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Abstract: To approach society and culture in a naturalistic way, the domain of the social sciences must be reconceptualised by recognising only entities and processes of which we have a naturalistic understanding. These are mental representations and public productions, the processes that causally link them, the causal chains that bond these links, and the complex webs of such causal chains that criss-cross human populations over time and space. Such causal chains may distribute and stabilise representations and productions throughout a human population, thereby generating culture. The lecture introduces several conceptual tools useful for such a naturalistic approach, and illustrates their use with the case study of ritual activity in a Southern Ethiopian household.

CONCEPTUAL TOOLS FOR A NATURAL SCIENCE OF SOCIETY AND CULTURE

Dan Sperber

In 'On Social Structure', Radcliffe-Brown wrote:

I conceive of social anthropology as the theoretical natural science of human society, that is, the investigation of social phenomena by methods essentially similar to those used in the physical and biological sciences. ... there are some ethnologists or anthropologists who hold that it is not possible, or at least not profitable, to apply to social phenomena the theoretical methods of natural science. For these persons social anthropology, as I have defined it, is something that does not and never will exist. For them, of course, my remarks will have no meaning, or at least not the meaning I intend (Radcliffe-Brown 1952: 189).

The sceptics may feel vindicated by the fact that, sixty years later, a natural science of society is yet to come. Obviously, Radcliffe-Brown underestimated the difficulties. However, at this turn of millennium, we may be better equipped to approach social phenomena in a truly naturalistic way.

What makes a science natural is both its ontology and its method, the kinds of phenomena it recognises as being part of the world, and the way it seeks to explain them. What are the phenomena to be explained in anthropology, and what counts as an explanation? There is little interest in these questions, and even less agreement on the answers. This has, from the point of view of a producer of anthropological explanations, the advantage that almost anything goes, and, from the point of view of a consumer, the disadvantage that almost anything goes.

I have suggested we play (not instead, but also) a different game (see Sperber 1996). The game is called 'naturalistic causal explanation'. The motto of the game is 'Whatever has causal powers has them in virtue of its material properties.' The first rule of the game is: 'Don't recognise phenomena unless your grasp of their material mode of existence justifies your attributing them causal powers.' The second rule is: 'Don't make a causal claim unless you can back it with the description of a mechanism, a description fine-grained enough for it to be reasonable to ask neighbouring natural sciences to fill in the missing parts'. The game is played in fields that should be familiar to anthropologists such as biology, ecology, or geomorphology. (On the other hand, don't seek a model in theoretical physics: the game there is a very different one).

It is common in anthropology to think that the social-cultural phenomena we have to describe and explain are macro-phenomena, such as 'kinship', 'state', 'capitalism', 'power', 'religion', 'ideology', and so on, related to one another and explainable in terms of their mutual relationships within a 'social structure'. Such explanations are not naturalistic, nor are they usually intended to be. (Radcliffe-Brown who both wanted a natural science and accepted much of the non-natural ontology of the social sciences was an exception.) From a naturalistic point of view, we must either dispense with such macro-entities, or unpack them in terms of micro-phenomena. To

reconceptualise the field we may draw inspiration from a science that is at once social and natural, I mean medical epidemiology. In epidemiology, social macro-phenomena such as endemic and epidemic diseases are unpacked in terms of patterns of micro-phenomena of individual pathology and inter-individual transmission. In this lecture, I would like to characterise some of the most basic conceptual tools needed to develop a naturalistic approach to social and cultural phenomena, to develop, that is, an ‘epidemiology of representations’.

To help suggest how this conceptual rethinking may also be relevant to more traditional anthropological pursuits, let me introduce an ethnographic example, derived from my fieldwork among the Dorzé of South Ethiopia.

Among the many ways of explaining and coping with misfortune, two types deserve special attention, both for their world-wide recurrence and for their socio-cultural import: mystical aggression or witchcraft, and mystical sanctions resulting from the transgression of taboos. In both types, misfortune is seen as initially caused by a human agent. In the case of mystical aggression, the culprit and the victim are distinct and indeed hostile individuals (or groups). In the case of transgression, the culprit and the victim are one and the same individual (or group). Many societies, while acknowledging both mystical aggression and transgression as possible explanations of misfortune, greatly favour one type of explanation over the other. This difference in the ascription of responsibility is rich in moral and social implications. For instance, in a witchcraft-oriented society, personal enrichment is likely to be viewed as evidence of guilt and therefore to be discouraged, whereas in a taboo-oriented society, it is likely to be viewed as evidence of moral worth and to be encouraged.

The Zandé are a paradigmatic case of a society where mystical aggression is the preferred explanation of misfortune (Evans-Pritchard 1937). The Dorzé were, when I visited them some thirty years ago, extreme in their preference for explanations in terms of transgression. When a misfortune occurred, most Dorzé would ask as a matter of course: ‘With which *gomé* did the misfortune come?’ The term *gomé* denotes both the act of transgression and the resulting mystical sanction.

