

Some Cognitive Origins of Cultural Order

Brian Malley^{a,*}
Nicola Knight^{a,b,c,d}

^a Department of Psychology, University of Michigan, 530 Church Street,
Ann Arbor, MI 48109-1043, USA

^b Department of Anthropology, University of Michigan,
Ann Arbor, MI 48109-1043, USA

^c Culture and Cognition Program, University of Michigan,
Ann Arbor, MI 48109-1043, USA

^d Department of Anthropology, London School of Economics and
Political Science, Houghton Street, London WC2A 2AE, UK

* Corresponding author, e-mail: bmalley@umich.edu

Abstract

The nature of cultural organization remains an open anthropological question. Although we eschew any simplistic global reductionism, here we argue that three organizational features of culture, its systematicity; the recurrence of distinctions across semantic, conceptual and practical boundaries; and the ‘bleeding’ of properties between associated concepts, may find their origin in fundamental operating principles of the human mind: respectively, the cognitive principle of relevance, the decompositionality of cognitive processing and the network structure of semantic memory. The reframing of some features of culture in cognitive terms may open up some ethnographic observations, so far resistant to anthropological explanation, to new avenues for theory and relevant data from other disciplines.

Keywords

Cognition, culture, anthropology, memory, modularity

The origins of thought are paradoxical. To some uncertain degree, thought is a product of one’s cultural environment and historical situation. But the cultural environment and historical situation are themselves imaginal, products of thought processes. Anthropological theory has been rife with attempts, some more plausible than others, to establish some kind of mapping between mind and culture. Emile Durkheim (1995 [1912]) famously declared the independence of the social from the psychological – while in the same breath positing a simple identity between psychological and social states. Other early theorists, most famously Lucien Levy-Bruhl (1923), tried to derive an

understanding of individual mental processes from cultural stories and practices. The ensuing years saw more sophisticated ideas emerge as anthropologists worked with improved ethnographic techniques and more developed psychological theory. Contemporary cognitive anthropology reflects the great progress both anthropology and psychology have made in the last century. Yet the paradox is not dissolved, nor do we expect it to be: culture and mind are irreducible terms.

Still, the relation between culture and cognition is much better understood than it used to be, and has progressed from a simple aporia to a research problem. The paradoxical nature of the problem has led to a bifurcation of theoretical emphases in cognitive anthropology. One line of thought, represented by Roy D'Andrade's (1987) studies of folk models of the mind, Naomi Quinn's (1996; Strauss and Quinn, 1997) studies of US Americans' models of marriage and Claudia Strauss's (1990; Strauss and Quinn, 1997) studies of US Americans' ideas about economic individualism, has emphasized the mechanisms by which individuals acquire and represent cultural models. A second line of thought, represented by Scott Atran's studies of folkbiology (1990) and religion (2002), Pascal Boyer's (1994; 2001) study of religious representations, Lawrence Hirschfeld's work on kinship (1986; 1989) and race categories (1996) and Maurice Bloch's (1998; Bloch and Sperber, 2002) work on memory, language and kinship has explored the ways in which cognitive predispositions favor the reproduction of some cultural representations over others. Broadly, the first of these lines emphasizes the malleability of cognition, treating local cultures as fixed patterns (or sets of patterns) that individual minds absorb. The second line of thought treats cognition as a fixed set of predispositions that shapes cultures over generations of cultural transmission. Neither perspective denies the validity of the other – both are patently necessary. But even together they are incomplete.

Both lines of theory focus on cultural and cognitive representations. But culture and cognition are dynamic, as much process as substance, and in this article we outline a mapping between cognitive processes and dynamic cultural patterns. We argue that some kinds of cultural patterns – kinds that have been repeatedly observed by ethnographers in many places – can be understood as the operation of dynamic cognitive processes documented by psychologists. Specifically, we will argue that the (partial) systematicity of cultures, the recurrence of distinctions across conceptual domains, and the conceptual 'bleeding' of symbols are the products of basic principles – basic processes – of cognitive functioning.

The present argument has some limitations the reader should note. First of all, we aim to explain patterns that have commonly been presupposed, with-

out explanation, in definitions and characterizations of culture. We assume here that there really are patterns of action and social interaction that can be called culture, and that ethnographers have gone some considerable way toward identifying those patterns. We shall clarify what we mean by cultural order below, but for the moment let us note only that we do not think analyses purporting to show cultural disorder have shown any such thing, and certainly not enough to vitiate the many quality ethnographies done in anthropology's classical period. Our aim here is to build on earlier findings, and therefore we shall settle for indicating the kinds of patterns we have in mind by reference to classic ethnographies, rather than attempting to argue them as if we were discovering them anew.

Secondly, our intent is explanatory rather than interpretive or critical. Explanation is, epistemologically, the most valuable kind of theory because explanatory theories – at least successful ones – do the most to broaden our knowledge. Their breadth is also their vulnerability, making them open both to different kinds of empirical falsification and to charges of incoherence with other knowledge. Our goal is precisely to establish a bridge between previously unrelated areas of knowledge, in the hope that the connection will open the door to further investigations; a goal of this sort is best served by an explanatory argument.

Finally, the present argument is necessarily abstract. We discuss here general patterns of organization of thought and behavior, and there is no way to discuss such things in purely concrete terms. Yet the abstraction has to do only with our subject matter, not with the rather simple logic of our argument, and we have provided, we hope, enough examples to convey what we have in mind.

Culture and Cognition

The problem of culture, as we see it, is one of order. To throw the problem of cultural order into sharp relief, let us adopt – for the time being – Dan Sperber's epidemiology-of-beliefs perspective on culture (e.g., Sperber, 1985b, 1996). In Sperber's framework, mental representations (variously constructed as ideas, beliefs, etc.) and public representations (public events like gestures, utterances, or writings) become part of a population's *culture* if they are highly recurrent in that population. Ideas are more or less "cultural" depending on how many minds, in a given population, have them.

