptual discriminations that she should take into account in judging the color of the fiber. The notion of what can count as *black* is not static but rather something that is progressively shaped and modified as participants inspect the changing materials they are working with, while interacting with each other.

p. 123 *Inventing New Category Systems Tailored to the Local Setting*

Upon encountering the limitations of off-the-shelf tools (the general lexicon of a language), participants can tailor those tools for specific tasks or make new ones more relevant to their needs through a process of situated improvisation (Brun-Cottan et al., 1991; Suchman, 1992; Star, 1988b). Although the term *jet-black* serves to officially record the process within the scientific literature, it does not make salient the precise distinctions between shades of closely related colors that those involved in assessing the fiber are required to make. To highlight the relevant perceptual distinctions, Billy, the senior scientist who invented the fiber, coined another

p. 124 set of terms to guide the looking of those making the fiber within his lab. Fiber that had reached the desired color was referred to as *gorilla fur*, whereas fiber that was not yet the right color was called *orangutan hair*. Rather than focusing discrimination entirely on two very similar shades of color, this new set of terms contrasted two distinct types of animals, each of which incorporated within its gestalt one pole of a color distinction that was relevant to the activity at hand. The perceptual distinction that counted for those making the fiber was thus highlighted. The humor in the new contrast set not only facilitated memory and heightened salience but also incorporated an affective stance into the perceptual distinction. In addition to color, the *gorilla fur/orangutan hair* contrast encodes another dimension of the material being manipulated: its fibrous qualities. It thus provides a richer evocation of the sensory environment of the task than a color term alone would.

By being more salient, specific, concrete, and humorous, the new contrast provides a tool that is simultaneously more powerful and better adapted to the specifics of the environment within which it will function than the more abstract *jet-black* was. However, much research on the language used by scientists has taken as its point of departure precisely the opposite set of assumptions. Thus Bernstein (1972) distinguishes elaborated codes from restricted codes specifically in terms of how *context-bound* they are. Restricted codes that “sensitize their users to particularistic meanings” are inferior to elaborated codes, the language of science, which “orient their users toward universalistic meanings” (p. 164). Similarly, Parsons' view of science

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emphasizes “conceptual abstraction from the concrete” (Heritage, :1984 p. 19). In these data we find scientists moving in precisely the opposite direction, actively inventing particularistic, restricted codes when they already have access to far more universal, less context-bound categories. Moreover, they have very good reasons for doing this: categories attuned to the particulars of the work that they are doing make relevant features of that work more vivid and salient and thus, help them to perform that work. Viewing such issues from a broader perspective, Schegloff (1972) has argued that the really difficult and interesting issues posed in the analysis of cognition concern not the development of abstractions but rather the analysis of systematic procedures capable of building the particulars of local events in a way that is sensitive in detail to the structure of relevant context in those events.

If, following Vygotsky, we think of language as a tool for mediating our relationship with the world (e.g., a term such as *black* mediates our perception of the materials being worked with), the *gorilla fur/ orangutan hair* contrast provides an example of a second level of mediation being bootstrapped on top of a first. These terms mediate between *black* and the fibers whose color is being assessed by tailoring the general color distinction encoded in *black* to the perceptual tasks faced in a specific local situation.

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Recent work in the sociology of science has called into question traditional notions of authorship by focusing attention on the contributions of workers, such as lab technicians, whose crucial, highly skilled practice was central to the findings reported in publications but made invisible there (Shapin, 1989). Here we find that similar processes occur with cognitive structures as well. The humorous contrast between *gorilla fur* and *orangutan hair* provides organization for the perceptual work involved in making the fiber, but disappears in publication, to be replaced by a less useful but more abstract and general category.

Highlighting and Positioning for Perception

A range of work is required simply to make the object available for relevant perception. In the lab, the chemical reaction occurs when the fibers are immersed in a deep purple potassium permanganate solution.



p. 126 It would be impossible to make a fine color discrimination while the fibers were sitting in this liquid. Before any color judgment can be made, they must be positioned for perception. To do this, a stick was used to lift a sample of fiber from the liquid and hold it over the vat. The purple solution clinging to the fiber on the stick was then washed away by spraying water on it.