Dorzé adults could list hundreds of rules the transgression of which would be *gomé*. Here are a few examples: it is *gomé* to let a drop of human blood fall in the food, to cook over a fire where a lizard has died, to ride a dog, to kill a snake, to have intercourse with a tanner or a potter (except, of course, for tanners and potters), to sacrifice an animal when one’s father is alive, or to commit perjury. The rules are so many that everyone is likely to have been wittingly or unwittingly guilty of several transgressions. This does not seem to worry people. The problem of establishing that a particular transgression took place arises only when diviners are consulted, either because of a misfortune, or in order to ascertain whether a sacrifice has been successful.

Only diviners are expected to know all the different types of *gomé*, and all the ritual practices that must be followed in order to expiate the transgression. These diviners are of two main types. There are enteromancers who can ‘read’, from the entrails of a sacrificed sheep or goat, which transgressions have been committed by the sacrificer or his dependants. This is a form of knowledge acquired with experience and typically held by senior men themselves sacrificers. After having performed a sacrifice, a man will typically show the entrails to one or several senior neighbours who are competent in enteromancy. The second category of diviners are seers who use a variety of techniques the most common one being geomancy. More important than the techniques they use, is the seers’ special divinatory gift, often linked to spirit possession. Seers can be men or women, central or marginal members of the community. People will often visit a seer at some distance from their home. Unlike consultations of enteromancers, consultations of seers tend to be private and discreet affairs.

The ensemble of representations and practices involving the notion of *gomé* could be described as a cultural system and a major component of the Dorzé worldview. It could be described as a system of norms that shapes social relations and helps maintain social cohesion and power structures. Both types of macro-level description would be insightful, and I do not particularly want to argue against

them. It should be obvious however that neither the cultural nor the functional-structural approach is naturalistic. Does the ethnographic data also lend itself to a more naturalistic approach, and could it provide relevant evidence in a naturalistic science of society and culture? To try and answer this, we must look – or here just peek – at the data at a lower, much more concrete level.

Ideas involving *gomé* and related practices are deployed in interindividual interactions, and in particular in consultations of diviners and in ritual practices. In spite of their variety, these interactions tend to follow a general pattern that can be represented in diagrammatic form (see [figure 1](#)). I will illustrate the various possible sequences in this diagram with three chains of events that took place in Albazo's household over a period of five months (names have been changed – for a more detailed discussion, see Sperber 1980). His was one of a sample of forty households the ritual activities of which were followed for a period of seven months in 1970-71 (in collaboration with Judith Olmstead who was surveying these households in a more systematic manner, and with her assistant Abesha Alemu – see Olmstead 1974, 1975). Albazo was at the time a thirty-five year old weaver. He had spent several years working in Addis Ababa and had come back a year before, at the death of his father. Present in his compound were his mother Bodé, his wife Maté and a young sister's daughter who helped with domestic chores. Albazo's younger brother Abaté had remained in Addis Ababa to work. Albazo and Maté were without children: an infant son had died a few years earlier. Albazo was well off and could have felt quite contented if it had not been for his being childless, and also for his mother not quite acknowledging that he was now the head of the household and treating him like a child.

Chain of events 1: In September 1970, at the time of the Ethiopian Maskal festival, Albazo sacrificed a lamb saying: 'Oh Maskal, you who have led me happily until now, be thanked!' He showed the entrails to three enteromancers of the neighbourhood. They said: 'There is a *gomé* of mother's insults.' Albazo recognised that his mother Bodé had indeed insulted him, because he had bought clothes for his wife Maté and not for her. The enteromancers instructed Albazo to make amend to his mother and to end the *gomé* with a libation, and so he did. This is a case of a sacrifice caused by the happy event of Maskal, resulting in a consultation of diviners, the identification of a minor *gomé*, and an offering to put and end it. (Figure 1, path **e-c-d**)

Chain of events 2: In October 1970, Albazo's wife, Maté, whose eyes had been hurting her for several days went to consult a seer. The seer, a geomancer, looked at the pebbles and said: 'There is a *gomé* of honey.' Maté remembered having eaten some of the honey her husband kept for offerings. Instructed by the diviner, she confessed her fault to her husband who made an offering of honey. This is a case of misfortune resulting in the consultation of a seer and in an offering. Neither sacrifice nor enteromancy is involved. (Figure 1, path **a-g**)

Chain of events 3: In January 1971, Albazo sacrificed a kid to his *k'ada ts'ala'e*, his 'good luck demon,' in order to find out why, unlike his friends, he was still childless. He showed the entrails to three enteromancers of his neighbourhood. They said: 'it is the *gomé* of the mother who gave you birth. She does not want you to have a child, and out of rancour, she cursed you. She should ask for forgiveness and give you a sheep [to sacrifice]'. Bodé indeed confessed to being filled with bad feelings towards her son, and gave him a lamb. Albazo sacrificed the lamb and showed the entrails to the same three enteromancers. This time they said: 'there is a *gomé* of you and your wife. Your *gomé* is to have said: 'Don't let me have a child from her!' and her *gomé* is to have said: 'Don't let me have a child from him!' Gather old men, have them forgive you both and make an offering of beer!' And so was done. This is a case of a misfortune so serious that a sacrifice performed in order to consult geomancers, resulting in a second sacrifice and then an offering. (Figure 1, path **f-c-h-c-d**)