In this minimal definition, a culture consists in the co-occurrence of ideas in a population: if a large portion of the population has the notion of bedroom slippers and also the notion of bologna, then these two ideas are part of that

population's culture. No connection between these ideas is presupposed: the ideas may be psychologically or semantically connected – as in hierarchies of concepts or semantic networks – but they need not be. They need only recur across minds to be part of culture. Sperber thus identifies culture with a particular kind of order – the semantic resemblance between the contents of individual minds in a population.

Neither Sperber nor we prejudge the causes of this resemblance. Indeed, we expect that the causes vary widely, from purely architectural features of human cognition, to environmental regularities, to the activities of institutions – and perhaps most often to various combinations thereof. To give one example of the first type of cause, human memory performs best when dealing with specific sorts of input. Several aspects of cultural products affect their chances of being learned, stored, recalled and transmitted. As predicted by Boyer's (1994; 2001) cognitive theory of religion, it has been found that concepts that are minimally counterintuitive (that is, different from everyday concepts in strange or unexpected ways, but not altogether bizarre) show the least amount of degradation in recall accuracy (Norenzayan *et al.*, 2006; Owsianiecki *et al.*, forthcoming); this, among other things, facilitates the spread of religious ideas in a population. While this article focuses on causes of this first kind, decades of anthropological work have provided evidence for the two latter types.

One property of culture that comes with this Sperberian definition for free, as it were, is its scalability: because culture is defined by distributional rather than ontological criteria, it is assumed that ideas will vary across populations, across groups within a population, and even across individuals within a group – there need be no *special* explanation for cultural variation. Cultural variation is (at most, for some variation is functional variation, itself a kind of order) a step or two in the direction of disorder, the unrealized limiting case being a population in which the contents of one mind reveal absolutely nothing about the contents of any other minds in the population. On this view, the opposite of culture is not, as has sometimes been suggested, variation, but variation that is *random with respect to the social environment*. Blood types display this latter kind of variation; the pattern of distribution of blood types within a population is not correlated with sociocultural factors, and as such it is uninteresting to anthropologists.¹ Imagine we were to take any society and

¹ This is not to say that, once such unevenly distributed properties are discovered they cannot be exploited as the basis of folk theories of their significance. For example, in Japan and other Asian countries, a theory that predicts personality from blood type is very popular; in Nazi Germany, certain blood types were interpreted as racial markers. Naturally, such phenomena *are* interesting to anthropologists.

divide its population into groups based on blood types. Such groups would not tell us anything about their members' culture – that is, group membership would not correlate with any meaningful social or cultural factors. The cultural variation within the blood-type groups will be equal to the cultural variation between them.

We have adopted the Sperberian definition of culture as a heuristic because it casts into sharp relief some other kinds of order in which we are interested. Specifically, it allows us to investigate the super-individual, synchronic cultural patterns anthropologists have frequently noted. We would not object to others preferring a different definition of culture. Nothing in our argument depends on Sperber's definition: we adopt it solely because it clarifies the phenomena we wish to explain – our interest is in specific cultural phenomena, and these remain however culture is defined. What matters is that these cultural phenomena can be mapped to cognitive processes.

Cognition, as much as culture, is a tendentious word, so if we are to invoke cognitive processes to explain cultural phenomena, we must be quite clear about what we mean by it. Following early Chomsky (1957) and the other major thinkers of the cognitive revolution (e.g., Bateson, 1972), we understand cognition to be an information-processing account of the activities of the human mind. Underlying this approach is psychologists' discovery that many of our mental activities are organized by their information-processing functions, and that information processing really is the key to understanding much of the mind.

Anthropologists (and, recently, cultural psychologists; see, for example, Cole, 1996; Nisbett, 2003) have shown convincingly that there are important differences in information processing across cultures. Minds are malleable at more than a surface level, but our appeal here will be to some of the deepest operating principles of mind, those that enable an individual's adaptation to his or her environment, including the principled acquisition of local ways of thinking and feeling. At present there is no evidence that these vary, and reason to believe they are part of our biological inheritance as a species.

Three Cultural Phenomena and their Cognitive Sources

Cultural Systems

A Sperberian definition of culture allows that cultures might be mere aggregates of ideas (practices, meanings, etc.), but many anthropologists (e.g., Geertz, 1973) go further and attribute to cultures some kind of systematicity. Systematicity has been a touchy subject in anthropology for some time now,

owing partly to anthropologists' recognition that cultural order and coherence have sometimes been products of domination – indeed, sometimes even the ethnographic recording of particular bits of cultural order (or particular kinds of variation) has amounted to a political act. Yet the counterclaim, that there is no systematicity to culture, is hardly plausible, and studies in linguistic anthropology show how cultural patterns emerge even from individual conversations (*cf.*, Tedlock and Mannheim, 1995). The remaining, and larger, problem is how to characterize it, and in this anthropologists have sometimes turned to a linguistic analogy.

The notion of a cultural or symbolic “grammar” is sometimes used to capture the systematic nature of cultures. Roger Keesing, for example, invokes the notion of a symbolic grammar, and the phenomenon it is intended to describe, in a particularly clear way (1982: 214f.):

I noted earlier... the temptations for kin groups to try to simplify and reduce periods of sacredness and the taboos and ritual sequences they entail. In these and other ways, and simply by error and failure in the transmission of lore and variations in personal style and knowledge, small changes are being introduced into local groups. Individuals – all individuals – are in small ways changing and contributing to “the system.” But this process of corner-cutting, error, convenience, and style would seem to erode structures as well as preserve them. We can think of a kind of informational or behavioral entropy at work in the way individuals apply and modify the cumulated ways of the group. How, then, are order and coherence maintained? Where do the new forms that *conform* to existing structures, even render them more elegant, come from? For the Kwaio, my data strongly suggest that despite continual small and local shifts in procedure, structural coherence and the overall order of the symbolic grammar are maintained across generations largely because of the impress of expertise, construed as ancestral will.