Only after the fiber had been extracted from the very complex background within which it was otherwise enmeshed could its color be evaluated. The activity of assessing the fiber is thus supported not only by work-relevant cognitive structures (e.g., an encompassing activity, category systems of various types), and frameworks for interaction, but also by sets of situated practices for appropriate manipulation of artifacts in the setting and by a tool kit that makes those practices possible (e.g. plastic spray bottles of deionized water, sticks,

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vats, buckets, chemicals) Although operating in the physical world, the practices engaged in here are analogous to the cognitive structures given such prominence by the gestalt psychologists (e.g., extracting a figure from a ground) and more recently, used by anthropological linguists to shed new light on the nature of reference and indexicality (Hanks 1990; 1992). Moreover, such processes of enhancement are central to the production of knowledge in science more generally, constituting what Lynch (1988) has termed an *externalized retina*. They are very important in other work situations as well. For example, some of the most pervasive activities found at the airport studied by Xerox PARC's Workplace Project involved tools and practices designed to highlight phenomena (e.g., the use of yellow highlighter to make information relevant to the task at hand stand out on a document) and amplify perception (e.g., video links that allowed visual access to distant locations). A major topic that has been virtually overlooked in the analysis of the organization of gaze and other body behavior in face-to-face interaction is the range of movements and activities involved in positioning for perception. The cognitive task of assessing the color of the fiber in the lab would be impossible without practices designed to extract the fibers from an irrelevant background and to massage them into phenomena that are available for work-relevant perception.

Seeing Activities

The systematic incorporation of these practices into the activity of manufacturing the fiber produced a framework for intelligibility, that enables one party to make inferences about what another is doing. In Example (1) Billy's negative head shake, which was interpreted by Gina as proposing that the fibers were not ready, occurred just after Gina positioned her squirt bottle over the vat. By seeing this action within the larger framework of the activity system, Billy was able not only to infer what she was doing but also to make an assessment about her perceptual competence. These practices thus form part of the texture of intelligibility that the participants are deploying to infer intersubjectivity and to make sense out of the activities that they are collaboratively performing.

p. 127 *Embodied Cognition*

Overwhelmingly, theories of cognition have divorced the mind from the body, treating the latter (with the exception of the brain) as irrelevant to analysis of how human beings think. This prejudice extends to other aspects of human social and cultural behavior. Thus, Schepher-Hughes (1994) has noted critically that “The

body in social anthropology emerges as a passive, inert, dead weight attached to a lively, responsive, nomadic mind, the true agent of culture” (p. 231). Although science is frequently depicted as the prototypical exemplar of disembodied abstract thought, these geochemists were consistently attuned to what the experience of working with the fiber might reveal to their bodies in an ad hoc fashion as the activity unfolded. In Example 2, after making several batches of fiber, a process that has required her to squeeze and manipulate the fibers at various stages within the production cycle, Gina comments to the professor, Billy, that, when the fiber is done, it not only has a particular color, but also a distinctive texture:

Example 2

- 1 Gina: En it gets a *certain texture* to it
- ↑
Billy Starts to Nod
- 3 (0.3)
- 4 Billy: [Yes.
- 5 Gina: [Also,
- 6 *When it gets* [right. (*fingers "feeling" fibers gesture*)
- 7 Billy: [It *certainly* [does.
- 8 Gina: [it gets sorta
- 9 Billy : It certainly does.
- 10 En that wasn't *quite* enough. (*repeats "feel" gesture*)
- 11 Gina: Yeah.
- 12 Billy: Uh huh.

Billy immediately agrees with Gina's observation (he starts nodding before she has finished the word *texture*). Alertness to the sensations experienced by her body as she manipulates the fiber while evaluating its current state of progress has revealed to Gina the possibility of another diagnostic criterion, one that is available through touch rather than sight. This possibility was made known to her not by instruction from her professor, but rather through the embodied process of physically working with the fiber. The presence of her mentor is not, however, irrelevant. By talking to him about what she has experienced, she is able to transform what might

p. 128 otherwise remain private sensations and hypotheses into public events that can be evaluated and confirmed (or denied) by a more competent practitioner. Note that an informed evaluation of her observation is possible only from another body that has also physically worked with the fibers.

