7 How Natural Selection Shapes Conceptual Structure: Human Intuitions and Concepts of Ownership

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7.1 Mapping Concepts from World, Language, … and Evolution

How do we map the inventory of human concepts? Here I propose that a precise description of selective pressures on species-specific cognitive systems is the best source of empirical hypotheses about conceptual repertoires, and I illustrate this in the case of *ownership* concepts. The hypotheses presented here stem from a naturalistic agenda, in which concepts like other mental phenomena are construed as functional properties of cognitive systems (Jackendoff 1983; Margolis and Laurence 2007; Millikan 1998). The example of ownership illustrates how a highly specific selective context can predict and explain equally specific aspects of human concepts. This account also suggests more general though tentative lessons, to do with what general computational properties, if any, should be expected from concepts; whether categorization is crucial to concept structure; and what role concepts play in linguistic reference.

The evolutionary perspective stands in contrast to two other possible ways of proceeding. One is a form of realism that is often implicit in psychological research on conceptual knowledge, and is often combined with the discipline's unreflective empiricism (Carey 2009, 27ff.). This perspective assumes that we can infer a cognitive system's conceptual repertoire from our knowledge of the world that system is embedded in. After all, the argument goes, to survive, complex organisms must entertain beliefs that at least roughly match the way the world is. This makes it likely that many organisms' systems of concepts "carve nature at the joints," to use the common phrase. So the fact that there are actually different kinds of things in the world makes it likely that concepts reflect those distinct categories. For instance, plants and animals are substantially different, so any animal with a complex cognitive system would probably have general concepts for plants and animals.

However, nature does not actually have "joints" that would all be equally relevant to organisms from different species. For instance, it is unlikely that dogs have a fully general concept ANIMAL, because they do not interact with all animals on the basis of a single set of expectations and motivations. One would expect that dogs

probably have at least the following distinct concepts: HUMAN, DOG, PREY, because each of these kinds of agents activates a distinct suite of cognitive systems. Being domesticated by humans, dogs interact with them based on cognitive resources that are not used for dealing with other dogs or with prey. But other systems in the dog's mind, for example, mating systems, are uniquely activated by other dogs and not by any other living thing.

A second standard approach is to try to infer a conceptual repertoire from natural language, taking concepts to be stable information structures that correspond to lexical units. This linguistic perspective has dominated general research on concepts, so I will not dwell on its essential tenets and many achievements. I should just point to some of its limitations. First, as Sperber and Wilson point out, though it is clear that human minds contain *as many* concepts as lexical items (barring genuine synonyms), it is quite plausible that they have *vastly more* concepts (Sperber and Wilson 1998, 275), even if we limit ourselves to propositionally encoded information. Second, humans have a large number of ineffable concepts, like modality-encoded information, that organize information in a stable way yet cannot be expressed linguistically (Barsalou et al. 2003). Third, the linguistic turn suggests a radical hiatus between human and other-animal cognition, which ignores behavioral homologies and plausible phylogenetic continuity between species.

Here I will outline and illustrate a third approach in mapping the conceptual landscape, one that starts from selective pressures over evolutionary history, and formulates hypotheses about optimal and feasible cognitive structures that would respond to these pressures in fitness-enhancing ways. Considering selective pressures on organisms provides a lot of information about what their concepts may be like and therefore many rich hypotheses about cognitive architecture that we can test (Tooby, Cosmides, and Barrett 2005). Indeed, one point of this article is to suggest that such evolutionary task analysis provides *much* more information than we would first imagine, and therefore should be used as an important source for an evolutionary account of concepts.

7.2 Ownership as a Conceptual Domain

Ownership is central to human social interaction. Among the culturally universal aspects of ownership are the fact that (a) all known human languages can express, through grammatical or lexical means or both, the special connection between specific agents and particular things, either material (natural objects, artifacts, territories) or abstract (songs, stories, knowledge); (b) there is a principled distinction between mere possession and ownership; (c) ownership is associated with specific emotions and motivations; (d) the acquisition of ownership notions and norms occurs very early and effortlessly, along highly similar developmental lines (Brown 1991; Heine 1997). By contrast, norms of ownership and property rights differ from one place or time to

another in terms both of scope (who can own things and what things can be owned) and of implications (what one may do with specific types of property) (Hann 1998).