Before leaving aside, for the time being, the story of Albazo, let me highlight what may have been its main import for the people involved. Albazo, his mother, and his wife were going through a transitory phase, after the recent death of his father. Albazo's new position as household head, his descent, his age, his wealth, should all have concurred in progressively making him a well-

established senior member of his community. However, he had no children, and too much of a mother. The part played by the diviners must be understood against this background. They took advantage of a Maskal sacrifice, an eye complaint of Maté, and a sacrifice directly aimed at divination to ease the tension and redefine the roles in Albazo's household. Let the son be kinder to his mother but let her acknowledge his authority; let the wife pay attention to her husband's new prerogatives; let the household head perform his new duties with serenity. Through divinatory procedures, the ineffective anxieties caused by misfortunes are refocussed on manageable psychological and social issues.

All this is, of course, anthropological data of a very familiar kind. In most cases, however, (with notable exceptions such as Fredrik Barth 1975) such micro-level data is used to illustrate an explanation given in terms of macro-level notions. What I want to suggest is that this micro-level is the proper level for naturalistic explanation. Now back to concepts.

Cognitive Causal Chains

At the time of Radcliffe-Brown, naturalistic explanations were not a genuine option in anthropology, nor, more generally, in the social sciences. The main reason for this has to do with the role that representations play in identifying the very objects of the social sciences. It is indeed quite impossible to identify most, if not all, social-cultural phenomena without crucially relying on the mental representations of social agents. There is no theoretical perspective from which the *gomé* system, for instance, could be described without attending to both general ideas Dorzé have about *gomé*, and ideas individuals have about the specific cases in which they are involved in one capacity or another.

Until recently, there was no hint of a way to naturalise representations. More specifically, representations have material and abstract properties. Materially, public representations such as utterances or symbolic gestures may consist of marks on paper, or bodily movements, or any other kind of object in the environment that humans can produce and perceive. The material character of public representations is relatively unproblematic and poses no serious challenge to a naturalistic approach. Mental representations such as memories or desires consist in neural patterns in the brain. With recent developments in neurology, the material character of mental representations begins to be investigated in scientific terms. The most serious difficulty facing any attempt to naturalise representations has to do with their abstract properties. Representations, whether mental or public, have content, which is an abstract property. Moreover it is by their content rather than by their material properties that we tend to identify representations. For instance, we can talk of the tale of Goldilocks and the Three Bears without referring to its various material realisations, in speech, in writing, or in brain activation patterns. On the other hand, we would hardly ever find it of interest to talk of these public or mental material realisations without identifying them first and foremost as bearers of the content of Goldilocks and the Three Bears.

How can the abstract property of content be realised or implemented in the material world? How can the fact that abstract properties carry no causal power be reconciled with the fact that the content of a representation can be highly relevant to explaining its causal relationships? One thing that has greatly helped answering these questions has been understanding how a computer program, which also has abstract content properties, can be materially realised and play a causal role in the world. With the recent development of the cognitive sciences – what is sometimes called the 'cognitive revolution' – the goal of naturalising representations is, for the first time, approached in a realistic manner. We begin to understand how material processes systematically implement content relationships, and have effects that are illuminated by these content relationships.

Let me sketch a brief and trivial illustration:

On October 31, at 7:30 p.m., Mrs. Jones's doorbell rings. Mrs. Jones hears the doorbell, and assumes that there is somebody at the door. She remembers it is Halloween: she enjoyed receiving treats as a child, and now, as an adult, she enjoys giving them. She guesses that there must be

children at the door ready to trick-or-treat, and that, if she opens, she will be able to give them the candies she has bought for the occasion. Mrs. Jones decides to open the door, and does so.

We have here an environmental change (the ringing of the doorbell), a process of perception (Mrs Jones hearing and recognising the doorbell), a process of epistemic inference (her inferring that there is somebody at the door), the retrieval from memory of a belief (that it is Halloween) and that of a desire (to give candies to children), a second process of epistemic inference (inferring that there must be children at the door ready to trick-or-treat), a process of practical inference (inferring that, in order to fulfil her desire to give candies, Mrs Jones should open the door) and the realisation of an intention (to open the door) resulting in an environmental change (the opening of the door). These events are causally related in a complex causal chain. This is a special kind of causal chain, that I will call a 'Cognitive Causal Chain', or 'CCC' for short. What makes it *cognitive* is, roughly, the fact that, to each of the *causal* link in the chain, there corresponds a *semantic* or *content* relationship. Mrs. Jones's perception of the doorbell ringing both represents the doorbell ringing, and is in part caused by it. Mrs. Jones remembering that it is Halloween and what is likely to happen now is similar in content (with appropriate updating) with the knowledge derived from previous experiences of Halloween, and has that stored knowledge among its causes. Mrs. Jones's coming to specific conclusions (whether epistemic – *someone is at the door, children are at the door ready to trick-or-treat* – or practical – *let me open the door*) is both justified by specific premises and caused in part by her entertaining these premises. Mrs. Jones's opening of the door both satisfies her intention to do so, and is caused in part¹ by this intention.