Keesing here describes the structure of culture as a “symbolic grammar,” and suggests that the grammar is maintained by expertise, which partly counter-veils a natural tendency toward entropy.

Keesing does not invoke cultural grammar as an explanation of cultural order, but only as a description of it – the relation between cultural behavior and cultural grammar is thus different from the relationship between linguistic behavior and linguistic grammar. And there are problems with this metaphor: John Gatewood (1998) argues that because anthropologists have repeatedly found that behavior is not rigorously segmentable, the notion of a cultural grammar makes little sense. We agree, but there are compelling reasons to believe that *thought* is in fact segmentable at many levels – as we will see below – so we do not regard Gatewood's as a fatal criticism.

Whatever the problems with “cultural grammars” as theoretical constructs, the basic observation underlying the notion remains: the ideas and practices found in societies seem to have an internal logic to them, and thus systematicity is a real property of cultures. We take the explanation of this systematicity to be a significant anthropological problem.

In saying that cultures are systematic we do not adopt the extreme claims (still found in introductory textbooks) that cultures are integrated wholes. Although there are no *a priori* reasons that cultures could not be highly integrated entities with clearly defined borders, in reality such claims have never been strongly empirically supported. Not only has there never been evidence of integration at this level, but there is no social or psychological mechanism yet discovered that would generate such a pattern. Even a process of ideational (practical, semantic, etc.) variation and selection in an isolated population would not necessarily produce thoroughgoing cultural integration. Work showing that cultural signifiers are frequently indeterminate and negotiated, subject to the often-conflicting interests of their recruiters, is merely the latest nail in the coffin of an implausible claim.

Yet there is ample evidence that subsets of cultural ideas are connected by a variety of logical, causal, predictive, and practical relations – indeed, one can hardly read ethnography without seeing all of these kinds of connections between ideas (practices, meanings, etc.) at play. It is in fact lower-level conventions – especially tacit agreements about communication – that enable more abstract cultural signifiers to be negotiated: such negotiations can take place only within a defined framework if interlocutors are to understand each others’ bids at all.

We think culture to be not an integrated whole (i.e., a unified system without tensions and contradictions) but rather a series of internally coherent systems. These systems – for the classification of animals, performing a sacrifice, gossiping, and so forth – are socially shared, although they are not usually identical from one individual to the next (Strauss and Quinn, 1997). Different cultural systems intersect in the individual, who acquires a great number of them in enculturation. Each system is internally coherent, a model or tool for thinking about some domain, but different systems may contradict each other, and in this they serve as a repertoire or resource that an individual may put to his or her own ends.

This more modest version of cultural order remains an anthropological problem. A Sperberian definition of culture allows that ideas might merely co-occur without any connection between them, and casts into sharp relief the fact that many cultural ideas enjoy some degree of coherence with others. This

systematicity requires an explanation, some kind of process or mechanism that could produce such interconnected pools of local order.

Cognitive Source: Relevance Theory

The explanation of cultural systematicity requires some kind of process that either creates new connections, thus filling in gaps between otherwise unrelated culture elements, or preferentially reproduces those culture elements that happen to be connected, in some way, to others.² Although both kinds of processes are part of normal human cognition, scientists' understanding of the first is extremely fragmentary, and so we shall focus on the preferential reproduction of systematic ideas. Fortunately, psychologists have excellent reason to believe that human cognition is biased toward systematic representations, a bias that is summed up in Sperber and Wilson's (1995) cognitive principle of relevance.

The cognitive principle of relevance states, briefly, that human cognition is geared to the maximization of effects for the expenditure of effort, to getting the most informational bang for its energetic buck. Experimental evidence for this operating principle is growing (Van der Henst *et al.*, 2002; Van der Henst and Sperber, 2004), but some principle of this kind is implied in all cognitive models of learning (*cf.*, Holland, 1992; Holland *et al.*, 1986). In order for the mind to sort out the implications of its environment, it must have some system for ranking different sets of inferences in order of processing priority, and cognitive effect is the most general ranking principle.

Applied to individual thought the cognitive principle of relevance states that, *ceteris paribus*, people will attend more to inferences with relatively greater cognitive effects than to those with relatively smaller cognitive effects, with the entailment that the greater an inference's connectivity to other ideas and the stronger those connections, the more cognitive resources will be allocated to its processing. Individual human thought will, therefore, tend to favor representations that are systematized more than those that are less so.

In application to communication, this implies that, *ceteris paribus*, people will attend more to those messages that connect to their existing ideas, that have ramifications for their mental models of the world, than to those that do not. Sperber and Wilson, following Grice (1989), suggest that communicators

² One might also postulate, of course, that cultural elements are only invented and "published" in an already systematized form. While we think it likely that this does account for some cultural systematicity, it cannot account for many of the patterns in which ethnographers have been most interested, and at present it is not possible to say much about it.

who want to have their message heard implicitly recognize this and usually adjust their message accordingly. Not only are cognitively integrated messages more likely to be heard, they are also more likely to be voiced.

The implications of this principle for the study of culture are enormous. If much of culture is communicative – and it is (Leach, 1954) – then we would expect cultures to tend toward systematicity. In a society where individual minds were completely random with respect to the social environment, we would expect that people would attend to those messages that resonate with the contents of their individual minds, and that consequently such relevant messages would spread more quickly across the population than messages that did not resonate with existing ideas. Within a short time, we would expect not only that culture – convergence among the mental representations in a society – would emerge but also that the emergent culture would be considerably systematic.