So how do we approach the conceptual underpinnings of these linguistic, mental, and social phenomena? The first method to concepts mentioned above, from actual kinds to constraints on concepts, is obviously not available here. There is no physical fact of the matter that corresponds to ownership. Whether an agent is the owner of a thing or not is the consequence, not of physical properties of agent and thing, but of shared mental representations between the agent and third parties. The second method, from lexicon and syntax to concepts, provides suggestive but ambiguous information. Ownership is part of a much broader domain of possession relations that includes kin, body parts, and other non-accidental appendages, as it were, of an agent. Possession can be conveyed by attributive means (e.g., "her blue eyes," "Jane's blue eyes") or predicative means ("she has blue eyes") (Heine 1997, 25ff.; Rudmin 1994). The linguistic evidence suggests that possession constructions, and a fortiori specific ownership constructions, are derived from nonpossession semantic structures (Heine 1997, 224), for example, from spatial schemas. For instance, OWN(AGENT, THING) can be seen as a special version of a BE NEXT TO(AGENT, THING) concept, and GIVE(AGENT_1, AGENT_2, THING) is analogous to MOVE(AGENT_1, AGENT_2, THING), and so on (Jackendoff 1983). These models also illustrate why semantic structures are only of limited value if we want to elucidate conceptual organization. Mappings, such as from spatial relations to ownership, occur in natural languages because they are intuitively appropriate—which is the case because of specific underlying assumptions about ownership, that are precisely what we want to describe.

Surprisingly, there was until recently very little systematic research on the psychology of ownership—on the intuitions and explicit thoughts engaged when people make claims about who owns what or how property can be transferred (Friedman 2010). Most of the relevant recent evidence comes from developmental psychology. Children have clear and specific intuitions about ownership and, of course, very strong motivations associated with those intuitions. Claims that a particular object is *mine* appear very early in young children's verbal communication, and children engage in frequent disputes over ownership. Although ownership is invisible, children readily infer it from verbal information to the effect that a particular object is *theirs* or *belongs to* another person, and they adjust their behavior accordingly, from thirty-six months (Eisenberg-Berg, Haake, and Bartlett 1981; Ross and Conant 1992), or even from twenty-four months (Blake, Ganea, and Harris 2012). What conceptual structures underpin this competence?

Children's *explicit* statements about ownership are not altogether consistent, and are sometimes downright odd. Children, for instance, agree that some objects can be owned, like artifacts or natural objects extracted from the environment, but they are less certain about abstract ideas. More surprising, four year-olds state that sleeping

people cannot "own" objects (Noles and Keil 2011). This may suggest that whatever ownership concepts have developed at that point, they are only weakly connected to the lexical items *own* or *belong*.

In contrast with these generic notions, even very young children have definite *intuitions* about the specific events that create or transfer ownership. In the absence of verbal information, children rely on a first possessor heuristic—whoever used or handled the object first is presumed to be the owner (Blake and Harris 2009; Friedman and Neary 2008). First possessors usually win conflicts over toys at age three, but not at age one (Bakeman and Brownlee 1982). Children's intuitions also imply that effort invested in some object results in ownership. Preschoolers, for instance, judge that an agent A's block of clay belongs to B if B sculpted it, but not if B merely handled it without changing its shape (Kanngiesser, Gjersoe, and Hood 2010). These and other studies show that from thirty-six months or earlier, children are familiar with the exclusion aspect of ownership. They also have stable intuitions regarding transfers of ownership, if these are made sufficiently explicit (Friedman and Neary 2008; Kim and Kalish 2009).

We find a similar contrast between explicit conceptions and intuitions in adults. In response to questionnaires, for instance, adults readily assert that persons cannot be owned (before being reminded of the history of slavery). Like children, they state that specific information can be owned, but not generic knowledge, although they cannot elaborate on the distinction (Noles and Keil 2011). Indeed, questions about what *kinds* of objects can or cannot be owned always trigger vague or inconsistent answers—because it is not clear in what sense ownership could be restricted to any particular ontological domain (Friedman 2010). But adults like children have reliable intuitions about use and possession, for example, they use a first possessor heuristic to determine ownership (Friedman et al. 2011), as do many legal systems the world over—as the saying goes, "possession is 90 percent of the law." This is not absolute, though. Friedman and colleagues demonstrated that intuitions about use and possession are largely dependent on cues concerning the *history* of the object, that is, who made it and how, or who extracted it from natural nonowned resources, what transfers took place, how much effort was involved, and so forth (Friedman et al. 2011). Also, adults' intuitions are sensitive to cues that make one agent responsible for the object being around, or being available, or having a utility, and responsibility here depends on an appreciation of the agent's intentions when he or she displaced or modified the object (Palamar, Le, and Friedman 2012).

