Naturalistic Approaches to culture?

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A STRATEGIC WORKSHOP ORGANIZED BY THE

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ABSTRACT BOOK EDITED BY

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INTRODUCTORY NOTES BY THE ORGANIZERS

Scientific background and rationale to study naturalistic approaches to culture

The main aim of the workshop is to explore the possibilities and limitations of naturalistic approaches to mind and culture. The most important new vistas arise from modern evolutionary theory but the issues also have, in the background, the traditional debates on reductionism and biological determinism. Two broad kinds of approaches will be discussed and compared:

1. During the past two decades with the advent of evolutionary psychology and related developments a new serious challenge has been made regarding the **biological routing of some of the most cherished cultural achievements and features of humans.** This challenge basically involves the idea that some of our cultural habits and propensities are the results of interactions between biological constraints and cultural shaping, rather then being constructed by culture alone.
2. Many scientists and scholars have argued, on the other hand, that the notions of the "biological" and the "cultural" are based on dualistic thinking that is increasingly problematic. Man has increasingly powerful means for refashioning nature through the "culturing" of natural environment and through molding living organisms e.g. by help of biotechnology and synthetic biology. The biological and the cultural also intermingle through human impacts on global climate and environment. Thus, many scholars have found it necessary to speak of "naturecultures" and "biosocialities". There are, furthermore, technical issues that need to be addressed. One major obstacle to a better understanding and collaboration between scientists and cultural/humanities scholars is that of differences in thods and approach. This constitutes a barrier for communication within the sub-disciplines in naturalistic domains and across the naturalistic and cultural fields.

A discussions between these two paradigms was the main moving idea for the Standing Committee of the Humanities of the European Science Foundation to support the strategic workshop. The two above broad paradigms need to be thoroughly discussed, annotated by some of the technical barriers to understanding, e.g., the barriers to understanding due to the technical and theoretical jargon in using neuroscience data and similar issues.

Some of the challenging issues involved are:

- the "natural" origin and "biology" of sociality
- the naturalistic origins of human cognitive capacities, including cultural phenomena such as art, literature, music, etc.
- the usefulness of the concepts of "naturecultures" and "biosocialities"
- the interface between biological evolution and cultural evolution
- adaptation as exaptation in explaining culture
- biological (most importantly neural and genetic) determinism and the prediction of human behavior
- universal and specific aspects of cultural systems such as languages
- the neural circuitry of primary (language like) and secondary (writing like) cultural systems

The organizers of the workshop hope both for a fruitful discussion and reasonable proposals to continue the nature/culture discussions in a more regular basis in the framework of the ESF.

2011. spring

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PROGRAM OVERVIEW

Sunday, 4 September	
12:00-16:00	Arrival, registration
19:00	Welcome dinner and reception

Monday, 5 September	
9:00 – 9:15	*Opening* by Csaba Pléh, Department of Cognitive Science, Budapest University of Technology and Economics
9:15 – 9:30	*Introduction to the European Science Foundation and its Standing Committee for the Humanities,* Eva Hoogland, European Science Foundation
9:30 - 10:30	*Natural pedagogy as an evolutionary adaptation* Gergely Csibra, Cognitive Development Center, Central European University, Budapest
10:30 - 11:00	Coffee break
11:00 - 12:00	*Multilingualism and Theory of Mind* Ágnes Kovács, Cognitive Development Center, Central European University, Budapest
12:00 - 13:00	*Why imitation is selective and cost-sensitive, and what difference it makes?* Olivier Morin and Jean-Baptiste André Institut Jean Nicod, Paris and CEU, Budapest
13:00 – 15:00	Lunch
15:00 – 16:00	*Discussion* **Developmental science and the nature-nurture issue** Teleconference with Judit Gervain, Laboratoire Psychologie de la Perception, CNRS, Paris Chaired by Csaba Pléh
16:00 – 16:30	Coffee break
16:30 – 17:30	*Discussion* **How to explain cultural behavior on the basis of evolution and neuroscience?** Chair: Gergely Csibra
17:30 – 19:30	**Poster session I. Language and culture** *Orchestrated* by Ágnes Kovács Bambini, Fusaroli, Halloy, Nánay, Lim, Mascaro, Hegnes, Pérez, Sosišc
19:30 – 20:30	Dinner

Tuesday, 6 September	
9:00 - 10:00	*Biocultural approaches to mind and knowledge* Eugenia Ramirez-Goicoechea, Department of Social and Cultural Anthropology, UNED, Madrid
10:00 - 10:30	Break
10:30 - 11:30	*The evidence for culture led gene-culture coevolution* Peter Richerson, Department of Environmental Science and Policy, University of California Davis
11:30 - 12:00	Break
12:00 - 13:00	*The Item/System Problem in Cultural Evolution* Nick Enfield, Max-Planck Institute for Psycholinguistics and Randboud University, Nijmegen
13:00 - 15:30	Lunch
15:30 - 16:30	*Discussion "How is culture shaping the mind?"* Chair: Matti Sintonen
16:30 - 18:30	**Poster session II. Culture in animals and children** Orchestrated by Olivier Morin Számadó/Zachar, Claidiere, Verpooten/Joye, Schwab/Bugnyar, Kis/Wilkinson, Téglás, Kampis/Király/Krekó/Topál
19:30 – 20:30	Dinner reception
Wednesday, 7 September	
9:00 – 12:00 (incl. coffee break)	*Discussion "How to move ahead: is there a naturalistic theory of all culture, or are there grounds to expect that one will emerge?"* Chair: Peter Richerson
12:00 – 14:00	Lunch
14:00	Departure

Keynote lectures

NATURAL PEDAGOGY

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While social learning and communication are both widespread in non-human animals, social learning by communication is probably human specific. Humans can and do transmit generic knowledge to each other about animal and artefact kinds, conventional behaviours to be used in specific situations, arbitrary referential symbols, cognitively opaque skills, and know-how embedded in means-end actions. These kinds of cultural contents can be transmitted by either linguistic communication or nonverbal demonstrations, and such types of knowledge transmission contribute to the stability of cultural forms across generations. We propose that by having evolved specific cognitive biases, human infants are prepared to be at the receptive side of such communicative knowledge transfer, which, together with adults' inclination to pass on their knowledge to the next generation, constitute a system of 'natural pedagogy' in humans.

While socially transmitted population-specific cultural skills exists both in human and non-human primate species (Whiten et al., 1999), the scope and kinds of cultural knowledge forms transmitted by humans suggests that our hominin ancestors may have evolved species-specific social cognitive adaptations specialized for cultural learning (Csibra & Gergely, 2006; Tomasello, 1999). There are a number of significant properties that differentiate the types of knowledge contents that are transmitted and maintained across generations in human cultures when compared to the much more restricted range of socially transmitted cultural skills that characterize non-human primate cultures. First, human cultures are unique in that they involve the transmission of *cognitively opaque* cultural knowledge that is not (or not

fully) comprehensible for the naïve observational learner in terms of their relevant causal and/or teleological properties. The variety of such cognitively opaque forms of cultural knowledge include relevant information about novel means-end skills and practical know-how embedded in relatively complex forms of tools use and tool manufacturing procedures, behavioural traditions that are 'ought to' be performed in specific ways in particular types of social situations, normative conventions, shared knowledge about social rules and roles, or arbitrary referential symbols. Second, human cultures involve the transmission of *generic* (or semantic) knowledge of properties that specify and generalize to *kinds*. Third, human cultures involve conveying *shared* cultural knowledge that is presumed to be equally accessible to all members of one's cultural group.

These three unique properties of human cultural knowledge forms would represent a serious learnability problem for naïve juvenile learners who could rely only on purely observational learning strategies to acquire them from others. This is so because standard mechanisms of individual observational learning lack the appropriate informational basis that would allow the novice to (1) differentiate the relevant aspects of the observed but cognitively opaque behaviour that should be selectively retained from those that are incidental or non-relevant and should therefore be omitted, (2) infer whether or how to generalize it to other situations, and (3) identify whether it represents shared knowledge that can be assumed to be available to other members of the cultural community as well (Gergely, 2010; Csibra & Gergely, 2009).

We hypothesized that this learnability problem would have endangered the successful intergenerational transmission of the highly useful and fitness enhancing, but cognitively opaque technological skills that had emerged during hominin evolution (Gergely & Csibra, 2005). This challenge represented selective pressure for a new type of social communicative learning mechanism, technically termed '*natural pedagogy*', to become selected in humans (Gergely & Csibra, 2006; Csibra & Gergely, 2006, 2011). Relying on ostensive-referential demonstrations of the relevant aspects of the opaque skills, communicative knowledge transfer could alleviate the learnability problem by having the knowledgeable conspecific actively guide the novice through selectively manifesting 'for' the learner the

relevant information to be acquired and generalized. Thus, we propose that the mechanism of natural pedagogy is *ostensive communication*, which incorporates evolved interpretive biases that allow and foster the transmission of generic and culturally shared knowledge to others (Csibra & Gergely, 2006, 2009). Such communication is not necessarily linguistic but always referential.

There is extensive evidence that infants and children are especially sensitive to being communicatively addressed by adults and that even newborns attend to and show preference for ostensive signals, such as eye contact, infant-directed speech or infant-induced contingent reactivity (Csibra, 2010). Such ostensive cues generate referential expectations in infants triggering a tendency to gaze-follow the other's subsequent orientation responses (such as gaze-shifts) to their referential target (Senju & Csibra, 2008; Senju et al., 2008; Deligianni et al., submitted; Csibra & Volein, 2008), which may contribute to learning about referential signals such as deictic gestures and words. These data suggest that human infants are prepared to being at the receptive side of verbal as well as pre-verbal communication from the beginning of their lives.

The most unique proposal of the theory of natural pedagogy is the hypothesis that the information extracted from the other's ostensive-referential communication is encoded and represented qualitatively differently from the interpretation of the same behaviour when it is observed performed in a non-communicative context. In particular, infants have been shown to expect that (1) kind-relevant features of ostensively referred objects (such as their shape or texture) are more important to encode than their other properties that are not informative about and do not generalize to object kinds (such as their location, Yoon et al., 2008, or numerosity, Chen et al., 2011), (2) ostensively demonstrated functional properties of novel objects specify the artefact kinds they belong to (resulting in kind-based object individuation, Futo et al., 2010), (3) object properties revealed in ostensive communicative demonstrations are relevant to judging object categories (Kovács et al., 2011), (4) a novel means action should be learned despite it's

apparent cognitive opacity as long as it has been communicatively demonstrated for them (Gergely et al., 2002; Király, 2009; Király et al., 2004), and (5) ostensive attitude expressions communicate shared cultural knowledge about referents (Gergely et al., 2007; Egyed et al., 2007). These effects suggest that infants assume that ostensive communication licenses certain inductive inferences that pure observation does not allow them to make, and this assumption enables fast learning of culturally shared knowledge about object and action kinds.

In sum, we propose that during hominin evolution a specialized social cognitive system for 'natural pedagogy' has been selected to enable the intergenerational transfer of uniquely human forms of cognitively opaque, generic, and shared cultural knowledge whose transmission would have posed a learnability problem for purely observational learning mechanisms. Natural pedagogy recruits *ostensive communication* to support inferential learning of such cultural contents from infant-directed manifestations provided by knowledgeable conspecifics. Ostensive signals induce built-in cognitive biases of referential interpretation (such as the genericity bias) that support the transfer of generic knowledge about object and action kinds from communicative demonstrations through particular referents even in pre-verbal infants.

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MULTILINGUALISM AND THEORY OF MIND (TOM): EVOLUTIONARY ANCIENT AND CULTURALLY MALLEABLE COMPONENTS OF TOM

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Successful social interactions require computing others' mental states, such as goals, intentions and beliefs. Research in the last quarter of century has suggested that the abilities to understand others' beliefs (theory of mind, ToM) arise only after the age of four and require effortful computations. Recently, however, a growing body of evidence suggests that basic ToM abilities are present already in the second year of life. Thus, the developmental differences observed in preschoolers may reflect the maturation of other mechanisms required for solving typical ToM tasks, such as language, executive functions (EF), or problem solving. In a series of studies we have asked how specific environmental factors (e.g., growing up in a bilingual milieu) would enhance performance on ToM tasks. Bilingual children could have an advantage on ToM tasks due to better representational abilities (resulting from practice in representing others' language knowledge) or to better EF abilities (due to practice in inhibiting one language when speaking the other). In a series of studies we compared three-year-old bilingual and monolingual children on standard and modified false-belief tasks that imposed different EF demands. Significantly more bilinguals succeeded on standard and language-switch ToM tasks, while the groups performed similarly on tasks with low inhibitory demands, suggesting that bilingualism may affect some, but not all components of ToM.

Thus, I will propose that, in contrast to most ToM accounts, the ability to attribute mental states cannot be considered as a monolithic construct, but rather as a collection of dissociable component mechanisms. Some of these mechanisms might have evolutionary ancient roots and might be automatically triggered even in very young infants, and some might emerge later in development and might be sensitive to environmental and cultural influences. For example, in order to attribute mental states, one needs to i) understand that others have representational mental states (i.e., beliefs); ii) compute the content of others' beliefs; iii) link belief representations to the corresponding agents; iv) sustain two or more belief representations concurrently; and v) make behavioral predictions based on others' beliefs. While previous investigations mainly focused on the last step of mental state reasoning, that is making explicit behavioral predictions based on the content of a false belief, either component might have distinct evolutionary origins, and might contribute differentially to various pathologies. For instance, we have recently shown that some belief computation components are present as early as 7 months of age, and primarily involve automatic processes. Current work investigates the development of other ToM subcomponents in different populations, and their specificity to humans. Such efforts target a better understanding of how theory-of-mind operates in typical and atypical development, and would provide fundamental insight into the evolution of the uniquely collaborative structure of human societies.

The ability to attribute mental states, including beliefs, desires and intentions to oneself and others, as well as to interpret others' behavior in terms of these mental states is usually called 'theory of mind' (ToM). Possibly, humans have evolved such mechanisms to optimize collaboration and communication. Indeed, without an ability to infer others' mental states, human society would be hardly imaginable.

While adults seem to use such abilities in everyday life with a great facility, research in the last 25 years has suggested that, children do not take into consideration others' false beliefs before the age of four (Wellman et al., 2001). Moreover, it has also been suggested that, even in adults, reasoning about others' beliefs might be an effortful process (Apperly et al., 2006). Developmental transitions in ToM have often been assessed using so-called "false-belief tasks" (Baron-Cohen et al., 1985; Wimmer & Perner, 1983). In these tasks, children have to predict a person's behavior based on the person's false belief while ignoring their own true belief. Most children succeed in this task around the age of 4, while younger children typically fail by erroneously predicting that the protagonist will behave according to their own true belief. Based on such failures, it was argued that ToM requires complex computations, and emerges after the age of four (Wellman et al., 2001; Perner, 1991).

In contrast to such accounts, other authors have argued that ToM abilities might be automatic and have an innate basis. However, solving a typical false-belief task requires the development of other abilities, such as problem solving (Fodor, 1992) or inhibition and selection (Leslie et al, 2005; 1998, Kovács, 2009), or language. For instance, in a typical ToM task, to give the correct response based on the character's false belief, children have to use their inhibitory and selection abilities to overcome their own true beliefs (Leslie et al., 2005), or to inhibit a prepotent response to communicate their own knowledge (Carlson et al., 1998).

Furthermore, cultural factors have also been found to have an effect on ToM abilities in adults, more specifically on perspective-taking, as participants from collectivistic cultures seem to be suffer less interference from their own perspective than people from individualistic cultures (Wu & Keysar, 2007). In a series of studies we have asked how specific environmental factors (e.g., growing up in a bilingual milieu) would affect the performance of children on ToM tasks. One might argue, that bilingual children could have an advantage on ToM tasks due to better representational abilities (resulting from practice in representing others' language knowledge) or to better EF abilities (due to practice in inhibiting one language when speaking the other). In two studies we compared three-year-old bilingual and monolingual children on standard and modified false-belief tasks that imposed different EF demands. Significantly more bilinguals succeeded on standard and language-switch ToM tasks (Kovács, 2009), while the groups performed similarly on tasks with low inhibitory demands, suggesting that bilingualism may affect some, but not all components of ToM.

In the light of these findings, and given the growing body of evidence that basic ToM abilities are present already in infancy (Onishi & Baillargeon, 2005; Southgate et al., 2007; Surian et al., 2007, Kovács et al., 2010), I will argue that, in contrast to most ToM accounts, the ability to attribute mental states cannot be considered as a monolithic construct, but rather as a collection of dissociable component mechanisms. Some of these mechanisms might have evolutionary ancient roots and might be automatically triggered even in very young infants, and some might emerge later in development and might be sensitive to environmental and cultural influences. The

converging evidence that specific ToM abilities arise much earlier than previously thought might also have important implications for the function of such abilities. While earlier theoretical accounts have argued that ToM is mainly used for explanatory proposes (e.g., to make sense of others' behaviour by inferring their beliefs; Wellman et al., 2001; Perner, 1991), here I argue that the main function of ToM is not to explain others' behavior, but rather to predict it, which allows us to be prepared to react quickly and adaptively to others' behavior, that has a crucial role in ensuring the efficiency of human communication and collaboration.

We addressed this issue in a recent set of experiments. If the benefits resulting from ToM abilities are important enough so that we compute others' beliefs irrespectively of whether it results in immediate benefits, then some ToM components should be automatic; further, they should be present very early during development, that is, even in the first year of life (Kovács et al., 2010). To investigate these issues, we have developed a novel implicit ToM paradigm to investigate automatic belief attribution in 7-month-old infants and adults. In this paradigm, adult participants simply performed a visual detection task in the presence of an agent, who could have congruent or conflicting beliefs with the participant. Adults watched movies and had to press a button as soon as they saw a ball behind an occluder. The critical manipulations involved the participant's beliefs about the ball's presence behind the occluder and the "beliefs" of the agent, such that the agent, the participant, both, or neither could believe that the ball was behind the occluder. The results showed that both participants' own belief and the agent's belief that the ball is behind the occluder speeded up participants' reaction times in detecting the ball. These data suggest that participants have automatically computed the agent's beliefs even when these were entirely irrelevant to the task. In the looking time version of this paradigm 7-months-old infants watched the same movies in a violation of expectation procedure. When no ball appeared behind the occluder, infants looked longer in the condition where only the agent believed the ball to be behind the occluder, compared to the condition when no one believed the ball to be behind the occluder. Thus, the beliefs of the agent influenced the infants' looking behavior, even though they clashed with the infants' own beliefs (Kovács et al., 2010).