Thus the simple but profound cognitive principle of relevance can explain the emergence of systematic properties in culture. The systemic properties that emerge from the independent operation of individual, systematizing minds are not necessarily global or coherent the way early anthropologists envisioned. Because cultural patterns must bubble up from individual interactions before propagating across a society, we may expect to find patterns at all scales, from the intimate habits of a pair of lovers to socially global properties such as dead metaphors and other stock idioms. The extent of any particular cultural pattern cannot therefore be stipulated or presumed, but must be investigated empirically. Some *kinds* of patterns, however, are more likely than others, and in the next two sections we will investigate two particularly common kinds of order.

Cross-Domain Correspondences

Ethnographers have long noted that communities often use a small set of distinctions repeatedly, across a variety of semantic, conceptual, and practical domains, to capture what are locally perceived as correspondences across these domains. Over the years, there have been many attempts at systematizing and finding commonalities among these cross-culturally recurrent strategies. Among these attempts, Ortner (1973) lists the following: cultural themes (Benedict), integrative concepts and dominant values (DuBois), dominant orientations (Kluckhohn), dominant symbols (Turner) and core symbols (Schneider). Ortner places herself in the same tradition as the above authors in her discussion of ‘key symbols’. In her formulation, symbols are ‘vehicles for cultural meaning’ (p. 1339). Key symbols are those symbols that have the most cultural salience, in terms of how frequently they are invoked, of how much elaboration they show, and of how many contexts they appear in.

A second strand of anthropological enquiry has dealt with a particular kind of recurrent distinctions: dual organization. Many societies, regardless of scale, divide themselves into moieties; one's moiety affiliation often determines one's residence, one's range of potential partners, and one's power relationship with others. But dual organization often extends beyond social organization, to cosmology, art, and folk philosophy. The fact that dual social divisions are found on every continent prompted early anthropologists to speculate that they are a primitive form of social organization, and that the tendency of members of many cultures (even non-dualistic ones) to engage in dualistic thinking ultimately derives from them. In contrast, Lévi-Strauss (1963 [1956]) proposed that dual social organization is a result, rather than a cause, of dualistic thinking. Since then, anthropologists have devoted a lot of attention to the study of dual organization and dualistic thought. Simple oppositional binarisms, such as male-female, right-left and pure-polluted, are among the most commonly used (and most frequently studied) cross-domain distinctions worldwide (see, e.g., the papers in Maybury-Lewis and Almagor, 1989; Needham, 1973). Roy Rappaport (1984 [1968]), for example, observed that the Tsembaga Maring used a hot/dry/hard (*romba-nda*) vs. cold/wet/soft (*kinim*) distinction to describe differences between pairs of items in vastly different domains, such as ritually prepared warriors and women; physical strength and fertility; upper body and lower body; land-only animals and animals associated with water; food and drink; and red spirits (hot), a female spirit (*kun kaze ambra*, cold), and spirits of the lowlands (cold).³

A third perspective on cross-domain correspondences comes from outside anthropology. George Lakoff, a linguist, and Mark Johnson, a philosopher, have proposed that metaphor, rather than being an inconsequential characteristic of language, is a way of organizing the ordinary conceptual system – they argue that “the essence of metaphor is understanding and experiencing one kind of thing in terms of another” (Lakoff and Johnson, 1980: 5).

³ Although Rappaport notes that the Tsembaga Maring regard these as opposing principles, he leaves ambiguous how static or dynamic these classifications may be. Frequently he reports that *x* is regarded as “hot” without specifying precisely what *-x*, its “cold” opposite, is. Therefore it is possible that some terms presented as opposites here are in fact missing a third term: for example, the full distinction between ritually prepared warriors and women might be ritually prepared warriors : [men] :: [men] : women – but the bracketed term is not discussed by Rappaport. Rappaport also does not indicate whether his informants' use of the hot-cold opposition reflects an underlying catalogue of opposites or only a rough-and-ready distinction applied as conversationally appropriate. These ambiguities, however, do not vitiate his observation that the Tsembaga Maring use classifications as described above.

We would argue that the three approaches we just described, in spite of their different foci, essentially point to a single phenomenon: the recurrent use of distinctions across different domains. Often the distinctions are dichotomous; sometimes they are polytomous. Their significance, the patterns of rights, duties and permissions that they reveal, and the image of the world that they embody vary from one society to the next. Yet in every culture some distinctions are used in ways that are cross-conceptual, semantic and practical boundaries.

From an epidemiology-of-beliefs perspective, this level of cultural organization is quite unexpected: there is no *a priori* reason to expect that from the aggregation of ideas in a community there will emerge such large-scale patterns. The use of these distinctions in such a variety of domains, each with its own behavioral implications, suggests that the contrast is drawn in a form that it is not readily used in communication, or even verbalized at all. Rather, Tsembaga infer, as did Rappaport, the nature (and limits) of this distinction from the variety of contexts in which it is used. It is presently an open anthropological question how such distinctions arise.

Cognitive Source: Decomposition

Our second cognitive principle is that of decomposition, the cognitive strategy of breaking processes down into their component elements, each of which is handled by dedicated cognitive mechanisms: the processing of a visual object's identity, for example, is handled by a different mental subsystem than is the object's location. The enormous variety of neural deficits (Gardner, 1985) and experimental studies (Hirschfeld and Gelman, 1994) attest to the mind's tendency to parcel out different aspects of a task to different mechanisms. As a consequence of the cognitive principle of decomposition, the mind is best viewed as bundles within bundles of task-specific microprocessors.⁴

Interaction between the principle of decomposition and the principle of relevance yields a mind in which the specialized sub-processors may be used for a wide variety of problems that seem, on a surface level, to have little in

⁴ Those familiar with psychological literature will recognize the similarity between our principle of decomposition and notions of modularity (structural or functional) and domain specificity. We have chosen the more general, but more precise, notion of decomposition rather than either of these terms because claims about modularity and domain specificity often conflate a variety of issues – innateness, anatomical distinctiveness, relation to semantics – which need not burden our argument, and because the arguments between connectionists and modularity advocates are irrelevant to the present argument, because connectionist networks decompose the computational components of the processes they perform.

common. For example, the theory of mind mechanism – the specialized cognitive mechanism used to interpret other people’s states of mind – is used not only in interactions with other people, but in reading texts, and in thinking about computers, nations, and all sorts of non-human animals. These kinds of problems have nothing obvious in common, but notions of understanding and intent are useful cognitive tools for making sense of them. One might say, with Daniel Dennett (1987), that the theory of mind is a very powerful mental heuristic, even when applied to entities that cannot really be said to have minds.