The psychological evidence, however, does not by itself explain *why* ownership is construed in this way, why people's intuitions are only imperfectly tracked by their explicit concepts, and why facts about an object's history modulate people's intuitions. To address these questions, one must consider the adaptive functions of these conceptual structures.

7.3 Possession and Ownership (I): Intuitions and Motivations

An evolutionary approach implies that cognitive systems constitute evolved responses to recurrent challenges facing organisms in their evolutionary environments. In the case at hand, I propose (along with others; see, e.g., DeScioli and Wilson 2011) that ownership as a conceptual domain is part of our responses to the fundamental challenge of reaching a measure of coordination that optimizes the extraction of resources.

7.3.1 Ownership Intuitions as an Evolved Coordination Strategy

Humans like other organisms from highly social species can extract resources from their environments better if they avoid a Hobbesian war of all against all, in which the acquisition and use of resources are extremely costly, as every item must be extracted from the environment under the threat of fights with, and potential theft by, conspecifics. That may be why this alleged "state of nature" is not actually very natural. Organisms from many species manage to avoid its pitfalls through coordination, that is, a broad class of strategies in which most organisms abide by some norm of resource extraction—for instance, that the first agent to occupy a territory will keep it, while others will try to find another place (Maynard Smith 1982). Having such norms greatly reduces the costs of resource extraction, thereby increasing each organism's fitness (Johnsson, Nöbbelin, and Bohlin 1999). (Note that adopting coordination strategies in this perspective is a matter of genetic fitness, not group survival—it does not matter if the strategy benefits groups or not). The pressure for coordination norms is especially acute in humans, who are more dependent than any other species on interaction with conspecifics to acquire resources from their environment, and have evolved the required capacities for sophisticated coordination in such endeavors as warfare, hunting, co-parenting, and many others (Dubreuil 2010; Gat 2006; Hrdy 2009).

The term *resource* should be taken in the broadest sense, as any part of the environment, interaction with which can increase the organism's fitness. This includes food, shelter, mates, and potential allies. Now many of the resources extracted are rival goods, such that one agent's enjoyment of the resource diminishes other agents' potential use. Many of these rival goods are also potentially excludable, such that an agent can to some extent bar another agent from access to a particular resource.

Trade and gift giving impose additional evolutionary pressures on ownership cognition. Trade appeared early in human evolution—indeed it may be one of the evolutionary innovations that mark the advent of modern human societies, as well as providing a significant boost to creativity and human innovation (Ridley 2010). As for gift giving, it is a universal feature of human societies. Social relations are created or cemented by gifts. Because of the selective pressures for appropriate understanding of trade and gift giving, human intuitions of ownership should not be immutably linked to an object's history. There should be some possibility for A's ownership of *x* to be transferred to

some other agent. Note, however, that this creates a series of coordination problems. First, if A transfers *x* to B, the extent to which A is not the owner of *x* should be construed in the same way by both parties. Second, A and B should have some means of knowing at precisely what point B owns *x*. Finally, third parties should also receive the information such that they adjust their behaviors accordingly.

The proposal here is that intuitions and motivations concerning who uses what resources constitute such a coordination tool for humans—and evolved from less efficient coordination strategies in the course of human evolution. In this perspective, the complex of intuitions and motivations generally called *ownership* are the outcome of largely tacit computations concerning the relative costs and benefits of using, guarding, or poaching resources, as well as collaborating with others in these diverse courses of action.

7.3.2 The Contents of Possession-Related Intuitions

Ownership, like other aspects of social interaction, is a domain for which normal human beings have specific, largely automatic *intuitions*, that is, mental representations of a particular state of affairs, or motivations to act toward particular states, without a clear or accessible representation of the processes that lead to these intuitions. In the same way as depth perception requires largely unconscious principles to organize visual information, ownership-relevant information in the environment can be processed outside conscious access to yield specific intuitions. Imagine the following scene: Robinson picks up some shells and seaweed on the beach and assembles them as a bracelet that he puts down. Friday handles the bracelet. The scene triggers in most third parties some intuitive representations to the effect that "this is Robinson's bracelet," "this is *not* Friday's bracelet."

infinite regress

The intuitions we consider here are all about some specific agent using some specific resource. Faced with some resource, the organism A has a choice among courses of action that we can label TAKE, NOT-TAKE, DEFEND, or RELINQUISH, each with its associated costs and benefits. Faced with two agents A and B, one of whom is using a resource, there is a choice of actions for C, dependent on the interaction between A and B. If A takes from B, there is a choice among DO NOTHING, HELP TAKE, HELP GUARD, and so on. (Although this seems to invite indefinite recursion, there may be no selective pressure for any such coordination beyond triadic interaction, as will be discussed presently.) These are the strategic choices. What is the content of the intuitions about these choices?

