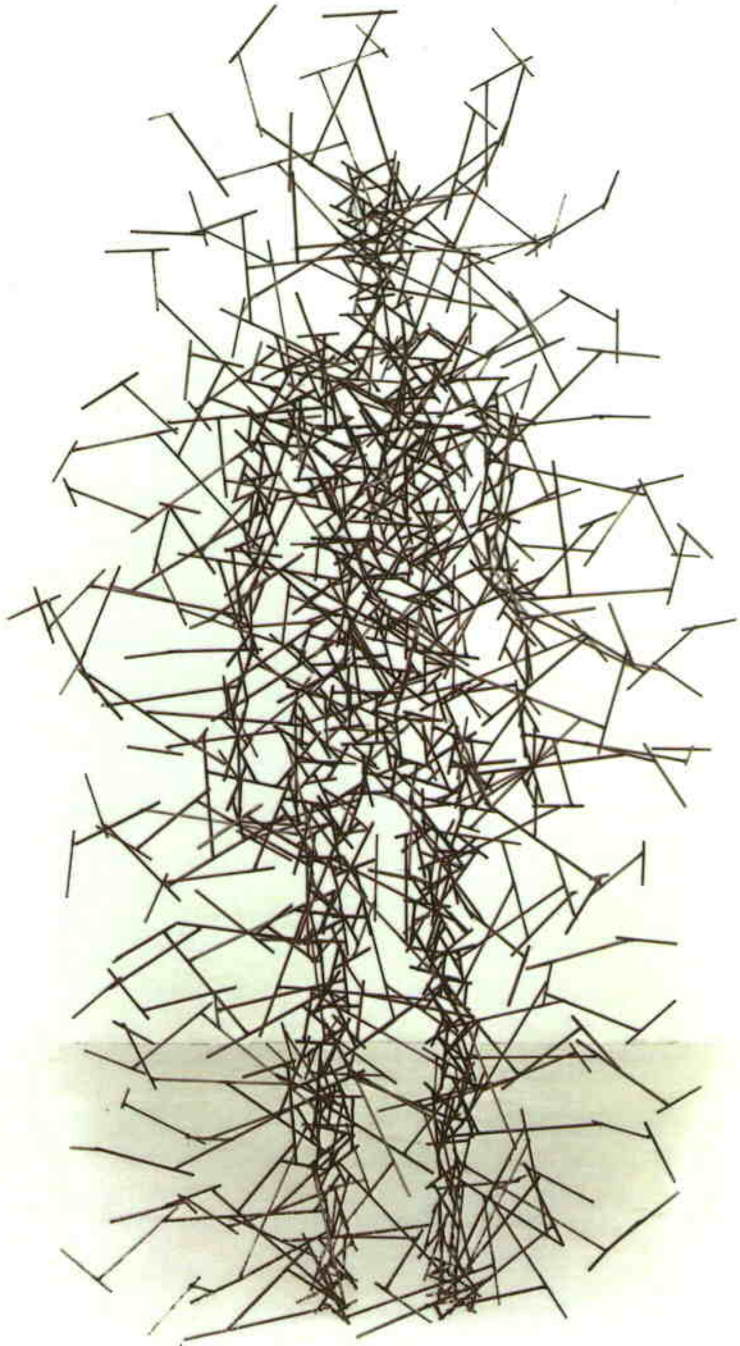
# Thinking Through Material Culture

## *An Interdisciplinary Perspective*



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# *Contents*

*Chapter 1*

# *Introduction: Thinking Through Material Culture*

*A fire hydrant, a taxi cab, a rush of steam pouring up from the pavement—they were deeply familiar to me, and I felt I knew them by heart. But that did not take into account the mutability of those things, the way they changed according to the force and angle of the light, the way their aspect could be altered by what was happening around them: a person walking by, a sudden gust of wind, an odd reflection. Everything was constantly in flux, and though two bricks in a wall might strongly resemble each other, they could never be construed as identical. More to the point, the same brick was never really the same. It was wearing out, imperceptibly crumbling under the effects of the atmosphere, the cold, the heat, the storms that attacked it, and eventually, if one could watch it over the course of centuries, it would no longer be there. All inanimate things were disintegrating, all living things were dying. My head would start to throb whenever I thought of this, imagining the furious and hectic motions of molecules, the unceasing explosions of matter, the collisions, the chaos boiling under the surface of all things.*

—*Paul Auster,* Moon Palace

This book advocates a full theoretical reappraisal of material culture and offers some initial steps toward this larger goal. Evidently it is written by an archaeologist and uses archaeological case studies. Indeed, of all disciplines it is archaeology that needs material culture most. It is perhaps surprising then that archaeology, while developing ever more sophisticated methodologies for artifact study, has not yet constructed similarly sophisticated theoretical models for understanding the roles of artifacts in human societies. So complex and daunting is such a task that it must inevitably be interdisciplinary in its scope, drawing upon cognitive science, psychology, sociology, anthropology, and history. And yet here's the rub. Many of these disciplines have only relatively recently begun to focus on material culture as a field worthy of serious attention. And rather than rue that this should have taken so long, we may see this as an exciting time to be thinking through material culture and its central yet ambiguous role in human societies. There seems to be real potential for building a more broadly based understanding of material culture, relevant to the past, the present and the future.

So a serious challenge lies before us: how are we to research material culture in an interdisciplinary fashion? Given the increasingly specialized nature of academic research, how is it possible to create an integrated body of theory that draws upon a wide range of disciplines? Does it not make the tag "jack of all trades, master of none" almost unavoidable? This book certainly runs this risk, but in the firm belief that it is a risk well worth taking. There are inevitable dangers in working with relatively unfamiliar areas such as cognitive science and psychology. But to my mind, the advances in these fields simply cannot be ignored by archaeologists truly interested in the role of material culture within human societies.

This interdisciplinary venture demands a process of hybridization, whereby connections are created between two seemingly different fields to form a common ground. Although rather daunting at first, it gradually becomes apparent, in a rather surprising fashion, how readily some areas lend themselves to such interbreeding. Interdisciplinarity is of course nothing new. Archaeologists have long looked to social anthropology (much more than anthropologists have looked to archaeology), and with the growth of cognitive archaeology more and more attention is being paid to some areas of psychology, notably evolutionary psychology (e.g., Mithen 1996; Renfrew and Scarre 1998). However, some deep fault lines that have existed for some time are only now being mended, such as between anthropology and psychology/cognitive science (cf. Hutchins 1995, 371), and anthropology and biology (Ingold 2000). Some of the various interdisciplinary connections that make up cognitive science are usefully summarized in diagram form by Bechtel et al. (1998, 94)—although archaeology is not explicitly included, it can easily be integrated, within what they term "sociocultural studies." Using the network diagram of Bechtel et al. as an analogy, the objective of this book is to explore some of the interconnections between disciplines as a means of moving us towards an integrated theory of material culture. I aim to create a new "network" in which previously separate entities and ideas are interwoven. Within this network, archaeology is considered to be a full and equal partner, able to make its own unique contribution to the interdisciplinary study of material culture.



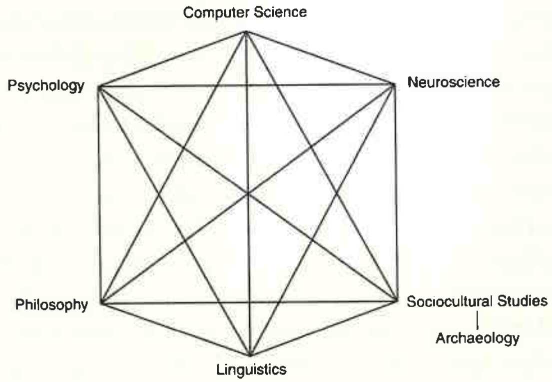


Figure 1.1. Diagram showing role of archaeology in relation to cognitive science.

To cut to the chase, I believe that to expand material culture theory we need to review the relationship between mind and matter, between agent and artifact. Given that the entire archaeological project of understanding past societies relies on these fundamental relationships it is surprising how little theorized they have remained.

## Mind, Thought, Cognition

The "default" archaeological approach to recovering mind and thought is probably best encapsulated in the following lines from Childe's "Piecing Together the Past":

> The archaeological record is constituted of the fossilized results of human *behaviour*, and it is the archaeologist's business to reconstitute that behaviour as far as he can and so to recapture the *thoughts* that behaviour expressed. (1956, 1; my emphasis)

There are a couple of important assumptions within this viewpoint that demand our attention. First, there is a clear hierarchy: thought is primary, behavior is secondary, and material expression is at the bottom of the chain. The archaeologist, of course, must work back and up from the material remains. Second, given that thoughts are separated from objects by behavior, it follows that the internal mind is buffered from the external world via the medium of action. We shall see in due course that this perspective is a classic expression of the Cartesian dualism that pervades not just archaeology but much social science.

Childe apparently believed such a progression, from materials to behavior to thoughts, to be well within the realm of possibility for the archaeologist. It is a hierarchical progression of this sort that was dubbed by Hawkes (1954) the "ladder of inference," though he was of the opinion that the ideational realm was all but inaccessible. To go no further than reconstructing past behavior from the archaeological record seems also to have been a tenet of New Archaeology, with attempts at recovering past thoughts dismissed as "palaeopsychology" (e.g., Binford 1965, discussed in Hodder 1984). There are, however, various ways Binford's perspective involves an almost willful misunderstanding of what "thought" might imply. First, it is hard to fathom exactly how Binford sees fit to isolate behavior from thought; as succinctly stated by Hodder, "the idea that archaeologists can get away without reconstructing ideas in the heads of prehistoric peoples is pure false consciousness and self-delusion" (1992, 18). Second, Binford insinuates that the archaeologists he accuses of engaging in "palaeopsychology" are chasing the conscious thoughts of individual people.[1] Returning to the Childe quote above, although no distinction is explicitly drawn between individual and collective thought, Childe certainly seems to imply the latter. This is understandable; after all, is not archaeology intrinsically better suited to commenting on the collective rather than the individual? The idea of "collective thought," of individuals somehow tuning into each other's minds, might sound a little odd when thus phrased. But it is meant in a sense more or less equivalent to "collective understandings" or "social attitudes." Thus Binford's fear that archaeologists might seek to recapture conscious individual thought rather than tacit shared understandings is a rather peculiar one. Of course it is impossible for the mental processes of past individuals not to form a part of a cognitive approach, but it is only a very limited part in relation to the collective (Hodder 1993, 254).