The embodied nature of the phenomenon that Gina and Billy are constituting together is aptly demonstrated by the way in which both specify the experience of the texture with hand gestures rather than words. A main focus of recent work on gesture has been on how gestures externalize internal mental representations (McNeill, 1992). The gestures performed here reveal a way of knowing that flows in the opposite direction, *from* the hand as a sensory actor alive to the ad hoc sensations it encounters as it works with external materials, *to* theories about how those sensations are relevant to the accomplishment of the activities in progress. The gesture points not to some hidden image lodged within the speaker's brain, but instead to the hand as an agent of experience in its own right, encountering specific phenomena in the world within which it is working. It is true that Gina is trying to make Billy aware of something she has experienced, (e.g., a mental event), a sensation of texture. However, rather than constituting a private point of origin for the gesture, that experience is embedded within and emerges from the embodied activity that the gesture makes visible. Indeed her interlocutor's ability to recognize and evaluate the sensation she is talking about requires co-participation in that same activity. The frameworks that make possible mutual understanding of this gesture and of the sensation it makes visible are not constituted by preformulated representations, but through co-membership in a relevant community of practice.

The way in which Gina learns from her ad hoc engagement with a relevant environment, (i.e., the fibers she is manipulating,) within a situation where she is able to talk about what she finds with a more competent practitioner, is compatible with Vygotsky's notion of a zone of proximal development (Cole, 1985). The way in which the professor sometimes learns from his students and changes aspects of the manufacturing process in light of what they discover is also compatible with Engeström's (1987) expansion of the zone of proximal development beyond individuals to processes of change within organizations.

Using Diverse, Serendipitous Criteria to Constitute a Category

The geochemists thus use their bodies as media that experience the material being worked with through a variety of different modalities, as one primary framework for uncovering and shaping the organization of the

process in which they are engaged. In so far as they remain open to what unanticipated sensations can reveal, their thinking contains an essential element of situated improvisation that can be incorporated into subsequent practice. Example 1 occurred approximately half an hour after the conversation about the texture of the fibers in Example 2. Looking again at Example 1, we find that, just after Billy counters Gina by noting that the fibers still have a tinge, she provides further grounds for her assessment (note the *But* that prefaces her turn in line 21)

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by drawing his attention to the current texture of the fibers (lines 21-22):

Example 1a

16	Billy:	(An: : : d)
17		It still has that <i>ti:nge</i> .
18	Gina:	(Ya mean ta)
19		Ye(h)a(h)h.
20		(1.7)
21	Gina:	But it's gettin a little- (<i>points with stick</i>)
22		the <i>lumpy</i> texture.
23		(1.2)
24	Billy:	We:ll,
25		(0.9)
26	Billy:	The <i>temperature</i> is doin we:ll.

Assessment of the current state of the fiber is not made by the simple application of a single category, the meaning of which is known in advance, but instead emerges within a situated matrix of action encompassing multiple perspectives. In this single sequence color, texture and temperature are all used to contest a diagnosis. Some of the criteria being used to make the assessment are progressively changing (e.g. Gina's sense of what can count as an acceptable black), whereas others have only just been discovered by some of the participants (e.g., Gina's recognition of the importance of texture). Rather than being explicitly taught, many of these criteria are acquired through embodied participation in the activity. The use of multiple criteria in this fashion cannot be accounted for within the analytic framework of Berlin and Kay, who, like many other cognitive anthropologists, carefully isolated for study a well-bounded taxonomy restricted to a single perceptual domain. It is, however, consistent with Wittgenstein's (1958) proposal that many categories are organized, not via underlying essences, but rather in terms of *family resemblances*: "a complicated network of similarities

overlapping and criss-crossing" (§66) When faced with the practical task of locating a category, participants artfully make use of and creatively discover a range of different methods drawn from a variety of sources.

The Social and Practical Constitution of Accountable Knowledge

Assessments of the fiber are lodged within a web of accountability encompassing at least two different orders of phenomena:

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(1) the task itself and its material infrastructure (i.e. will the fiber actually work?). Participants are not free to ignore the fit between the decisions they make, and the usefulness of the tools that are thus produced.

(2) what others will hold one responsible for.

There is thus a reciprocal relationship between the development of new tools within a discipline and the development of socially organized structures of perception by practitioners of that discipline. By working in concert with others on relevant tasks, the body of the geochemist is transformed into a tool of the trade. When Gina, one of Billy's graduate students, reached the shore of the Amazon, she wanted to know approximately how much sea water it contained. To determine this, she scooped a handful of the river water into her mouth and used a chemist's sense of taste to evaluate its salinity.