We suggest that this is how cross-domain distinctions should be understood. Distinctions are conceptual tools, and, while they may be expressed as opposing terms, they often seem to involve further dimensions of contrast not obviously related to the terms they use. The calculation of cross-domain distinctions is a computational process, used for a variety of problems that may not have anything obvious in common. When the Tsembaga Maring used a hot/dry/hard (*romba-nda*) vs. cold/wet/soft (*kinim*) distinction to describe differences between ritually prepared warriors and women, strength and fertility, upper body and lower body, land-only animals and animals associated with water, food and drink, it may not be because there is any obvious resemblance between hotness, warriors, strength, land-only animals, and food – there is not, or at least not more than between hotness, women, fertility and land-only animals. Rather, we suggest, the same computational process that serves, along with others, to distinguish cold and hot is also employed, along with different others, to distinguish women from men and, along with still others, to distinguish animals associated with water from those that live on land only. What precise computational elements these distinctions share we cannot say without further investigation, nor can we be sure that an ethnographer could hit upon precisely the same tool as native informants. What we can say is that the recurrence of distinctions is not surprising, given the principles of decomposition and relevance, and we suggest that these operating principles of the mind explain why there is a general phenomenon of cross-domain distinctions. Of course, more specific explanations would be required to account for specific distinctions – our concern here is only to explain them generally, as a common property of cultures – but, conversely, more specific explanations are by themselves insufficient to explain the generality of the phenomenon.

Conceptual ‘Bleeding’

The second attribute of culture treated here is the ‘bleeding’ of properties between associated concepts. The ‘bleeding’ of properties across distinct but associated (indeed, often jointly invoked) concepts is well documented in the

anthropological literature, and forms the basis of what Claude Lévi-Strauss (1966) termed the “science of the concrete.” While Levi-Strauss focused on dyadic pairs – such as the Siberian Yakut’s use of a woodpecker’s beak to treat a toothache – conceptual bleeding is not limited to them: Godfrey Lienhardt (1961) discusses the tendency among the Dinka for clan divinities to form “little groups of associated images.” Lienhardt’s first example is worth quoting at length because of the large number of associations involved (1961: 111):

The imagery of the divinities of the Pajiang clan is an illustration of this. It may be said of this clan, by those who are not members of it and when no members are present, that its divinity is Excrement. Pajiang . . . acquired the black cobra as its clan-divinity; this is a deadly snake, and the Dinka regard its swift bite as inevitably fatal. The black cobra . . . is for this and other reasons specially associated with night-witches, who are thought to use its blood and venom to injure their victims. The darkness of the cobra and its unexpected and deadly attack connect it with the secret nocturnal operations of the most powerful witches the Dinka can imagine; and as the cobra sheds and leaves its skin (*roc kuac*) and disappears, to appear anew and claim further victims, so witches are thought to renew themselves and return to cause further injury. One of the signs which lead a man to suspect witchcraft is to find human excrement in his homestead when he wakes in the morning. To excrete in the homestead, as an anti-social act of particular unpleasantness, is thought to be a witch’s habit. Hence the total constellation of imagery around the black cobra includes human excrement, and thus the notion that Excrement may be the divinity of the clan which respects this creature.

In the case of another clan, Pajiek, brushes, head carrying rings, and “more widely the whole action of sweeping” are all respected because they are made out of *wec* grass, the clan divinity. Lienhardt reports that lions and anthills are divinities of the same clan because lions often find shelter in the bushes surrounding anthills. The *deleib* palm is associated with a certain grain because the pestle used to grind the grain is made of *deleib* palm wood. Lienhardt gives further examples, and many more could be recounted from the anthropological literature, but we trust that these suffice to identify the kinds of associations we have in mind.

It is worth noting at this point that Sperber (1985a) has suggested that data of the kind reported by Lienhardt are often interpretive descriptions of fragmentary patterns that have been uttered at some point by some informants. Lienhardt, then (in Sperber’s view), is effectively conflating several of these patterns in order to reflect what he perceives as the inherent systematicity of these representations. While we have reservations about the way Lienhardt presents his evidence, we believe that, in this case, the apparent systematicity is not simply an interpretive artifact. Sperber’s main example of interpretation in ethnography is Evans-Pritchard’s account of sacrifice in *Nuer religion*.

Sacrifice, according to Evans-Pritchard, is a form of contract between humans and God. Sperber rightly notes that this interpretation of sacrifice is many times removed from what Evans-Pritchard could actually observe. Conversely, it is perfectly plausible that Dinka readily and explicitly made these associations in speech (though we cannot be certain because accurate reporting of utterances was not Lienhardt's aim). It is very likely that different Dinka would not recognize all of these associations, or would interpret some of them differently; nonetheless, we think that the propensity to make such associations is, as we will later argue, simply the outcome of the way memory is instantiated in the mind. For now, let us stipulate that at least some of these associations are made by at least some people under some circumstances.

The sorts of associations people make are not principled in an obvious and transparent way. Some of the associations above could be described loosely as "causal" – the connections between excrement and witches, between pestle and grain – but as many are coincidental – the blackness of cobra and night, the lion and the anthill – so we do not see a particular causal bias in the connections. Rather, associations seem to follow a variety of paths, some quite opaque to outsiders, as Lienhardt notes (1961: 112). That a large number of different kinds of associations can connect concepts in people's minds is also evidenced by a linguistic study by Casagrande and Hale (1967), who found that in Papago folk definitions concepts can be linked by 13 different relations, including precedence, co-occurrence, source, analogy and others.