There is a third way in which Binford's views on the archaeological reconstruction of past thoughts are problematic: he assumes that thoughts occupy an internal domain, separated from the external world (following an essentially Cartesian logic). In this, however, he is not alone—Hodder too, as seen in the above quote, talks of the "ideas in the heads of prehistoric peoples." It is apparent that, as far as Hodder is concerned, "thoughts" occupy the domain of the internal mind and are not to be found in the external world, that is to say, the domain of material culture. One of the main arguments of this book is that this dualistic conception, almost universal in archaeological thinking, hinders the full development of a satisfactory theory of material culture. Indeed, it is even found in some of the attempts that are made to define the scope of a "cognitive archaeology" (e.g., Flannery and Marcus 1993). Here the mind is conceived almost solely in terms of conscious mental operations, such as are assumed to be at work in the use of language. It is the mind's capacity for the mastery of symbolic systems that lies behind language, and indeed other forms of communication. It appears that Renfrew, for example, considers "cognitive" to be largely equivalent with "symbolic" (1993, 249; cf. also 1994, 1998), referring to those aspects of meaning that operate in a language-like fashion, notably in their ability to "communicate" a consciously encoded message (a theme to which we shall return below). However, some cognitive perspectives within archaeology barely concern themselves with symbolism at all—the *chaîne opératoire* approach depicts technological processes such as flintknapping or pottery manufacture as cognitive activities. Schlanger (1994), for example, states that such activities are related to the "doing mind" rather than the "thinking mind"—in other words, his focus is on the practical rather than the symbolic facets of cognition.



This distinction is echoed in the work of Hodder, who identifies two types of socially situated cognition (1992, 205; 1993, 255; 1999, 76). His proposed scheme of "linguistic knowledge" on the one hand and "practical knowledge" on the other is largely based on a distinction made by Bloch (1991), an anthropologist rather than a psychologist. One way of understanding the difference is through an example—riding a bicycle. It is possible for someone to be told how to ride a bicycle, to understand the principles involved in the activity, without actually being able to perform those activities. It is argued that the cognitive processes through which we acquire explicit understandings of phenomena (linguistic knowledge, or "connaissance") are quite different from those involved in the acquisition and embodiment of motor skills (practical knowledge, or "savoir-faire"). The first type of knowledge is held in the mind, the second in the body; the first is explicit, is based on formal symbolic codes, and is focused on communication, whereas the second is implicit, nonsymbolic, and noncommunicative. Given that the model for the first type of knowledge is clearly language, the difference between the two seems essentially to be that of "saying" versus "doing" (Hodder 1993, 255), and tallies with the distinction made by Schlanger between the "thinking mind" and the "doing mind."

Therefore, one assumption would be that any communication in material culture operates in a language-like fashion, that is, through symbolism. But then we also find contradictory statements, such as those that emerge when the distinction between linguistic and practical knowledge is likened to that between "connaissance" (knowing that) and "savoir-faire" (knowing how). Hodder elsewhere (1992, 205) chooses to subdivide "connaissance" into discursive and nondiscursive knowledge—the former is explicit and linguistic, the latter is implicit and nonverbal.[2] If "connaissance" is at the same time equivalent to "linguistic knowledge," we then find ourselves discussing explicit vs. nonverbal linguistic knowledge. Clearly this latter category does not make a great deal of sense. One might, of course, alter this to speak of verbal as opposed to nonverbal communication, and adapt Bloch's "linguistic knowledge" so that it becomes "communicative knowledge." But a plethora of problems remains nonetheless. For example, how is nonverbal communicative knowledge organized—according to symbolic codes (i.e., like verbal knowledge), or through nonsymbolic cognitive processes? And how do these communicative forms of knowledge connect, if at all, with practical knowledge?[3]

Hodder's version of "cognition" is clearly problematic, in many of the same ways as Renfrew's version—particularly in terms of the connections made between cognition, symbolism, language, and communication. Thus both cognitive-processual and post-processual approaches run into difficulties because of their adherence to a set of assumptions, based on a Cartesian worldview, that situate mind, cognition, language, and thought in a different domain from body, perception, practice, and action. Renfrew's equation between cognition and symbolism (1993, 1994), particularly as taken up by Flannery and Marcus (1993), results in the exclusion of many practical, "nonsymbolic" domains from the remit of cognitive archaeology (as we shall see below). On the other hand, the *chaîne opératoire* approach chooses these very nonsymbolic domains as its focus, and it too can be seen as a version of cognitive archaeology. Hodder's version does allow for the existence of nonsymbolic cognitive processes, and their relevance to a cognitive archaeology. The issue of how to arrive at a nondualistic theory of cognition is crucial—we shall be exploring this constantly through the chapters that follow, particularly in Chapter 3. But another major sticking point for both cognitive-processual and post-processual approaches is the confusion over symbolism and communication in material culture. We will now discuss this confusion, particularly as it brings us around to the issue of *meaning* in material culture too.

## Symbolism and Meaning

Within cognitive-processual approaches, cognition and symbolism are, as we have seen, very much interwoven and inseparable issues. Thus, logically,



"cognitive" applies only to those areas of communication that are organized on a symbolic basis, that is, in a language-like way, using formal conventions. Flannery and Marcus express this quite perfectly when they recommend restricting the scope of cognitive archaeology to the areas of cosmology, religion, ideology, and iconography.

Flannery and Marcus do acknowledge that "such common subsistence-settlement behaviours as hunting, fishing, farming, plant-collecting, tool-making, and so on" actually involve the deployment of intelligence. Nonetheless, such activities and their material correlates are deemed to lie beyond the scope of cognitive archaeology. This is presumably because such activities are not considered "symbolic"—fishing does not communicate a message (and thus a "belief") in the way a religious inscription or funerary depiction can. The problem here seems to lie in the narrow equivalence drawn between "symbolism" and meaning. Yet there are many ways in which objects and actions can be meaningful without necessarily being in the least bit symbolic. Fishing may not be symbolic in the strictest sense, but can we then say that the activity has no meaning? Of course not. Quite simply, we need to recast the equivalence drawn by Renfrew between "cognitive" and "symbolic." But let us first see how others have approached the connections between symbolism, communication, and meaning.

Just as Flannery and Marcus use an essentially linguistic model in implicitly equating "communicative" with "symbolic," so we see a parallel tendency in the post-processual literature, albeit far more explicit: "Given the long tradition which considers the symbolic in terms of signs in a language (Hodder 1989), the challenge of a symbolic archaeology is to explore the relationship between material culture and language" (Hodder 1992, 201). Here we see the idea that objects are to material culture as words are to language: they are elements within a symbolic code (Hodder 1989; Buchli 1995). Just as one needs to understand a language as a symbolic system to understand properly an individual word within it, so the symbolic meanings of objects can only be understood with a knowledge of a culture's symbolic codes. This is very much an idealist approach, a criticism that can be leveled at both processual and post-processual camps. Yet in the post-processual scheme (as epitomized by Hodder at least), this is not the only way in which meaning occurs. Hodder acknowledges the existence too of "functional meanings," which accrue through practice rather than through representational codes (e.g., Hodder 1992, 1993, 1999). Although he is keen to stress that symbolic and functional meanings are very much interdependent, in effect, the two do tend to remain rather separate in archaeological analysis.

Thus it emerges that the boundary between two domains, the practical/functional on the one hand and the symbolic/communicative on the other, is drawn in different ways. Flannery and Marcus assume that the practical cannot be meaningful, symbolic, or communicative; presumably they would also maintain that the reverse is true, that the symbolic cannot really be treated on the same terms as the practical (hence for them only the symbolic domain becomes the subject of cognitive archaeology). Hodder too constructs a boundary between functional and symbolic domains; in contrast, however, he contends that meaning *can* inhere in the functional domain. In his earlier work, he also says the reverse is true, that the symbolic domain can be treated from a functional perspective. In *Symbols in Action* (1982), for example, he takes on broad aspects of the "symbolic functionalist" approach, in which it is argued that the functional meanings of artifacts may sometimes lie in their capacity for communicating information, presumably through "symbolic" processes (cf. Wobst 1977; Wiessner 1983; and more recently Wattenmaker 1998). Aspects of material culture, notably "adjunct" features such as decoration, are invested with energy because they have a communicative role. Thus the symbolic is brought within the realm of the functional; but it does not seem as if this approach allows for the functional to be treated from a symbolic perspective. There are a number of problematic assumptions, such as the idea that a producer knowingly encodes information in an artifact so that it may be interpreted by the consumer, not to mention the uncritical borrowing of a linguistic model for material culture (for further criticisms see Dietler and Herbich 1998).

What we can certainly say for all of the above approaches is that they confuse the difficult concepts of "communication" and "signification" (see Dietler and Herbich 1998, 244). They fail to acknowledge that an entity may be seen as a sign without necessarily being part of a communicative act. For example, smoke usually indicates the presence of fire, and as such is a sign. However, this is not the same as saying that smoke communicates a message. If a forest fire ignites spontaneously, the smoke seen in the distance is understood to have meaning, but is not communicating a message. However, if a forest fire is interpreted as an act of arson, with the arsonists responsible known to be using this means of conveying a political message, then the smoke seen from a distance may well be understood to be communicative. The point to draw from this example is that, although signification and communication may very often overlap, they need not do so at all.