Making judgments that others can not only recognize as appropriate but also rely on constitutes being a competent practitioner. That knowledge can be gained only through embodied practice, by working with the relevant materials and having the judgments made in such circumstances evaluated by other competent practitioners. Thus, by the end of the day (approximately one hour after Example 1 Gina was in a position to justify her decision to give a batch of fiber more time by noting *tinges* in it (i.e., precisely the criterion to which Billy had earlier drawn her attention) and to have Billy agree with that assessment after inspecting the fiber himself:

Example 3

1	Billy:	Let's look at it.
2	Gina:	Huh- oh-
3		I was givin it like <i>two</i> more <i>mi:nutes</i> here.
4		Because it's been in the solution
5	Billy:	(Let's go ahead)
6		(11.5)
7		(<i>Randy inspects the fiber</i>)
8	Gina:	There is a couple a little <i>bro-wn</i> tinges
9	Billy:	Yeah. Good.
10	Billy:	Uh huh.
11	Gina:	So I was just gonna leave it until it's done.
12	Billy:	Okay.
13	Billy:	Okay.

The crucial importance of such embodied practice for being able to know what *black* means within this activity system is well illustrated by my own inability to make such a decision competently. I was physically present throughout the entire fibermaking process. Several hours of that time were spent less than a yard from the vat where these judgments were being made. Because I was videotaping the process, I spent a lot of time looking at both the fiber and those working with it. I was however outside the structures of accountability that linked Billy and Gina to the fiber. I was not required to make decisions about when to withdraw the fiber, did not have my color judgments evaluated by others, and did not feel the fiber repetitively as it was undergoing the reaction.

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Although I did not share with these geochemists a workable notion of *jet-black fiber* so that they could rely on my judgment, this does not mean that their use of the term was idiosyncratic. Instead, as Billy's careful work with Gina amply demonstrates, the ability to make such an assessment was very much a social fact, something that competent practitioners could hold each other accountable for and that they were careful to teach to newcomers. The problem lies in assuming that the language as a whole, as a cognitive structure abstracted from the messy details of practice, is the place to study how categories encoding perceptual judgments are organized. Instead, as argued by M.H. Goodwin (1990), the proper locus for the analysis of culture, including

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the categories and practices through which it is constituted, is not the society or disembodied language but *situated activity systems*. By defining *langue* in the way that he did, Saussure found it impossible to include human agency in the constitution of meaning or structure. For the geochemists being analyzed here, determining what could count as black so that they could successfully perform the tasks in which they were engaged, was a contingent, ongoing achievement, something that they had to work at to accomplish (i.e. a prime locus for the analysis of human agency as a socially embodied process).

Conclusion

The analysis in this chapter has focused on one of the central topics in anthropological studies of cognition: semantic categories used to encode perception of color. How does the view of cognition developed here differ from that in the classic treatment of the subject by Berlin and Kay (1969)? Rather than contradicting their findings, it uses as a point of departure a notion of what counts as human cognition, and where it is located, that leads to the investigation of a range of phenomena that were systematically excluded from the domain of scrutiny they so ingeniously probed. It is useful to note explicitly some of these differences.

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The Methodology of Berlin and Kay

For Berlin and Kay, the primary objects of study, the phenomena they are attempting to uncover and describe, are universal structures divorced from the messy contingencies of situated practice. These structures are located in two related places: the human brain and the semantic systems of particular languages. This theoretical agenda led to a specific methodology: First, the relevant units of analysis are separate languages (e.g., English is compared with Japanese and Tzeltal). Second, within each language, analytical criteria (e.g., that the term be monolexemic, that its application not be restricted to a narrow class of objects) are used to locate a small set of basic color terms. One effect of this is to isolate color distinctions as a self-contained semantic domain; criteria from other sensory modalities¹⁰ and from task-relevant use of color vocabulary, are eliminated. Third, in line with accepted experimental procedure in psychology, a standard stimulus was prepared: an array of 329 Munsell color chips mounted on stiff cardboard. Fourth, basic color terms were elicited from speakers of different languages. Finally, these native speakers were asked to locate on the chart both the best example of a specific color term and the boundaries of that term (e.g. all chips that the term could validly designate).

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These procedures were used to systematically collect data from a wide sample of languages from many different parts of the world. However, the use of color terms in locally relevant, endogenous activities was never probed. All speakers were performing exactly the same experimental task, and, with the exception of the Tzeltal speakers, all of the speakers resided in the San Francisco Bay area. The notion of a relevant community of competent practitioners was completely irrelevant to Berlin and Kay's analysis.; for many languages, only a single speaker was used. Thus, in a very strong sense, the basic analytic unit in these studies was a context-free component of *langue*, located in discrete languages that were treated as relatively homogeneous rather than as a set of endogenous speech communities.