Unlike the cross-domain distinctions discussed above, conceptual bleeding focuses on explicitly described and readily verbalized properties of the specific concepts involved. In understanding cross-domain distinctions, the ethnographic challenge is to discern precisely the unarticulated principle of distinction; the challenge in understanding conceptual bleeding is to trace the (usually heterogeneous) connections from one concept to another.

Cognitive Source: Semantic Networks

Our third and final cognitive principle derives from associative theories of semantic memory (Smith, 1978). Semantic memory refers to the capacity of humans to acquire and use knowledge about the world. It is generally defined in opposition to episodic memory, which refers to the capacity to remember previous experiences as experienced (Tulving, 1985, 1995). The vast number of things we hold in our memory, and the speed with which they can be retrieved, imply that this knowledge is organized in an efficient way. When trying to build a computer model of human information processing, Quillian (1968) proposed that semantic memory is organized as a network composed of nodes – concepts – and links between the nodes, which represent the prop-

erties of the concepts. These associative links are weighted; that is, they are more or less strongly activated when the corresponding node is activated.⁵

Two general characteristics of network models are particularly relevant for the understanding of conceptual bleeding. The first is known as “spreading activation” (Collins and Loftus, 1975). This refers to the notion that the activation of a node in the network through retrieval (recalling the concept of seagull) also leads to a partial activation of connected nodes (bird, fish as food, etc.) However, because the activation of connected nodes is only partial, downstream activations fade out over the space of the network.

The second relevant characteristic is known as the developmental perspective. This simply posits that strength of association (and, therefore, ease of activation, and ultimately of recall) is proportional to degree of exposure. The connection between the ‘my birthday’ network node and my date of birth is very strong, because it has been activated thousands of times. That between ‘my grandfather’s birthday’ and his date of birth has been activated many fewer times, and so it would take me longer to state my grandfather’s birth date than my own.

Three decades of psychological research has provided a great deal of evidence for the network organization of semantic memory. To take just one classic example, Meyer and Schvaneveldt (1976; Meyer *et al.*, 1972) found that semantic priming aids performance in a lexical decision task. Lexical decision tasks are simple experiments in which participants are given a stimulus – a string of letters – and asked to decide whether it forms a word or not. Meyer and colleagues used stimulus pairs, composed of either two words, two non-words, or one of each; in the two-word pairs, they used both semantically related (bread, butter) and non related items (bread, engine). Participants had to make lexical decision about each element of the pair in turn. These decisions were faster if a stimulus word was preceded by a semantically related stimulus word. Speed of response can be used as a metric for closeness of association, which makes it possible to map the network with some precision.

How far can evidence obtained in laboratory studies speak to the anthropological problem of conceptual ‘bleeding?’ While anthropologists rightly criticize the ease with which some psychologists extrapolate from small samples to the whole of world cultures, there is a vast amount of real-world evidence that converges with the experimental evidence for the semantic network organization model of memory.

⁵ The best-known implementation of the associative network approach is known as the hierarchical network model (Collins and Quillian, 1969), but the specifics of this version (and their criticism) are not relevant for our claims.

First, associative theories of semantic memory can account for the developmental process of cultural learning observable in all human societies. In particular, the model helps explain problems associated with adult cultural learning. While children acquire their native culture effortlessly, learning (as an immigrant, a refugee, or an anthropologist) the structuring principles of a new culture after having been raised in another is a strenuous task that entails the meticulous dismantling and rebuilding of semantic networks. For example, the association between cobras and witches found among the Dinka would not be familiar or intuitive to most people who have been raised outside Dinka society. The classic memory studies by Bartlett (1932) showed that when English participants struggled to remember the unfamiliar features of a Kwakiutl tale (originally collected by Franz Boas), they filled in what they perceived as holes in the narrative with their own culturally-derived expectations.

Secondly, the semantic network organization of human memory predicts that it will perform best when dealing with specific sorts of input. As we argued in the introduction, most common cultural products exploit the most efficient aspects of the memory system. For example, content-rich myths that do not rely on verbatim narration are very widespread in oral cultures, even though there is no intrinsic reason for their popularity. Naturally, the opposite also holds: cultural items that run afoul of the same formal constraints – specifically, in failing to exploit the network-like structure of semantic memory – will be less likely to be remembered, and therefore to be transmitted from one person to the next.⁶ Bateson (1958 [1936]), for example, estimates that learned Iatmul men can remember between ten and twenty thousand names. However, he argues that rote memory plays a negligible role in the process of remembering (1958 [1936]: 222f.):

The names which are remembered are almost all of them compounds, each containing from four to six syllables, and they refer to details of esoteric mythology, so that each name has at least a leaven of meaning. The names are arranged in pairs, and the names in any one pair generally resemble each other much as the word Tweedledum resembles the word Tweedledee – with the notable difference that the altered syllable or syllables generally have some meaning and are connected together by some simple type of association, e.g. either by contrast or by synonymy. A progressive alteration of meaning may run through a series of pairs.

⁶ Although exceptions do occur – witness the importance of accurate genealogical recitation in many societies – they are characteristically (1) of fundamental cultural significance and (2) their handling is restricted to a specialized sector of society (who can presumably devote time and resources to this special kind of learning).

Let us now reconsider the cross-culturally recurrent phenomenon of conceptual bleeding in the light of the above considerations (Fig. 1).