Semantic relationships such as truth, satisfaction, justification, or similarity of content are abstract relationships, and not causal ones. Perception, inference, remembering, and the carrying out of an intention are causal processes. These processes, however, are characterised in terms of the abstract semantic relationships they tend to instantiate. When we describe mental processes as processes of perception, inference, remembering, or intending, we mean that these processes tend to produce outputs that are in a characteristic semantic relationship to their inputs. A successful perception yields a representation that represents the very stimulus that caused the perception; a successful process of inference yields a conclusion justified by its input premises; a successful remembering yields a memory similar to the initially stored information; the successful carrying out of an intention brings about the state of affair represented in the intention.

Mental life is made of CCCs where the links are both semantic and causal, and not fortuitously so, but because the causal processes involved have the function of instantiating each a certain type of semantic relationship.² Materialists of the past could well postulate that the causal aspects of cognition should in principle be wholly describable in material terms, but it is only recently that we have become capable of actually describing material mechanisms that instantiate abstract semantic relationship. When describing CCCs, not only can we claim, on general grounds, that they occur in the brain and in the interactions between the brain and its environment; we can also begin to describe, in computational and neurological terms, the kind of material processes that realise these CCCs.

Assuming that the cognitive sciences do provide us with a naturalistic notion of mental representations (or, at least, with a notion that is in the process of being naturalised), how does this help us naturalise the notion – or notions – of representations used in the social sciences?

Psychologists are talking about individual mental representations. Social scientists are talking about representations that are in some sense collective (whether they use the term 'representation' or just talk of ideologies, beliefs, values, and so on, which are all kinds of representations). It could be argued, then, that 'representation' in psychology and 'representation' in the social sciences merely share the most basic property of representations in general, i.e. 'aboutness', being about something, having some 'content', but that otherwise they are quite different things.

Social Cognitive Causal Chains

The story of Mrs. Jones, as told so far, is typical of individual psychology: it is all about inputs to a single individual organism, its internal processes, its individual representations, and the behavioural outputs of this organism. In this particular case however, the causal chain directly involved other individuals, and to begin with, Billy and his little sister Julia:

Billy and Julia are following the Halloween practice of going from door to door in the street, hoping to be given candies. When they reach Mrs. Jones's door, Billy rings the bell with the intention of letting the house owner know that someone is at the door, and of making her open the door ... [*plug in Mrs. Jones's story as told above*] ... Mrs. Jones opens the door. Billy and Julia shout 'trick or treats!' Mrs. Jones gives them candies.

Ringling a doorbell is a process of communication. Like all processes of communication, it has the function of causing, in the mind of the addressee, the formation of a representation similar in content to a representation the communicator had in mind (in this case, the content is that the addressee should open the door to the ringer of the bell). Notice that, in such an inter-individual causal chain, the inter-individual links are no less cognitive (i.e. instantiating semantic relationship) than the intra-individual ones. Communication instantiates semantic relationships of similarity of content not within an individual but across individuals. When a CCC extends over several individuals, I will call it a 'social CCC'. Social CCCs may involve just two individuals, or a few, or extend indefinitely over social time and social space. Thus the interaction between Mrs. Jones and the children on the night of Halloween is just a fragment of a much longer and wider social CCC that links all particular Halloween events to the emergence of the practice and to one another.

Communication provides paradigmatic examples of social CCCs. In the case of an assertive act of communication, the social CCC typically goes from a mental event in the communicator, to an environmental event (e.g. the production of a signal such as a doorbell ring, or of a linguistic utterance), to a mental event in the addressee, and stops there. In the case of a request, the social CCC typically extends one step further, to a second environmental event that fulfils the request. Thus Mrs. Jones, having understood that someone wants the door opened, opens the door. Both Billy and Mrs. Jones form the intention that the door be opened. However, while Mrs. Jones is in a position to carry out this intention by herself, and does so, Billy, for the same purpose, needs to recruit Mrs. Jones, and does so by communicating a request. Mrs. Jones's fulfilment of Billy's request instantiate a semantic relationship between one individual's mental state and another individual's action. More generally, the fulfilment of a desire by means of a request to another individual is a major kind of social CCC. This is true of the very simple communication established by ringing a doorbell, or of the more elaborate back-and-forth communication involved in ongoing collective action.