These findings, together with converging data from other studies (Onishi & Baillargeon, 2005), suggest that even young infants possess basic ToM abilities, and are in sharp contrasts with proposals that ToM abilities emerge around the age of 4. However, it is possible that different components of ToM may have different developmental trajectories. If so, the hypothesis that the function of ToM abilities is to predict others' behaviors, and that its associated benefits are large enough to afford automatic belief computations for any agent, leads to new perspectives on the proximate mechanisms involved in belief computations.

To have a fully-fledged theory-of-mind, one must be able to identify agents who can have beliefs and to conceive of beliefs as representational states; one must compute the content of this belief, and somehow link it to the corresponding agent in order not to confuse this representation with one's own belief representations. Furthermore, one also needs efficient mechanisms for sustaining two belief representations concurrently (a false and a true belief), and to use false beliefs for behavioral predictions. Thus the component mechanisms underlying ToM abilities may be: i) identifying beliefs; ii) computing the content of someone's belief; iii) binding belief representations to corresponding agents; iv) sustaining two belief representations concurrently; and v) making behavioral predictions based on false beliefs. The standard ToM tasks typically used in the last 25 years tackle on the very last component, that is, how one makes behavioral predictions based on false beliefs. Research suggests that when having to make such predictions, or when faced with two conflicting representations concurrently, participants' behavior seems to be affected by bilingualism (Kovács, 2009), or specific cultural factors (Wu & Keysar, 2007).

Thus, while some ToM components seem to be highly sensitive to environmental influences, humans seem to possess some automatic and possibly evolutionary ancient mechanisms to track others' mental states in the service of prospective social interactions. Such abilities might confer important fitness advantages to individuals who possess them, as they would allow them to rapidly modify their own behavior as a function of the anticipated behavior of others, ensuring the efficiency of human collaboration and communication.

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WHY IMITATION IS SELECTIVE AND COST-SENSITIVE, AND WHAT DIFFERENCE IT MAKES

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Two divergent views of imitation and cooperation seem to coexist in the literature on gene-culture coevolution, often in the same authors. The first view holds that culture is acquired in bulk by blind agents who do not care about the costs of what they imitate. As a result, we act against our interests, and culture readily yields biological altruism. The second view sees cultural acquisition as selective and cost-sensitive. Therefore, cultural transmission yields only small amounts of maladaptive altruism, no more than what we would expect from any other imperfect decision-making mechanism. The ambiguity deepens when arguments backing the second view are offered in support of the first. This paper argues for the second option, and in favour of a clear dissociation between the two.

IN MODELS OF CULTURAL INHERITANCE, CULTURAL TRANSMISSION IS ROUTINELY ASSUMED TO LACK SELECTIVITY AND COST-SENSITIVITY.

Consider two models often cited to argue that biologically altruistic punishment can evolve by cultural transmission: Guzmán et al., 2007, and Henrich and Boyd, 2001. Both papers model a population where norms of cooperation and norms of punishment are applied by some agents, whom others can copy. The norm of cooperation is a norm of mutual help: the agents endorsing it benefit in the long run. The norm of punishment is genuinely altruistic: agents punish other agents at a cost to themselves, without getting anything in return. Some agents are predisposed to copy others, some are not. Those who copy reproduce the norm of mutual help. As a result, they fare better than non-copiers, because mutualistic cooperation is beneficial. However, there is a catch: the agents who copy the (beneficial) norm of mutualist cooperation *must* also copy the (detrimental) norm of punishment. Selectivity is not an option. Still, copying agents fare better than non-copiers, because the costs of punishment are assumed to be smaller than the benefits of cooperation, thus making the overall package beneficial.

With such models, Henrich and Boyd show that natural selection favors genes predisposing individuals to imitate more faithfully the behavior of others, altruism included, while Guzmán et al. show that natural selection favors genes coding for conformist imitation. Cultural transmission, backed by natural selection, promotes the diffusion of a genuinely altruistic behavior.

To an evolutionist, this is surprising, because punishment entails a net fitness loss for the punisher, a loss uncompensated by reciprocity, gains in reputation, or avoidance of retaliation.

True, the contrary is sometimes suggested. Gintis, Bowles, Boyd and Fehr (2003), who define strong reciprocity as a "predisposition to cooperate with others and to punish those who violate the norms of cooperation, at personal cost, even when it is implausible to expect that these costs will be repaid", still claim that "strong reciprocity is adaptive in the sense of emerging from a gene-culture coevolutionary process". Yet they do not explain how a vocation for uncompensated sacrifice could produce, on average, anything other than a net fitness loss, or how cultural transmission could change the nature of this selective pressure.

Being a genetically maladaptive trait, altruism toward non-kin entails a lack of adaptation on the side of genes, whether because individuals mistakenly act altruistically, or because they mistakenly imitate other altruists. Altruism would immediately collapse if genetic evolution simply endowed individuals with the ability to distinguish helping (benefitting the individual) from punishment (detrimental to individuals) and imitate one but not the other.

Why assume that agents cannot be selective? After all, they could endorse the beneficial norm while neglecting to enforce the costly norm; we see it happening every day. Choosy agents would enjoy a fitness boost, as they would be able to reap the benefits of others' compliance with altruistic norms, without paying the cost. If selective and cost-sensitive imitators were introduced, cultural transmission could probably not cause genuine altruism to evolve. The spectacular results of these models rest on the implicit assumption that, when we imitate others, agents are not selective. They pay no attention to the cost of what they copy. In the words of Peter Richerson and Robert Boyd, "... individuals must adopt what they observe with only marginal modifications. As a result, we may often adopt maladaptive behaviors." (Richerson and Boyd, 2005, p. 161).

HOW COULD IMITATION BE COST-INSENSITIVE AND YET ADAPTIVE?

According to Richerson and Boyd's widely shared opinion, two simple imitation heuristics play a major role in cultural transmission: prestige-biased (copy the prestigious) and conformity-biased (copy the many) imitation. These strategies (conformist imitation in particular) can lead us to imitate behaviors whose costs should be obvious, like kamikaze suicide (to cite one of Richerson and Boyd's favorite examples). If such blind imitation heuristics have maladaptive consequences, how could they evolve?

A frequent answer to this question states that, on average, crude and blind imitation heuristics are not as maladaptive as they appear, and are quite common among modern humans. It is backed by several arguments.

0. **Sometimes, the costs and benefits of cultural practices may be hard to evaluate.**

   In those cases, the prestige and number of people to adopt a given practice may indicate its usefulness better than other cues. In itself, though, this is not a reason to assume that agents should use these cues *exclusively*, and disregard what they might know from other sources. We do not know how frequent the situations are, where prestige-bias and conformity would outperform other decision heuristics. Even in those situations, it would seem sensible to combine various sources of information instead of focusing on one type of cues.

   The argument that costs are hard to compute is not sufficient, but it introduces what we take to be the two main arguments in favor of blind prestige- and conformity-biased imitation:

1. **Most of the time, the number of individuals adopting a given behavior (or their prestige) are the best cues we can use to evaluate its payoff.**

2. **Paying attention to the number or prestige of adopters exclusively is a 'simple heuristic that makes us smart'.**

   These theoretical arguments are often followed by an empirical one:

3. **There is ample evidence that humans blindly imitate costly behaviors.**

ABOUT ARGUMENT 1 — WHY SHOULD WE NEGLECT THE MANY PRECIOUS SOURCES OF INFORMATION, PUBLIC OR PRIVATE, THAT GUIDE OUR DECISIONS?

The information we may use to guide our decisions stems from many kinds of sources, public or private. On the side of public information, we find arguments, testimonies, etc., carrying our culture's accumulated knowledge. The number and prestige of models is only one piece of public information among many. Private information includes everything we learn from individual experience (combined with some innate intuitions).

Dual-inheritance theorists tend to treat cultural information as an alternative to private information: relying on culture would get us rid of our tedious dependence on experience, sparing us many errors. Therefore, the argument goes, it makes sense to grant cultural information a strong favorable prejudice. We do not challenge it with our private information. We blindly rely on culture.

This argument is misleading. Just because culture is a useful *complement* to individual learning, does not make it a good *substitute*. In some domains, private information cannot be replaced. As Friedrich Hayek argued, private knowledge is not a smaller, inferior version of the general stock of public information. It has uniquely valuable properties of its own (Hayek, 1945).

First, you have privileged access to your own private information: the knowledge of what you did last minute, of where you were a few days ago, etc. is much cheaper to you than it would be to anyone else. It is also much more reliable: the occasional self-deception notwithstanding, you are not as interested in misleading yourself as you would be in misleading others. Second, there are things about which you can only be privately informed. Nothing can inform you about your preferences, for instance, like private knowledge can. Insofar as your preference differ from those of others, their choices tell you nothing about what you would gain from copying them. Any suitably prudent decision heuristic should tell us: pay attention to the things only you know.

Thus, a sensible way of dealing with the sources of information we have access to treats them as complementary, not as alternatives.

ABOUT ARGUMENT 2 — BLINDLY FOLLOWING THE MANY AND THE PRESTIGIOUS IS NEITHER SIMPLE NOR SMART.

To this, proponents of dual inheritance theory usually reply that consulting many sources of information entails some computational cost. Focusing on one type of cue is cheaper. Thus, crude imitation heuristics are preferable to more sophisticated strategies, in spite of the mistakes they cause. Richerson and Boyd refer to Gigerenzer's "fast and frugal rules of thumbs" (Gigerenzer and Goldstein, 1996, Richerson and Boyd, 2005, p. 120). According to Gigerenzer and colleagues, those "simple heuristics that make us smart" have two precious qualities. First, they use a small number of cues, thus sparing us a costly search for information. Second, because they discard confounding information, they are more accurate than more exhaustive decision-making mechanisms.

Yet, blind imitation of the many or of the prestigious has none of these properties. The cues it uses are quite hard to retrieve, and the useful information it discards makes it less accurate than selective, cost-sensitive imitation.

The number and prestige of models is not an easy cue to fetch from the environment. Consider prestige. Vague cues like general reputation track the possession of useful knowledge in a mediocre way. For instance, among the Tsimane, a reputation for wisdom is only weakly correlated with one's knowledge of medicinal plants (Reyes-Garcia et al., 2008). This problem can be solved by using more specific reputational cues, such as people's abilities as hunters, their success in politics, etc. But these cues are hard to build, hard to track, hard to evaluate. Anthropologists Hill and Kintigh (2009), working among the Ache of Paraguay (who hunt for their food on a daily basis) have tried to observe the relative success of hunters while controlling for obvious confounding factors. Gathering the data, they report, took 14 000 observations over 27 years (not to mention the difficulty of computing the results). To avoid this, one might trust the testimony of others on such matters — but then, one would have to keep in mind the reputation of informers, which brings us back to where we started. Compared to private information (easily accessed by definition), prestige and reputation cues lack the frugality that is supposed to make them appealing.

Gigerenzer and colleagues have always been clear on one point: in their view, rules of thumb are adaptive because they are *more* accurate. They *make us smart* by discarding confounding information. In their reference paper on simple heuristics, Gigerenzer and Goldstein (1996) thus conclude "Models of inference do not have to forsake accuracy for simplicity. The mind can have it both ways". Crude imitation rules do not have it both ways. They discard a lot of useful information, to concentrate on indirect and uncertain proxies. Simpler, less accurate. Indeed, they would not readily yield maladaptive altruism otherwise.

ABOUT ARGUMENT 3 — THE EVIDENCE FOR BLIND IMITATION IN HUMANS HAS BEEN OVERSTATED.

A nice example of this is provided by the many replications of Asch's famous conformity experiment. It is well-known that a substantial minority of people will systematically endorse the false opinion of a majority (Asch, 1951). But one should note that, in most versions of the experiment, imitating the majority entails no cost at all. What happens when penalties and rewards are introduced? In a modified version of Asch's paradigm, Baron et al. (1996) asked subjects to recognize, in a lineup, an individual they had previously seen on a picture. They varied both the amount of information available to the sub jects (by changing the time of exposure to pictures), and the importance of the task (by introducing monetary incentives). Subjects blindly imitated a misleading confederate when the stakes were not high, or when their own personal information was unreliable (when the task was difficult). They trusted their own judgments otherwise, that is to say in the condition where the stakes were high and the task was easy. In other words, they imitated in a sensible and cost-sensitive way.

Yet, a number of empirical findings challenge this view of imitation.

Overimitation. The study of so-called 'overimitation' effects provides many reports of children copying pointless gestures in addition to the ones they are supposed to imitate. Overimitation is found also in adults (McGuigan et al., 2011). In at least one experiment, children overimitate even though it diminishes the reward they would get, if they completed the task faster Lyons et al., 2011.

The causes of overimitation may be multiple and are not yet well understood. One leading author on the topic, Derek Lyons, sees overimitation as reflecting a misunderstanding of the causal power of the overimitated gesture. If true, this would imply that children overimitate because it seems to them beneficial. This interpretation is supported by the fact that overimitation decreases when the lack of causal connexion between the irrelevant gesture and the desired effect is made obvious (Lyons et al., 2007). Another interpretation might be that overimitation is, quite simply, fun : it adds some challenge to otherwise somewhat boring activities (all the more so when the subjects are told they are not

supposed to copy the useless gesture, or that it will make it more difficult to win a reward). Even in the rare experiments where overimitation carries a small cost, it is unclear whether the fun, or the apparent benefits of overimitation do not offset this cost.

Other cases of blind imitation in children. Children are more likely to act generously or violently when they have witnessed a model behaving generously or violently (Bandura, 1963, Bryan, 1971). In the "jar studies" in particular, children are made to win a small reward in chips (which may be exchanged for toys), and then told they may give a part of it away to a child in need. Children are quite likely to show some generosity, with or without imitation. However, when the experimenter sets the example by giving away her own chips, children are more generous. Yet the effect is weak, and it does not fit easily with current theories of imitative altruism. Instead, the authors of these studies suggest that imitation enhances giving merely because "the witnessing of a novel behavior without reprimand would subsequently increase the likelihood of such behavior".

The contagion of deleterious behaviors. Many authors have argued that behaviors as costly as suicide, homicide, tobacco use or obesity could readily spread by imitation (Christakis and Fowler (2009), Phillips, 1974). These researchers argue that deleterious behaviors tend to cluster in time, in space or in social networks, in a way which is consistent with a contagion model. That much is true, but recent papers remind us that the clustering of suicides, tobacco use or obesity need not reflect imitation (Lyons, 2010). They are entirely consistent with at least two alternative explanations. First, the clustering of costly actions may be produced by some overlooked confounding factor. Individuals may be influenced by a common cause rather than imitating one another. Second, people with a propensity to smoke, commit suicide or become obese might not be randomly dispatched in space, in time or in social networks. They might be attracted to certain points by the presence of similar individuals, a phenomenon called *homophily* (Steglich et al., 2009). Aral et al. (2009) estimate that properly taking these biases into account would reduce the estimated influence of contagion by a factor of 3 to 6.

What about celebrity suicides? The effect of celebrity suicide on suicide rates is, depending on the studies, small (Yip et al., 2006), neutral, or even negative (Baron and Reiss, 1985). But most importantly, it has never been compared with the effect of simple celebrity deaths. People committed suicide after lady Diana's involuntary death (Hawton et al., 2000). Non-imitative suicide caused by grief appears at least as strong as alledgedly imitative suicide.

Other alleged examples of blind imitation in humans are dealt with in Morin and André (2011).

WHAT IT WOULD ENTAIL TO ABANDON BLIND IMITATION

In their most recent writings, Henrich, Boyd and Richerson seem ready to claim that imitation should rarely make us adopt maladaptive behaviors. Therefore, the only forms of biological altruism which it can promote are cheap: they do not impose important fitness costs on cooperating agents. In their models of altruistic punishment, people primarily cooperate because they fear punishment. The helping actions are not altruistic: they benefit helpers, who enjoy reciprocity and avoid punishment.

The norms of punishment are themselves grounded in the fact that people are ready to punish even at one1s personal cost. Those second-order retributive actions are genuinely altruistic, but they are cheap. In equilibrium, most individuals cooperate and are never punished: one might not have to punish at all. The threat of it suffices. Thus, the costs of altruistic punishment are so small that even a reasonably cost-sensitive imitation heuristic might occasionally fail to detect it (Henrich and Boyd, 2001).

I will leave aside the question of why we would *more* readily imitate altruistic punishment, merely *because* we hardly ever see it happen. Instead, we will point a possible point of agreement between this model and my argument: if mistaken imitation is rare, biological altruism should be just as rare, and human cooperation should be backed instead by sanctions, rewards, reputation-monitoring, etc. Human cooperation would not be, for the most part, biologically altruistic. (Or, if it were altruistic, it would not be because of culture.) This position, however, is quite at odds with cultural group selection theory, or at least with one of its major selling points.

Proponents of cultural group selection see human cooperation as a "huge anomaly" (Fehr and Fischbacher, 2003), in that it is "fundamental ly incompatible with the biologists' model of the self-regarding reciprocal altruist" (Gintis, Bowles, Boyd and Fehr, 2003). Because of culture, says the theory, humans generally and systematically differ from non-humans in their readiness to help and punish at a net inclusive fitness cost to themselves. This argument is what allows cultural group selection theorists to account for cooperation in anonymous contexts, when it cannot benefit the givers (Fehr and Fischbacher, 2003). However, if altruism is a product of maladaptive imitation, and imitation is mostly flexible and cost-sensitive, cultural altruism cannot be an important feature of human cooperation.