Phenomena Made Available for Analysis by a Situated Activity System

In contrast to this, the basic unit of analysis for the study in this chapter was the situated activity system.

Investigation was focused on a group of geochemists who had to determine when a fiber they were working with was *jet black* in order to know when to stop a relevant chemical reaction. *Black* and *white* are the most basic color names in Berlin and Kay's analysis. However, for the geochemists, *jet black* (i.e. the most

p. 133 prototypical example of black) was not a context-free universal color category that pointed automatically to a specific set of color shades; instead, the term constituted a point of departure for a problematic judgment to be artfully accomplished through the deployment of a collection of systematic work practices. It might be argued that such practical work is irrelevant to the constitution of color categories as abstract entities, for example, mere performance details that have no bearing on the underlying system of idealized competence where semantic categories should properly be analyzed. However, limiting the scope of analysis in such a fashion arbitrarily excludes by fiat a host of issues and phenomena that are central to the organization of human cognition. Thus, Wittgenstein (1958) notes, "If language is to be a means of communication there must be agreements not only in definitions but also (queer as this may sound) in judgments" (§242). The practices used by the geochemists to assess the color of the material they are working with are central components of the process through which the consequential judgments required for the proper use of the category *black* are organized as systematic phenomena by a community of relevant practitioners. Moreover, for Wittgenstein, the meaning of a name is not its bearer, (e.g. a range of shades named by a color term), but rather mastery of the practices required to use that category competently within a relevant language game (Baker & Hacker :1980).

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Consistent with Hutchins' (1991; **this volume**) analysis of how cognition does not reside exclusively in the individual brain but is instead distributed throughout a relevant setting, focus on such practices opens up for systematic study not simply mental representations but also external cognitive artifacts, tools shaped by a prior history of engagement in the tasks being performed in the setting, the social distribution of knowledge, and the processes of human interaction and apprenticeship (Lave & Wenger, 1991; Rogoff, 1990) through which relevant judgments are calibrated within an endogenous workgroup. From such a perspective, analysis of a semantic category is not restricted to discovering fixed, essential features common to all situations of use. Instead, the usefulness of a category, as a tool capable of being continuously appropriated to accomplish novel tasks, lies in its inherent, contextually constituted, flexibility (Heritage, 1984). Once this is taken into account, investigation of how such appropriation is accomplished emerges as a topic of study in its own right.

The situated activity system, within which the color judgments being examined here are lodged, provides organization for a range of phenomena. For example, as has long been noted by conversation analysts (Sacks, 1972; Schegloff, 1992a), a central issue posed in any analysis of human category use is that of *relevance*. Any entity can be accurately categorized in an indefinite number of different ways (e.g., a person can be described in terms of his or her weight, height, date of birth, gender, religion). Issues such as how a category is to be defined or whether it is being accurately applied are thus analytically subordinate to the prior question of what organizes the selection of a particular category system (e.g. why do these parties choose to attend to these fibers in terms of their color, instead of, for example, their weight?). The answer is provided by the relevance of that specific category system to the activity they are engaged in: When the fibers reach jet black, the reaction being monitored has to be terminated. The encompassing activity thus provides a motivational framework within which color discrimination becomes a relevant and expected thing to do. Simultaneously, the structure of that activity sets parameters for what will count as an acceptable solution to the task set by the relevant use of a color term (e.g. those shades of black that will produce usable fiber). In turn the successful accomplishment of that task leads to the deployment of a range of other practices and tools (e.g., the invention of new category systems that highlight subtle differences among similar colors, tools for extracting the material being examined from a confusing background and positioning it for perception). The use of these tools within the framework of the activity provides the participants with a visible texture of intelligibility, enabling them to

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make inferences about what each other is doing. By virtue of the encompassing activity, a heterogeneous collection of very diverse phenomena — color categories, spray bottles, descriptions of animal fur, sticks — is integrated into the accomplishment of a common cognitive task. Proper use of these tools (what counts as “proper” is defined by the encompassing activity) requires the mastery of socially organized embodied competencies e.g., the ability to see, feel, smell, and taste as a geochemist). Rather than being private perceptual structures lodged within the individual brain, such professional vision (C. Goodwin, 1994) is socially organized by the tasks set by activities, such as the one investigated in this paper, and is something that members of the communities responsible for doing these activities hold each accountable for if one is to be recognized as a competent practitioner. Using the situated activity system as a basic framework for analysis thus opens up to systematic study an expanded view of human cognitive activity.