Archaeologists and anthropologists have tended to think of both signification and communication in narrow linguistic terms; in other words, symbolism is thought to be fundamental to both. Yet we need to realize that communication is about pragmatic action as much as it is about signification; and, moreover, that signification involves much more than just symbolism. There are many different ways in which entities can have meaning without being symbols—after all, smoke is not a *symbol* for fire, but is rather an *index* of fire (for more on this, see Chapter 5). This means, of course, that taking on the subject of cognition requires an engagement not just with symbolism, but with the much broader topic of signification. This can incorporate many forms of association and reference, besides those that are language-like. And, most important, all those everyday activities dismissed by Flannery and Marcus come right back onto the agenda. Acknowledging that the domain of the pragmatic and the everyday may be meaningful is just one step among many. We also need to work hard at overcoming a series of deep-seated dualisms between practical and linguistic, between doing and thinking, between functional and symbolic. Thankfully, this appears to be happening already, with dialectical perspectives on human-thing relations just emerging in archaeological theory (Thomas 1998b, 2000a; Kus 2000; Hodder 2001, 9). Nonetheless, the difficulties we face in this task are considerable, as expressed by Jean-Pierre Warnier in his book *Construire la culture matérielle*, in which he says that although we know that an articulation between the pragmatic and significative domains exists, we do not know *how* it works.[4]

Understanding the nature of this articulation is crucial if we are to construct a theory of material culture that is at all adequate. But there are many steps we need to take to get even close. For instance, we only have an approximate grasp of the status of physical objects in relation to human subjects; thus in the chapter that follows we examine this relationship, developing the idea that the human subject must be understood simultaneously in terms of biological animacy, psychological agency and social personhood. We look at the extent to which physical objects are drawn into these roles. In Chapter 3 we introduce the topics of cognition, perception, and action in an attempt to throw some light on the processes through which mind, action, and matter hold together and coimplicate each other. In this we draw heavily upon work in cognitive science and ecological psychology, arriving at an approach to cognition that is appropriate to material culture, sailing between the extremes of idealism and materialism.

This allows us to move toward further theory-building in Chapter 4, through a discussion of various kinds of network models for understanding the connectivities that hold together humans and nonhumans in heterogeneous social groupings. Chapter 5 takes on this theme of connectivity, but with a more explicit focus on cultural meanings: we develop a semiotic approach to material culture, based on the fundamental work of Charles Sanders Peirce and more recent contributions by scholars such as Sonesson, Gottdiener, and Gell, rather than being derived from Saussurean linguistic models that are inadequate for understanding meaning in material culture. The overall approach thus constructed is then put into practice in Chapter 6, through a discussion of various categories of contemporary material culture; everyday objects, art objects, and magical objects are all investigated, with an emphasis on the fluidity between these different registers. Cases cited range from the everyday coffee cup to Trobriand canoe-boards, and from French stoneware to the ready-mades of Duchamp. In Chapter 7, in order to emphasize that our approach is readily applicable to ancient as well as modern contexts, we present archaeological case studies drawn from the Aegean Bronze Age. The focus is on certain categories of Minoan artifacts and techniques, and the ways in which they can be understood as meaningful within sociotechnical networks. Finally, Chapter 8 contains concluding remarks and some comments on future prospects: if cognitive archaeology is to be the archaeology of the future (Renfrew 2001, 33), it needs to be developed in new post-Cartesian and nondualistic directions. This is the aim of *Thinking Through Material Culture.*

*Chapter 2*

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*Chapter 3*

# *Cognition, Perception, and Action*

## Rethinking Cognition

It was apparent in the last chapter that biologists have tended to focus on individual organisms independently of their physical environment; much the same can be said of cognitive scientists, in their propensity for isolating internal mental states in explaining cognitive phenomena (Clark 1997, 46). The upshot is that "mind" is still very commonly treated as a domain separate from the body and the world, not only in cognitive science but also in much psychology and in cognitive anthropology. In the pages that follow we shall critique this tendency, and propose an alternative perspective that links together cognition, perception and action much more fluidly. It is an approach that depicts cognition as a distributed, situated, and embodied process.

The common view to which we are reacting portrays the human body as the passive receptor of an array of stimuli from the environment, stimuli that are detected through various sensory modes (perception). The rather jumbled information embodied in these stimuli is then channeled through to the brain, imagined to operate as a kind of central processing unit. The information reaching the brain is duly processed and internalized; this operation allows for the information to be interpreted and given meaning. In interpreting this information, the mind creates a set of representations that allow for the formulation of an appropriate behavioral response, which is then conveyed to the body and enacted in the external environment. The feedback between external world and internal mind may be rapid and continuous, but world and mind nonetheless remain separate. Some key tenets of this perspective are that the cognitive processes of the mind are of a higher order; that cognition is an internal process, separate from the external world of perception and behavior; and that perception is somewhat "dumb," unguided, and passively responsive to stimuli.

This "internalist" perspective, essentially Cartesian in its separation of action and perception on the one hand and cognition on the other, conceives of mind as a computational unit. It is as if the information being processed is nothing more than a set of patterns (e.g., sequences of bits and bytes), disembodied and disassociated from any material presence (Hayles 1999). Within this very powerful computational perspective, there are two quite different threads: the symbolist and the connectionist. The former sees cognition as a process that operates through rule-based symbol manipulation (Bechtel and Abrahamsen 2002, 9; Kosslyn and Koenig 1992, 18). It can be partially explained by likening the brain to a computer, although originally it was the other way round: most computers derive from a design (by John von Neumann in the 1940s) that deliberately sought to mimic the operation of the brain, or at least as far as its operation was understood in the 1940s and 1950s. The development of the digital computer served to strengthen this general model and provide it with sophistication. Ironically, it was by developing artificial neural networks on such computers that some scientists put themselves in a position to argue for a radically different model of brain function—the model described above as connectionism.[1] Although some key aspects of this model have been around since at least the 1940s, for example in the concept of neural networks (McCulloch and Pitts 1943), it is really only in the last twenty years that it has come to the fore in discussions of brain function. In the intervening years, and especially the 1960s and 1970s, it was the symbolist model that dominated our understanding of the internal workings of the brain. However, the computer hardware that was supposed to be brain-like has helped to show how very unlike the brain it actually is.[2] Besides these artificial simulations, advances in neuroscience mean that much more is known about the inner workings of the brain; and this additional knowledge has itself encouraged the development of more "brain-like" computational models.

The fundamental idea of the neural network models that form the basis of the burgeoning connectionist paradigm is that the individual units that process information are akin to neurons (of course, in the brain they actually are neurons!). These neurons, be they real or simulated, are interconnected in such a way that they work in tandem in information processing—hence the term "parallel distributed processing." In the human brain a single neuron may receive signals from up to ten thousand other neurons. Modeling this kind of complexity is rather daunting to say the least, but some of the essential features of neural networks can nonetheless be illustrated with some simplified examples.

A refreshingly straightforward explanatory account can be found in



Goldblum (2001). She contrasts connectionist networks with semantic networks, and it may be worthwhile to start here. How is a concept registered in the brain? Let us take the concept of "bird." With semantic networks, popular within what we have referred to above as the symbolist approach, the concept "bird" would be represented by a single node in a network. It would find itself connected with other concepts, for example fish (another animal), feathers (a feature it has), and flying (something it does). There are all sorts of problems with this kind of network (see Goldblum for more on this). Goldblum suggests that whereas in semantic networks the concepts reside in the nodes, in a connectionist network they reside in the connections: "the nodes and the links change roles." All the different elements that constitute the concept "bird" intersect and connect at various points; it is in the space of these intersections and connections that the concept resides. Each individual concept is thus represented by a whole network. Crucially though, it also appears that a whole set of concepts of a particular type is located in a single network. As Goldblum emphasizes, this raises an interesting and critical question: how can a single network "know" which concept it is using at any given moment? If "cat" and "dog" are mapped on the same network, what distinguishes them?

It appears that the answer to this lies in the patterns of neuron activation, which differ according to what is being represented. Let us imagine that a certain sector of a network is composed of a series of interconnected neurons that fire in a particular way when stimulated by the sensory input corresponding to the output "cat." Because these neurons have developed connections of differential strength, and because they possess variable activation threshold values, the network sector in question will, topographically speaking, consist of a particular pattern of peaks and valleys. In short, the output "cat" consists of a certain kind of topographical map. Its topography will differ a little from that of the map correlating to the output "dog." This system of topographic recognition is essentially based on parallel distributed processing, a kind of processing to which a network is well suited. The conventional computer, however, would have to tackle the same task of differentiating cat from dog using algorithms to process the information sequentially (Spitzer 1999, 25–26). This may work for relatively simple tasks, but, once the patterns get a little more complex, the sequence becomes very long and the operation is jeopardized by even a single small error. Conventional computers have shown themselves to be rather poorly adapted to the solution of pattern-recognition problems (recognition of faces, handwriting, etc.).

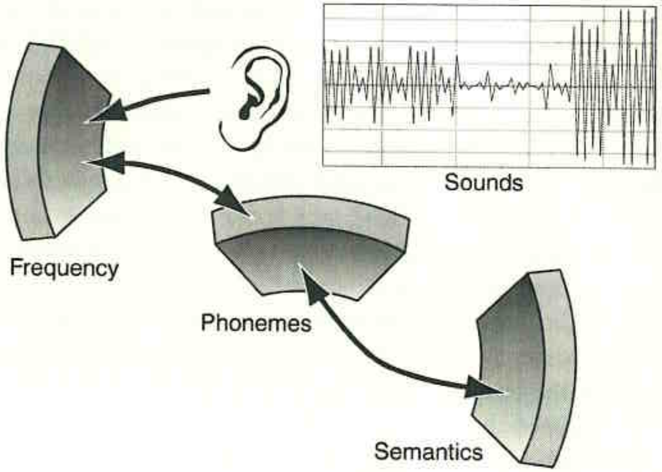


Figure 3.1. Diagram of auditory perception (after Spitzer 1999, 139). Copyright © MIT Press. Courtesy of MIT Press.