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BIOCULTURAL APPROACHES TO MIND AND KNOWLEDGE: AN OVERVIEW

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To Tim Ingold, unpretended master and teacher

INTRODUCTION

Dualism it very much entrenched in Western intellectual philosophical traditions: from Parmenides, Pitágoras, Middle East philosophies and religions that have influenced Judaism, Christianity and Islam, Cartesian Rationalism, etc[1].

Western dualistic epistemology is also embedded in Cognitive Sciences, Life Sciences, Physics and Chemistry, Engineering, Politics, Sociology, Economics, Anthropology, , Law, Ethics, etc.. Our common sense intuitive psychology and folk taxonomies partition the world in everything-out-there and what is considered human and human-made and its thinking. The so-called advancement on modern, posmodern, postindustrial, posthuman, globalised society in terms of technology and life sciences, cannot be understood without these epistemological foundations. Neoconservatism, neoliberal and neo-colonial practices of power and new ways of subjugation of people and devastation of earth resources, strongly depend on philosophical and moral ideologies and practices that ignore holistic epistemologies of interconnectedness.

1 Dualism is also a feature in Budhist, Hinduist and Taoist philosophies and their religious practices but these have devised logical and practical spaces for their integration I cannot discuss at this moment

Nature/Culture is one in a myriad of oppositions derived from such a dualistic partitioning. It is related to many more clusters of antinomies, most of them very well known by all:

- mind/matter, mind-soul/body-flesh, mind-conciousness/ brain-intelligence
- Real/symbolic, material/symbolic, organic/symbolic

- Cognition/emotion, reason/desire(motivation,intention, etc.), reason/senses

- Culture/Biology, Genetics/Culture, Biology/Society, Evolution/Development
- subject/object, society/individual

- Action-practices/ norms, representations, discourses, categories
- Innate-instinct/learned
- human/animal, male/female, child/adult

The nature/culture divide paradigm is hardly absent in any of our scientific and intellectual disciplines.

Have these frames not come to a dead end for the understanding of how we build our worlds and ourselves, the complex interconnected relationships that undelrly humans as evolved and developed organisms? To suggest a sort of way out of this entrapment is one of the main goals of this paper.

Many scientists and researchers, among which I include myself, live the epistemological and theoretical divide between nature and culture as a heavy and boring load that impinges on our efforts to move forward towards a more integrated, interdisciplinary and dynamic conception of what it is to be(come) a human as anthropogenic builders of our (and other organisms) world landscapes.

Hopefully, as the song goes 'times are changing'. The more we contribute to accelerate this long and winding road, as is one of the purpose of this workshop, the better.
From my point of view, the nature/culture divide is untenable because, among others, the following main reasons:

a. It is biased, simplistic and unrealistic
b. It jeopardizes true interdisciplinary
c. It hinders alternative knowledge production and practice for sustainability and world ethics.

The problem does not rely in theory, methodology, lexicon, but on something much more entrenched and enduring: epistemology. The paradigms upon which be build our theoretical work, our research methods, are the core from where we should start the change.

Paradigms are the broad conceptual-practical categories – epistemologies – of how we think and address ontological(ised) relationships, types of causality, agency, etc. Different epistemologies orientate different clusters of theories, being that these specify according methodologies. In the end, specific materialsymbolic accounts, views and practices of the (our) world are produced, which feed recursively the previous epistemologies they were founded in (as in an open boolean systems. Cf. {Shmulevich, 2002 #5065}.

It is not that I am looking for the logical origins of a series of dualistic results and outcomes. Scientific production is an open-ended systemic process that can be sensitive to change at any moment and hierarchy of complexity; any conceptual change that affect one will probably have consequences for the others. But epistemological principles encompass all moments of scientific production, being a very entrenched stand point from which other processes derive (theoretical processes, methodologies, data production, analysis, etc.)

I will review the basic paradigms that hinder standard scientific thinking and practice in getting rid of this divide and, therefore, producing more fruitful and challenging accounts. I will concentrate in three major disciplinary scientific areas:

1. Neodarwinian evolutionary thinking and Gene-centered Biology,
2. The Cognitive Sciences Research Program, and especially Cognitivism
3. Social Sciences in general and Social and Cultural Anthropology in particular.

I do not presume that these are monolithic nor homogeneous. I will attend those more basic and shared views within their necessary diversity.

After that I will resume what conceptions of Nature(s) and Culture(s) derive from these paradigms to immediately propose an epistemological turn with specific consequences for each of the above mentioned disciplines. I do not pretend to teach a lesson to anybody; take it that my arguments follow from my personal intellectual development towards a more comprehensive approach that hopefully will open up more challenging questions and debates.

After that I intend to discuss what type of Biosociocultural Anthropology may contribute to a new theoretical research programme. Empirical examples will be provided to show the benefits of this truly interdisciplinary line of thought and research.

I will finish re-considering the frames, the phrasing and the intended consequences of the eight proposed questions outlined in the workshop introduction.

I. UNAVOIDABLE OLD-NEW DEBATES: NATURE/NURTURE, BIOLOGY/CULTURE-SOCIETY AND OTHER OBSOLETE DUALISMS.

I.1. The nature-culture divide in neodarwinian evolutionary thinking and genetic determinism

The basic general tenets of these approaches are:

1. Darwinian evolutionary theory conflated with genetics in what J.S.Huxley named as the *New synthesis* and Romanones as *Neodarwinism*.
   Neodarwinian evolutionary accounts reduced Biology to Genetics; life evaporated from Biology. The shift from genes to DNA as the molecule of life information (Watson and Crick 1953) did not change this gene-centered fetichism but reinforced it.
   Genes – either in the individual or in a population (i.e. (Cavalli-Sforza and Feldman 1981); (Boyd and Richerson 1985) – although see (Richerson and Boyd 2004)) became structural units of inheritance, selection and evolution. For the gene-centrism that is prevalent in Neodarwinian theoretical developments (Cognitivism, Evolutionary Psychology, Behavioral Ecology, Memetics, etc.) Biology is reduced to Genetics.

2. Gene-imperialist thinking is based on an ontological essentialism that conceives the gene as a discrete replicating unit, bounded and self-contained (cf. (Ingold 1990). It relies on an objectivist, ontological essentialism instead of on dynamic systemic processes and interactions that produce emergencies at different grades of complexity.

3. The unit of evolution is the gene and its frequency in a population, understood this as an aggregate of people.

4. Computational metaphor. Genes are segments of a macromolecule called DNA that reside in the nucleus of the eukaryotic cell and carry the necessary coded information for a specific trait. The gene has been conceived as a digital code of instructions (information) that could be deciphered; from its signs one could get to know its order, its grammar (not its meaning).

5. Linear causality. Genes code for specific traits, the genotype explains the phenotype. Everything that is not the genotype is the phenotype. Based on Weissman (1834-1914), Johanson (1910) established the non reversibilibility of genotype/phenotype as the new dogma of a chemical written Genomics. This barrier has been dogma for what Romanes named as *Neodarwinism,* which has dominated 20th century evolutionary thinking.

6. Individualism. The organism, as an individual, is a bounded container/carrier/reproducer/of the genes.

7. Rationalistic instrumentality. The individual is conceived as maximising his/her benefit or that of his/her (kinship selection, inclusive fitness, etc.). This leads to an anthropological pessimism that stresses conflict, deceit and competition over cooperation. Helping others is helping ourselves because they carry our same genes. Game theories as applied to action in rationalistic approaches take resources as given, and rules as granted.

8. The adaptationist programme of Neodarwinian theories of evolution imagines that organisms adapt to the constraints of a changing and challenging environment.

9. Inherittance. What is *transmitted* through the generations is not a life current but a bunch of genes with instructions for the building of phenotypes as reflected sequels of the former (cf. Ingold 1990). The model of evolution is a tree with unconnected branches that evolve from an original stem.

10. Behaviour and Culture. Behaviour is conceived as measurable action observed without any consideration to subjective involvement. Even in its more comprehensive approaches, genetic determinism is, in the end, the explanatory of behaviour. Behaviour is equated to *culture*, and is re-named as *extended phenotype*, which as any of its kind, depends on *genotype*. Cultural reproduction and evolution is explained in the same way as in genetics. Memetics (Dawkins, 1982) consider *culture* as a collection of *memes* as units of replicated behaviour. The *extended* phenotype can be distributed in a population as contagious ideas, following an epidemiological metaphor (Sperber, 1985, 1994). In its more reductionist type, *behaviour* 'helps' *genes*.

11. Society is understood as the aggregation of monadic individuals seeking for their own benefit in a competitive environment of equals and others. Entomology is the model for sociality. The *social* has been reduced to that of adaptation. That has been the case of Hamilton's (Hamilton 1964) *kin selection*, R. Trivers (Trivers 1971) *reciprocal altruism* and E.O. Wilson's *Sociobiology* (Wilson 1975) and the concept of *inclusive fitness*, the rationale of behaviour in favouring relatives because they convey one's own genes; Behavioral Ecology (Standen and Foley 1989), Evolutionary Psychology (Cosmides 1994), and Memetics (Dawkins 1982).

12. Gene-centered Biology and Evolution have never considered development nor ontogeny (as life-course processes). In this gene-deterministic agenda, development has been understood as the combined effects of external environmental factors and the genetic program that unfolds to produce a more or less predicted outcome.

13. Methodology. Use of modelisation of little realistic and empirical situations.

1.2. The nature-culture divide in cognitive sciences

Here I will refere to what I consider some standard views in the interdisciplinary Cognitive Sciences Programme, which obviously has its exceptions. I will concentrate in some standard dominant views of the mind, some of which may be shorthened as C*ognitivism,* but not only.

1. Cognitivism. The primacy is given to cognition over other mental phenomena. Reasoning and propositional thinking, classifications, problem-solving, planning, are higher order mental processes compared to lower order mental processes (emotions, desires, intentions, etc.) because it is the privilege of human superiority over any other living creature or in terms of quantity of neural circuitry (quantity is paramount over quality, -and qualia). Thinking is a higher order process where there are lower other processes (because it involves more neural circuitry or because of cartesianism?). Psychology is reduced to cognition.

2. Bodily and organic processes, motricity, actions, emotions, experiences, and subjectivity are generally absent in the standard Cognitive Sciences view. Cartesian philosophy distinguished between the mind and body because of their different extension properties. Sensoriality and passion, belonging to the body, were eliminated from rationality, because they belonged to the lower instincts and bodily humours (cf. Shilling & Mellor 1996) that confuse the mind. Cognition transcends any bodily experience, which belongs to our animal side, and therefore, to *Nature*. The neurological is conceived as independent of other organic processes such as the hormonal.

3. Consequently with rationalistic primacy, the computational and digital approach is a very common feature in this approach. Cognition is producing/coding (output) and receiving/decoding (input) bits of information. Subjective/collective character of this information, the meaning, the interpretative aspects of it, are irrelevant. Boolean systematicity (as in connexionism) can be accepted but to Bayesian network systems.

4. In Cognitivism, perception is understood as information. Cognition elaborates the data coming from perception, which is a straight forward process of input information from reality-out-there to the mind.

5. For the Cognitive Sciences in general, there is an ontological realism, the *real-out-there,* captured by the representational kind of the mind. In the case of Cognitivism, representations are algorythms to be decodified from a set of rules. Disembodied individualism.

6. Standard approaches in Cognitive Sciences show a monadic conception of the individual, devoid of any subjective involvement and practical engagement with the environment, emptied from his/her biographic and sociocultural embeddedness. The epistemic agent is a disembodied, a-contextual, a-social, a-historical thinker, where actions and experiences are irrelevant. Cognition is a-contextual, non-situated, independent of external influences (but of challenging cognitive problems posed by *Nature*). In any case, behaviour is the consequence of what happens in the mind.

7. There is not much interest in neurobiological developmental processes. Capacities are mainly inherited and depend on genotype; they are intrinsic to the individual as an instatiation of his species.

8. Cognitive Sciences shows a kind of *languagecentrism* as the most evolved and complex capacity that distinguish humans from other creates. Grammar and syntaxis are those linguistic aspects preferred for research, not semantics: content is irrelevant (cf. Searle, 1990). Verbal children and adults are privileged objects of analysis, without any consideration for biopsicosocial precursors of communication in babies and infants. Thanks to our innate Language Acquisition Device (LAD, cf. Chomsky, 1980), language is a universal trait of the human species.

9. Cognitive Sciences have recently adhered to theories of mind modularity. Stemming from a mechano-lego metaphor (Shore, 1996), and as a side-effect of mental modularity (Fodor, 1983), modularity a rigid geographical division of the brain, instead of a diffuse soft architecture of mental activity. The world is fragmented in specific domains for which humans have evolved (genetic) special cognitive devices or modules (Whiten, 1991; Byrne,1995; Boyd & Richerson, 1983; Gómez & Núñez, 1998; Hirschfeld, 1988, 1994; Baron-Cohen, 1991; Leslie, 1987; Sperber, 1985; Boyer, 1994; Mithen, 1996; Barkow, Cosmides & Tooby, 1992; Chomsky, 1980;Pinker, 1994), innate ready-made universally shared capacities for partitioning the world in kinds of objects (Atran, 1990). In its more blunt trend, it is not interested in crossmodality, polisensoriality, brain plasticity, or integrated mental processes.

10. There is a clear cut between what is considered *innate* and that of *learned*. Although the first means what it comes with birth, as all prenatal uterine experiences are irrelevant, innate is equated to *genetic*. For Cognitivism in particular, there is no interest in how learning is really produced. The learner process information; learning is not a creative personal and collective process but an internal mental activity of neuronal connections.

11. Society. The epistemic individual is an evolved given entity that is not construed through a life of engagional and embodiment development within itself and with its sociocultural environment. Obviously nobody would affirm that some social environment is needed to bring these forth, to unfold them from their primeval state. But it does no follow that abilities are the emergency of a history of sociocultural coupled relationality that elicit and stimulates epistemic connectedness as the basis for sharing a world and getting to know it (i.e. eye contact, joint attention, etc.). Society is a kind of background stage for the epistemic actor with its own challenges.

12. Culture is the flavouring/colouring of universal capacities that come on top of the biological (the genetical), as in the aforementioned paleomorphic stratigraphic model. Cognitive scientists dismisse crosscultural comparative research (Domínguez, 1997), because the brain works the same anywhere. Culture is sometimes the transmission/learning process, sometimes the symbolic. Therefore, studies tend to be ethnocentric. Modelling of cognitive process are supported on very little empirical situations.

13. The only social anthropologists included in the standard Cognitive Sciences Project are those that take for granted Neodarwinian basic tenets. For these Nature (as Genes) is prevalent on Culture. Culture may be a *factor* on Evolution or even on Biology, but not a mutually embedded co-ontogenic process.

1.3. The nature-culture divide in social/cultural anthropology and other social sciences.

I spent four academic years in Cambridge University (UK) disguised as a Visiting scholar; what I really did was to became again a student who wanted to learn and know all possible about how and what it was to became human beings. I was a little fed up with Social and Cultural Anthropology unlimited relativistic thinking and cultural arbitrariness. I had to de-centered myself as a social scientist but without loosing the critical approach that most social anthropologists get to learn; just leaving it behind and trying to open my mind to new ideas, disciplines, concepts and empirical work.

Social Sciences and Social Anthropology in particular, have been captured also in the nature/culture divide (with some exceptions, obviously)[2]. The constitution of Social Anthropology and its diciplnary development during the last century has been framed by the following basic tenets:

1. Particularism and hiper relativism. Eurocentric evolutionism of XIX century conceived hunter-gatherer societies as savages, precultural people,. These 'primitives' were conceived as our living ancestors, cultural fossils of a pre-time (cf. Wolf,) from which Europeans and Americans had long departed. Culture was for civilised societies; Nature, in its primeval form, for the exotics. Along the XXth century Social Anthropology shifted from this linear and moral conception of human evolution and insisted that EuroAmerican man was not necessarily the model. A whole range of cultural possibilities and ways existed around the world.

2. The Saussureian arbitrariness and unmotivation of the linguistic sign was taken as a metaphor for culture. Culture as an arbitrary system contributed further more to cultural relativism.

2 Tim Ingold, M. Law, Ch. Toren, R. Borofsky, T. Csordas,....

3. Social Anthropology was built as an independent discipline from Biology (besides Psicology and Sociology). Human nature was a biological given (cf. Malinowsky, Radcliffe-Brown, Lévi-Strauss), a matter of Life Sciences, not concerning Social and Cultural Anthropology. Rejecting Eurocentric and racialist Evolutionism of XIXth and early XXth centuries, and later Neodarwinian Sociobiology, Social and Cultural Anthropology rejected anything to do with Biology, assuming that it was the same than Genetics.

4. Sociocultural Anthropology assumed man as the finished product of organic evolution, on which culture would shape its real form.

5. Symbolic/material dualism. Social anthropology has suffered, as the others of an incapacity to assume the materialsymbolism of all human productions. A very rationalist Economic/Ecological Anthropology critisiced the ideographic character of Symbolic Anthropology, while this last one opposed the formers their lack of enphasis in shared meaning and semanticity.

6. Mental/sociocultural dualism. Since its very beginning, Social Anthropology has hade difficulties in dealing with mental activity, which was relegated as the matter for Psychology. The mind issue was split between Cognitive Anthropology (i.e. classifications, language, combinatorial modelyng) and Symbolic Anthropology (Geertz, Parkin, etc.), leaving orphan the most interesting parts. The need of a comprehensive theory of knowledge has been put forward by many anthropologists (Brad Shore, Christina Toren, Roger D'Andrade, Claudia Strauss, Naomi Quinn, etc.) some of them from Psychological Anthropology and Crosscultural Psychology. Body has been traditionally envisaged mainly as the slate on which to inscribe cultural representations and practices (but see further).

7. With some important exceptions, Social Anthropology and Social Sciences can be critisized as anthropocentric, adultcentric (but see Toren, Whitting an Childe, Jahoda, Mead, etc) and androcentric (except for Feminist and Gender studies)

To follow:

What ideas of Nature/Culture derive from these three disciplinary traditions and their underlying epistemological paradigms?