Our hypothesis here is that, faced with such situations, organisms are equipped with a domain-specific system that takes as input certain cues, as well as some background information, to produce definite intuitions and motivations toward TAKE(x), GUARD(x), HELP TAKE(x), HELP GUARD(x), and so forth.

These intuitions and motivations are principled. The domain-specific system involved is such that in response to specific patterns of situations, it produces predictable intuitions and motivations that guide the organism's behavior. The organization

of these intuitions instantiates strategic conventions, that is, evolutionarily stable strategies. They help organisms save energy by avoiding fights for resources and expend that energy on seeking alternative resources.

Note that the intuitions and motivations of different agents are, of course, not always matched. That is, coordination may break down and encounters lead to a number of fights. This may happen because the cues processed by two organisms are different (e.g., an organism actually is the first occupant of a territory, but an intruder failed to perceive that). This may also happen because the potential rewards of fights in some cases outstrip the motivation for strategic withdrawal. That would be the case, for example, if your friend knows that your lottery ticket is a winning one.

7.3.3 Computational Properties of Ownership Intuitions

Note the following important points about the mental representations involved:

This is all intuitive. All the mental content I have described so far comes in the form of *intuitions*, that is, mental content that is *not* the product of deliberate ratiocination; nor is it necessarily explicit. What makes it intuitive is that some representations and motivations, for example, "Don't take berries from this bush!" or "Attack anyone who tries to use this tool!" are entertained without any representation of the processes that led to them. This should be emphasized because intuitions in this sense are contrasted below with reflective mental content.

Intuitions and motivations are outputs of the same systems. The mental representations described here come as a package, in which a description of a state of affairs and a drive to make a certain state of affairs real are intertwined. A particular situation triggers a mental representation that is both description (e.g., Individual A is using object *x*) and motivation (e.g., take *x* away from A!).

Intuitions are domain specific. So far, we have considered common features in all such intuition systems, regardless of their domain of operation. That is why this description is bound to remain extremely abstract. To go further in the description of these cognitive processes, we may need to consider specific domains of such resources, such as mating, foraging, hunting, or tool making. Different domains of behavior, in a highly social species, result in different challenges in terms of access to resources and exclusion of other agents, such that it is unlikely that an optimal system would just realize one single set of principles for them all.

Computations explain norms (not the other way around). One might want to object that the model proposed does not so far capture the normative aspects of ownership. In describing ownership psychology, most attempts at either evolutionary or historical construction start from a rich notion of norms applied to possession and use. Indeed, this may seem the most natural starting point. After all, a concept of ownership should make sense of cases in which someone *is* but *should not* be in possession of an object, and even young children grasp the point. One goal of the present research program, however, is precisely to elucidate the various computational processes leading to, for

example, a strong motivation to have the thief restitute stolen goods to their previous possessors, or to a specific feeling of frustration when people take away what we made without compensation. These (and many other) specific emotions and intentions underpin what we call ownership *norms,* but calling them that does not in any sense illuminate the processes involved. The deontic intuition is precisely what we should explain. Instead of assuming, for example, that representations about how a resource was extracted feeds into an ownership norm, I choose here to consider how cues about history (e.g., an agent A extracted object *x* from nature, or agent A invested work into *x*, etc.) directly trigger motivations and intuitions to the effect that A keeps *x*, that one is not motivated to try to appropriate *x*, that others may want to defend A against such exploitation, and so on, which are motivating, predictable, and shared—the features of what we call *norms*.