Such network-based topographical maps are apparently crucial to brain function at a number of levels. The question of registering "cat" or "dog" is in fact the most interpretive level, the "semantic." There are more basic perceptual levels in operation—in terms of listening to language these are the phonemic and the phonetic. To hear and interpret a sound as the word "dog" or "cat," the phonemic, phonetic, and semantic must interact. A critical example concerns the neurological changes that occur when patients suffering from hearing loss receive cochlear implants (Spitzer 1999, 137–38; Rauschecker and Shannon 2002). At first, the implants are no help at all to the patients—the signals being sent to the brain by the artificial inner ear are quite different in frequency from those that were previously provided by the natural cochlea. These signals simply cannot be decoded. But, about a year after the operation, the patients are able to understand spoken language: the brain gradually adapts to the new auditory input patterns it receives. Yet the reconfiguration of tonotopic maps, remarkable though it may be, is in itself insufficient. For the patients to hear, the new frequencies can only be made sense of as speech when they are contextualized in terms of both phonetics and semantics (see Figure 3.1). The reconfiguration at one level must be carried through to other levels too. Given that all these levels are involved synthetically in auditory perception, it may



well be that semantic maps are themselves affected by changes in input patterns.

The notion that not only simple features but also more complex, semantic features may be represented on topographical feature maps does not initially seem unreasonable. If simple features like sound pitch, graphemes, or phonemes can be topographically represented, then why not also the meanings of ideas, actions and objects (Spitzer 1999, 224–27)? The idea is that semantic feature maps could self-organize in such a way that similar concepts would be arranged relatively close together. Thus white and black may be found close together, as may hoofed animals (e.g., zebra, horse, and cow). When "white" is registered as an input, "black" may also be partially activated. Thus by seeing "white" our brains are primed for "black" too, and if the latter concept does subsequently arise we recognize it more quickly than we might otherwise have done. A single idea in this way has a *spreading activation* effect (Spitzer 1999, 225).

Spitzer's introduction of the idea of semantic networks in connection with neural networks may at first seem rather confusing, because any mention of semantic networks creates links with the symbolist rather than the connectionist approach (Goldblum 2001; Bechtel and Abrahamsen 2002). These have generally been portrayed in the literature as competing paradigms. The symbolist (or representational) perspective considers that, in a semantic network, concepts are represented by nodes; these are connected to other nodes by various forms of association (Goldblum 2001, 35–39). The connectionist viewpoint, increasingly dominant in recent years, maintains that a single concept is not represented by an individual node but by a whole interconnected set of nodes. For Spitzer to merge what Goldblum would have us believe to be two irreconcilable positions might appear contradictory. Yet Spitzer's objective is to develop a hybrid position that says concepts are neither widely distributed through a network, nor confined to a single node. He uses Kohonen feature maps to show how certain concepts may occupy relatively restricted topographical areas, consisting of a limited number of neurons.

Related concepts may come to be located topographically close to one another on a feature map—their proximity means that when one concept is activated, this activation may very well spread to the neighboring concept and partially activate that one, too. This differs from connectionist networks, in which related concepts might be distributed over precisely the same set of neurons (Goldblum 2001). Noting "symbol-based semantic networks with spreading activation" as an example of a hybrid model, Bechtel and Abrahamsen tentatively suggest that it might be possible to achieve more of such reconciliation between symbolist and connectionist approaches (2002, 15).[3]

A rather more radical suggestion, however, is that symbolists and connectionists, far from representing quite different positions, are not in fact all that far apart. Timothy van Gelder and Robert Port (1995) argue strongly that both approaches are guilty of ignoring the environment and constructing static models of its inputs. They instead advocate a *dynamicist* perspective, insisting upon the revolutionary consequences of Dynamical Systems Theory when introduced into cognitive science. They claim that "The cognitive system is not a computer, it is a dynamical system. It is not the brain, inner and encapsulated; rather, it is the whole system comprised of nervous system, body and environment" (van Gelder and Port 1995, 2–4).

Van Gelder and Port are rather skeptical of any computational model, be it symbolist or connectionist. Bechtel and Abrahamsen, however, feel that the dynamicists overplay their hand. Their impression is that, considering how the dynamicist perspective grows out of studies focusing on sensorimotor function,[4] such studies do not need to give much consideration to representations or symboling. But this does not mean that van Gelder and Port are justified in rejecting the entire symbolist project just because it plays little apparent role in their own specialist domain of sensorimotor function. Their dynamical approach, while appearing to hold much in common with the embodied/situated cognition perspective developed notably by Edwin Hutchins and Andy Clark (Bechtel and Abrahamsen 2002, 243), is actually somewhat more extreme. Clark has dubbed this extreme position that sees little or no role for "internal" representations or categorizations in either cognition or perception (e.g., Gibson 1979; Brooks 1991; van Gelder and Port 1995) the "Thesis of Radical Embodied Cognition" (Clark 1997, 148). He notes that historical precursors for this kind of scepticism over the role of internal representation include Heidegger (1927) and Merleau-Ponty (1942).

As will be seen below, Clark has been one of the principal proponents of a less computational and more distributed approach to cognition. And yet he realizes, nevertheless, that the representational approach is still hard to replace when it comes to the human capacity for reasoning about the distant, the non-existent or the highly abstract—such kinds of problem-solving tasks, entailing a degree of disembodiment and internalization, are "representation-hungry" (Clark 1997, 166). They cannot be accounted for within the *radical embodied cognition* standpoint. One cannot help but agree with Clark's "ecumenical" stance, that we cannot reject the symbolist approach outright: it may not be at the heart of everyday, procedural activities as we maneuver ourselves through our environments, but it is difficult to see how else to explain certain human reasoning capabilities (see also Strauss and Quinn 1997). If we embrace the optimism and spirit of compromise of Clark, and of Bechtel and Abrahamsen, then it may ultimately be possible to create links between the neuroscience approach of Spitzer, and the situated/distributed cognition approach of Clark and Hutchins. This would represent a marriage between two recent movements in cognitive science, one "vertically" or "downward" into the brain, and the other "horizontally" or "outward" into the environment (Bechtel, Abrahamsen, and Graham 1998, 77, 90). One would hope that these two approaches do prove compatible as each field develops, but, at the present time, this is still a vanguard development and so rather premature for us to take any further.[5]



Thus this is simply a cautionary note: while the embodied nature of cognition needs its case to be put strongly in the face of the long dominant representationalism, this does not mean we should swing to the other extreme, as van Gelder and Port have done, and deny representationalism altogether. The crucial point, somewhat marred by the overly radical nature of their exposition, concerns the idea that cognition is both a *dynamic* and a *distributed* process. Humans are purposeful agents, actively seeking out environmental features rather than passively awaiting cues and stimuli. Moreover, the separation between an internal mind and an external world is wrong-headed; "the skilled practitioner consults the world, rather than representations inside his or her head, for guidance on what to do next" (Ingold 2000, 164). Ingold implies that the whole of cognitive science persists with the opposition between mind and matter, and that only James Gibson's ecological psychology offers a way out (2000, 167–68). Yet Suchman (1987), Hutchins (1995), Kirsh (1995) and Clark (1997, 1998), among others, show clearly how cognitive science is itself rising to meet the challenge, through the emerging fields of artificial life and situated cognition. Usefully, some of these cognitive scientists draw upon Gibsonian ecological psychology.[6] The following discussion is drawn from such work.

Human cognitive processes are adapted to provide solutions to problems encountered in the course of everyday life. In the coarsest sense, the brain is just another organ adapted to perform a series of functions. This perspective in which brain, body, and world are integrated grows quite naturally from our attempts thus far to understand agent and object as mutually constitutive. And just as we have argued that agents and organisms extend beyond their own obvious boundaries, so we shall posit that "mind" is similarly unconfined.

How is it possible to believe that mind can exist anywhere but in the brain? Well, in many ways, most of our earlier comments on the fuzzy boundary between organism and environment apply equally well to the mind. This is stunningly encapsulated in recent cognitive science, particularly in the work of Hutchins and Clark. Describing the boundary between mind and world as "the plastic frontier," Clark suggests that "mind is a leaky organ, forever escaping its 'natural' confines and mingling shamelessly with body and with world" (1997, 53). This kind of perspective requires us to rethink many deeply entrenched assumptions, of the kind discussed above. Thanks to various examples supplied by Clark (1997), we can see that a mind/brain operating in such a way would not be particularly efficient. Imagine a brain that first seeks to solve a jigsaw puzzle through "pure" thought, without any direct manipulation of the pieces themselves. Or try playing Scrabble without shuffling the tiles around as a means of prompting the brain into thinking of new words (see also Maglio et al. 1999). This is how such a mind would operate, when we know from our own experience that this is not what happens. Instead, the search for cognitive solutions in these and indeed other circumstances seems to involve the constant manipulation of *external* structures and supports. When the world is its own best model, why bother wasting valuable on-line neural resources to store information that can be much more readily and reliably stored in the environment itself? Some of our actions, categorized by Kirsh and Maglio (1994) as "epistemic" actions, are aimed primarily at altering the nature of the mental tasks with which we are faced. To come back to the jigsaw puzzle, an epistemic action would be to sort through all the pieces and set aside those with a straight edge and a patch of blue sky. This serves to modify, and hopefully simplify, the mental task with which the mind is confronted.

By way of further exemplification of the embodied/distributed cognition approach, Clark (1997, 65–66) discusses the computer game Tetris, another example deriving from the research of Kirsh and Maglio (1994). This game involves placing different geometric shapes (zoids) into rows—each time a row is completed it disappears, allowing more space for new zoids (Figure 3.2). The zoids fall from the top of the screen and, as they do so, the player can rotate and flip the zoids before dropping them in such a way that they best fit into the already accumulating rows and columns.