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NEXT

II. THE NEED FOR AN EPISTEMOLOGICAL TURN

Based on:

- Dynamic Systems Theories (Autopoiesis and self-organisation, Complexity and Chaos theories)
- Developmental Systems Theories
- A theory of practice
- True interdisciplinarity (intersectionality, triangulation, etc.)

III.. THEORETICAL RECONCEPTUALISATIONS

In Evolutionary thinking, Biology, Theories of knowledge, Biopsicosocioculturality

IV. BIOSOCIOCULTURAL ANTHROPOLOGY

V. REFRAMING THE DEBATE

From all that has been explained, how can we reconfigure some of the necessary debates?

VI. CONCLUSIONS

THE ITEM/SYSTEM PROBLEM IN CULTURAL EVOLUTION[3]

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Ever since Darwin's earliest remarks on the similarity between language change4 and natural history in biology, there has been a persistent conceptual unclarity in evolutionary approaches to cultural change. This unclarity concerns the units of analysis. In some cases the unit is said to be the language system as a whole, meaning that a language is 'like a species' (Darwin 1871:60). On a standard conception of species, this implies that there are populations of hereditably varying and competing language systems, presumably in the form of a population of idiolects that is coterminous with a population of brains. (In the typical situation—multilingualism—one brain houses two or more linguistic systems.) In other cases the unit of analysis is any unit that forms part of a language, such as a word or a piece of grammar. This is seen in Darwin's (1871:60) quote of Max Müller (1870): 'A struggle for life is constantly going on amongst the words and grammatical forms in each language'. In contrast with the idea of populations of idiolects, this suggests that there are populations of items (as memes or the like), where these items are observable in complete form in spoken utterances. Both of these units of analysis—items and systems—seem legitimate. But their ontologies are not the same. This means we must not only define the differences between item phenomena and system phenomena, we must know which we are talking about and when, and we must show whether, and if so how, we can translate statements about one into statements about the other.

With the item/system distinction as a starting point, I have two goals here. First, I want to define the elements of an item-based account of language change. Second, I want to show that once this item-based account is in place, no further analytic tools are required for the description of system-level processes. System phenomena are emergent.

3 In writing this I have benefited greatly from conversations with Morten Christiansen, Dan Dediu, Michael Dunn, Bill Hanks, Jennifer Johnson-Hanks, Simon Kirby, Paul Kockelman, Steve Levinson, Hugo Mercier, Pieter Muysken, Dan Sperber, and Monica Tamariz.

4 This paper is generally concerned with cultural evolution, though mostly I will be using the example of language evolution (i.e., linguistic transmission and change in history).

The item/system problem may be posed as a question:

If cultural evolution is an item-based causal process, how do cultural systems evolve?

We know that a causal account of item-based evolution is necessary. This is because the pieces of a language or other cultural system can change independent of other pieces, and they can be plucked out and borrowed from one system to another. With an appropriate account of these item-based processes in hand, would we then need a whole second type of causal account, one that operates at the level of systems? Or can an item-based account do all the work? Many linguists and cultural anthropologists will insist on the special properties of higher-level systems, and they will point out that these systems display a coherence so robust that we can treat them as if they were organisms with bodies. But cultural systems don't have bodies, so we need a causal account for why it seems that we can treat them as if they did. If cultural transmission is item-based, what explains the apparently incorrigible coherence of languages as systematized clusters of units? Sub-organic entities like genes are items but they 'caucus' and 'form alliances' (Gould) thanks to the bodies and body plans in which they are instantiated. But what are the forces that cause sets of items to cohere given that languages don't have bodies? These questions direct us to the item/system problem.

Language: current issues

Research on language change has had a long and distinguished history in linguistics, and has over the last decade or so been the subject of a spectacular burst of exploratory research in cognitive science using a range of quantitative methods. The emergence, maintenance, and change of linguistic systems is important for cognitive scientists because it is a key example of cultural evolution more generally, and because it is well-defined and well-studied, it gives us a good angle on a domain in which cognitive processes are linked to social and cultural processes. There is said to be an emerging consensus as to how language change should be understood within a loosely Darwinian framework. But just as in ostensibly Darwinian approaches to cultural evolution generally, there is quite a bit that needs to be worked out. For example, which bits of the Darwinian system of inheritance, variation, and selection correspond to which bits of the process of language change? There is talk on the one hand of 'languages' as being like species, presumably with idiolects

being the unit of selection, and on the other hand of 'linguistic items' being the unit of selection. Only Bill Croft has come close to resolving the issue, but having made surprisingly little impact so far. The recent TiCS paper which he co-authored was utterly non-commital in this respect, and so in that sense failed to resolve this issue. Everyone will agree that we must seek to characterise the natural, causal processes involved if we are going to capture the phenomenon (Boyd & Richerson, Sperber). On the one hand, the phylogenetic work does not tap into processes of change at all (Gray, Pagel, Dunn, etc.). That work takes items as its unit but (a) does not work in terms of actual processes that operate upon these items, and (b) takes statements about the phylogeny of these items to be proxy for conclusions about the phylogeny of the systems to which these items belong. These are the moves that historical linguists have always made. They lack explicit treatment of the connection between the causal processes and the (1) existence of and (2) historical integrity of linguistic systems as wholes. Then there is the work that does deal with causal processes of language change directly or it does so by omitting a crucial feature of language, its communicative function.

A problem remains unaddressed in currently vibrant research on language change, both in much traditional linguistic work, more modern advances from within that tradition (Keller, Croft, Mufwene, Enfield), and in a 'new school' of quantitative and experimental work on the topic (Gray, Pagel, Atkinson, Kirby, Chater/Christiansen, Dunn). We know that linguistic systems 'hang together' and that they show historical integrity. At the same time, however, we know that language involves a socially-conducted kind of cultural transmission. It is learnt through social interaction and used. Sociological models of diffusion of innovation have been embraced and further developed by some cultural evolutionists. The Item/System problem is this: If language evolution is an item-based process, how do systems evolve?

Systems as such are never externalised as part of the process of cultural transmission. The diffusionists have suggested biases. There is a danger that these may be unconstrained. An underlying 'logical space' of the causal process is required in order to locate the causal loci of each part and constrain the analytic space. This paper tries to work in that direction.

Culture: some preliminaries

Culture captures a wide range of phenomena, including language, practical knowledge, technological artefacts, patterns of ritual practice, and values. There is no assumption that the specifics of any one of these can be automatically presumed of the others. Language has its own special properties, but it is still part of culture in that it is locally learned and historically cumulative.

Culture has been defined in different ways by different traditions of anthropology. For some, culture is in knowledge, that is in the declarative and procedural representations necessary for producing and interpreting culturally normal behaviour (Goodenough). For others, it is in public symbolic structures like icons, clothing, and words (Geertz). For yet others, culture is in embodied practices, actual events of socially conventionalized behaviour (Bourdieu). These three views of culture are sometimes regarded as competing alternatives but they merely reflect differences in emphasis and interest. Each is the truth though not the whole truth.

Each of these stances on what culture is—ideas vs. symbols vs. practices—represents one segment of a cyclical process of behaviour and interpretation. As just noted, different authors privilege different parts of the process. Runciman (2009:11) offers a modern view that 'all behaviour is a phenotypic effect of information internalized by its carriers'. That is, when we talk about culture, we are talking about information in heads. Information in heads is what causes the observable behaviour and physical artefacts we study in anthropology. But we can easily frame the same facts in a very different way. It would be no less true to say that the observable behaviour is what causes the information to be in people's heads. Had Runciman been of the view that when we talk about culture we are talking about behaviour, he could just as well have said that 'information internalized by people is a psychological effect of behaviour'.

The solution is not to decide between rival accounts of culture—it's-in-the-head versus it's-in-the-behaviour—but to acknowledge the necessary truth of both.

Culture involves both private mental states (beliefs, values, know-how) and public states of affairs (symbols, artefacts, environment). Consider a simple example of a cultural item. 'Bread' is a kind of information as much as it is a kind of artefact and a set of behaviours. It is all of these, interconnected. The English word bread, actual bread, events of the production of bread, the use and consumption of bread, and the normative knowledge of how and why bread is made, displayed, exchanged and eaten, are all of equal importance. They are different points in a proliferating causal chain of processes. This chain has private aspects (mental representations of knowledge) and public aspects (observable behaviour and artefacts). There are causal relations from the private to the public and back again in an ongoing and developing trajectory. So culture resides in relations between (1) psychological representations (i.e., intentional states including beliefs and desires), (2) goal-directed behaviours, (3) artefactual products of those behaviours (that may stand as signs of both the representations and of the behaviours), and (4) interpretations of those behaviours and products that in turn cause and relate to (1) psychological representations.

In sum, it is not possible to give a full account of the natural history of cultural states of affairs like artefacts and patterns of behaviour without reference to mental states. Nor is it possible to account for the natural history of cultural information without reference to public states of affairs. Rather than taking the public or the private as basic, we must instead acknowledge their co-dependence by taking as our unit of analysis the relations between them. It is a distributed theory of culture. In slogan form: Culture consists of relational processes between things that happen in the mind and things that happen in the world. And historically, culture consists of trajectories of those relational processes, linked. Minimal sets of such relational processes are what we identify as cultural items. Items form larger structures called systems.

Some current research on cultural transmission adopts assumptions that are highly simplified so as to render the problems tractable in mathematical and computational models.5 Does this simplification compromise the quality or relevance of the analysis to the facts that are abstracted from? Most recent evolutionary approaches tend to stress a 'culture is information' view (Sperber, Boyd and Richerson, Runciman, etc.). This general stance locates culture primarily in ideas that can stick in the head and that can motivate and constrain our public behaviour. The model is straightforwardly applicable to language on the assumption that diffusible ideas or memes are Saussurean 'form-meaning mappings'; i.e., where a word is a psychological structure that links a mental image of the sound of the word to a mental image of the word's meaning. But language has the same unsubtractable public component. The sign is no more a psychological relation in private thought than it is a social relation in public behaviour. To see why, ask how one would study signs without using public events (Miller 1963).

Different modes of change?

Because culture changes and diversifies, showing 'heritable variation and competitive selection' (Runciman 2009), it can be readily approached within a Darwinian evolutionary framework. This has been widely recognized, but there is so far no consensus as to what exactly the units of variation and selection are, how exactly they are inherited, and how exactly they compete with each other. A fundamental issue is to distinguish between items and systems as distinct loci of change and diversification with distinct ontologies.

Cultural items, on the one hand, are bits of diffusible culture or language that can be learned, borrowed, invented or lost in their own right. Systems, on the other hand, are the higher-order structured aggregates that correspond to what we call cultures and languages. Items have a different ontology from systems. What are the differences between the two, and how are they linked? I argue that answers may be found by first

5 Much of the work on evolutionary approaches does not stem from research within a social anthropological tradition, with the result that there is little connection to major literatures that have wrestled with these questions. One reason why this is a problem has to do with the importance anthropologists have placed on the higher-level systematization of culture. For the moment, we leave the macro issue of cultural systems to one side. This is taken up in later sections.

focusing our attention on items, their ontology, and the evolution of their diversity. The transmission and diffusion of cultural items is a population level phenomenon that can be well handled by existing analytical tools. These tools are available in the form of a biased transmission model of the distribution of cultural knowledge and practice within human populations and across generations, following a general framework of cultural epidemiology (cf. Sperber 1984, 1996, Boyd and Richerson 1985, 2005, Enfield 2003, 2008). In a biased transmission model, fashions of cultural practice in a population will spread, decline, change or remain as they are, as determined by the cumulative effect of a range of biases which ultimately serve as accelerants or decelerants in a competition for cultural uptake. Note that whether cultural items change or stay the same, they are still continually being actively transmitted within a human population.

My thesis is that the mechanisms we need for handling item-level evolution in culture and language are the same ones—and the only ones—we need for devising a full account of the transmission of cultural and linguistic systems, that is, an account of how systems exist, cohere, and diversify across space and time. The argument proceeds as follows. First, I present the elements of a biased transmission model for the diffusion of cultural items. Existing versions of this model are modified, in particular by motivating a set of biases directly from a finite anatomy of the process of item transmission through what I shall call iterated social practice. With the elements of a biased transmission model for items in place, I propose a solution to the item/system problem solely in terms of these item-based biases. I claim that the biases required for item evolution are sufficient not only to account for how and why certain cultural items win or lose, spread or die out, they can also account for the key forces that link items and systems. There are three such forces: (1) bundling of items through sociometric biases, (2) determination of items' combinatoric properties through context biases and the relation of item-utterance fit, and (3) grammatical systematization through content biases relating to (a) psychological representation by individuals of large inventories of linguistic data and (b) functional motivations such as ease in production and recognisability of meaning in comprehension (e.g., as facilitated by iconicity and other sources of natural meaning).

Item transmission and evolution

In item transmission and evolution, cultural items persist in a human population over time, with or without change. Dutch hond and English hound are changed versions of what was once a single 'entity', the common ancestor of these two words. The term 'entity' is in scare quotes because we are not talking about an actual or individual thing. We are talking about a class or type, as a species is to any individual instance of the species. (And as noted already, cultural items are relational processes not objects.) On this view our hound/hond example features two populations of items. One is made up of all instances of mental representations and usages of the word hound meaning 'hound', which we identify with a system called English. The other is made up of all instances of mental representations and usages of hond meaning 'dog', identified with Dutch. In what exact sense are these two modern item-populations evolving? In what sense have they separated and in what sense do they diverge? How do these populations remain coherently structured?

Before addressing these questions directly, consider how this example of distinct item-populations contrasts with the transmission and evolution of populations of systems. In system evolution, it is whole systems that persist in human populations over time (with or without change). The idealized linguistic systems that we call Dutch and English are generally understood to be changed versions of what was once a single 'entity', the common ancestor of the two systems (though this notion of common ancestry for whole systems is very much more abstract and tenuous for systems than it is for items; see below). Here, the two modern populations are populations of idiolects. One of them is made up of all mentally instantiated representations of the system of items and rules recognized as English, the other is the same for Dutch.

Now while items can be concretely characterised as types of event that instantiate reliable relationships between psychological states and behavioural events (e.g., mental representations of words, instances of them in actual speech, resultant effects on other's mental states and behaviour), systems cannot. Psychologically, the system is a state that can be characterised in terms of items, with the added feature of being identifiable (though not always without controversy) as a system in political or other

ideological terms. Questions like 'Is email a recognizable linguistic item?' are readily resolved empirically for a given human population: people will either recognize the word with a given meaning or they won't. By contrast, questions like 'Is email a word in the Dutch language?' are not so readily resolved, because the measure is not an objective one. Some people will insist it is English and not Dutch (cf. Koops et al 2009). In other words, it is not a matter of opinion whether the word email is used with communicative function in a certain community—in the Dutch case it clearly is—whereas it is a matter of opinion whether the word is to be (read: should be) identified as belonging to a certain ethnically identified cultural system.

We now put aside for a moment the question of system transmission, as we turn to define the mechanisms necessary for item transmission and change. We will come back to systems.

BIASED TRANSMISSION IN ITEM CIRCULATION

Dawkins (1976) and others have argued that culture can be thought of as bits of information in competition for propagation by humans, through processes like learning, imitation, and action. This is almost right. I say almost because, as I have argued above, the causal units of interest are semiotic processes in which mental states are just one part. But we can still talk in terms of cognitive-behavioural units that diffuse in human groups. The way to approach the problem is with population thinking (Mayr), as Boyd and Richerson (B&R; 1985, 2005) have long argued for culture. Their framework of guided variation with biased transmission is the starting point for an anatomy of cultural transmission to be developed in this section.

Cultural items are distributed not only through time but spatially in human populations. At any given moment, a human population is abuzz with a mesh of ongoing causal chains that constitute continuous trajectories of production and comprehension of item-level patterns of behaviour. I am referring to all of the situations in which people carry out goal-directed behaviour involving language, tools, or other public cultural devices. People are saying things, changing light bulbs, stopping at traffic signs. These trajectories of behaviour play out the natural history of cultural and linguistic items. They constitute causal chains that oscillate from mind (I know a word, I understand a tool) to usage (I utter the word in a communicative act, I use the tool for a purpose), to mind (my addressee learns or recognizes the word, an onlooker builds or confirms an understanding of the tool's function), to usage, to mind, to usage, to mind, to usage, and on. We may call this type of causal trajectory a chain of iterated practice, or a cognitive causal chain (Sperber 2006). See Figure 1 for an illustration.

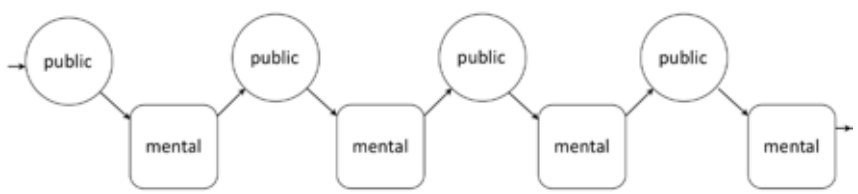


Figure 1. Iterated practice, or a social cognitive causal chain (Sperber 2006:438).

Figure 1 is not the same as the 'iterated learning' chains presented by Christiansen and Chater (C&C), Kirby, and others (see below). Those iterated learning depictions resemble Figure 1, but they are different. In iterated learning, each arrow from public to mental represents an entire learning process such as a child's learning of an entire language. One step in a sequence of iterated learning involves multiple, often very many, exposures to an item used in context. With language in particular, learning involves not one event but many iterations of exposure and reproduction, and there is feedback that comes from others' reactions to our usage of words for communicative goals in context. This feedback plays a critical role in learning. The iterated learning model abstracts away from these details (not without practical reason), while the iterated practice model in Figure 1 attempts to capture them directly and explicitly.