7.4 Coordination Proposal (II): Explicit Beliefs and Norms

Beyond intuitive representations, people in some circumstances also entertain *reflective representations* of ownership-relevant information. These are explicit, generally verbalized series of representations that explicate, amplify, concatenate, or comment on intuitions. To reprise our example, these would be explicit representations like "It is R's bracelet because R made it," "It is not F's bracelet as R did not give it to F," or "It is not Y's necklace because X only lent it to Y." Note that one does not require the explicit reflections to entertain the intuitions. Young children, for instance, will share some of the intuitions mentioned above without being able to articulate their rationale. This distinction between intuitions and reflections is similar to that between *intuitive* and *reflective beliefs* (Sperber 1997), *aliefs* and *beliefs* (Gendler 2008), or *architectural beliefs* and *metarepresentations* (Cosmides and Tooby 2000).

7.4.1 Why Bother with Explicit Representations?

Why have explicit, universally lexicalized concepts as a complement to (and loosely associated with) specific intuitions? The requirements for extensive coordination among humans make this development, if not inevitable, at least very likely in most human groups. This is because coordination requires compatible motivations, but also shared information. It requires that, once agent X has extracted resource R, most third parties that were not present during resource acquisition adopt the same noninterference strategy as the parties present. In other words, it requires some signal that sums up what can be inferred from the history of acquisition, and it triggers relevant motivations in other agents. This requirement is, of course, not unique to humans. For instance, many animals need to signal that they are "owners" of a particular territory rather than passersby, which they usually convey by specific signals. Humans accomplish that in the species-specific manner that matches their much greater requirements

for coordination, through verbal communication of the connection between agent and thing possessed.

Explicit beliefs about ownership do not easily track the subtle contextual cues that modify our intuitions. Consider the familiar case of jokes. Most people would assume that a joke is not something you can "own." So telling a joke you heard is not taken as an instance of plagiarizing, of stealing anyone's property. But the intuition can change. On our way to a fancy dinner, you tell me a great joke that you hope will dazzle the crowd. But as we sit down at the table, I tell that precise joke. Now it seems that in a sense I did take something that was "yours." Even clearer, of course, is the case of a comedian who uses a colleague's material—that is definitely stealing. Why do our intuitions change with the context, given that the actions are similar? An easy (and wrong) answer is that the actions are not similar, because in the case of the comedian (vs. ordinary conversations), a joke is "intellectual property." But that is question begging—we readily assign that label to comedian's jokes precisely because we have intuitions, for example, that they have a special entitlement to getting benefits from their material, that we should approve them when they exclude others from using it, and so on. From the instant a joke is something that can accrue utility, like social prestige, and is rival (you cannot tell the joke to the same people), the intuitive system triggers a clear reaction, while the reflective *ownership* concept would have much difficulty explaining why such contextual circumstances make all the difference. Obviously, it is *possible* to refine our concept of ownership to accommodate such contextual cues. But that is not required. As long as people share intuitions and have some confidence that they do, the strategic norms are in place and transaction costs are diminished.

Given that coordination is made more efficient by explicit concepts and words, what explains the discrepancy noted above, between these explicit understandings and our intuitions? Note that the discrepancy is not specific to the domain of ownership. Indeed, one can observe a similar phenomenon in most cognitive domains handled by both intuitions and deliberate, explicit reflections, as described by *dual process* models (see, e.g., Evans 2003). The fact that explicit representations do not always track intuitions is mostly due to computational differences in the two kinds of systems described in such dual-process models.

Intuitions are delivered by nonconscious integration of many different types of cues, each of which triggers inferences that are then weighted for relevance and trigger specific intuitive content, as well as motivational states. That much is common to many domain-specific inferential systems. In the case at hand, the relevant cues include information about whether the resource is rival (which is itself the outcome of previous computation, based on semantic knowledge but also on episodes or inferences from episodes), information about the history of the connection between an agent and a thing, information about other agents' past interaction with the same thing, and much more besides that. Because the cues are many, and because their inferential

potential is often modulated by the values of other cues, they do not lend themselves to the kind of inference typical of explicit, reflective systems. Explicit systems are constrained by the limits of working memory and imagery buffers, which is why they cannot in general represent complex webs of contingencies between multiple aspects of a situation. Explicit thoughts on ownership provide general representations that, to some rough extent, track the usual results of intuitive processes concerning possession and ownership, in the forms of general principles about ownership, for example, "what is owned by X cannot be used by Y," "a gift of R from X to Y entails that X does not own R any longer," and so on.