One hypothetical means of playing this game would be to solve the



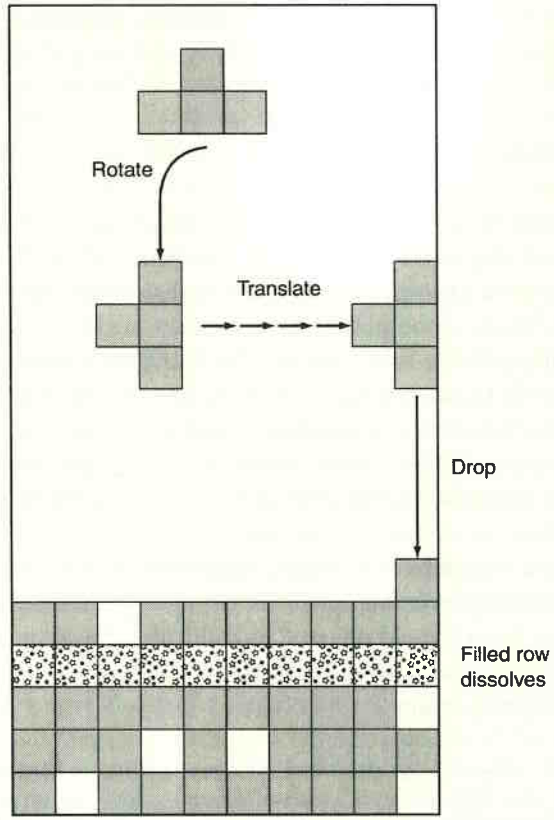


Figure 3.2. Tetris (after Kirsh and Maglio 1994). Courtesy of David Kirsh.

problem posed by each descending zoid through "pure thought" and then quickly implement the solution through the requisite actions on the screen. It was observed, however, that advanced players of Tetris manipulate the falling zoids as an active means of arriving at a solution. Such players are thus employing epistemic actions to reduce inner computational effort, and this strategy is the only way of coping once the speed of the game increases significantly (as it most certainly does at advanced levels). In such cases it seems as if the brain is completing patterns suggested to it by external structures in the world. Brain, body, and world complement each other, and one might even go so far as to dub this complementary system "mind," particularly when the mutualism runs as deep as it does in playing Tetris at an advanced level. Indeed, such a conclusion finds support in the work of

Jean Lave on the use of mathematics in everyday contexts—"cognition is seamlessly distributed across persons, activity and setting" (1988, 171).

## Direct and Indirect Perception

This perspective thus portrays the mind as being a system heavily oriented toward action.[7] Cognition and perception are geared toward tracking possibilities for action in the world, and objects in that world are recognized and perceived in terms of the possible actions they might afford (Clark 1997; Glenberg 1997, 4; Kirsh 1995). Indeed, the Tetris zoids embody this point particularly well. In any context other than the game the form of the zoids is meaningless, yet within the game the possibilities each zoid offers can be "directly" perceived. This "direct" perception of the properties of objects holds true in many real-world situations—very often when we encounter objects within active contexts we are able to "directly" perceive their possible uses. When encountered in broadly appropriate contexts, the potential of a plate for eating from and a chair for sitting on announce themselves to the user in an unmediated fashion. This is highlighted in amusing fashion in the following quote from Georges Henri Luquet, one of the early students of child psychology:

> One small girl I knew always described objects according to their role, not their name. A chair was "for sitting on," a plate "for eating on," and so on. One day, in the hope of catching her out, I showed her a slug and asked her what that was for. I was left feeling completely sheepish when she said that it was for squashing. (Luquet 1913, 134)

Costall (1997, 79) has also used this quote to illustrate what he calls "teleological reasoning"—the tendency, particularly noticeable among children, always to ask what an object is for.[8] This propensity for teleological reasoning is by no means the sole preserve of children—for humans, generally, an understanding of what an object *is* seems to be fundamentally linked to how that object is encountered in active situations.[9] Where solely physical characteristics are concerned, one can see that this argument makes a good deal of sense. But how far can this idea be extended? Is it possible that more abstract properties, such as the appropriateness of an object for eating or for ritual uses, may also be "directly" perceived? This is an area of considerable debate and controversy within the psychology of perception, the reasons for which we shall now explore.



The idea that the function of objects can be directly perceived runs counter to most psychological thought. It is generally held that humans are only able to understand the function of an object indirectly, through internal representations. That is to say, once we perceive the physical structure of an object (e.g., four legs, flat surface), the next step is to place it in a preexisting category within our memory ("chair"). Only then, once the category "chair" has been accessed, are we able to retrieve the potential function of the object ("for sitting on"). Thus, the human perception of function is believed to be indirect, mediated by cultural representations (a two-stage process of perception and conceptualization). Unsatisfied with this orthodoxy, the psychologist James Gibson developed the notion of "direct perception," in the course of his work on visual perception (1979). For Gibson, the potential of an object for sitting on, to continue the chair example, could be observed without first categorizing the object as "a chair." The potentialities held by an object for a particular set of actions was termed by Gibson its "affordances."

The perception of affordances has barely been studied, for various reasons: not only did Gibson die shortly after developing his theory, but his analysis was unclear in some crucial respects. Moreover, the indirect/mediated approach to perception has long been dominant (Palmer 1999, 409). Some scholars have pursued a Gibsonian ecological psychology since the early 1980s, but they have been in a definite minority.[10] Yet the approach appears to be attracting increasing attention, to the extent that Stephen Palmer (1999) describes the affordances concept as one of two major theoretical approaches to the visual perception of function (the other being the "categorization" approach). The concept has also been granted serious consideration in general works on visual perception by Gordon (1997, 180–220) and Bruce et al. (1996).[11] The general impression is that, although far too radical as developed by Gibson, the concepts of affordances and direct perception have much to offer. Perception of function, it would seem, is likely to rely both on affordances and categorization, on direct and indirect components.

## Affordances

Having outlined the nature of the debate, let us now explore the affordances concept further, returning in particular to the question whether it can be stretched to encompass properties other than the purely physical. Gibson,

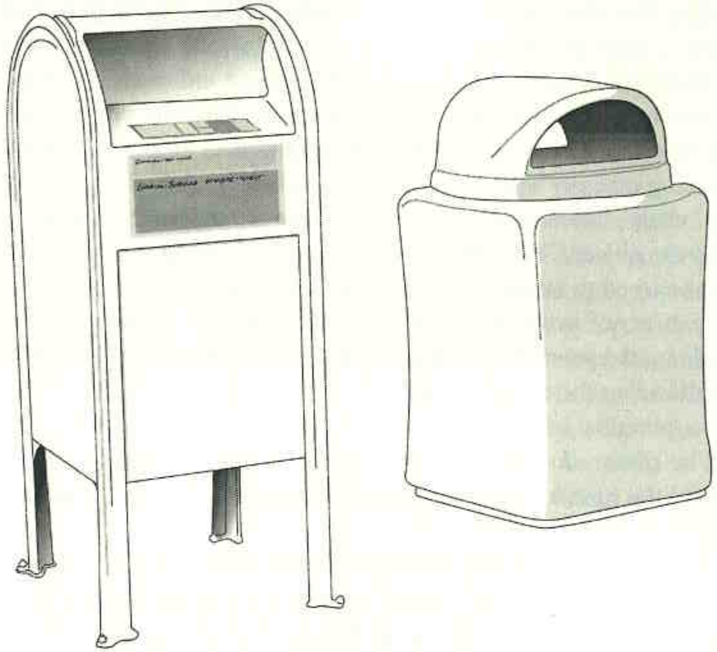

Figure 3.3. Mailbox and trash bin (after Palmer 1999). Copyright © MIT Press. Courtesy of MIT Press.

of course, considered that many kinds of objects, indeed perhaps all objects, could have their function directly perceived. This is a rather radical position that seems difficult to maintain; one example used by Gibson represents the way the idea is overextended. For Gibson, a mailbox can be said to afford letter-mailing (1979, 139). Indeed, the physical size and shape of the slot would seem to invite the deposit of a letter-sized object (see Figure 3.3). But, as is pointed out by Palmer (1999, 409), many kinds of trash bins also have slots of similar size and shape that could be taken to afford letter-mailing. The reason people use mailboxes rather than litter bins to mail letters is not solely to do with the physical form of the receptacle; the user possesses cultural information such that he/she knows the letters will be emptied from the box and eventually delivered (Noble 1991, 207–8). This understanding of the function of the mailbox is not accessible from its physical form alone, but derives from numerous associations and access to internal representations. Its function is thus in large part *indirectly* perceived.



The mailbox contravenes one of the two important conditions identified by Palmer (1999) as fundamental to direct perception: that the relation between an object's form and its affordance must be transparent. The other condition is that of observer relativity—it is in relation to a particular organism that an object can be said to have affordances. When the functional properties of an object conform to both of the above conditions, Palmer sees fit to talk of "physical affordances." Crucially, he goes on to say that "Physical affordances are the only ones for which a sensible case can be made that perception of function is direct in the sense of not requiring mediation by categorisation" (Palmer 1999, 412). Let us discuss further the two conditions described by Palmer, in relation to our previous example, the chair. As the arguments are relatively complex we shall deal with "relationality" and "transparency" in two separate sections.

## The Relationality of Affordances

The function of the chair is relational in that it is codependent with the human body: although a chair may afford sitting to the majority of people, it may not to those of a particular size or shape (e.g., babies, the elderly). It may be, of course, that in certain circumstances the chair's affordance for sitting will not be recognized by the human actors present. Yet this does not mean that the chair stops affording sitting—its affordant properties are in a sense independent of the actors' perceptions. A chair does of course have other affordances too (see Figure 3.4), such as being used to prop open a door; this may be one of its affordances, but it is not its *canonical* affordance (Costall 1997, 79). Naturally, the chair's door-propping affordance persists regardless whether people actively recognize it or not.[12] As Gibson himself states:

> The observer may or may not perceive or attend to the affordance, according to his needs, but the affordance, being invariant, is always there to be perceived. An affordance is not bestowed upon an object by a need of an observer and his act of perceiving it. The object offers what it does because of what it is.[13]

Ingold suggests that Gibson shows himself to be somewhat inconsistent on the status of affordances, sometimes implying that they arise in the mutual relationship between object and agent, and sometimes, as here, that they inhere within the object. Noble (1993), too, is critical of what he sees as Gibson's tendency to describe affordances as existing independently of