In Figure 1, each link in the chain from mental-public-mental does not represent a generation of individuals in a human population (unlike Figure in C&C). It represents a generation of individuals in an item-population, that is, one local cycle of instantiation of a practice, such as a single use of a word, a single performance of a ritual, or a single occasion of making bacon and eggs for breakfast.

guided variation = essentially the idea that C&C use to argue that learning and processing shape the way that language is; as population-thinkers, B&R stress that the way people learn increases the frequency of certain variants in the population, and all things being equal, these variants then increase in frequency simply because they are already higher in frequency.

I interpret this to mean that higher frequency causes them to be more likely to be exposed to people, one critical step in the cycle of transmission.

The schema in Figure 1 draws our attention to a set of bridges that a bit of culture has to cross if it is to survive a cycled of iterated practice. What are the forces that inhibit the passage across those bridges, and what are the forces that facilitate? These forces are called transmission biases, following Boyd and Richerson. I will propose a re-casting of Boyd and Richerson's transmission biases, but let me first summarize the essence of their proposal.

B&R'S TRANSMISSION BIASES

B&R assume that there are variants of cultural behaviour that compete for adoption by individuals in a human population. An example from table tennis is the choice between holding the bat with a pencil grip or a handle grip.6 They discuss different biases that might cause a person to select one grip over the other. A direct bias concerns the relationship between the variant and the adopter, thus it concerns affordances (Gibson). It says that an individual should choose the variant if it is somehow advantageous in its proximate function, compared to available choices for the same function in that context. By a direct bias we should choose the grip that is easier, more effective, feels better, gives better results. An indirect bias works on a notion of social identity, assuming that the variant a person selects will be witnessed by others and that this will lend a certain status to both the adopter (as the kind of person who adopts that variant) and the variant (as a variant that is adopted by that person or someone like that). Also, as potential adopters we foresee this identificational function. We adopt variants of behaviours not only for their proximate efficacy but also with some notion of how we will be seen by others having made that choice.7 So by an indirect bias we should choose the same grip as people who we identify with or want to emulate. A frequency-dependent bias favours variants that are more frequent. Frequency can increase the likelihood in a crowded world that you will actually encounter the variant, or encounter it often enough that it will stick.8 (This relates to the direct bias.) It can also trigger a conformity bias: if more people do it (not exactly equal to frequency) then I want to do it too. (This relates to the indirect bias.)
There are other versions of these transmission biases. We now consider two, starting with C&C. C&C present a number of constraints that shape language (Cog. Sci. article 2009): (1) perceptuo-motor factors, (2) cognitive limitations on learning and processing, (3) constraints from mental representations, (4) pragmatic constraints.

6 This example (Boyd and Richerson 1985) implies that the variants—the two grips—are alternatives. But could they merely be two different things? Perhaps they are not fully interchangeable. One can use both on different occasions, for different purposes. There is a distinction between selecting among different means to an end and selecting among different ends. Depending on the framing, we can see going surfing or playing volleyball as competing ends, or as competing means of pursing the same end—leisure.

Sociologists interested in the diffusion of social practice in human populations speak not so much in terms of biases but they are talking about the same kinds of things when they seek to understand the causal anatomy of diffusion. Why are certain new technologies and practices widely and quickly adopted, while others are not? The question is reviewed in great detail by Rogers (1995). It cannot be answered without taking a large range of factors into account. The relevant factors are typically too many to pin down. As Lewis (1986:214) says, 'we might imagine a world where causal histories are short and simple; but in the world as we know it, the only question is whether they are infinite or merely enormous'. Nevertheless, sociological work on diffusion has been successful. It reveals three sets of conditioning or causal factors in the success or failure of a practice.

Sociometric factors concern the network structure of the demographic groups involved. Network structure goes some way to predicting the role of different individuals who are differently socially connected, especially in terms of the number and 'intensity' of their points of connection to others in a social network. In terms of the kinds of biases discussed above, a practice is more likely to spread if it is being modelled by someone who is widely connected in a network, simply because he or she will expose a greater number of people. Gladwell (2000) refers to this as the law of the few. [9]

Personality factors concern differences between individuals in the population that can have consequences for the success or failure of an innovation. Some people are more willing than others to innovate and to adopt others' innovations (early adopters versus laggards). And these differences may correlate with social categories such as age, class, and sub-culture. Some people are better known or better admired and may thus be more likely to be imitated.

7 Sexual selection is associated with indirect bias, being one force that can motivate us to undertake very costly behaviours that are of no intrinsic value or are indeed dangerous. (Cf. Zahavi on the handicap principle, Veblen on the logic of conspicuous consumption.)

8 Marketers know this. They are to academics what professionals are to amateurs in sport. I expect that the frequency itself is not the most proximate reason for you to adopt it, it's because the higher frequency has made it more entrenched or the like.

Finally there is the sheer appeal of the innovation, more or less what Boyd and Richerson mean with the term direct bias. The innovation will take off if it is more advantageous to potential adopters.

None of these kinds of forces can account on its own for the success or failure of some practice.

Where do all these biases come from and how are they related to each other? How can we limit the search for questions and their answers in this possibility space? Can we motivate these biases by locating them directly in the causal anatomy of transmission? I propose the following solution. We take the structure of the basic cultural causal chain in Figure 1 and use it to give us a constrained framework for locating and characterizing the biases. At the heart of the transmission mechanism that drives the circulation of bits of culture in human populations—illustrated in Figure 1 above—is a repeating cycle of transmission consisting of the following:

1. Exposure (a process of going from public to mental, made possible by a mind and body coming into contact with the public instantiation of a bit of culture)

2. Representation (a process of capturing and organizing a mental construct based on (1), and the mental product of this process)

3. Reproduction (a process of going from mental to public, made possible in part by an individual's motivation to cause the same public event as in (1)).

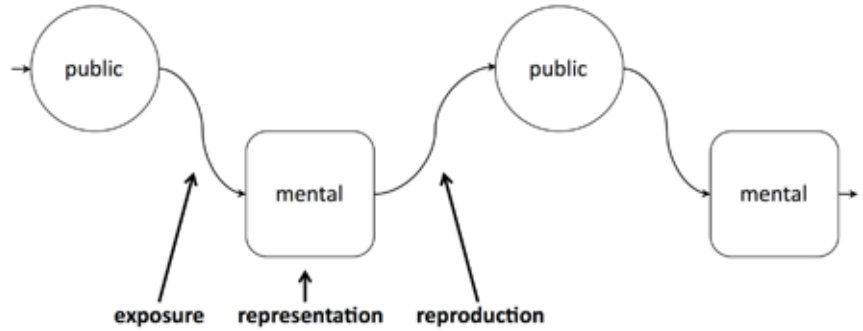
4. Stage (3) then leads to another round by exposing another person to the cultural item in question (feeding into a new stage (1)).

Figure 3. Primary elements of culture transmission

Each of the three steps is a bridge or existential threshold for any bit of culture to succeed or fail in the competition for uptake in a human population. If people aren't exposed to it, it will die. If it is difficult to represent mentally, or if in the course of mental representation it is radically altered, it will (effectively) die. And if people aren't motivated to reproduce it, no further exposure will happen, and with the biological death of those individuals with mental representations of the practice in question will come the historical death of the practice. Failure on any of these three links causes a break in the chain and causes the variant to no longer exist.

- How to constrain the framework so that the lists people give are not merely random? Start with some assumptions:

1. embodiment assumption: culture is always (partly) embodied in people
2. continuity assumption: identifiable cultural behaviours have continuity over time
3. mortality assumption: people die, so (2) must be independent of individual memory
4. no telepathy assumption: people embody culture by encountering and learning it



These assumptions give rise to the 'cognitive causal chain' concept (Sperber).

The 'bias question' is: What are the filters, pumps, and transformers in a unit's career?

Using the existential causal chain supplied above to constrain the scope of our analysis and the extent of the machinery we are required to invoke, we posit three functionally-defined groups of biases. Each group of biases is defined by the function it serves in accelerating, braking, or transforming the transmission of practices in human populations through social-cultural interaction.

1. An *exposure bias* (world-to-mind) is anything that affects the likelihood that a person will come into contact with, and pay attention to, the practice.

2. A *representation bias* (mind structure) is anything that affects the likelihood that, or the manner in which, a practice will be learnt or stored by a person.

3. A *reproduction bias* (mind-to-world) is anything that affects the likelihood that a person will employ the practice themselves.

4. A *material bias* (world structure) is anything that affects the likelihood that, or the manner in which, a practice will be 'readable off' the environment.

Within each functionally-defined group, different biases may perform the same basic function in very different ways. Some will be related to facts about social networks, some to individual personality characteristics, some to properties of human attention and memory, some to the organization of complex information in cognition.

WORLD-TO-MIND BIASES
(OR EXPOSURE BIAS)

An exposure bias is anything that affects the likelihood that a person will come into contact with, and pay attention to, the practice. Exposure biases operate by distinct mechanisms: connectedness, salience, and identity.

Connectedness. One type of exposure bias is sociometric. All people are situated in social networks, but they are situated in different ways. One type of difference concerns the number of people we come into contact with. So-called connectors have a very large number of social ties, and so are more likely to be involved in an encounter with an innovation.

Salience. Once one is in the presence of a behaviour or kind of innovation one may or may not pay attention to it. Things that stand out will be noticed. The definition of 'stand out' is clearly a matter of perception in the classical sense of affordances, that is, relating to the *relationships between* a person and the practice. Some things are more likely to be noticed because of the nature of our perceptual apparatus in relation to the world. Other things are more salient to us because we are 'on the lookout' for them; this is a kind of *active salience*.

More than one property of a thing will contribute to its salience. It may be especially prominent in a part of our perceptual field, it may be especially persistent.

MIND-STRUCTURE BIASES
(MIND-INTERNAL OR REPRESENTATION)

A representation bias is anything that affects the manner in which a practice will be learnt or stored by a person, or how the psychological component of a practice will be structured. Once we have come into contact and at least noticed a practice, we learn it. We form a representation of it, attributing to it some meaning or function, and we situate that representation into a framework of existing representations or knowledge.

Some innovations are more memorable than others. Of two things we may notice, one will be more easily internalized. The reasons for this difference concern cognitive propensities that are either known from psychological science or on the research agenda.

There are other differences in how things are learnt. The modality of an input can have consequences for how the thing is learnt and understood. This then affects in turn how the knowledge is used in practice (e.g., it may account for how an agent decides that a practice is an appropriate means for certain ends in a particular context).

There are effects of the psychological context into which a practice is contextualized. Practices are partly constituted by knowledge; knowledge that is caused by, and in turn causes, public behaviour and associated states of affairs. Now like any structured domain, knowledge is characterized by relational patterns that include part-whole relations, hierarchical relations, and other sorts of dependency among items in a system. When we learn something we relate it to other things we know, at the very least because it was related to other things in the context in which we learnt it. As an example, if I learn a new word such as *unfriend*, I relate it to other words I already know, both in terms of similarity (*untie, undress*) and association (the fact the *unfriend* is a verb and can play some roles but not others in English sentences). Or if I learn about the possibility of downloadable ringtones I will naturally contextualize this in terms of my existing knowledge of mobile phones and Internet access. Through this context bias I am more readily able to learn and psychologically represent those things that 'have a place'. In language, things will be structured into conceptual frames, systems of categorization, semplates, conceptual metaphors, structural paradigms and syntagms. There is good reason to think that these systems will tend

toward symmetry, consistency, and simplicity. Though this does not mean that they will be symmetrical, consistent, and simple. Change is always taking place, and because of the nature of systems, when something happens here it will have effects over there. In the densely structured linguistic systems of grammar, such system-internal relational perturbations sometimes give rise to a degree of 'psychological shakiness', as Sapir put it (1921), which leads to the reorganization of a system.

In the broadest sense of meaning, capturing everything from the arbitrary meanings of words in languages to the affordance-motivated functions of tools, we are helped by what can be called natural meaning. If a word or grammatical expression is compatible with other information, for example by being iconic, it is better learnt and remembered. Similarly for technology, if there is a good match with affordances, then we are more likely to understand the practice, it's easier to learn and indeed less needs to be stored because the relevant information is stored artefactually (Norman). This is a kind of content bias that pertains to learning, storage, and reducing load on cognition.

MIND-TO-WORLD BIASES
(OR REPRODUCTION)

A reproduction bias is anything that affects the likelihood that a person will employ the practice themselves. One way to think of this sense of reproduction is whatever causes a person to turn the psychological representation of a practice into action whose production and effects are perceptible by others.

What motivates us to turn knowledge into action? On a commonsense and philosophically well-grounded view (cf. e.g., Searle 1983, Dennett 1987, Fodor 1987) daily life consists of courses of goal-directed behaviour that are motivated by our beliefs and desires. When we act, we have reasons. Typically these reasons are grounded in our beliefs and oriented to our goals. A typical reason for reproducing a practice—making a piece of knowledge public by carrying out a behaviour corresponding with a mental state grounded in earlier learning—is as a means to an end. I may want to get something done for which I need someone else's cooperation. One way to do this is to construct an utterance using words and grammatical constructions. So I am motivated to choose words. Depending on my specific goals, and much else besides, I will select certain words and in so doing will select against all the other words I could have chosen. This is the competition or struggle for life among words and grammatical forms that Müller spoke of in the earlier quote from Darwin's *Origin*. The competition among different cultural practices is identical. I have a goal, I have certain beliefs about how it can be attained, I have certain knowledge that allows me to set courses of action in to motion where certain effects are foreseen. All this points to a most obvious and powerful bias under the reproduction rubric, concerning functional needs, and means to ends.

Boyd and Richerson's content bias is partly about this rubric. A content bias favours a practice that is more beneficial in some way. As B&R point out, some aspects of these biases are 'direct', others are 'indirect'. A direct bias is in operation when the benefit concerns the greater functional payoff, or reduced cost, of the practice, in terms of the primary effects it brings about. In the table tennis example, a direct bias would favour the pencil grip if the pencil grip were lower in cost or greater in benefit than

the handle grip in terms of its efficacy for getting the ball back over the net and, ultimately, winning matches. An indirect bias is in operation when the perceived cost or benefit involved concerns not the direct effects of the practice on things in the world (e.g., efficacy in getting the ball back over the net) but concerns how by virtue of having made that choice, how other people will regard you because of *who else* makes that same choice. The indirect bias is about the effects of who you identify with (or against) by virtue of choosing a practice. In language, there is a very extensive literature on this phenomenon in the field of sociolinguistics. Speaking English, I might say *guy* in one context and *bloke* in another. It may be that there is a slight meaning difference between these two (thus invoking a direct content bias), these differences may be minimal compared to the effect of identifying myself with certain sub-cultural groups by virtue of this choice between different word forms with near-identical meanings. Clearer examples concern pronunciation: whether I say *working* or *workin'* is a choice that has more to do with who I identify with (an indirect bias) rather than what meaning I convey (a direct bias). In the cultural realm, both a Rolex and a Tagheuer will tell the time for a high price but the choice may depend on whether you want to identify with Roger Federer versus Tiger Woods (or, indeed, tennis versus golf). And there is perhaps most often some combination of the two. Do I choose to drink this brand of beer over all the rest because it tastes better (direct bias) or because by doing so I identify with some person or group of people (indirect bias)? Presumably it is some combination of both. In any case, the mechanisms at play will serve to bias a person's motivation for selecting one practice over all the others that he thereby does not select.

The indirect bias is also sometimes described as a model bias. There is an important distinction to be made here concerning the different mechanism of this sort of bias depending on the age of the person concerned. Infants and children, who cannot yet be considered full members of a culture, are engaged in a very intensive project of socialization. The process involves constant and massive adoption of cultural practices, in which the child attends to certain practices (often because their attention is drawn to them by adults and peers, other times because they are naturally interested), and reproduces them in their own behaviour as means to ends. How does a child select which variants of a practice to adopt? A conformity bias favours those

practices that 'everyone else' adopts (Boyd and Richerson, Gergely and Csibra 2006). Another term for this is docility (Simon 1990), that is, a propensity to adopt more or less unquestioningly the practices of your group. For the infant this group will tend also to be the people who one is genetically closely related to. The effect is that cultural practices tend to (but need not) have similar histories as genes. However, as a person becomes socialized to the point that they are regarded a full member of a cultural group, they will begin to encounter a great number of cultural items (they keep learning), and they may find themselves therefore with new choices. This may be because they encounter other ways of doing things than the way 'my people' do things through their contacts with other groups, for instance in trading, ritual and social interaction, etc. Different people will have different degrees of mobility, sometimes differing because of personality sometimes differing more predictably depending on things like gender (men travel more for work in many cases), age or sub-culture. It is at a later age when there is a greater degree of choice and therefore greater competition between choices (cf. Müller quote above) that the indirect bias is not the default adoption of docility but is a mode of adoption (in the sense of deciding to use one over another practice in reproduction) in which the person has greater agency or choice. This is not to say that they consciously deliberate about this choice, but they may do so. And they will be more aware of the meanings of the different options. Here's where the indirect bias looks more like the 'model bias' exploited in advertising and also active in any other diffusional process as a low-level favouring of those practice modelled by more admired or charismatic individuals.

WORLD-STRUCTURE BIASES

(WORLD-INTERNAL OR MATERIAL)

A material bias is anything that affects the manner in which a practice will be physically instantiated in the physical world. This particularly concerns its affordances for processes of exit and entry. Public biases can affect entry biases in some obvious ways. Speech, for instance, as a result of an 'exit' process, has the property of being instantiated in fleeting form. Speech is perceptible during the process of production but then is gone. When an exit process involving language is constituted by writing, then this evanescence is significantly lessened. Outside of language, we see similar contrasts. Forms of activity such as adopting a certain grip for table tennis are temporally fleeting and are only available for entry processes at the same time as the exit process on the other side. The table tennis bat itself, however, has a persistent physical existence. Public biases concern the specific nature of the 'publication' of practices such that they may continue to play a role in the entry-exit cycle described above as iterated practice.

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Having outlined the nature of these biases, I propose that this constitutes a rich and possibly complete account of how item-based transmission works. At least it provides a framework for constraining the biases, and for resolving the Item/System problem. This is to be further illustrated, with specific reference to the findings of research in language contact and change, in the presentation to be given in Hungary in September.