7.4.2 How Do We Extend the Scope of Ownership Concepts?

Human representations of ownership are not exhausted by intuitions and the kind of explanatory, comment-like reflections described above. In fact, in many human groups, people have put together formal codes of ownership, including legal systems, that extend the scope of intuitive and reflective representations. Most important, these formal systems apply ownership concepts to domains of social interaction for which there are no evolved predispositions. For instance, humans have evolved intuitions about territories and their use. If you occupy a territory, you can exclude others from resources found in that space. But modern legal norms make the exploitation of mineral resources and the use of airspace possible and efficient, by creating specific limited property rights, by creating such notions as royalties and refunds for negative externalities, and so forth. Indeed, modern legal scholarship tends to deny that there is such a thing as ownership in the abstract, which is replaced with the notion of *bundled,* highly specific rights, such as the right to occupy land but not sell it, or the right to sell property but not to damage it, and so forth. (Merrill and Smith 2001). By building these nonintuitive notions, legal systems can extend ownership to domains such as ideas, tunes, and designs, for which our common reflective notion of ownership is defective.

7.5 Implications of the Evolutionary Perspective

A naturalistic evolutionary perspective on mental content diverges in important ways from standard assumptions about concepts. For a long time, theoretical debates about the structure of concepts focused on categorization, notably on prototypicality effects, the role of perceptual imagery, and artificial intelligence models of knowledge representation (see, e.g., Gelman and Medin 1993; Medin, Goldstone, and Gentner 1993; Medin and Wattenmaker 1987; Murphy 2002). Empirical evidence persuaded psychologists to move away from seeing concepts as lists of properties (the so-called classical view), to recognizing that they include prototypes or exemplars, and finally to construing them as encapsulated theories about kinds of objects (Medin and Wattenmaker

1987). These debates have now lost much of their intensity, perhaps because of a realization that the world of mental concepts is far more extensive than previously envisaged, and that representational formats are far more diverse. Depending on the domain, category structure is best described by one format or another, but none of them applies across many different domains (Machery 2009). Moreover, a large part of our conceptual menagerie includes ineffable, modality-specific information that does not easily lend itself to a unified nonmodal code (Barsalou 1993, 1999). These findings converge to suggest that there is simply no possibility of (or need for) a general theory of concepts, if this means a series of general strictures on the representational format of all or most concepts (Machery 2009).

But cognitive and evolutionary considerations may allow us to go further, explaining why concepts come in diverse formats and why these are appropriate to specific conceptual domains. As a starting point, an evolutionary perspective may introduce important corrections to standard assumptions about concepts, to do with (a) the connections between intuitive and reflective representations, (b) the connection between concepts and valuation, and (c) the contribution of concepts to meaning and reference.

7.5.1 Intuitions and Reflections

Concepts as described here include both intuitive components, whose inferential background is not available to conscious inspection, and reflective components, which explicate, enlarge, modify, or otherwise elaborate on intuitions. Consider the example of OWNERSHIP. This is involved in a large spectrum of situations, all the way from simple tactical conflict avoidance (e.g., when three-year-olds tacitly abide by the first possession principle), to large-scale coordination (as when people elaborate property rights for a community). In the first case, the selective pressure is for efficient strategic norms, which require that roughly similar cues trigger roughly similar intuitions and motivations in conspecifics. In the case of large-scale interaction, the complexities of coordination make explicit verbalized rules an efficient addition to intuitions.

This interaction of intuitive and reflective components is familiar in many cognitive domains and usually described as an example of *dual-process* systems (Evans 2003; Hassin, Uleman, and Bargh 2005). From a selective viewpoint, one would expect pressure toward fast, rough-and-ready systems in some domains and slower, integrative systems in other domains. However, again based on these functional considerations, one would certainly not expect the mind to comprise two general-purpose systems that support gut-feeling and reasoning-driven decision making respectively, as is sometimes argued in the dual-process literature (Kahneman 2003). That is because decision making itself, rather than being a unified, all-purpose mental faculty, is fragmented in myriad distinct domain-specific capacities, with their distinct input formats, databases, and computational rules (Barrett and Kurzban 2012).

7.5.2 Concepts and Valuation

As standard research on concepts focused on categorization, it left aside aspects of concepts formation and use that are just as crucial, and especially salient from an evolutionary viewpoint. Concepts, like other cognitive structures, are there to direct behavior efficiently in the context of specific selective pressures. So concepts should be such that they result in appropriate motivations, in the different valuation of distinct courses of actions (Tooby, Cosmides, and Barrett 2005). This is clear in the case of ownership. Indeed, two distinct situations may be construed as cases of ownership versus mere possession, as a result of salient differences in the motivations triggered. For instance, having created an artifact gives us a greater motivation to defend our possession of the artifact than if we had just found it, and this difference in motivation is what creates the intuition that the artifact "belongs" to us. It seems contrived and artificial to distinguish categorization from motivation in this case.