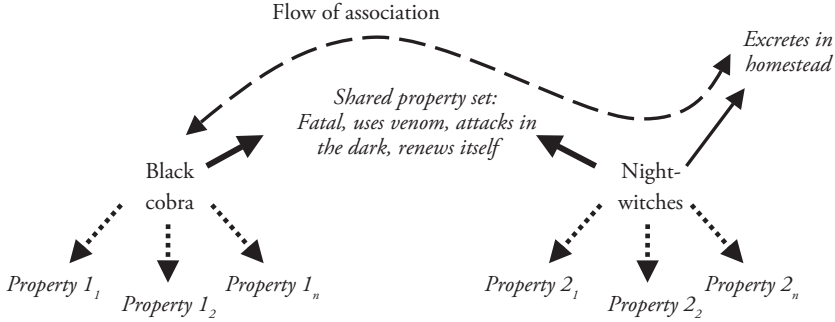


Figure 1. A representation of Dinka associations between concepts. Properties of concepts are italicized; properties that are presumed to exist, but for which there is no direct evidence are connected to concepts by dotted arrows. The path of association described by Lienhardt is depicted by a dashed line.

Because of the organization of human memory, properties shared by two concepts become activated when either concept is recalled; and when a concept is recalled, the activation spreads from it to other concepts through the properties they have in common, progressively losing power. Thus, in the Dinka example the cobra and the night-witch are both dangerous, use venom to injure their victims, and are able to renew themselves. The large number of shared properties makes it likely that invoking the image of a cobra will prime that of a witch in people’s minds – and *vice versa*. The enhanced ease of activation is in turn responsible for the increased likelihood that both concepts will be recalled and produced at the same time, and that the association will be recognized by others who possess the same kind of network structure.

Conclusions

At the outset of this paper, we undertook to show that some organizational features of culture could be fruitfully described and explained in terms of operating principles of the human mind. Arguments about the relation between culture and mind tend either to see culture as mind writ large or to see mind as culture writ small. Whether as a matter of disciplinary priority (“We have the real action”) or familiarity and comfort, anthropologists and

psychologists have tended to minimize each other's purview and to make extravagant claims about their own. But this is nonsense: culture and mind cannot be reduced to each other, either at present or in the foreseeable future.

The kind of theorizing we engage here focuses on the interaction between dynamic cognitive processes and larger social and ecological processes. It differs from preceding kinds of inquiries in its dynamism: whereas most other work on culture and cognition holds one term fixed and examines its influence on the other, we focus on the interaction between cognitive and social processes. Harvey Whitehouse's theory of modes of religiosity (Whitehouse, 1995, 2000, 2004) is the best developed theory along these lines, delineating broad patterns in religiosity that result from the interaction of memory and social structure. Malley's (2004) ethnography of evangelicals' Bible use also emphasizes the interaction between social and cognitive processes in an institutional context.

We have tried here to show how a few kinds of cultural patterns may be identified with a few cognitive processes. But in making this identification we do not dispose of either. The cultural patterns that ethnographers have observed among the Dinka and the Trobrianders and the Maring are not straightforward manifestations of individual thought, but are the product of minds in interaction with each other and their environment, in a historical context. This is why we have spoken of kinds of cultural order: a kind of cultural order can be identified with a cognitive process, but the specific ideational structure that emerges could not have been predicted from cognition alone. Conversely, the cognitive processes we have described are manifest also in many non-cultural forms, and general cognitive processes cannot be derived from the kinds of specific inputs that ethnographers have identified.

Acknowledgements

We thank Rita Astuti and Fabrice Clément for their helpful comments on an earlier version. Parts of this paper were presented at the workshop on "Bringing together anthropological and psychological methods in the study of cognitive development and cultural transmission," organized by Dr Astuti, held at the London School of Economics in January 2006, and sponsored by ESRC and the LSE Department of Anthropology. We gratefully acknowledge the participants for their comments and stimulating discussions. Pascal Boyer provided valuable commentary on a previous version.

References

- Atran, S. (1990). *Cognitive foundations of natural history: Towards an anthropology of science*. Cambridge University Press, Cambridge.
- (2002). *In gods we trust: The evolutionary landscape of religion*. Oxford University Press, Oxford.
- Bartlett, F. C. (1932). *Remembering: an experimental and social study*. Cambridge University Press, Cambridge.
- Bateson, G. (1958 [1936]). *Naven: a survey of the problems suggested by a composite picture of the culture of a New Guinea tribe drawn from three points of view*, second edn. Stanford University Press, Stanford, CA.
- (1972). *Steps to an ecology of mind*. Ballantine Books, New York, NY.
- Bloch, M. (1998). *How we think they think: anthropological approaches to cognition, memory, and literacy*. Westview Press, Boulder, CO.
- Bloch, M., and Sperber, D. (2002). Kinship and evolved psychological dispositions: the mother's brother controversy reconsidered. *Current Anthropology* 43, 723-748.
- Boyer, P. (1994). *The naturalness of religious ideas: a cognitive theory of religion*. University of California Press, Berkeley, CA.
- (2001). *Religion explained: the evolutionary origins of religious thought*. Basic Books, New York, NY.
- Casagrande, J. B., and Hale, K. L. (1967). Semantic relationships in Papago folk definitions. In D. Hymes (Ed.), *Language in culture and society*. Harper and Row, New York, NY.
- Chomsky, N. (1957). *Syntactic structures*. Mouton, 's-Gravenhage.
- Cole, M. (1996). *Cultural psychology: a once and future discipline*. Harvard University Press, Cambridge, MA.
- Collins, A. M., and Loftus, E. F. (1975). A spreading activation theory of semantic processing. *Psychological Review* 82, 407-428.
- Collins, A. M., and Quillian, M. R. (1969). Retrieval time from semantic memory. *Journal of Verbal Learning and Behavior* 8, 240-248.
- D'Andrade, R. G. (1987). A folk model of the mind. In D. Holland and N. Quinn (Eds.), *Cultural models in language and thought*, pp. 112-148. Cambridge University Press, Cambridge.
- Dennett, D. C. (1987). *The intentional stance*. MIT Press, Cambridge, MA.
- Durkheim, É. (1995 [1912]). *The elementary forms of religious life* (K. E. Fields, Trans.). The Free Press, New York, NY.
- Gardner, H. (1985). *The mind's new science: a history of the cognitive revolution*. Basic Books, New York, NY.
- Gatewood, J. (1998). *Some formal contrasts between language and other forms of behavior-action*. Paper presented at the Conference Name]. Retrieved Access Date]. from URL].
- Geertz, C. (1973). *The interpretation of cultures: selected essays*. Basic Books, New York, NY.
- Grice, H. P. (1989). *Studies in the way of words*. Harvard University Press, Cambridge, MA.
- Hirschfeld, L. A. (1986). Kinship and cognition: Genealogy and the meaning of kinship terms. *Current Anthropology*, 27, 217-242.
- (1989). Rethinking the acquisition of kinship terms. *International Journal of Behavioral Development*, 12, 541-568.
- (1996). *Race in the making: Cognition, culture, and the child's construction of human kinds*. MIT Press, Cambridge, MA.
- Hirschfeld, L. A., and Gelman, S. A. (1994). *Mapping the mind: Domain specificity in cognition and culture*. Cambridge University Press, Cambridge.
- Holland, J. H. (1992). *Adaptation in natural and artificial systems: an introductory analysis with applications to biology, control, and artificial intelligence*. MIT Press, Cambridge, MA.