Using General Structures to Build Locally Relevant, Situated Action

In searching for cognitive universals, Berlin and Kay were reacting against ethnographic particularism. It might be argued that focusing on the situated activity system leads right back to particularism, for example, instead of examining color distinctions common to all speakers of English, or even to all geochemists, this chapter has investigated a perceptual discrimination used in the work practices of a small group of geochemists. However, other ethnographic work has demonstrated that versions of many of the practices described here are found generally. Consider, for example, *highlighting*: the way in which the geochemists extracted the fiber they wanted to examine from a confusing background so that its perceptual salience was emphasized, and it was positioned for focused, intense scrutiny. Similar practices constitute part of the professional craft of archaeologists who both lift objects from the dirt to examine them and annotate the earth with lines drawn with such tools as trowels, brightly colored flags, bits of string, in order to make dim features stand out from a confusing background (for a detailed analysis see Goodwin, 1994; Lynch 1988). Such highlighting is an instantiation in concrete practice of a most general cognitive structure, the figure-ground relationship. As noted earlier highlighting of documents, so that information of relevance to a particular workgroup is made salient, was one of the most general work practices found at the airport studied by the Xerox PARC workplace project. By virtue of the way in which such highlighting structures the perception of others, by reshaping a domain of scrutiny so that some phenomena are made salient, whereas others fade into the background, it can have strong

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rhetorical and political consequences. The lawyers defending the policemen who severely beat an African-American motorist, Rodney King, highlighted the videotape of the beating through gesture, category systems, and by drawing white lines around Mr. King's body in order to focus the attention of the jury on "aggressive" body movements of Mr. King and away from the actions of the policemen beating him (Goodwin, 1994). In brief, human cognitive activity characteristically occurs in environments that provide a very complicated perceptual field. It is, therefore, not surprising that a general class of cognitive practices consists of methods for structuring that perceptual field so that phenomena relevant to the activity in which participants are engaged are made salient, a process that simultaneously helps classify those phenomena (e.g., as an archaeological feature rather than an irrelevant patch of color in the dirt, or as an aggressive movement) However, such processes remain outside the domain of what can be studied, if the notion of what counts as cognition is restricted to structures hidden inside the brain. Moreover, a central component of this process is the framework of relevance provided by the situated activity system within which the act of highlighting is embedded. Practices such as highlighting precisely link relevant features of the setting to the activity being performed in that setting. When setting and activity are lost, these cognitive practices disappear. The issue, therefore, is not particularism but rather access to a range of basic cognitive processes that require for their analysis detailed study of actual work in endogenous settings (Scribner, 1984).

An excellent example of how scientists use highlighting to make complex phenomena amenable to rigorous investigation can be found in the procedures developed by Berlin and Kay to extract the domain of basic color terms from a very confusing environment. To accomplish this, Berlin and Kay had to proceed on several fronts, developing, on the one hand, semantic criteria that would apply across languages to systematically separate a small set of basic terms from the much larger color vocabulary found in each language and, on the other hand, constructing a relevant perceptual target, the Munsell chart, that would enable explicit comparison between languages. Assembling this package of procedures so that basic color terms uncontaminated by extraneous phenomena could be rigorously measured and compared was a major accomplishment that led to new knowledge about how the brain and language work together to structure perception. As such practices reveal, however, the context-free universals of Berlin and Kay were themselves

p. 136 shaped into distinct kinds of entities and made available for a particular form of analysis, through an artfully crafted situated activity system.

Even if one's goal is analysis of how the brain organizes categories, questions can be raised about whether extracting phenomena from the rich context of situated activity is the only or even best way to proceed. For example, recent neurological research investigating how categories are organized in the brain reveals that information from a range of different sensory modalities is integrated in a concept. Thus, the concept of a *cup* includes not only a visual image but also a sensation of weight, and an association with liquids (Damasio & Damasio 1992). Possibilities for investigating such a network of overlapping criteria were eliminated in Berlin and Kay's analysis by the very procedures that extracted pure color terms from their encompassing background. However, when the task of color discrimination posed for the geochemists was investigated as a relevant component of an encompassing activity (i.e., the geochemists were not assessing color in a controlled environment as disinterested observers, but instead they were working hard to figure out when to stop their reaction) it was found that they creatively brought to bear whatever information their embodied ad hoc work with the fibers made available to them (e.g., noting that when the fibers reached the proper color, they also had a distinctive texture). As an embodied practitioner Gina found the black that she was seeking not only with her eyes, but also with her hands. Such complementary use of the information provided by different modes of sensation is consistent not only with recent work on how the brain structures categories but also with Wittgenstein's (1958) argument that categories can be organized through a network of family resemblances rather than core common properties. In brief the analysis of situated activity systems provides a rich arena for the study of a diverse range of basic practices central to the organization of human cognition.