The same may apply to many other concepts. As Tooby and colleagues point out, valuation is ubiquitous in the representation of situations, such that a division between categorization and motivation makes little biological sense (Tooby, Cosmides, and Barrett 2005). Indeed, one may argue that the separation between conceptual functions understood as pure categorization (describing which objects go together) and motivation understood as a separate process of decision making may be a hangover from the classical faculty psychology description of *volition*. To take a simple example, the cognitive system that makes a male chimp notice a female's genital swelling, rather than treat it as visual noise, is the very same system that triggers sexual arousal in the male and prompts courtship behaviors. Or, to return to the dog's ontology as mentioned in introduction, the systems that notice differences between *humans* and *other animate beings* are the same systems that motivate highly specific behaviors toward humans. The point is that valuation is not some external factor that is added to categorization. Valuation generates categories by motivating different behaviors toward different objects (Tooby, Cosmides, and Barrett 2005).

7.5.3 Concepts and Reference: Deflationary Implications

To the extent that philosophers consider mental content to contain structured bundles of information, they generally assume that these conceptual bundles should be such that they can support reference (Block 1987; Rey 1983). There is no space here to discuss accounts of reference and their connections to various hypotheses about mental content. In fact, a normative notion of reference perhaps has no place at all in a naturalized account of cognition, as some philosophers have argued (Davidson 1984; Quine 1960). But it may be of help briefly to signal how a naturalistic evolutionary framework diverges from common normative expectations about concepts.

A possible objection to an evolutionary perspective is that concepts construed in relation to evolutionary pressures denote not genuine kinds in the world, but broader

equivalence classes of phenomena with similar effects on a lineage of organisms. For instance, in this view, it is difficult to say that cows have a concept GRASS, when in fact all they seem to have is the concept GREEN, GRASSLIKE LOOKING, SMELLING AND TASTING STUFF, which fails to pick out all grass and only grass. This objection is not really compelling, however, for two reasons. First, a failure to pick out genuine natural kinds in the world is only a problem if one assumes that the point of concepts is to provide organisms with scientifically accurate or metaphysically coherent accounts of the world. By contrast, once we consider concepts as information structures that help organisms survive and reproduce, metaphysically imperfect concepts can be seen as perfectly fine tools. In this perspective, cows and other ruminants have managed rather well so far with GREEN, GRASSLIKE LOOKING, SMELLING AND TASTING STUFF mostly because, on average and over eons of evolutionary history, there were not many nongrass objects in their environment that matched this "flawed" concept. Second, most of our mental concepts track kinds of things that are not proper categories in any case. Even so-called natural kinds are generally not actual classes (Millikan 2005, 106ff). Natural organisms come in different species and genera, that is, *not* in classes but in populations that merge with other populations as one goes back in time and that diverge into distinct species as time passes (Mayr 1996). So there is no distinct class of objects in the world that GRASS or TIGER could normatively refer to. From a naturalist standpoint, then, concepts can do their functional work without "metaphysical correctness."

In functional terms, once we abandon normative metaphysical requirements, concepts are best described as a set of specialized computational *skills* (Millikan 1998), with specific triggers, a specific set of rules for operations, and a range of typical outputs, for example, a modification of that information, the recruitment of specific information from memory, a specific motivation or emotional reaction, and so on. The case of OWNERSHIP illustrates this. The range of mental representations associated with possession and use do not converge on a set of criteria, such that a particular agent could be said to *grasp* the concepts OWN or BELONG while another one does not. There are shared intuitions (e.g., about first possession), external cues that influence these intuitions (e.g., the way a resource was extracted from an environment), as well as reflective thoughts on the intuitions (e.g., about what in general determines ownership and what it implies). The connections between actual situations and the activation of all these representations is a matter of *greater or lesser* success in tracking relevant agent-environment interactions.

More generally, what evolved organisms need are not information bundles that connect to the way the world is, but information bundles that track the way the world affects fitness, which is a property not of the world outside the organism, but of the combination between that world and species-specific adaptations. Taking this into account may allow us to make sense of properties of human concepts that would otherwise remain puzzling and provides a way of mapping human concepts

that is based not on a priori philosophical requirements, but on biological matters of fact.

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