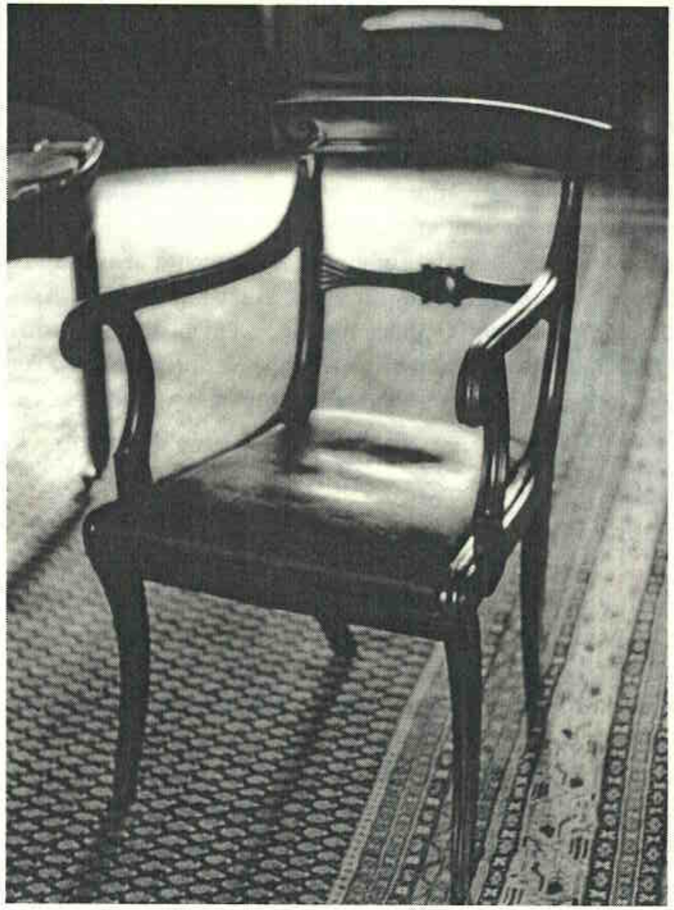

Figure 3.4. Chair. Photograph by the author.

active subjects. But despite this particular quote, Gibson is not denying mutualism altogether in stating that a chair simply is a chair—the fact that he means this in relation solely to humans is surely implicit. This becomes clearer if we think of the matter at the species level—Gibson argues, for example, that grass *affords* eating insofar as there are grazing animals. Grass does not afford eating to humans, no more than chairs afford sitting to grazing animals. Whether or not an object's affordances are actually perceived, our bodies are constructed in such a way that a given object (e.g., a chair) affords certain activities to us that it does not afford to other animate



bodies (e.g., grazing animals). To return to the example of the chair, it affords sitting to most human bodies, irrespective of whether a human body needs or perceives it. But this is not to deny that there is a mutualism between human agent and chair object. After all, if humans did not exist (along with any other being capable of sitting behavior), then chairs could hardly be said to afford sitting. Without grazing animals, grass ceases to afford eating.

Thus objects do not possess affordances that are truly independent and objective, and there has surely been some misunderstanding over this. There is only one sense in which one might say the affordances of objects are independent—affordances may be said to exist irrespective of whether they are perceived or not (which is precisely the point Gibson makes in the above quote). In other words, an agent may be physically capable of sitting on a chair, but may not need to sit and so may not perceive the chair as an object that affords sitting. The agent may in fact be looking for something to prop open a door, and sees the chair as an object that affords door-propping. Gibson's line is that affordances exist at the "ecological" level, as a relationship between an organism's body and its environment; these affordances remain even if the organism in question does not perceive or recognize them. Hence, from Gibson's viewpoint there is nothing necessarily mental or cognitive about affordances—the chair continues to afford sitting even if the agent does not have sitting in mind. Another way of avoiding the problem of perception is to focus on what the *situation* affords to an agent possessing a given *action repertoire* (Kirsh 1995).[14]

Harry Heft (1989), too, is keen to stress the relational quality of affordances; he suggests, however, that the body be considered not just as a physical entity but rather more broadly, as a conduit through which the individual expresses intentions and achieves goals. In saying that "an affordance is perceived in relation to some intentional act, not only in relation to the body's physical dimensions" (Heft 1989, 13), he seeks to introduce intentionality into the equation in a way that Gibson never did.[15] Yet Heft emphasizes that in so doing he is not breaking away from Gibson's legacy, but trying to clarify the nature of the tension between the "independent" and the "relational" properties of objects.

## The Transparency of Affordances

Palmer's second key condition for an affordance is transparency—a chair affords sitting by virtue of the fact that its particular physical properties (shape, rigidity, etc.) render its function transparent and conspicuous. One might say that to understand the potential function of a chair requires no prior cultural knowledge and so may be perceived in a direct and unmediated fashion. But let us take the other example used by Gibson and cited above—grass. It seems quite "natural" that grass does not afford eating to humans, but is it a property that can be directly perceived, or one that has been learned? Surely its nonedibility is not a feature that is transparently knowable from its physical form alone? With an example that is a cultural artifact, such as the mailbox, it seems much clearer that its function lacks transparency and can only be ascertained through recourse to cultural knowledge. As for a noncultural object like grass, it is much less clear quite how we ascertain its affordances, directly or indirectly.[16] Indeed, as is noted by Palmer, the boundary between the two may be rather blurred.

## Affordances and Meaning

So how does this excursion into "ecological" psychology help us with our overall focus in this book—the nature of meaning in material culture? Well, the concept of affordances does indeed provide the link, as we see in the following quote from Gibson himself:

> Water causes the wetting of dry surfaces. It affords bathing and washing, to elephants as well as to humans. Streams of water can be dammed, by beavers as well as by children and hydraulic engineers. Ditches can be dug and aqueducts built. Pots can be made to contain water, and then it affords pouring and spilling. Water, in short, has many kinds of meaning. (Gibson 1979, 38)

Here we see a sort of conflation, such that the affordances of water essentially constitute its meaning too. Thus the tension we identified above between the independent and the relational properties of affordances carries over (in ecological psychology at least) into questions concerning the nature of meaning. A. M. Byers, for example, believes that Gibson's view depicts meaning as a property of things rather than as a mental property of intentional subjects; he takes exception to the implication that humans simply "pick up" the objective meanings that are "out there" (Byers 1994, 379). He rejects Gibson's objectification of meaning and relocates it in the active subject. Thus, as in the discussion of affordances, the issue of meaning residing independently within the object or as a property attached by intentional subjects comes to the fore, and Byers unfairly characterizes affordances in terms of a dualistic opposition between objects and subjects. William Noble (1993) also offers a strong critique of the Gibsonian perspective on meaning: "My thesis, contra Gibson, is that meanings are not properties of environmental entities awaiting discovery, any more than are affordances" (Noble 1993, 379).



Noble certainly hits the mark when he accuses Gibson's conception of meaning as being very limited—for Gibson, affordances and meanings seem to be largely equivalent. The idea that some elements of an object's meaning might inhere in its indirect associations rather than its direct affordances appears not to enter into his theory. Indeed Gibson's theory is particularly radical in its denial of any role for internal mental representation in the visual perception of function.[17] Yet Noble seems to fall into the same trap as Byers, that of adopting a dualistic line of reasoning. A much more fruitful approach would surely be to deradicalize Gibson's theory, as a means of reconciling it with the representational perspective. This is the line taken by Palmer (1999), Bruce et al. (1996), Clark (1997, 172), and indeed in some detail Heft (1989).[18] The latter makes a conscious (and cautious) effort to extend Gibson's predominantly "ecological" theory of meaning and affordances so as to cover cultural circumstances too. His idea is that the functional meanings of something like water may exist at a species-wide, transcultural level, but more often than not they will be to some extent culturally derived, too (Heft 1989, 17). Heft returns to the by now familiar example of the mailbox (itself taken from Gibson, of course). It was noted above that its physical form alone does not transparently announce its function; cultural information is required if one is to understand the mailbox's affordances. Heft stresses the importance of understanding the affordances of the mailbox in relation to the intentions of a knowledgeable actor (who seeks to mail a letter). And yet he cannot fail to admit that the intentional act of mailing a letter only finds a connection with the mailbox through cultural knowledge. The issue of direct versus indirect perception (and unmediated versus mediated access) is conveniently sidestepped by Heft. He is seeking, it would seem, to disassociate the concept of affordances from that of direct perception. Although the overall objective of seeking a compromise between extreme positions is sound, his means of achieving it devalues the potency of the affordances concept. The stance adopted by Palmer (1999) appears to have more going for it: limit the affordances concept to those physical properties that can be directly perceived (e.g. the capacity of water to wet, the ability of a flat rigid surface to bear weight), whilst recognizing that, in many cases, the human perception of an object incorporates not only affordances but also categorizations.

Another effort to adapt the Gibsonian model so that it might more readily incorporate cultural variables is also made by Norman (1998), albeit from a rather different starting point. The way Norman achieves this is interesting, so let us now focus briefly on his approach.

## Affordances and Constraints

Donald Norman (1998, 9) uses the concept of affordances as a good base from which to explore the psychology of things, a psychology that is non-dualistic, neither mentalist nor materialist. He develops the concept in a number of ways, in particular, by coupling it with the notion of "constraints"—"whereas affordances suggest the range of possibilities, constraints limit the number of alternatives" (1998, 82). By devising experiments in which people were asked to construct simple composite objects from a series of parts, with no plan or specific knowledge of the finished product, Norman maintains that constraints fall into four broad categories: physical, semantic, cultural, and logical. One example of Norman's experiments involved the assembly of a toy motorcycle from a set of Lego pieces (Figure 3.5). There were thirteen parts, only two of which were alike. Through a combination of physical, semantic, cultural, and logical constraints, every person in the experiment was able to construct the motorcycle without instructions or help, even without ever having seen the process of assembly.