While communication provides the most obvious cases, non-communicative forms of interaction may also determine social CCCs. These include imitation and other forms of emulation. Consider a group of people walking for the first time from a new settlement to some landmark in the distance. One person walks in front, choosing the best path through the bush – a cognitive process – and treading over grass and ground. The others follow in line, each contributing to marking the path. The following days, months and years, when people follow this footpath, they contribute each to maintaining it as a stable and salient feature of the landscape, causing others, or themselves on later occasions, to borrow it in turn. The path started its existence as the visible effect of a series of micro-decisions (of stepping here rather than there) of one individual. This visible effect caused other individuals to make similar micro-decisions, adding to the initial effect.

Now the path has become the collective production of all those who have followed it, an item of the socially shared landscape, and a spatially extended perceptual input guiding the steps of every new walker. There is, then, a social CCC going from the micro-decisions of past walkers to those of future walkers, via the environmental changes that each walker contributes. At times, as when walkers walk in line, there may be a deliberate imitation of the behaviour of one individual by

others. A solitary walker, on the other hand, may choose to follow a path without paying attention to the fact that, in so doing, she is emulating other people. Whether conscious or unconscious, such spontaneous forms of emulation may determine a social CCC, and this without resorting to communication proper.

Mental Representations and Public Productions (including Public Representations)

Social CCCs link together mental and public things. The mental things involved are mental representations and processes. These mental representations and processes may cause behaviours that alter the environment in ways that can be perceived and thus serve as stimuli to further cognitive processes. Some of these environmental changes are perceptible as processes, e.g. bodily movements, speech sounds; others are perceptible as stable states of the environment, e.g. the presence of paths, buildings, artefacts, or writings. I will call all such perceptible behaviours and effects of behaviour ‘public productions.’ Some public productions, for instance utterances, signals or pictures, are produced for the purpose of being perceived and causing mental representations. These ‘public representations’ form a particularly important subclass of public productions. Social CCCs, then, are characterised by an alternation, along the causal chain, of mental representations and public productions (including public representations).

The three chains of events in Albazo’s story were each a case of a social CCC. The point of saying this is not to introduce new terminology for terminology’s sake. It is to suggest a level at which the very different ingredients of such a causal chain, worries, misfortune, divination, confession, sacrifices, offerings, and so forth, can be seen as an alternation, along the causal chain, of public productions and mental representations that are linked both by causal relations and by content relations. The mental representations involved were beliefs and desires both caused and justified by public events, and most of the public productions were, in this case, public representations such as utterances and symbolic gestures fulfilling mental intentions and caused by these intentions.

In the diagram I presented earlier (figure 1), outlining the various kinds of *gomé*-related chains of events, only public events were mentioned. But public events cause further public events through the mediation of mental events, which must also be taken into consideration. To illustrate this, let us go back to the second chain of events. Albazo’s wife, Maté, suffering from eye pain, goes and consults a seer. But what are the psychological processes that link her eye pain to her going to consult a seer? Not all such pains result in such a course of action. Maté might have sought help in traditional medicine, or she might have waited for the pain to go. However, her husband’s mother, Bodé, had, a few days earlier, scored a kind of domestic victory: after Albazo had sacrificed a thanksgiving lamb, the enteromancers had diagnosed a *gomé* caused by his having bought clothes for his wife but not for his mother. By going to the seer, Maté makes sure that her husband next ritual action will be for her sake. In other words, Maté’s capacity to anticipate some indirect effects of her action may well be playing a decisive role.

When the seer diagnoses a ‘*gomé* of honey’, Maté could interpret this in various manners. She could for instance have wondered whether she had unwittingly spoiled honey or mead. Or she could reject the seer’s diagnosis by saying that she did not see what he could be referring to. In this case, however, the words of the seers cause her to remember having eaten from her husband’s ritual honey. By interpreting the seer’s diagnosis as referring to such an event, Maté turns the fault to which she will have to confess into a reassertion of her husband’s privileges as the new head of the household. After the consultation, Maté could have decided to ignore it altogether, or maybe to go and see another seer. Similarly, her husband Albazo could have dismissed the whole matter. Each of these micro-decisions would have changed the chain of events. Thus such a chain of events cannot be explained just by saying that it conforms to a cultural pattern or norm. On the contrary, the cultural pattern is a recurrent one – is a pattern – because relatively idiosyncratic causal factors tend, in a variety of circumstances, to converge on similar courses of action.

More generally, at every juncture in every social CCC, the mental processes of the individuals involved may tilt the chain of events one way or another. These mental processes exhibit cross-

individual regularities. Some of these regularities have to do with basic cognitive and emotional dispositions that are part of the biologically evolved psychological make-up of humans. Other regularities are contingent on historical and local circumstances. The anthropologist's goal is not to explain individual cases, but recurring patterns. However, I have argued, explaining recurring patterns requires attending to the kinds of psychological factors that affect individual cases.