THE EVIDENCE FOR T

THE EVIDENCE FOR CULTURE LED GENE-CULTURE COEVOLUTION: THE NATURALIZATION OF CULTURE OR THE CULTURALIZATION OF HUMAN "NATURE"?

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My thesis is that the alleged difference between humanistic and naturalistic approaches to studying human behavior is largely mythical. On the one hand, few humanist scholars understand recent developments in the evolutionary sciences. On the other hand, many evolutionary scientists themselves, sometimes inadvertently, play into stereotypes humanists have of scientists. The theory of gene-culture coevolution exemplifies how a proper science of culture in fact echoes several of the themes that humanists take especially seriously. The basic idea is that human agency plays a large role in how culture evolves, a fact well described by Darwin in the Descent of Man. Cultures in turn create environments in which genes evolve. Because cultural evolution is rapid compared to genetic evolution, cultural evolution can play a leading role in the evolution of human genes. Clear cases of this process are known, and many more are likely to be uncovered. More broadly, organic evolution itself is fundamentally a recursive process in which the agency of organisms can play a creative, even reflexive, role. The "evo-devo" and "niche construction" research programs illustrate this pattern.

CULTURAL EVOLUTION

For our purposes, it is useful to think of culture as that body of knowledge, opinions, skills, norms and so forth that humans learn from other humans by imitation and teaching. Other social organisms have simple forms social learning, but human psychology and human development is highly specialized to support the relatively accurate and faithful acquisition of large amounts of quite complex information by imitation and teaching. This is not necessarily the only useful definition of culture; I only claim it is one useful definition.

Culture obviously changes over time. At least in most contemporary societies change is rapid enough to be observed by everyone. We variously celebrate and deplore such changes, but no one denies them. Perhaps in the past societies changed so slowly that the people involved did not notice, but historians, archaeologists, and paleoanthropologists have certainly documented that they did change.

To "naturalize" cultural evolution we advocate strategy pioneered by the psychologist Donald Campbell (1965) and first put in mathematical form by Luigi Cavalli-Sforza and Marcus Feldman (1973). The work starts with the idea that culture is a system of inheritance. This idea follows directly from the definition above. We acquire culture by imitating other individuals much as we get our genes from our parents. The existence of a fancy capacity for high-fidelity imitation is one of the most important derived characters distinguishing us from our primate relatives, who have only relatively rudimentary imitative abilities. We are also an unusually docile animal and unusually sensitive to expressions of approval and disapproval by parents and others. Thus parents, teachers, and peers can shape our behavior rapidly and easily compared to training other animals using more expensive material rewards and punishments. Finally, once children acquire language, parents and others can communicate new ideas quite economically to those who don't know them. This economy is only relative; although we get our genes all at once at the moment of conception, acquiring an adult cultural repertoire takes some two decades. Humans ultimately acquire a repertoire of culture that rivals the genome in size.

The existence of cultural transmission means that culture has what evolutionary biologists call "population level properties." Individuals' behavior depends on the behaviors common in the population from whom they acquire beliefs just as individuals' anatomy is dependent on the genes common in the population from whom they acquired their genes. The cross-cultural diversity of human behavior is staggering, but for the most part we are limited to learning those extant in our culture in our time. However, in the long run, the commonness or rarity of genes or culture in the population is a product of what happens to the individuals who reproduce or not, and are imitated or not. The analogy is more than a curiosity because population biologists have developed a formidable kit of empirical and theoretical tools to analyze this intricate interplay between the individual and population level. In the terms sociologists often use, population biologists have the means to make the sociologists' macro-micro problem tractable. By now a considerable number of empirical and theoretical scholars pursue cultural evolutionary research strategies (Mesoudi 2011).

In this exercise, we think it best to wear the analogy between genes and memes most lightly. For example, we have resisted using the term "meme" to describe the "unit" of cultural transmission. Who knows if the structure of cultural inheritance is anything like the neatly particulate gene? We do know that culture is most ungene-like in many respects. Culture has the principle of inheritance of acquired variation (what one person invents another can imitate). We are not necessarily blind victims of chance imitation, but can pick and choose among any cultural variants that come to our attention and creatively put our own twist on them. We don't have to imitate our parents or any other specific individuals but can always be open to a better idea, or own invention or someone else's. The innovative part of the Darwinian analysis of cultural evolution has been to explore the impact of such differences on the cultural evolutionary process, letting model results and empirical facts not substantive analogies guide the research. Substantively, cultural evolution turns out to have its own unique adaptive properties and its own unique suite of characteristic maladaptations, some examples of which we discuss here.

Maladaptations are epistemologically more interesting than adaptations. The trouble with adaptations is that the competing theories—creationism, genetic fitness optimizing, cultural evolution, macrofunctionalism, rational choice theory—all predict that adaptive behavior will be common. Each theory's predicted maladaptations are much more distinctive. For example, W.D. Hamilton deduced from the principles of natural selection acting on genes that organisms should engage in altruistic acts only when the benefit to the recipient exceed the costs to the provides by a factor greater than the reciprocal of the relatedness by descent between them, his famous $b/c > 1/r$ rule. Since in most animal species, individuals have only few relatives with appreciable r Hamilton's theory predicts that altruism will be massively undersupplied compared to a perfectly group-selected case where altruism within groups should be supplied whenever $b/c > 1$. Every individual in a group would be better off if every other followed the $b/c > 1$ rule instead of the $b/c > 1/r$, but natural selection on genes cannot favor such acts. With the exception of humans and a few other special cases, Hamilton's rule predicts the maladaptively low amount of animal cooperation quite well. Human societies are a theoretical puzzle because they typically include much cooperation between distantly related and unrelated people. We have adaptively evaded a rule that otherwise seems to have nearly the law-like force of a physical principle. Robert Boyd and I have argued that cultural inheritance and evolution preserve more variation between groups of unrelated and distantly related people than can genes, leading to selection for tribal and larger scale cooperation in our species (Boyd, Richerson, and Henrich 2011).

The unique features of the cultural system of inheritance are predictable from the elementary consideration that selection on genes to increase our capacity to learn from each other would surely not have favored this rather costly system if it did only what genes could do for themselves. One important advantage of the cultural system is the linkage of decision-making processes with transmission to create a system for the inheritance of acquired variation. Given that decision rules ultimately derive from the action of selection on genes and hence are adaptive, on average at least, a system that responds both directly to natural selection *and* to adaptive decision-making forces will be able to adapt to varying environments more quickly than can organisms that adapt by genes and non-transmitted learning. Strategically plagiarizing the learning of others, while also being willing to learn yourself when the opportunity arises, creates a system that can adapt swiftly to new conditions without a crippling expenditure of effort on individual learning. Individual learning is heavy lifting, and culture allows to share this load among many individuals.

Secondly, accurate and rapid social learning allows humans, but seemingly not other species, to accumulate innovations so as to build up, historically over many generations—but rather rapidly compared to organic evolution—more sophisticated cultural adaptations than individual people could possibly have invented for themselves. The Arctic adaptations of the Inuit and their relatives and the ocean voyaging adaptations of the Austronesians are Stone Age examples. Human cultural adaptations are not only dramatically different from place to place and time to time but are also as complex as organic adaptations that would take much longer to evolve. The Inuit adaptation to the Arctic and the Austroneasian one to tropical coastlines and islands are impressively complex and impressively different on a scale that would result in different species if accomplished by organic evolution. In support of these theory-derived conjectures, we note that humans evolved during the Pleistocene, a period of high frequency climatic variation, and we became an unusually widespread animal by middle Pleistocene times. The ability to adapt quickly to a temporarily variable environment is easily put to use adapting to spatial variation as well, adapting a tropical ape to live in temperate and eventually periglacial climates. We became completely cosmopolitan using subsistence strategies tailored to practically every terrestrial and amphibious habitat on the planet. We believe that ability of the cultural system to rapidly create sophisticated adaptations to niches that persisted for a relatively few generations was the main advantage that paid the overhead of our large brain and long learning curve.

GENE-CULTURE COEVOLUTION

The hominin lineage probably had rudimentary forms of culture stretching back to our last common ancestor with the other apes. Oldowan stone knapping goes back to 2.6 million years and quite sophisticated stone tool-making goes back at least 100,000 years; discoveries in Africa keep pushing back earliest dates for various techniques. Over this long span of time, genetic and cultural evolution most likely became entangled. Genes most certainly must have adapted our minds to acquire and manage culture. Much cultural variation is obviously adapted to promote human survival and reproduction, as Julian Steward (1955) and his followers demonstrated long ago. Charles Lumsden and Edward Wilson (1981) that gene-culture coevolution would lead to powerful selection on genes to keep culture on a leash so that cultural evolution would be tightly constrained to be adaptive.

Probably no one really doubts that the mechanisms considered by Lumsden and Wilson are important. Humans have used cultural adaptations to become a strikingly successful species. But that is only half the story. Culture has also played a large role in shaping human genes. Culture creates novel environments to which genes have to adapt. Because cultural evolution is faster than genetic evolution, culture-led gene-culture coevolution is potentially as important or more important than genetic leashing mechanisms. Selection for physiological adaptations to plant rich diets and various adaptations to the epidemic diseases of denser populations are well documented in the wake of the evolution of agriculture (Laland, Odling-Smee, and Myles 2010; Richerson and Boyd 2010). So far the evidence is less striking for evolutionary events deeper in the past. But a reasonably good case can be made that the innate aspects of our social psychology were shaped by tribal scale selection for culturally transmitted cooperative social institutions. If we want to look at it this way, cultural evolution has played an active leading role in shaping human genes. In some non-trivial sense we can say that human nature is socially constructed and we arrive at this conclusion via wholly naturalistic assumptions.

TOPICS FOR DISCUSSION

Gene-culture coevolution raises many other issues that are of interest to humanists. I here flag some of these for our discussions.

Complexity and diversity. Biologists realize that the phenomena they study are exceedingly complex. As ecologists Burnham and Anderson (2002: 20) put it, "we believe that 'truth' (full reality) in the biological sciences has essentially infinite dimension, and hence full reality cannot be revealed with only finite samples of data and a 'model' of those data." Further, differences between species, and even the same species at different times or in different places, are real. Biologists are postpositivist. Human cultures exhibit the same complexity and diversity as other biological phenomena. Very many questions can be asked about human phenomena and there are no authoritative final answers to any of them. At best we may be fairly certain that some answers to a given question may be better than others.

Agency. Humanists are loath to think that human behavior is entirely determined by scientific laws. If our behavior is entirely determined by natural causes, human freedom would vanish. In the models we make of cultural evolution we speak of "decision-making forces." Some of the most important forces acting on culture are the choices individually and groups make in deciding what ideas, skills, attitudes, opinions and so forth to adopt. Darwin, in the *Descent of Man*, spoke of such forces as the example of the best people, customs and public opinion being the more important causes of moral progress than natural section in "civilized times." (Not the he thought that selection had no role at all to play in civilized times.) The vast diversity of human subsistence systems, social institutions, languages, artistic creations, religions, and philosophies testifies amply to our individual and collective creativity. Harnessing creativity more efficiently than genes can do is the most significant feature of culture.

History versus science. Many humanists and scientists both hold history and science to be antithetical human endeavors. Nevertheless, it is a false dichotomy (Boyd and Richerson 1992). It is easy to show that natural selection generates historically contingent patterns of change. True, the simplest models of selection acting in the simplest environments act like classic exceptionless scientific "laws." However, real environments and more realistic models generate much more complex and fundamentally unpredictable trajectories of change.

Toolkit theory of theories. If the complexity and diversity of evolving genetic and cultural systems can't be understood in terms of general laws, can we do science at all? The approach that has evolved in evolutionary biology and ecology supposes that we have some hope of understanding complex and diverse phenomena, but only locally (Richerson and Boyd 1987; Burnham and Anderson 2002). A particular instance of evolution has likely been influence by many different factors, some strong, some weak. With limited data, and data is always limited, we can hope to explain only the strong factors. But the strong factors in one case will not be the strong factors in other cases. Therefore we try to have as large a toolkit of candidate explanations as we can in the hopes that one or a small set of models can capture the strong effects in as many cases as possible. With a large box of sound tools we ought to be able to account satisfactorily for most phenomena we encounter, always with the proviso—expectation even—that in the future better tools and more data might make current best explanations seem quite naïve.

Qualitative versus quantitative methods. Some humanists and some scientists make rather bold claims about the suitability of numbers and mathematical models versus language for understanding phenomena. This is another false dichotomy. Most evolutionists, ecologists, and geologists are proud of their natural historical abilities. Ethnographers, historians and others interested in humans use the same techniques. Acute observations and ordinary reasoning are the quickest and cheapest way to get a general feeling for a phenomenon of interest and to integrate many separate threads of knowledge. At the same time, our natural reasoning skills are not terribly well suited to rigorous logic and our raw observational skills deal with quantities quite poorly. Verbal reasoning and communication is handicapped by the imprecision of word meanings and by their polysemy. Mathematical models and quantitative observation are merely prostheses or instruments to aid the mind, rather like spectacles, telescopes and microscopes aid the eyes. The Bayesian theory of empirical inference formalizes the relationship between quantitative and qualitative methods. First we distill all our basic understanding of the problem at hand to construct our priors. Much of this exercise is typically qualitative. Then we consider that quantitative data and update our priors. Computational techniques now allow us to try out a reasonable number of models on the data and see which fit the best. What is not to like about combining qualitative and quantitative approaches?

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DEVELOPMENTAL SCIENCE AND THE NATURE-NURTURE ISSUE: THE CASE OF LANGUAGE

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For the last five decades, the study of language, especially its ontogeny, has been one of the most important arenas for the nature vs. nurture debate, i.e. the question of whether human knowledge comes from the species' genetic endowment (nature) or whether most of it is learned from the environment through experience (nurture). Nurture-type theoretical positions dominated the first half of the 20th century, grounding natural languages, seen as infinitely variable and different from one another, in culture (Boas, 1940) and its ontogenetic acquisition in stimulus-response cycles, learning and imitation (Skinner, 1957). After the cognitive revolution in psychology in the 1950s and with the advent of developmental neuroscience, naturalistic approaches emerged and became dominant in the field (Chomsky, 1959; Guasti, 2002; Pinker, 1984), although nurture-type accounts did not disappear (Tomasello, 2000). The last 10-15 years have witnessed the emergence of a new synthesis, whereby innate mechanisms, learning and experience, perception as well as social factors have all been acknowledged to play an important role in the development of language. In this new perspective, the question is shifted from a simple nature vs. nurture dichotomy to exploring exactly what mechanisms are responsible for what aspect of language acquisition and how these mechanisms interact with one another.

Newborn babies have a rich repertoire of speech perception abilities. They have been shown to prefer human speech to equally complex speech analogues (Vouloumanos & Werker, 2007), and were found to have larger left hemispheric brain activity when listening to speech played forward as opposed to speech played backward (Pena et al., 2003). Newborns have also been found to discriminate between languages. They distinguish and prefer the language spoken by their mothers during pregnancy over other languages (Mehler et al., 1988; Moon et al., 1993). This suggests that learning about spoken language begins during the fetal period. This is not implausible, since the auditory system is functional by about the 24th week of gestation (Moore, 2002), and although the womb filters out most of the fine details of speech, some of the more general properties, such as intonational contours or rhythmicity, are preserved. Interestingly, newborns can also discriminate two languages that they never heard before, if those are rhythmically different from each other, such as English and Japanese (Nazzi et al., 1998). Newborn infants also have surprising abilities to process acoustic information pertaining to word forms. They can detect the acoustic cues that signal word boundaries (Christophe et al., 1994), discriminate words with different patterns of lexical stress (Sansavini et al., 1997) and distinguish between function words (articles, pronouns, prepositions, determiners etc.) and content words (nouns, verbs, adjectives, adverbs etc.) on the basis of their different acoustic characteristics (Shi et al., 1999). Importantly, they show universal phoneme perception abilities, being capable of discriminating most phoneme contrasts that appear in the world's languages, not only those that appear in their native language (Eimas et al., 1971). Whether newborns are also able to learn about the structure of language, or only about the perceptually available sound patterns, remained unknown for a long time. Recent studies have shown using optical imaging (Gervain et al., 2008; Gervain et al., 2011) that newborn babies are also sensitive simple structural patterns, such as adjacent repetitions, and they are able to discriminate trisyllabic sequences containing identical second and third syllables (ABB: "mubaba", "penana") from random controls (ABC: "mubage", "penaku").

These findings suggest that newborns have an initial perceptual bias for speech, underlying all subsequent language acquisition processes. The discrimination abilities facilitate acquisition, allowing infants to tune in to the relevant environmental input. Moreover, they enable infants growing up in multilingual environments to separate and keep track of their different languages.

During the first years of life, many of the initially broad-based, universal abilities narrow down onto distinctions and categories used in the native language. The most striking example of this perceptual attunement to the mother tongue is probably the loss of universal phoneme discrimination during the second half of the first year (Werker & Tees, 1984). Infants gradually lose the ability to discriminate most, although not all, phoneme contrasts that are not found in their native language(s). During these early months, infants also develop language-specific knowledge beyond the phoneme level. For instance, by 9 months, they become sensitive to the most common phonotactic patterns that characterize their native language (Höhle et al., 2009) and they are able to use these to segment words out of continuous speech (Mattys & Jusczyk, 2001). At 7 months, infants have been shown to learn abstract rules based on identity/repetition (e.g. ABB, ABA etc.) in artificial grammar learning paradigms (Marcus et al., 1999). At the same age, they know where frequent grammatical words such as prepositions, articles etc. are placed with respect to content words, i.e. nouns, verbs etc., in their native language (Gervain et al., 2008). Japanese infants thus expect functors to follow content words, as is typical in Japanese (*Tokyo* ***ni*** 'to Tokyo'), whereas Italian infants expect them to precede content words, which is the characteristic order in Italian (***a*** *Roma* 'to/in Rome').