The physical constraints simply mean that large pegs cannot fit into small holes. The Lego motorcycle model was designed in such a way that the windshield, for example, only fits in one place. The semantic constraints, which "rely upon the meaning of the situation to control the set of possible actions" (Norman 1998, 85), dictate that the rider must be placed sitting forward. As this requires some knowledge of a socially constituted world, there might appear to be some overlap with cultural constraints. However, Norman posits that "some constraints rely upon accepted cultural conventions, even if they do not affect the physical or semantic operation of the device" (1998, 85). The three lights on the bike are red, yellow, and blue and, apart from their color they are indistinguishable and physically interchangeable. Yet red is a standard cultural convention for tail lights and yellow for headlights; thus cultural constraints solve the problem of

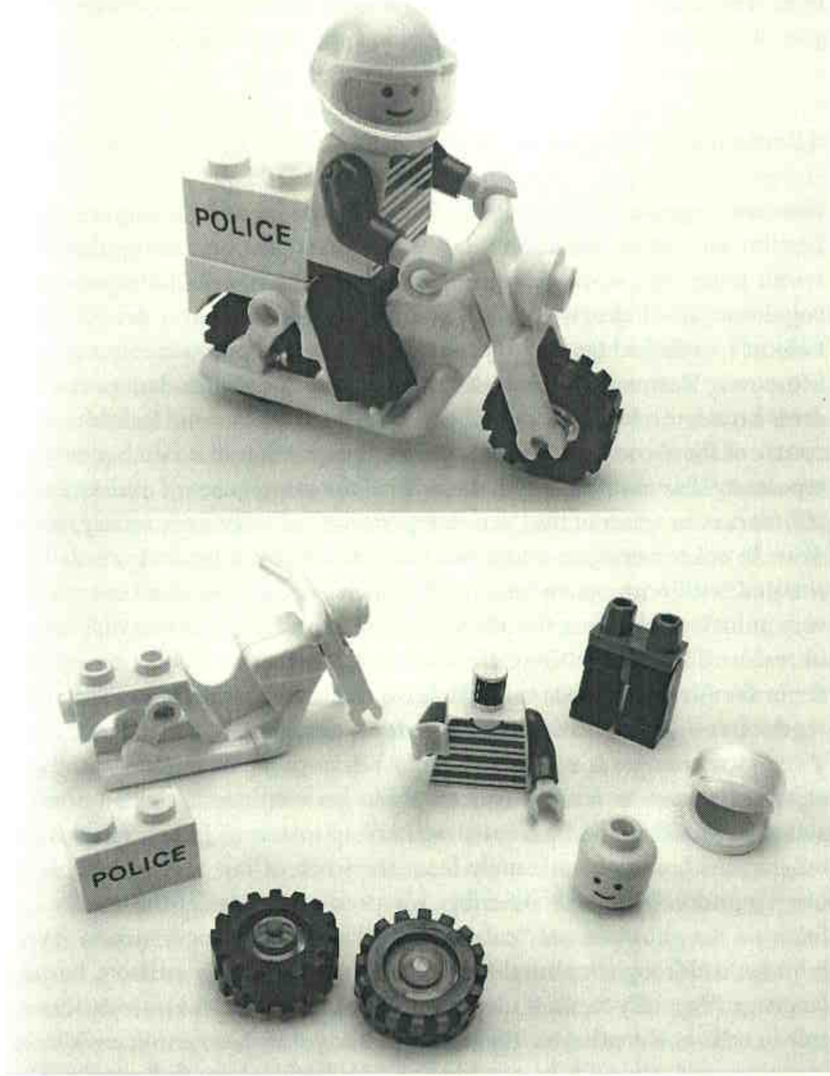


Figure 3.5. Lego motorbike (after Norman 1988, 83). Copyright © 1988 Donald Norman, published by Basic Books, reproduced by permission of the author and the Sandra Dijkstra Literary Agency.

where they should be positioned on the model. This does still leave the blue light, but, with only one place left to put it, logical constraints came into play. Logic also dictated that all the pieces should be used.

## Affordances and Mediated Action

Norman's approach is interesting for its fluid approach to cognition, perception, and action, with seemingly no hard and fast boundaries drawn between them. His work emerges from within the distributed approach to cognition (allied closely to Kirsh and Hutchins), while also drawing upon Gibson's ecological psychology, with its relational approach to perception. Moreover, Norman demonstrates that the concept of affordances can have even broader relevance, notably to questions of action. Indeed, in the course of the above focus on perception, the question of *action* has emerged repeatedly. For example, Kirsh underlined the importance of understanding affordances in terms of the "action repertoires" of relevant human protagonists. In other words, to understand an artifact's affordances it needs to be situated within an active context. Norman proceeds to demonstrate this very point by examining the affordances and constraints of everyday objects in real-world, active settings. He selects objects that we frequently encounter in familiar situations, and which we tackle with straightforward action repertoires—such as various types of door, especially badly designed ones.

What emerges is a relational approach not only to cognition and perception but also to action. This emphasis on relationality with respect to action is found in the "mediated action" approach of James Wertsch and others, which derives ultimately from the work of the Soviet psychologist Lev Vygotsky.[19] Wertsch describes his perspective straightforwardly as a focus on how humans use "cultural tools" when engaging in action (Wertsch 1998). Although "cultural tools" here means not only artifacts, but also language, Vygotsky focused, in particular, on the latter and its instrumental role in action. Nonetheless, the concept clearly does have a much wider application, and can refer to any kind of "mediational means" employed in human action. In the way it is used by Wertsch, there are clear links with the distributed cognition approach within cognitive science.

A further interesting aspect of mediated action is that, according to Wertsch, mediational means are associated with both affordances and constraints (Wertsch 1998). This creates an extremely useful connection with Norman's work discussed above, for much of what Norman describes also



makes good sense within the mediated action approach. For example, in his discussion of physical constraints, Norman uses the simple example of the door key—quite plainly, a vertical slot places a visible physical constraint upon how the door key can be inserted, yet there are still two possible orientations. Evidently, "a well-designed key will either work in both orientations or provide a clear physical sign for the correct one" (Norman 1998, 84). The key here can be understood as a "mediational means." Indeed, this sense that a cultural artifact such as a key may act as a mediator is wonderfully exemplified in a case study of a peculiar kind of door key described by the sociologist Bruno Latour (Latour 2000).

The key in question (Figure 3.6) is of a type used to lock and unlock the outer doors of apartment buildings in Berlin and its suburbs. The object resists interpretation, until, of course, it is encountered in its active context. Latour shows how, even to someone wholly unfamiliar with this particular technology, the material features of lock and key restrict possible patterns of action. In Norman's terms, there are clearly strong physical constraints in operation, dictating the ways the key can be inserted, turned, and removed. Logical constraints also come into play—one cannot just leave the key in the lock without retrieving it, and neither can one leave the door bolted but unlocked. Interestingly, this door key technology also incorporates strong semantic and cultural constraints—it inculcates the idea that the resident should unfailingly bolt the door at night and never during the day (the apartment block concierge only locks the door in this way after 10 P.M.). If an individual (an outsider) is unaware of this conceptual model, even given the strong physical constraints, it is hard to make sense of the technology and make it work (and thus Norman may consider it a case of poor design). Latour's point, however, is that this technology, through its very materiality, engenders a strong collective discipline among the residents (except for the resident who subverts it by doctoring his key). It is not as if the idea of collective discipline was constructed internally in the mind and then externalized in the form of the key—"the very notion of discipline is impracticable without steel, without the wood of the door, without the bolt of the locks" (Latour 2000, 19). The key is simultaneously and indivisibly material, agent and idea.[20] Latour's argument seems consistent with ideas on mediated action—the Berliner key is a cultural artifact that has a mediational role, acting as a kind of "pivot" between humans as they engage in action.

Although we may not realize it, objects are nearly always encountered in this way. It is what lies at the heart of what was described earlier as our

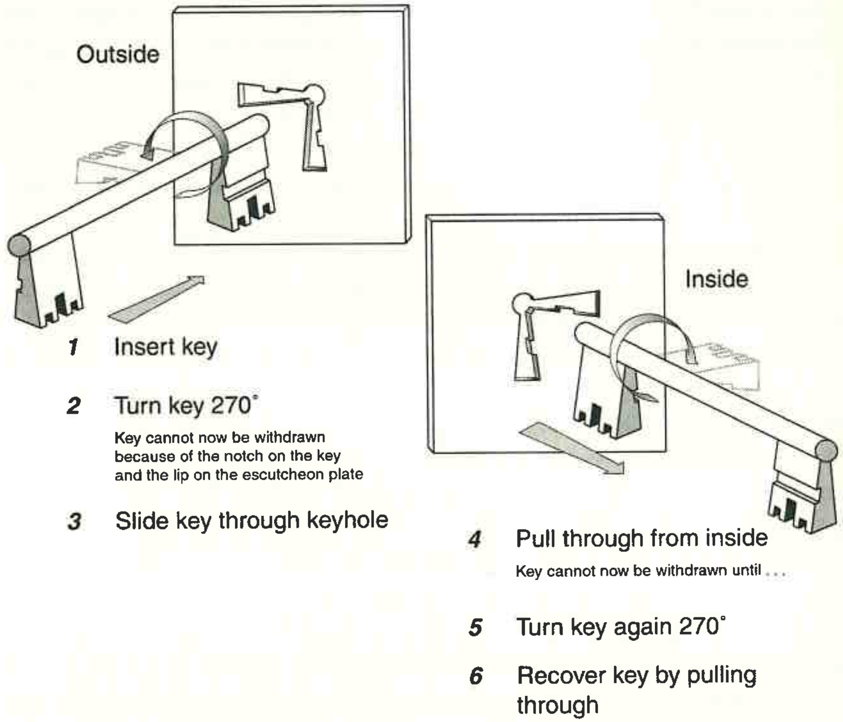


Figure 3.6. Berlin key (after Latour 2000, 15–16). Courtesy of Routledge and Thomson Publishing Services.

interpretative, teleological stance toward things—at the same time as we see the material, we unavoidably see the action and the conceptual model too. Analogous to this is the idea that an artifact "can be seen as an encapsulated 'theory of the task' and simultaneously a 'theory of the person' who fulfills the task" (Holland et al. 1998, 61). It is perhaps only in extreme cases that this does not hold true. The Berlin door key certainly threatened this for a moment. But the biggest challenge to our teleological attitude toward things comes from a series of fictional, invented objects put together by Jacques Carelman in his *Catalogue d'objets introuvables* (1994). There are dozens of fabulous and ludicrous cases, but we shall take just one—a "cafetière pour masochiste," sporting its spout and handle on the same side (Figure 3.7).



Figure 3.7. Carelman cafetière (after Carelman 1994, 63). Copyright © 2003 ADAGP, Paris, and DACS, London.

This object appears at first sight to obey semantic and cultural constraints, but with a second look it quickly becomes apparent that neither physical nor logical constraints are respected. Our intuitively teleological stance soon unravels, as we are thwarted in our efforts to project from the object any sort of meaningful intention or action; the Carelman cafetière reveals itself as a freakish, very unhuman artifact. It is thus perhaps one of those rare examples of an *isolated* object, albeit a fictional one (Carelman 1994).