Cultural Cognitive Causal Chains

Most social CCCs are short. They bring about only local and brief transfers of information, coordinations of behaviours, or movements of matter such as transfers of goods. They are episodes like the three chains of events in Albazo's household. Though they are causally related to one another, each has its own specific content. Some social CCCs, though, are long and lasting, involve a great many individuals over time, and exhibit no discontinuity of content. The Halloween interaction I evoked was a typical fragment of such an extended chain. These long and lasting social CCC have the effect of stabilising mental representations and public productions in a population and its environment. Mental representations and public productions (practices or artefacts) that are stabilised by such extended social CCC correspond to what we call 'cultural'. I propose to call social CCCs that do so stabilise cultural representations and productions 'Cultural Cognitive Causal Chains,' or CCCCs for short (see table).

<p>Cognitive Causal Chain (CCC)</p> <p>A causal chain where each causal link instantiates a semantic relationship</p>
<p>Social Cognitive Causal Chain (Social CCC)</p> <p>A CCC that extends over several individuals</p>
<p>Cultural Cognitive Causal Chain (CCCC)</p> <p>A Social CCC that stabilises mental representations and public productions in a population and its environment</p>

Let me illustrate what I mean when I say that representations or practices are 'stabilised'. Take the case of a folktale such as Goldilocks and the Three Bears, and take it at the time when it was transmitted only orally. Each time the tale was told, it contributed to the audience's knowledge of the tale, and, to their desire to hear it again, and possibly tell them in turn. If it had not done so to a sufficient degree, the tale would not have remained as a stable cultural representation, since it was stabilised only by the CCCC which linked tellings of the tale (public productions, and more specifically, public representations) to individuals' knowledge of the tale and motivation to telling it in turn (i.e. mental representations).

The existence of CCCCs and their stabilising effect are among the most obvious aspects of human social life, but they are not so easily explained. Human memory, imitation and communication are not true replicating mechanisms. Their outputs are rarely, if ever, identical to their inputs. Even when the alteration between, say, the story heard and the story understood, the story understood and the story remembered, the story remembered and the story told, are small – and often they are large –, the cumulative effect of these alteration in an extended social CCC are likely to be such that contents rapidly decay or transform beyond recognition. This is indeed what happens with most stories told. For instance,

Carol tells Bob how she made a fuss at the supermarket. Bob tells Ted how Carol made a fool of

herself at the supermarket. Ted, a while later, mixes this story with another one he had heard about Carol at the library, embellishes it and tells it to Alice, who does not believe it anyhow, and ends up remembering only that Ted accused women of behaving absurdly in department stores.

Most social CCCs are like these interactions between Bob, Carol, Ted, and Alice, they don't extend very far and they stabilise very little if anything.

Only some mental representations such as folktales, and some public productions such as sacrificial rites exhibit great resilience and do get stabilised by CCCs. That is, they remain recognisably similar to antecedent representations or productions in the chain. Recognisable similarity is a matter of degree. There is no real boundary, therefore, between unquestionably cultural representations such as Goldilocks on the one hand, and apparently idiosyncratic stories such as that told by Carol to Bob about her adventures at the supermarket. Even the latter is recognisably similar, in its gist, to stories very often told. In telling it, Carol was relying not just on her memory of the event, but also on her memory of similar stories she had heard. In retelling it, Bob, and then Ted, were altering it, not at random, but in the direction of the cultural cliché that Alice all too easily recognised. No social CCC is ever unconnected to cultural CCC; rather all short and local social CCCs are offshoots of one or several CCCs, and these offshoots may contribute to the persistence of the CCCs themselves.

To further illustrate this point let us go back to Albazo's story.

The three chains of events I described were clearly idiosyncratic versions of enduring patterns, offshoots of CCCs that criss-cross Dorzé social life. When Albazo decided to sacrifice a thanksgiving lamb for the festival of Maskal, for instance, this decision and this action were clearly linked, both causally and in content, to innumerable similar decisions and courses of action taken in the past by other Dorzé household heads (and in particular by Albazo's father). Again, in showing the entrails to enteromancers of the neighbourhood, Albazo was reproducing countless past actions of Dorzé household heads. On the other hand, in apologising to his mother for having bought clothes for his wife but not for her, Albazo was attending to the particulars of his situation, but, nevertheless, his behaviour was recognisably similar to many others.

The diviners themselves, when 'reading' the entrails, were producing a version of past diagnoses adjusted to the particulars of the situation. Their thought processes and their diagnosis were at the crossing point of two social CCCs: the short social CCCs triggered by Albazo's Maskal sacrifice, and the long Cultural CCC that stabilises the particular type of *gomé* that they diagnosed.

One point should be underscored here that is highly relevant to the explanation of cultural resilience and change. The diviners were extremely unlikely to opt out, so to speak, of available CCCs, and to produce a truly novel diagnosis – a new type of transgression for instance -, that could have been challenged by Albazo or by other ritual experts. Still, there was a wide range of type of diagnoses to choose from. Each particular type of diagnosis is maintained by a specific cultural chain. In choosing a particular diagnosis, the diviners are contributing to the persistence of one of these cultural chains. Each time a type of diagnosis is chosen, it gains in saliency and in likelihood of being considered on future occasions. If a particular type of diagnosis becomes more and more popular with the enteromancers, its cultural importance will grow, and so will the likelihood that sub-variety of this diagnosis will become distinguished, leading to a split of the underlying CCC into several new CCCs. On the other hand, if a type of diagnosis becomes less and less reproduced, its CCC will lose momentum and may eventually come to an end.