Recently, it has also been shown that the language learning process is modulated by social factors. Infants learn phoneme contrasts better in a live social interaction than from a recorded video (Kuhl et al., 2003) and their babbling as well as their word learning performance is adjusted to the responsiveness of their social partners (Goldstein & Schwade, 2008; Goldstein et al., 2009).

The research on infant speech perception described above suggests that infants are born with auditory sensitivities and initial learning mechanisms that are tuned to speech and language. These early abilities are highly developed and allow successful learning in all domains of language. However, it is also clear that learning and experience play an important role in shaping these early sensitivities both at the level of behavior as well as in the brain. This learning takes place in a social context, and infants appear to be socially sensitive learners, adjusting their learning to the social environment.

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POSTER ABSTRACTS IN ALPHABETIC ORDER
THE NUMBERS INDICATE
THE POSTER ALLOCATIONS AND
THE PRESENTATION ORDER

POSTER SESSION I. LANGUAGE AND CULTURE

MONDAY 17:30-19:30 1 TO 8

ORCHESTRATED BY ÁGNES KOVÁCS

(1)Bambini, (2) Fusaroli, (3) Halloy, (4) Nánay,
(5) Lim, (6) Mascaro, (7) Hegnes, (8) Pérez, (9) Šošić

POSTER SESSION II. CULTURE IN ANIMALS AND CHILDREN

TUESDAY 16:30-18:30 9 TO 17

ORCHESTRATED BY OLIVIER MORIN

(10) Számadó/Zachar, (11) Verpooten/Joye, (12) Claidière,
(13) Schwab/Bugnyar, (14) Kis/Wilkinson, (15) Téglás,
(16) Kampis/Király/Krekó/Topál, (17) Hernik

ALPHABETICALLY:

Bambini, Claidiere,Fusaroli, Halloy, Hegnes, Hernik,
Kampis, Kis,Lim, Mascaro, Nánay, Pérez, Šošić, Schwab,
Számadó, Téglás, Verpooten

POSTER Nº 1

BETWEEN NEUROBIOLOGICAL DESCRIPTION AND CULTURAL VARIATION

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INTRODUCTION

The last decade has witnessed an increasing interest toward the neural mechanisms supporting metaphor comprehension. Most of the literature has focused on the lateralization of the process in the brain, leaving aside a consideration of the phenomenon of metaphor in the broader picture of human cognition. In a recent fMRI study (Bambini *et al.*, in press) we aimed to break down metaphor comprehension into its neurocognitive components. Based on the pragmatic-cognitive models of metaphor and on the fMRI literature, we identified a set of cognitive resources distributed over a bilateral network of brain regions, among which a crucial role seems to be played by the conceptual/pragmatics system, the Theory of Mind system, and attentional resources. The next step – here only outlined - is to explore the interplay of nature and culture underlying a similar neurobiological architecture. I will suggest that the complex orchestration of functions supporting metaphor comprehension is strongly shaped by culture. This is confirmed by late acquisition in children and by cultural variation in metaphorizing. The universal tendency towards the use of metaphor in communication may lie in the costs-benefits balance that characterizes human communication, as postulated by Relevance Theory.

THE EXPERIMENT: COGNITIVE DECOMPOSITION OF METAPHOR THROUGH fMRI

Ten healthy volunteers (5F/5M, mean age 25 ± 1 years) took part in the study. All participants were right-handed monolingual native speakers of Italian with a high educational level (18 years of schooling on average). A total of 200 Italian two-sentence passages built de novo functioned as stimuli. The experimental design was based on the comparison between passage-pairs, e.g.: "*Do you know what that fish is? A shark*." (literal) / "*Do you know what that lawyer is? A shark*." (metaphorical, with modulation along the familiarity parameter). During scanning, participants implicitly processed metaphorical and literal passages, while being explicitly involved in a lowdemanding adjective association task to be performed after reading and comprehending the target passages (Figure 1).

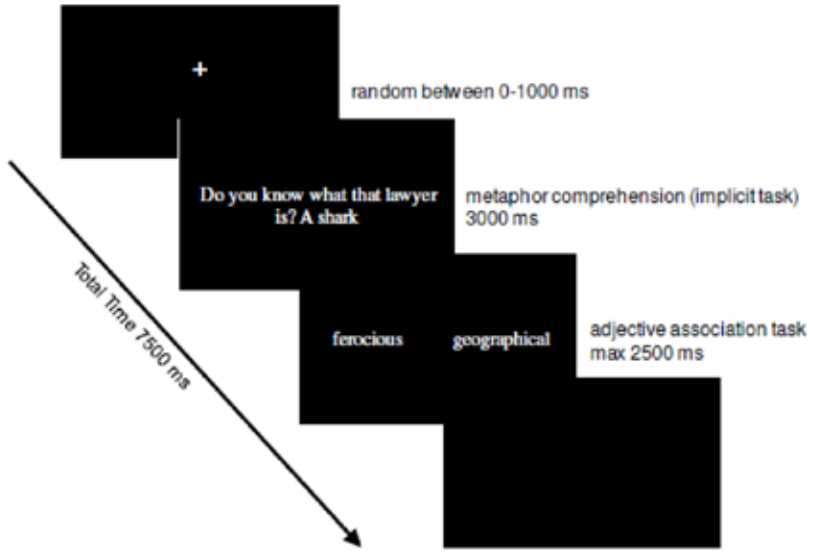

Figure 1: Trial example

Several regions showed greater activity to metaphors as compared to non-metaphors, including left and right inferior prefrontal areas, right superior temporal gyrus, left angular gyrus, and anterior cingulate (Figure 2). This pattern of activations, markedly bilateral, can be decomposed into circumscribed functional sub-systems mediating different aspects of metaphor resolution, as foreseen in the pragmatic and cognitive literature:

a. the conceptual/pragmatic machinery in the bilateral inferior frontal and left angular gyri, which supports the integration of linguistic material and world knowledge in context;

b. the attentional component in the anterior cingulate and prefrontal areas, which is set to monitor and filter for the relevant aspects of context and for the appropriate meanings;

c. the Theory of Mind system along the right superior temporal sulcus, which deals with the recognition of speakers' communicative intentions and is more extensively activated by unfamiliar metaphors.

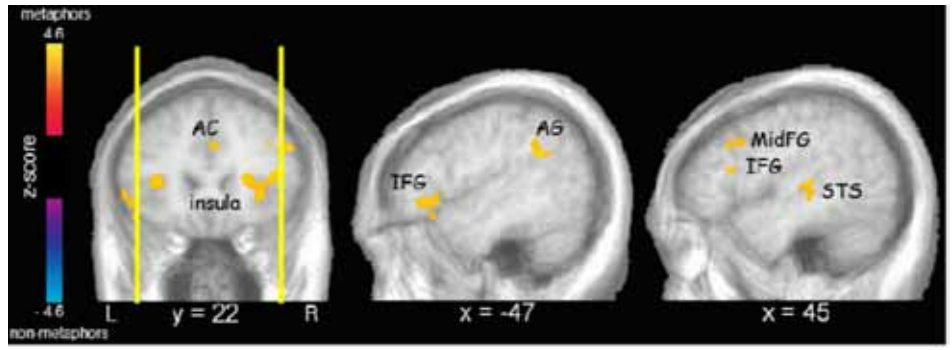

Figure 2: Brain areas with higher activation for metaphors vs. non-metaphors (warm colors). P < 0.005 (cluster size corrected for multiple comparison). Coronal and sagittal images from spatially normalized T-score maps are projected onto an across-subject brain template. The yellow lines in the coronal image correspond to the locations of the sagittal slices. AC: anterior cingulate; IFG: inferior frontal gyrus; MidFG: middle frontal gyrus; STS: superior temporal sulcus; AG: angular gyrus.

NATURE AND CULTURE IN METAPHOR COMPREHENSION

In light of similar results, the paramount question becomes whether the neural network for metaphor comprehension in the adult brain can be described as a universal human endowment. A bunch of data must be taken into account. Although there is current evidence that metaphor is a uniquely human ability and cannot be extended to monkeys (Merrit *et al.*, 2010), it seems that metaphorizing abilities varies significantly among the speakers' community. First, it has been showed that metaphor comprehension develops quite late in the course of language acquisition and continues to improve during adolescence until the adulthood (Nippold *et al.*, 1997, Rundblad and Annaz, 2010). Second, it has been argued that active metaphorizing is a culture-specific speech practice, playing a minor role in cultures such as Pitjantjatjara and Malay (Goddard, 2004). This evidence suggests that metaphor comprehension cannot be described in terms of endowments as, for instance, syntactic abilities. Rather, metaphor seems a culturally shaped high-level capacity that posits significant demands on brain activity. Then why do humans develop metaphorical abilities? Relevance theory describes human communication as a balancing between cognitive efforts and cognitive benefits. Metaphor seems to fit this scenario nicely: although effortful in terms of brain resources, it produces benefits, which have been measured in terms of reference resolution (Noveck et.al., 2001) and persistence in memory (Vance and Virtue 2011), including poetic effects (Sperber and Wilson, 2008). Metaphor comprehension thus appears as one of the most powerful, although costly, resources that the human mind can exploit in communication.

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POSTER N° 12

INTEGRATING THE STUDY OF CONFORMITY AND CULTURE IN HUMANS ANDNON-HUMAN ANIMALS

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One way in which the study of cognition and culture can be naturalized, is through the use of comparative studies—studies comparing human and non-human animals' cognitive and cultural capacities. Ideally, this method of naturalization proceeds by first selecting a relevant human capacity usually identified and studied in the social sciences (e.g. teaching), then redefining the capacity in terms that are compatible with the social sciences and with studies across species (see Caro & Hauser, 1992 for a redefinition of teaching for instance) and finally carrying out across species comparisons with standardised protocols and definitions (Franks & Richardson, 2006; Raihani & Ridley, 2008; Thornton & McAuliffe, 2006 for studies of teaching in animals). Comparative studies of vocal and gestural communication (see Tomasello & Zuberbühler, 2002 for a review), teaching (see Hoppitt et al., 2008; Thornton & Raihani, 2008 for reviews), imitation (see Whiten, McGuigan, Marshall-Pescini, & Hopper, 2009 for a recent review), have successfully shown both the limit of non-human animal's capacities and the similarity between humans and other animals. As such, they constitute the experimental foundations on which naturalistic approaches can be built.

Conformity, broadly conceived as a tendency through which an individual's attitudes, beliefs, and behaviours become markedly similar to those of other individuals, has long been recognized by social psychologists as one of the main categories of social influence (see for instance Asch, 1955, 1956; Cialdini & Goldstein, 2004; Deutsch & Gerard, 1955; Kelman, 1958; Tanford & Penrod, 1984). Surprisingly, it is only recently that conformity has become an active topic in animal studies (e.g. Galef & Whiskin, 2008; Pike & Laland, 2010; Whiten, Horner, & de Waal, 2005)and evolutionary biology (e.g. Boyd & Richerson, 1985; Eriksson & Coultas, 2009; Henrich & Boyd, 1998; Wakano & Aoki, 2007). Here we endeavour to naturalise the notion of conformity by redefining it in a way that is coherent with the social sciences and compatible with more recent studies of animal behaviour and cultural evolution. According to our definition, a behaviour is said to conform when an individual in a group displays that behaviour because it is the most frequent they witnessed in others. Based on this definition, we review and organize the newer literature on conformity in behavioural ecology and evolutionary biology in light of the foundational work in social psychology.

In particular, we propose that the notions of 'informational' and 'normative' conformity that, until now, have not been recognized in recent literature can resolve some important controversies. In social psychology, informational conformity functions to gain non-social information and adapt one's behaviour to the non-social environment, whereas normative conformity functions to gain social information and adapt to one's social environment.

Informational conformity is not influenced by the other's awareness of the individual's behaviour and can exist in the absence of social feedback on one's behaviour. For example, one might assume that it is safe to swim in an area if a good proportion of individuals are swimming there. The number and proportion of individuals who swim there gives information regarding the safety of the location; this is informational conformity. The other's awareness of your behaviour (swim or do not swim) is not affecting your decision to swim.

Normative conformity is generally linked with the social consequences of one's behaviour. For instance, even if one knows that smoking has important health consequences and one does not find smoking particularly pleasant, one might still be motivated to smoke if others do so. In that case, the social consequences of not smoking in a group of smokers can outweigh one's own preference, knowledge and experience.

We show that this distinction can be exploited by behavioural ecologists and evolutionary biologists to bring conceptual clarity to the field, avoid some experimental pitfalls and help design new and challenging experiments. In turn, research on animal culture should be of great interest to social scientists, because understanding human culture and human uniqueness requires an evolutionary analysis of our cognitive capacities and their evolutionary origins.

In summary, we believe that the naturalisation of the study of cognition and culture will proceed more spontaneously if social and natural scientists join forces in building an interdisciplinary and integrative approach to these phenomena. This review seeks to take a significant step in this direction by providing a common ground for the study of conformity across social psychology, behavioural ecology and evolutionary biology; thereby providing excellent opportunities for the naturalisation of conformity.

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POSTER Nº 2

HOW TO DEVELOP A COMMON LANGUAGE: AN EXPERIMENTAL INVESTIGATION INTO THE BASES OF CULTURAL EVOLUTION

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Recent advances in evolutionary and cognitive anthropology (1-3), neuropsychology (4, 5), evolutionary robotics (6-8), and linguistics (9, 10) suggest that human language evolved from a pressure for increasingly sophisticated means of socio-cultural coordination and cooperation. More generally, an increasing amount of literature is showing how culture in its network of practices, semiotic systems, artefacts and institutions is the most effective mean for both the alignment and the constructive coordination at different time scales of human cognitive systems (11-15). However, the mechanisms through which human beings get to coordinate have only started to be experimentally investigated (16, 17) and even less so is the role of language and cultural patterns in this process of coordination (18).

I will thus present experimental findings related to i) some of the mechanisms through which interlocutors align and evolve language to more effectively coordinate in solving a task; ii) the effects that different linguistic strategies and stabilised symbolic patterns have on the coordinative process. This work is aimed at paving the way for a more systematic experimental exploration of the evolution of cultural patterns and their role in social and cognitive coordination.

Experimental Setup

The investigation (19) expands upon a recent experiment by Bahrami and colleagues (20). The participants had to individually discriminate between two briefly shown visual displays containing Gabor patches. If the individual choices were divergent, they were prompted to negotiate, by freely discussing with each other, a joint decision. In order for dyads to achieve a cooperative benefit, that is, to perform better than the better of the two individuals, the individuals had to develop a shared linguistic scale for individual confidence, so to be able to choose on a trial-by-trial basis the more confident participant.

The main prediction was so that interlocutors who managed to get to speak the same language would optimize their coordination and thus improve their cooperative performance on joint tasks.

Results

- Linguistic mimicry:

Non-verbal mimicry has been associated with increased coordination (21). Analogously (22), the dyads' degree of adaptivity to each other's way of talking about confidence on a trial-by-trial basis significantly predicts the benefit of cooperation ($r = .40, p < .05$).

- Symbolic patterns:

By aligning to each other the interacting agents can – instead of indecisively drift between multiple sets of expressions – gradually develop a stable symbolic pattern (23), in this case a limited functional set of shared expressions of confidence. The more a dyad converge on it the better the cooperative benefit in the task ($r = .86, p < .005$).

Discussion and Conclusions

This experiment paves the way for a systematic quantitative exploration of the coordinative components of the evolution of language and cultures in general, to be integrated with ethnographic and conceptual explorations. Further developments in progress of the study involve i) the analysis of other linguistic indexes, such as pitch and word count; ii) the investigation of cross-cultural variations in linguistic and interactional strategies; iii) the testing of the effects of different models of cultural transmission.

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POSTER N° 3

TOWARDS A COGNITIVE ETHNOGRAPHY : AN ALTERNATIVE NATURALISTIC APPROACH OF CULTURE IN SOCIAL SCIENCES ?

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During the past two decades, cognitive anthopology, as a relatively new sub-discipline at the frontier of cognitive and social sciences, made important contribution to the elaboration of a naturalistic approach to culture (Barrett 2004; Boyer 2001; d'Andrade 1995, McCauley & Lawson 2002; Sperber 1996; Sperber & Hirschfeld 2004, Tooby & Cosmides 1992). By developing a research program grounded on an epidemiology of ideas, the mainstream cognitive approach in anthropology drew the attention of social scientists to the crucial role of "cognitive constrains" in the elaboration and memorization processes of (potential) cultural representations. However, from a social scientist perspective, such an approach to cultural transmission presents at least three important limitations. Firstly, as most naturalistic approach to culture in biology and evolutionary psychology, it voluntary avoids to deal with the complexity and dynamics of real life situations where social and contextual factors may play a constitutive role (and interact in an unexpected way with cognitive mechanisms) in cultural transmission. A second limitation is its focus on "representations", while emotional and perceptual factors may be crucial in learning and memorizing cultural skills (cf. embodied cognition). Thirdly, if cognitive anthropology's theoretical models see transmission as a constructive process that tends to (but never reaches) the identical, it does not embrace creativity and innovation as a natural process in cultural transmission. For like all social processes, cultural transmission and learning are open-ended processes involving not only imitation, emulation and the like, but also innovation and imagination (Harris 2000 ; Roth 2007 ; Sneath et al. 2009).

Each of those limitations has been addressed by alternative approaches of cognition. Among the current labels used in this vein, "cognitive ethnography" is one of major interest given its willingness to describe cognitive processes distributed and situated into specific places (Hutchins 1995). Broadly speaking, cognitive anthropology highlights universal cognitive constraints and cognitive ethnography describes situational factors relying on specific circumstances. However the potential gain of collaboration between those approaches is most often underestimated, each tends to minimize the relevance of other side, not to say expressing some disdain.