To return to "affordances," the concept obviously does direct our attention firmly toward the properties of the object itself. Yet, at the same time, it forces us to see the object as a sort of nexus, where mind, agency and material meet and merge. With the Berlin door key we saw how an idea (collective discipline) requires materiality (the steel of the key, the wood of the door), and with Carelman's cafetière it was apparent that an object requires an idea. It has emerged that the dualistic perspective of Byers and others, whereby meaning must inhere either in the object or in the agent's intention, is misguided. In that ideas coopt objects, and objects coimplicate ideas, we can say that meaning is *distributed* between both.[21]

## Sociality and Scaffolding

One point may have struck the reader through the course of the above discussion. The examples used by Gibson tend to be *natural* objects such as water or grass. Let us take another such natural object—a pebble on the beach. Some pebbles may be more suitable than others for what a person has in mind; if a hypothetical individual walking along the beach wishes to throw pebbles into the sea so that they skim over the surface, then presumably flat pebbles of a certain weight will be selected. Flat pebbles afford skimming, but they have not been *designed*. That is to say, other human agents are not implicated in the mutual coming together of agent and object.

A designed cultural object is different from a pebble because it means there is already a prior mutualism between producer and agent enduring within the object. As soon as design is involved, one can say that producers and consumers communicate with each other, however implicitly, through the nexus of the artifact. And this is, of course, the point that is made with the examples used above in connection with Norman's ideas on affordances and constraints, in particular the Lego model, but also the Berlin key. These cases encourage us to think of design as a social process that serves to focus the consuming agent toward the affordances of an object.[22] Therefore, a successfully designed artifact is one that announces its affordances and constraints. Through design, the producer is able to channel the impending mutualism between consuming agent and object along certain paths (although this is not to say that the design of an artifact is always fully respected and followed, for example when a chair is used as a door-stop). Whether or not the designer has intervened minimally or substantially, the resulting artifact is nevertheless a social nexus. What Gibson may have characterized as an ecological mutualism between agent and object turns out very often to involve a social relationship too.[23]

But let us return briefly to the pebble on the beach. Imagine that it is not an individual but a group (let's say a family) who are walking along the beach looking for pebbles to skim. The process of scanning the pebbles for good skimmers becomes a "joint practical activity" (Jackson 1989; Reed 1988a; Ingold 2000, 167), such that all the members of the family become attuned to what constitutes a good skimmer. One might also bear in mind that not all members of this beach-walking family will have the same bodily properties: a skimmable pebble for the father may be too large for the six-year-old to grasp and throw effectively. Nonetheless the point remains that a "natural" object like a pebble may through practical attention and use become a social object, a nexus through which a using group may come to communicate.[24]

This example of pebbles on the beach finds a fascinating ethnographic parallel in the work of Dietrich Stout (2002). His case study also serves to draw connections once again with the mediated action approach that is traced back to Vygotsky. Stout's research on the stone adze makers of the village of Langda in Indonesian Irian Jaya focuses on the skills required in stone adze manufacture and the means by which these skills are acquired. The first step in the production process, finding raw materials of sufficient quality, is also one of the most important. The search for suitable stone takes place at certain locales along the local river and is usually done in groups led by experienced knappers. Subsequent stages are also collective endeavors: during flake removal, for example, it is "common for knappers to observe and comment on the work of their neighbours . . . and even to give aid by taking over for a while from another individual who is having difficulties" (698). This kind of interaction, Stout explains, is most common between experts and apprentices. Indeed, it appears that almost all technical processes in adze production "are conducted as group activities, with a great deal of interaction among individuals" (702). The apprentice learns the craft within a context that is structured both physically and socially. The structure thus provided acts as a kind of "scaffolding" upon which the apprentice can hang new knowledge, allowing for a more rapid and effective acquisition of the requisite skills. With this opportunity to externalize at least some newly acquired information, the onus upon the apprentice to retain large chunks of new knowledge within the brain is much reduced. The notion of scaffolding derives from Vygotsky, and takes its place in developmental psychology. As is underlined by Holland et al., "individual skills originate in cooperative activity" (1998, 83).

Although the idea of scaffolding is particularly useful in understanding apprenticeship, it has a wider application to other learning contexts too.

There are many situations in which the meaning of an artifact or activity takes shape and is learnt within structured social settings. We discussed this point above in terms of "natural" objects such as stone and pebbles, but of course the same holds true for designed objects like chairs or keys. However, such objects do differ to some extent; in addition to the mutualism that develops between consumers in the course of use, there is an added mutualism between producer and consumer implicit within the design of the object.

Although for much of this chapter we have largely focused, and deliberately so, on the relationship between *individual* minds, agents, and objects, ultimately these relationships cannot be isolated from the social skein in which they are inevitably entangled. The fact that the human understanding of an artifact and its associated activity is very often a collective rather than an individual process finds further emphatic demonstration in the work of Edwin Hutchins (1995), briefly referred to earlier in this chapter. In his detailed study of the cognitive processes involved in complex navigational procedures at sea, he does indeed draw attention to the way in which producer and consumer communicate through the design of an artifact. The artifact in question is a nautical chart, the "key representational artifact" used to calculate position at sea. Hutchins describes the producers of the chart and those who ultimately use it as "joint participants in a computational event every time the chart is used" (1995, 64). But there are other social relationships involved in computation, not only between producer and user but also between different users within a navigation team. The cognitive task that is navigation is, more often than not, distributed among a number of individuals who must work together as a unit. The organization of these individuals' social interactions is as critical to the success of navigation computations as is the accuracy of charts and instruments or the level of skill of individual protagonists. Describing their solution to a particular navigational problem, Hutchins notes that "the team arrived at a division of cognitive labour in which the behavior of each of the participants provided the necessary elements in the information environment of the other just when they were needed" (1995, 345). Although most social groups may lack the formal organization of the navigation team, there is nonetheless a sense in which any individual's cognition is an unavoidably cultural process, coordinated within the framework of both material and social relations.



## Isomorphy, Tuning, and Resonance

The examples of Carelman's cafetière and Latour's Berlin door key focused our attention on the codependency of idea, action, and material. These three dimensions coimplicate one another to the extent that it is difficult to conceptualize the material divorced from its associated action and idea. An object such as the Carelman cafetière that has no conceivable purpose or concept thwarts all our efforts at establishing the object's meaning. It would seem, therefore, that thought, action, and material form a "vertical" axis along which the meaning of the artifact is distributed. It is worth bearing in mind that this notion comes to us not only from distributed/embodied perspectives in cognitive science and psychology (e.g., Hutchins 1995; Clark 1997; Wertsch 1998), but also from anthropology, notably the work of Gell (1998). He uses the term "isomorphy of structure" to describe the links between "the cognitive processes we know (from inside) as 'consciousness' and the spatio-temporal structures of distributed objects in the artefactual realm" (Gell 1998, 222). The close correspondence between this and the arguments made above concerning both distributed cognition and indeed the notion of scaffolding, is uncanny. Moreover, comparisons can be made with Pickering's (1995) use of the term "tuning" to describe the interaction of human agency and material agency; we might equally well choose to use the term "resonance" instead of tuning. Gell's example of the circulation of Kula valuables in Melanesian society allows us to see how the resonances between the human and the material emerge:

> For success to accrue, the Kula operator must possess a superior capacity to engage in strategic action, which necessitates a comprehensive *internal model* of the external field within which Kula valuables move about. . . . The successful Kula operator controls the world of Kula because his mind has become coextensive with that world. He has internalised its causal texture as part of his being as a person and as an independent agent. "Internal" (mental processes) and "outside" (transactions in objectified personhood) have fused together. (Gell 1998, 231)

This application of the notion of structural isomorphy (or tuning, or resonance) to the world of Kula exchange is not only an excellent example of the potentially fruitful overlap between cognitive science and anthropology (and indeed archaeology, we hope), but is also an apt demonstration of what we mean by the vertical axis of cognition. Of course, Kula exchange involves whole networks of objects rather than single artifacts. This means that we are dealing not only with vertical but also horizontal networks, essentially a matter of "the significative networks in which all objects find themselves."

## Recap

In this chapter, we have given consideration to the codependent nature of the connections between mind and object. Given that the received wisdom across much of the social sciences is that mind and object are clearly separable, we have had to rethink many of our common assumptions concerning the nature of cognition, perception and action. To this end, various novel perspectives being developed in the fields of psychology and cognitive science have been presented in this chapter; particular emphasis has been placed on the compatibility of these approaches with regard to cognition, perception and action. Not only is the idea of cognition as a situated and distributed phenomenon compatible with the relational approach to perception adopted within ecological psychology, but both are also compatible with Wertsch's approach to action that stresses mediation. Through an exploration of these various concepts we have moved toward an understanding of material culture meaning in which the codependency of mind, agent and object is fundamental.

The three examples discussed a little earlier, Norman's Lego motorcycle, Latour's Berlin door key and Carelman's cafetière, all served to illustrate the human teleological attitude toward objects, and the idea of objects having affordances and constraints. Perhaps more importantly still, they gently encouraged us to introduce the key social dimension into the equation—that to be human is to be not only a biological organism and a psychological agent but also a social person. In that all these dimensions feed into one another, objects are inevitably implicated in animacy, agency, and personhood (see previous chapter).

However, the properties of individual artifacts are just one part of the story. An exclusive focus on such characteristics runs the risk of dealing only with the *affordances* and not the *associations* of objects, when the very challenge before us is to understand the interaction of these two facets.[25] With this in mind, we should not treat objects as individual, isolated items; attention must be devoted to both their spatial and temporal situatedness. The former refers to the complex environment of human and non-human objects in which individual artifacts are enmeshed. The latter consists of an



artifact's location within the flow of time, and how that artifact is experienced by agents over the course of a lifetime (cf. Riggins 1994a, 3). These patterns of associations are extremely significant in the constitution of an artifact's meaning; it is to such *networks* of association, and their role in the generation of meaning in material culture, that we turn in the chapters that follow.