The evolution of the *gomé* system is thus, to a large extent, determined by the mental processes and the interactions that, on each particular occasion, tilt the diviners' diagnosis one way or another. Among the factors that contribute to the diviner's preferences, I would like to mention two: the reactions of the consultants and the state of the entrails. Consultants are more or less welcoming to different diagnoses. They may, like Albazo with the enteromancers or Maté with the seer, recognise without difficulty that they are guilty of a transgression of the type mentioned by the diviners. In

elaborating on the diviners' diagnosis, consultants contribute to the way the diviners themselves understand and mentally exemplify their somewhat cryptic diagnoses such as 'gomé of mother's insult', or 'gomé of honey'. Consultants may also be sceptical, or even disbelieve the diagnosis. Diviners who produce unconvincing diagnoses may readjust their interpretations, or else they are likely to be less consulted in the future, and therefore play a less important role in cultural transmission.

Diviners practising enteromancy are also constrained, in their diagnosis, by the state of the entrails they are asked to read. After all, there are rules of interpretation, and different shapes, different spots, and different anomalies of the entrails have more or less standard interpretations. Different oddities of entrails have different frequencies, on which the sacrificers and the enteromancers have no control. However, rules of interpretation are themselves cultural representations, maintained by their own CCCs. It is likely that, without their awareness, the interpretive preferences of the enteromancers determine the evolution of the rules of interpretation. If, say, at a certain historical time, the swelling of a certain gland in the entrails is taken to indicate a type of *gomé* that diviners are less and less inclined to diagnose, and if this swelling is relatively frequent, it is likely that, through a series of micro-decisions, the interpretation of this swelling will be altered. The frequent swelling will progressively be interpreted as indicating a favoured type of *gomé*.

I introduced the Dorzé example by contrasting those societies which give pride of place to explanations of misfortune in terms of witchcraft, and those which, like the Dorzé at the time of my visit, almost exclusively resort to explanations in terms of transgression and sanction. The relative place given to these two types of explanations results from a series of micro-decisions and behaviours along cultural causal chains. The Dorzé did recognise various forms of mystical aggression – *bitha* or 'sorcery' in particular – as possible sources of misfortune. It is just that these were very rarely invoked. They were never diagnosed by enteromancers and only rarely by seers. After the 1974 Ethiopian Revolution where the Emperor Hailé Selassié was deposed and replaced by a Marxist leadership, the senior members of Dorzé communities – including most of the enteromancers – were often denounced as 'bourgeois'. Many rules the transgression of which was considered *gomé* were denounced as 'reactionary'. This was in particular the case of rules having to do with seniority and ritual prerogatives. These are types of transgression typically 'read' from the entrails, where patterns of blood vessels are interpreted as a genealogical tree indicating relationships of seniority and their possible disruptions. Such changes, in turn, rendered enteromancy less attractive than other forms of divination; it made people less willing to accept diagnoses involving issues of seniority; it encouraged seers to prefer diagnosis in terms of other kinds of *gomé* (having to do, for instance, with food, with sex, or with spirit possession), and to increase the frequency of diagnosis in terms of *bitha*, sorcery. Though the new ideology was equally against ideas of *gomé* and ideas of *bitha*, both denounced as superstitions, its propagation had, in fact, the effect of favouring explanations of misfortune in terms of mystical aggression, rather than in terms of transgression of taboos.

More generally, the existence of all degrees of balance across human societies between explanation of misfortune in terms of witchcraft or in terms of taboo is the cumulative effect of micro-processes, both mind-internal and mind-external along the causal chains of culture. While a task for ethnography is to describe the factors that, locally, stabilise or alter the balance one way or the other, a task for a naturalistic anthropology is to identify the type of factors that may be involved in such stabilisation or changes, and to explain how these factors work by affecting people's minds and people's environments.

Conclusion

Social CCCs are not an aspect of the social. They *are* the social. Things are social to the extent that they are involved in cross-individual cognitive causal chains. Cultural causal chains are not an aspect of the cultural. They *are* the cultural. Social things are cultural to the extent that they are involved in cultural cognitive causal chains. I know of no counter-examples to these claims. On the

contrary, I believe they provides a fine-grained way to tease apart what is social and what is not, and within the social what is cultural and what is not.