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Notes

- p. 112 ¹Problems with Wittgenstein's initial treatment of color perception provided the Achilles' heel that led to the dismantling of the *Tractatus* (Hacker 1986 p. 109), and its replacement with a theory of color terms that emphasized their situatedness within the grammars of diverse natural activities.
- p. 113 ²The work of Berlin and Kay generated a substantial body of subsequent research, some of which led to modifications of their original typology. Such modifications, however, are not consequential for the analysis in this chapter.
- ³ According to Saussure, *Langue* "is a storehouse filled by the members of a given community through their active use of speaking, a grammatical system that has a potential existence in each brain, or, more specifically, in the brains of a group of individuals. For language is not complete in any speaker; it exists perfectly only within a collectivity" (1959 pp. 13-14).
- p. 115 ⁴The term *situated activity system* was introduced by Goffman (1961 pp. 95-99) to describe repetitive encounters in social establishments in which an individual is brought "into face-to-face interaction with others for the performance of a single joint activity, a somewhat closed, self-compensating, self-terminating circuit of interdependent actions" (1961 pp. 95-96). Goffman's interest in moving role theory in new directions is different from my use of the concept to investigate how properties of an encompassing, situated activity shape cognition within specific settings. Such differences do not however detract from my complete agreement with Goffman's central argument: "the point about looking at situated activity systems is that the complexities of concrete conduct can be examined instead of by-passed" (1961 p. 99). For an analysis of situated activity systems constituted through talk in local settings, see M. H. Goodwin (1990).

p. 116 ⁵Such systems are frequently lodged within settings, such as the geochemists' lab, in which collections of tools have been brought together to deal with particular kinds of tasks. Other examples include centers of coordination (Suchman, this volume; Heath & Luff, in press) such as Operations Rooms, and business and educational establishments. The same personnel work repetitively in such settings (although with considerable differences in experience because newcomers arrive and oldtimers leave) and thus develop skill in both handling the tools located there and dealing with the range of tasks that the setting is organized to accomplish. Such a setting constitutes a historically shaped environment of possibilities for action. Although this paper

p. 117 focuses only on a particular situated activity system, this larger setting must be kept in mind. Methodologically, the way in which such workshops develop through time and practice, relevant toolkits and systematic solutions to the repetitive problems they encounter (such as classifying color for the chemists) demonstrates the importance of investigating situated activity systems within the natural environments where a society's work is done.

⁶The work of Collins (1985), on the situated work required to build an existing scientific instrument from scratch in a new lab demonstrates how much practical knowledge is required to translate a written description into a working machine.

p. 118 ⁷See Goodwin (1994) for an analysis of the socially organized practices of seeing that must be mastered by a young archaeologist in order to make one of the standard documents of her discipline: a map of an excavated section of dirt. Although the young archaeologist knows the linguistic meaning of rules telling her where to take measurements (e.g., "wherever there's a change in slope") finding what counts as such an event in the complicated perceptual field provided by the landscape in front of her is a complicated, contingent process. Mastery of such ability is something that all competent archaeologists expect of each other, and it constitutes part of the embodied infrastructure required for proper understanding of the writing practices that constitute archaeology as a profession.

p. 121 ⁸If necessary, other measurements can be taken later to check the color judgement. However, as a way of working skillfully and efficiently, this professor teaches his students to try to use the easiest measurement to get the necessary result, and to check that later.

p. 121 ⁹See Heritage (1984) for extended discussion of how the prevasiveness of the documentary method of interpretation as a resource for making definite sense with indefinite resources leads to “an inherently approximate relationship between a description and the range of states of affairs it may be used to describe” (p. 145).

p. 132 ¹⁰Although as Berlin and Kay (1969) acknowledge in the very first paragraph of their book, Conklin (1955) had drawn attention to the presence of non-colorimetric information in Hanunóo color words.

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