- Holland, J. H., Holyoak, K. J., Nisbett, R. E., and Thagard, P. R. (1986). *Induction: processes of inference, learning, and discovery*. MIT Press, Cambridge, MA.
- Keesing, R. M. (1982). *Kwaio religion: the living and the dead in a Solomon Island society*. Columbia University Press, New York, NY.
- Lakoff, G., and Johnson, M. (1980). *Metaphors we live by*. University of Chicago Press, Chicago, IL.
- Leach, E. R. (1954). *Political systems of highland Burma: a study of Kachin social structure*. Harvard University Press, Cambridge, MA.
- Lévi-Strauss, C. (1963 [1956]). Do dual organizations exist? In *Structural anthropology*. Basic Books, New York, NY.
- (1966). *The savage mind*. The University of Chicago Press, Chicago, IL.
- Lévy-Bruhl, L. (1923). *Primitive mentality* (L. A. Clare, Trans.). Macmillan, New York, NY.
- Lienhardt, R. G. (1961). *Divinity and experience: the religion of the Dinka*. Clarendon Press, Oxford.
- Malley, B. E. (2004). *How the Bible works: an anthropological study of Evangelical Biblicism*. AltaMira Press, Walnut Creek, CA.
- Maybury-Lewis, D., and Almagor, U. (Eds.). (1989). *The attraction of opposites: thought and society in the dualistic mode*. University of Michigan Press Ann Arbor, MI.
- Meyer, D. E., and Schvaneveldt, R. W. (1976). Meaning, memory structure, and mental process. *Science*, 192, 27-33.
- Meyer, D. E., Schvaneveldt, R. W., and Ruddy, M. G. (1972). *Activation of lexical memory*. Paper presented at the Paper presented at the meeting of the Psychonomic Society, St. Louis, MO.
- Needham, R. (Ed.). (1973). *Right and left: essays on dual symbolic classification*. University of Chicago Press, Chicago, IL.
- Nisbett, R. E. (2003). *The geography of thought: How Asians and westerners think differently – and why*. Free Press, New York, NY.
- Norenzayan, A., Atran, S., Faulkner, J., and Schaller, M. (2006). Memory and mystery: the cultural selection of minimally counterintuitive narratives. *Cognitive Science* 30, 531-553.
- Ortner, S. B. (1973). On key symbols. *American Anthropologist* 75, 1338-1346.
- Owsianiecki, L., Upal, A., Slone, D. J., and Tweney, R. D. (Forthcoming). Role of context in the recall of counterintuitive concepts.
- Quillian, M. R. (1968). Semantic memory. In M. Minsky (Ed.), *Semantic information processing*. MIT Press, Cambridge, MA.
- Quinn, N. (1996). Culture and contradiction: The case of Americans reasoning about marriage. *Ethos*, 24, 391-425.
- Rappaport, R. A. (1984 [1968]). *Pigs for the ancestors: ritual in the ecology of a New Guinea people*, enlarged edn. Yale University Press, New Haven, CT.
- Smith, E. E. (1978). Theories of semantic memory. In W. K. Estes (Ed.), *Handbook of learning and cognitive processes*, pp. 1-56. Erlbaum, Hillsdale, NJ.
- Sperber, D. (1985a). Interpretive ethnography and theoretical anthropology. In *On anthropological knowledge: three essays*. Cambridge University Press, Cambridge.
- (1985b). *On anthropological knowledge: three essays*. Cambridge University Press, Cambridge.
- (1996). *Explaining culture: a naturalistic approach*. Blackwell, Oxford.
- Strauss, C. (1990). Who gets ahead? Cognitive responses in heteroglossia in American political culture. *American Ethnologist* 17, 312-328.
- Strauss, C. and Quinn, N. (1997). *A cognitive theory of cultural meaning*. Cambridge University Press, Cambridge.
- Tedlock, D. and Mannheim, B. (Eds.). (1995). *The dialogic emergence of culture*. University of Illinois Press, Champaign, IL.
- Tulving, E. (1985). How many memory systems are there? *American Psychologist* 40, 385-398.

- (1995). Organization of memory: quo vadis? In M. S. Gazzaniga (Ed.), *The cognitive neurosciences*. MIT Press, Cambridge, MA.
- Van der Henst, J. B. and Sperber, D. (2004). Testing the cognitive and communicative principles of relevance. In I. Noveck and D. Sperber (Eds.), *Experimental pragmatics*. Palgrave, Basingstoke.
- Van der Henst, J. B., Carles, L. and Sperber, D. (2002). Truthfulness and relevance in telling the time. *Mind and Language* 17, 457-466.