Anthropologists and, more generally, social scientists might be worried less with problems of conceptual analysis, and more with substantive matters, and in particular with the place given to mental things in an epidemiology of representations. They may feel that I give far too much importance to representations and to cognition in characterising the social and the cultural, or worse still, that I am reducing the social and the cultural to the mental. Aren't agriculture or war, for instance, paradigmatic examples of things social, aren't artefacts and public performances paradigmatic examples of things cultural, and yet, without denying their cognitive dimension, surely, they are not principally mental things, and their importance has to do first and foremost with their effects on the bodily lives – not just the mental representations – of people? I fully agree, and if this were thought to be an objection to the naturalistic approach I advocate, then I would have failed to make myself understood.

Let me be quite clear. Many things can be caught in a web of social CCCs, not only mental and public representations, but also other public productions such as paths, buildings, crops, markets, machines and massacres. All things caught in a social CCC have mind-internal – or psychological – causes and effects, and all have mind-external – or environmental – causes and effects. Which of these causes and effects matter more may vary with specific cases and with points of view. In the case of *gomé* chains of events such as those that took place in Albazo's household, much of the explanatory weight lies on the psychological side, even though, typically, these chains of events are triggered by non-psychological events or states of affairs such as a disease or a bad crop. In the case of a path, the psychology is rather trivial and the ecology plays a greater explanatory role. After all, in the absence of deliberate maintenance, the stability of paths in a community depends on some balance between the rate of plant growth and erosion on the one hand, and the intensity of use of the path on the other hand.

The epidemiological approach must, in all cases, combine an environmental perspective and a psychological perspective and is not committed to – or opposed to – giving pride of place to one or the other of these two perspectives.

Why then characterise social and cultural causal chains in term of their psychological links rather than in term of their environmental links? To begin with I would like to stress that psychological links are themselves a sub-category of environmental links. They are links located in brains and bodies which are themselves part of the environment. So, to recognise a special place to psychological links in a social CCC is just to highlight one type of ecological factor. The reason for giving a defining role to psychological links is that the other, non-psychological links in a social CCC can be indefinitely varied: sounds of speech, gunshots, images, paths, dances, foods, clothes, machines, and so on. No sub-category of these environmental links is either necessary or sufficient for the causal chain in which they occur to be thereby a social chain. What makes a causal chain social is the cognitive linking of different individual minds. What makes a social chain cultural is the stabilisation of representations. It does not follow, however, that the psychological ingredients of the social are more interesting than its non-psychological ingredients. Interest is a pragmatic matter.

Another worry some anthropologists might have is that there is some arbitrariness in distinguishing the social and the cultural and recognising each as an equally worthy object of study. They might argue that everything that is social is also cultural, and conversely. This is true in the human case, of course. But, in this respect, humans differ greatly from other social animals. Most social animals only transmit information about the here and now (e.g.: *beware, there is a predator!*). Whatever knowledge and skills members of these animal populations durably share, they owe to similar biological dispositions expressed in the same environment, rather than to their ongoing mutual interactions. In other terms, the social CCCs of most social animals don't stabilise any common knowledge or skills, they are not CCCs. Still, there are fascinating exceptions, examples of

practices (and therefore of the mental representations that make them possible) spreading through imitation and stabilising in non-human animal populations. For instance it is now well documented that different chimpanzee populations have different, socially transmitted techniques, for termite-fishing for instance (McGrew 1992). These techniques are, in other terms, transmitted through CCCs. They are cultural. Still, even in those non-human animals that exhibit some degree of cultural transmission, most activities, whether individual or social, are free of any cultural influence.

In the human case, and in the human case only, culture is all encompassing. All social CCCs draw on culturally transmitted representations, even when they don't directly propagate them. The domain of the social and that of the cultural are indeed co-extensive. In this extensional sense, there isn't any difference between social and cultural things. On the other hand, being social and being cultural are two different properties. Something is social to the extent that it involves some cognitively mediated co-ordination among individuals. Something is cultural to the extent that it involves the stabilisation of representations or productions by means of cognitively mediated co-ordination among individuals.

One may be more interested in the social or in the cultural aspects of things that are inevitably both social and cultural. That is, one may be more interested in answering the question: 'How do humans co-ordinate?', or the question 'How do representations and productions stabilise?', but the domain of facts relevant to answering these two questions is the same. I have tried to suggest that, to both questions, a naturalistic answer might be given. For this, the domain of the social sciences must be reconceptualised by recognising only entities and processes of which we have a naturalistic understanding. These are mental representations and public productions, the processes that causally link them, the social and in particular the cultural CCCs that bond these links, and the complex webs of such causal chains that criss-cross human populations over time and space. Start from such a reduced ontology, and, yes, Radcliffe-Brown's goal of a natural science of society might not be entirely utopian, though I doubt it would much resemble the science he had in mind.

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Notes

1- Since I am never describing the entire complex cause of some event, but only highlighting some part of it, from now on 'caused' will be understood to mean 'caused in part'.

2 -A number of philosophers, Fred Dretske, Ruth Millikan, Karen Neander, David Papineau for instance, have tried to naturalise meaning by appealing to a notion of function. Although no final and compelling solution has yet be found, I see these attempts as being obviously on the right track. For an overview, see Jacob 1997.