In this workshop, I would like to suggest a way of reconciling cognitive and ethnographic approaches of culture by embracing a *cognitive ethnography of cultural transmission* (CECT). By adding the topic of cultural transmission to cognitive ethnography, our aim is to support a theoretical and methodological framework focused on learning processes and able to take into account and articulate the relevant elements of the material, cognitive, emotional and perceptual context of action and communication. A CECT presupposes thus an epistemological convergence, inasmuch as it can combine, in analytical description, both cognitive and emotional mechanisms, as well as the material, contextual and institutional factors involved in cultural transmission and learning. It also reconceptualizes the relationship between cognition and culture in ontogenetic terms to account for the social, situated and embodied dimensions of cognition as well as the way cognitive skills spread and emerge locally. My suggestion is that relevant analytical elements of cultural transmission can be described as "patterns" of acting, interacting, thinking, perceiving and feeling that can be identified by the ethnographer while fieldworking. Each category of patterns potentially draws on hard-wired cognitive mechanisms that constrain cultural diversity but also on the pragmatic features or conditions of its actual transmission (Houseman 2002, Houseman & Severi 1998) which are, this is our main hypothesis, able to reframe or « hijack » intuitive processes of thinking, automatic emotional responses and attentional and perceptual skills. For example, let's consider how religious cultures make use of particular forms of embodiments - dance, meditation, icon painting etc. - in order to convey and implement corresponding mental states (Barsalou 2005: 43), i.e. cultural ideas, values

and expectations about spiritual beings and attitudes towards them. In other words, recurrent features of cultural transmission might be found not only in conceptual forms, a position defended by cognitive anthropology, but also in how cultural knowledge is performed, organized and embodied - involving not only concepts/representations, but also spaces, artifacts, actions, interactions and emotions.

The project of a cognitive ethnography addresses thus the current disciplinary divide between cognitivist and culturalist approaches to cultural transmission, providing a more adequate level of ethnographic description able to articulate not only the conceptual, but also the perceptual, emotional and material dimensions of cultural transmission. The project seeks thus to engage in cross-cultural ethnographic research and experiments through the work of an interdisciplinary team drawing on the recent upsurge in cognitive studies of cultural transmission.

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POSTER Nº 7

CULTURAL ADAPTION WORK AND THE SPREAD OF SOCIAL PRACTICES

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INTRODUCTION

The objective with my poster presentation is to present an outline of a new conceptual framework for understanding cultural and natural complexity and change, namely Cultural Adaption Work (CAW). Different cultural and natural adaptation processes are often conceptualized through concepts such as translation, re-organization and transformations, but the concepts are still often only used as labels on processes without showing how the processes are going on, leavting CAW a black box. The core argument of CAW is that people continually adapt their understanding, their interaction forms and their material and biologically environment relationally, in time and space. These processes are more specified as the interaction between people's translations of meaning, reorganization of social relations and the transformation of things in the tension between the global and the local and between tradition and innovation.

My outline of the CAW perspective is based on two empirical examples:

1. The Food-Cultural Adaption Work of Protected Designations of Origin (My PhD project)

2. The Bacteria-Cultural Adaption Work of Disposable Gloves (A recently developed postdoc project)

The common denominator for these two cases is that both PDO and disposable gloves are introduced in new settings, triggered by the dynamics of globalization and innovation, which calls upon processes of adoption work. To explore such new modern regulations and objects is especially interesting to better understand the making of the cultural adaptation process. PDO and disposable gloves are therefore empirical cases that will generate theoretical knowledge about cultural adaption work of meaning, sociality and things and additionally promote scientific development with special focus on the field of food culture and hygiene.

FOOD-CULTURAL ADAPTION WORK AND PROTECTED DESIGNATIONS OF ORIGIN IN NORWAY

The first case concerns the implementation of the Norwegian scheme for Protected Designations of Origin (PDO) and Protected Geographical Indication (PGI). PDOs and PGIs are special kinds of Geographical Indications (GIs) as defined in the TRIPS agreement which is part of the global WTO agreements. "Geographical indications are, for the purposes of this Agreement, indications which identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin" (TRIPS Agreement Article 22 (1)).

This study show how the scheme for Protected Designations of Origin is adapted to Norwegian food culture and how Norwegian food culture is adapted to this new way to think about food. The study is based on diverse forms of empirical material. Document studies of laws, policy documents etc. has been analysed to uncover what kind of measures and conceptions that have been important for the implementation of the scheme in Norway. Producer organizations interviews have been conducted with persons responsible for working out product regulations in producer organizations in addition to interviews with informants representing public administrative bodies administrating the regulation.

SPREAD OF SOCIAL PRACTICES – ATLE WEHN HEGNES

The Norwegian food culture has no extensive tradition to designate products with the name of the place they originate. This fact activates CAW and its three kinds of adaptation processes at the introduction of PDO. The meaning of food and food culture are translated, producers organize themselves different when applying for PDO, the silent knowledge concerning food production are translated to text and the products are further transformed according to this text or product regulation during the product qualification process.

BACTERIA-CULTURAL ADAPTION WORK AND DISPOSABLE GLOVES

In this second example disposable gloves are used as a case study and a symbol for objects that first were introduced for hygienic reasons in the health sector and that are now spread to several sectors of society. Disposal gloves and hand hygiene perfectly fit the aim to better understand the cultural conception, use, adaption and consequences of material objects in different cultures and different situations.

Previous research on the use of disposable gloves has been concentrated on microbiological issues in the health sector and how gloves help to improve hand hygiene. Few studies have been done on the use of disposable gloves in other situations and on the users' own understanding of glove use but some of these studies indicate that gloves may act as a sleeping pad and lead to greater proliferation of bacteria.

A deeper understanding of culture in combination with knowledge of the microbiological perspective is needed to better understand the materiality of gloves and the cultural adaptation of things. This study will help to close this gap by concretely combining microbiology with a cultural perspective.

In the case of disposable gloves it is reason to believe that all three forms, and maybe even more, of adaptation work are present. The meaning of gloves are translated, people organize themselves different when wearing gloves, and the use of glove transform the hand from unhygienic to sterile.

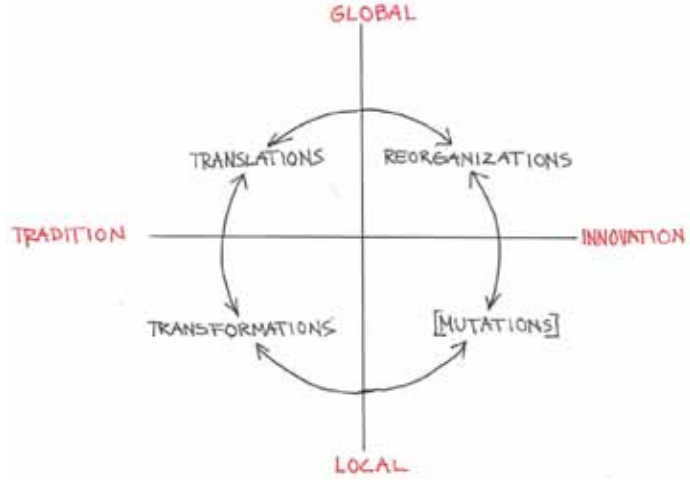
CONCLUSION

The rationale for developing the CAW perspective is that the study of cultural and natural diversity and evolution, and the adaptations that these processes depend on and bring about, have been and should remain the most important and common tasks for social and natural sciences. CAW also exceeds the distinction between conflict-oriented and harmony-oriented perspectives on cultural complexity and social change. In CAW conflict and harmony are merged and work together. This dynamic perspective underlines the processes that contribute to adaptation more than harmony and conflict, that are neither considered as basis nor result.

Studies of PDO and disposable gloves both contribute to development of the theoretical perspective of CAW. On a general level the conceptual framework conceivably can be transferred to other case studies of CAW in cultural complexity and social change, not just the food and glove culture.

During the writing of this proposal my on-going reflexion on new potential processes in CAW have resulted in, an almost obvious, new process – mutations. Mutations represent changes and adaptations of different kinds of life, and should also be seen in relation to other processes included in CAW.

The dynamic of CAW, its dimensions and processes, can be illustrated as in the figure on the next page.



POSTER Nº 17

BODILY ORIENTATION OF AN INANIMATE AGENT MODULATES 12-MONTH-OLDS' EXPECTATIONS ABOUT ITS BEHAVIOR

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Agent's bodily orientation can be an important source of social information guiding interpretation and reasoning about the agent's action. It matters for judging action as intentional or not and provides cues about epistemic state of the agent. Human infants early in the first year of life take into account the orientation of human agents performing goal-directed actions and several non-human species have been shown to monitor orientation of humans and/or conspecifics in social interactions. Still little is known about how orientation of goal-directed inanimate agents is monitored by infants and whether it can influence their expectations about the agent's behavior.

In study1, 12-months-old infants watched short animations showing an inanimate agent reacting contingently to the behavior of a target-object. In test trials, after just a 2-trial-long familiarization, the agent stopped reacting to the target-object's entry. Infants were faster to look away from the AOI (which included the agent and the target) on test trials showing the non-reactive agent oriented away from the target-object than on test trials showing the same agent oriented towards the target. This looking-patter suggests that the inanimate agent's orientation modulated infants' expectations: if target emerged behind the agent's back, infants were faster to give up on the expectation that some movement will eventually happen. The same expectation pattern was observed regardless of whether the agent's front was marked by an iconic human-like face or not, suggesting that the motion alone provided enough cues about agent's bodily orientation.

Results of two subsequent studies demonstrated that both 12-month-olds (Study 2) and even 6-month-olds (Study 3) show this pattern of anticipatory waiting only if the agent is self-steering and reacting contingently upon the its target-objects' behavior.

The poster discusses this early ability to map agent's orientation from motion for the purpose of immediate action prediction from a standpoint of the evolutionary theory of action prediction and social cognition.

POSTER Nº 16

FIDELITY TO CULTURAL KNOWLEDGE IN THE IMITATION OF TWO-YEAR-OLDS

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Research on imitation revealed that children until a certain age tend to encode the relevant elements of observed actions and re-enact event components selectively. There are at least two competing interpretations of these results. On the one hand it can be that children encode only the goal-relevant components of events. On the other hand, it is possible that children encode specifics of the original situation, though just because of the imitative learning process, they do not use them during re-enactment - in this case the selection processes happen during retrieval.

With the method of deferred imitation we can rephrase the question, whether young children are flexible enough to adapt their retrieval process to the characteristics of the situation. Can knowledge acquired through cultural learning - such as the acquisition of a new tool use – be revised if the situational context changes?

We presented 24-month-old infants (n=42) with a four-step event with two 'irrelevant' components open to imitation, (the irrelevance of the steps was transparent, opaque or semi-opaque) and varied whether the steps were relevant during encoding and irrelevant in retrieval phase or vice versa. In half of the children we emphasized the situational constraint that was the basis for the relevance of the tool use (i.e. whether the hand of the experimenter fits into a whole). Every child was tested two times, the first time after presentation and the second time after a week delay without presentation.

According to our results, children tend to imitate the tool use according to the situational features in immediate re-enactment, but only in the group where before demonstration there was an explicit evidence on the efficacy of tool use. However, after the delay, in the changed context children follow their original use of the tool irrespectively of the contextual cues in the retrieval phase. On the other hand, from re-enactment they leave out the fully opaque component more frequently in the condition, where the original phase was the demonstration of a relevant tool use.

In sum, in the presence of evidence for efficacy two-year-old children selectively imitate the necessary components, but then stick to their original strategy, they do not adjust their reactions to the situational demands. This can be interpreted as a fidelity to the cultural knowledge acquired, despite the obvious change of the situational context.

POSTER Nº 14

TESTING IMITATION IN BEARDED DRAGONS *(POGONA VITTICEPS)* USING THE TWO-ACTION PROCEDURE

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The ability to learn from the observation of others and the transmission of cultural knowledge by the means of social learning was long thought to be a characteristic distinctive to humans. Since this early view many animal species have also been found to be capable of imitation, including several representatives of the mammal and bird taxa, and the notion of animal culture has been introduced. However we know nothing about the imitative capacities of other vertebrates although for example the study of reptiles, a class that evolved from the same common amniotic ancestor as birds and mammals, in such tasks could contribute to our understanding of the evolution of social cognition.

In order to investigate this question and to redress the unbalanced contribution to our present knowledge about social cognition we examined the imitative abilities of (N=12) bearded dragons *(Pogona vitticeps)* by adopting the two-action procedure widely used in birds and mammals. We divided our subjects into two groups each of which could observe one of two video demonstrations showing a conspecific performing an action that differed in their body movements but created symmetrical changes in the environment (opening a trap door left- or rightwards and obtaining a food reward). Immediately following the demonstration and after a two-weeks-long delay the subjects were presented with the same apparatus they could see in the demonstration.

We hypothesized that bearded dragons would perform the demonstrated action more often than an alternative action; and that the relative use of the demonstrated action would be connected to the individual success and the persistence of the learned information.

POSTER Nº 5

LONGITUDINAL CROSS-CULTURAL COMPARISON OF THE DEVELOPMENT OF NAÏVE PSYCHOLOGY AND PRETEND PLAY BEHAVIOUR: AN EXPERIMENTAL AND NATURALISTIC OBSERVATIONAL STUDY

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Naïve psychology (also known as theory of mind) is a term used to describe one's ability to attribute mental states to oneself and others. A host of Western studies have documented age-related changes in children's naïve psychology. By about 18 months of age, children gradually acquire knowledge of rudimentary aspects of pretence understanding and discrepant desires (Harris & Kavanaugh, 1993; Repacholi & Gopnik, 1997). By around 2½ years of age, children develop an understanding of level-1 visual perspective-taking (Flavell et al., 1981). At around 3 years of age, children acquire knowledge of mentalistic nature of pretence (Davis et al., 2002). At around 4 years of age, children exhibit understanding of level-2 visual perspective-taking, appearance-reality distinction and false-beliefs (Flavell et al., 1981; Flavell et al., 1986; Wellman et al, 2001). Non-Western studies have tended to rely on false-belief understanding as an index of children's understanding of mental representation. Some comparative studies have shown similarities in children's false-belief understanding across cultures (e.g. Callaghan et al., 2005) whereas other non-Western research suggests that false-belief understanding emerges at different ages (e.g. Vinden, 1999). The majority of the studies to date have focused on either Western (individualistic) (e.g. United Kingdom (UK)) or Eastern (collectivistic) (e.g. China and Japan) cultures. Little is known about naïve psychology development in hybrid countries like Singapore, where the culture draws on both Eastern and Western influences.

Numerous studies have shown that Western children acquire a range of pretend play behaviour, including pretend play with peers, strategies used to integrate pretence into social play, pretend themes, types of social pretend role-play, and pretend transformation modes. Nonetheless, there is no published longitudinal cross-cultural study that compares the development of this range of pretend play behaviour. Some Western research demonstrates that individual differences in children's naïve psychology development are linked to early social experiences in pretend play (Bartsch & Estes, 1996). There is little non-Western research to date that attempts to verify whether social interactions in the context of peer pretend play might disentangle the observed differences in naïve psychology.

This paper discusses the longitudinal results of a three-phase cross-cultural study of the development of naïve psychology and pretend play behaviour between children in the UK and Singapore. A repeated-measures design was employed to track the developmental patterns at 2½, 3 and 3½ years of age (phases I, II and III respectively). Children's understanding of pretence, desires, visual perceptions and beliefs was assessed using a battery of established experimental tasks. Additionally, a semi-structured observational approach was used to study naturally-occurring pretend play behaviour. A total of 36 UK (M = 42.75, SD = 1.84) and 38 Singaporean (M = 43.68, SD = 2.79) children participated in the study. Although the two cohorts were similar in terms of age, number of siblings, birth order, and first language spoken, they differed widely from each other in other respects such as family experiences. The purposes of this paper are to examine cultural similarities and differences in the (a) developmental patterns of naïve psychology and pretend play behaviour, and (b) links between pretend play behaviour and naïve psychology development.

The experimental data showed cultural similarities in children's knowledge of many aspects of pretence understanding, level-2 visual perspective-taking, appearance-reality distinction and false-belief explanation across the three phases. At 2½ years of age, subtle cross-cultural differences in children's understanding of discrepant desires and action prediction were observed. However, substantial cultural differences emerged at 3½ years of age. The UK cohort performed significantly better than the Singapore cohort in the false-belief prediction task at 3½ years of age, after verbal mental age and gender were considered as covariates. Across the three phases, the Singapore cohort scored significantly higher in total mean for the discrepant desires task. In contrast, the UK cohort achieved significantly higher total mean for the level-1 visual perspective-taking task across the three phases and the mental representation in pretence task across phases II and III.

The observational data, on the other hand, indicated considerable cultural differences in pretend play behaviour at 2½ years of age. The Singaporean children spent significantly more time engaged in non-pretend play and non-social pretend play whereas the UK children spent significantly more time engaged in social pretend play. This finding contrasted with the substantial cultural differences in naïve psychology development found at 3½ years of age. Although there was cultural differences in age of emergence of pretend play behaviour, the UK and Singaporean children showed similar developmental sequences from non-pretend to non-social pretend and finally to social pretend play behaviour and from simple to complex forms of social pretend play behaviour. With regards to other pretend play behaviour, the Singaporean children spent significantly less time engaged in positive complementary bids, negative conflict, other forms of pretence, metacommunication and in the pretend theme of outings, holiday and weather across all phases than the UK children.

The partial correlation analysis revealed associations between some early pretend play behaviour and later acquisition of some naïve psychology concepts for both cultures. This finding provides partial support for the proposition that pretend play behaviour is an early marker of understanding of mental representation. There was evidence of longitudinal associations between early understanding of some aspects of naïve psychology and later engagement in complex forms of pretend play for the Singaporean children alone. The reciprocal relationships between some pretend play behaviour and some naïve psychology concepts for the Singaporean children alone provide partial support for the premise that pretend play behaviour and naïve psychology are closely intertwined.

Taken together, the experimental and observational approaches employed in this study map out the gradual development of children's naïve psychology and pretend play behaviour. This study highlights the importance of considering the influences

of family background characteristics, language ability, and social interactions in the context of peer pretend play when comparing naïve psychology development between children from different cultural backgrounds. More importantly, recognising cultural and social influences as factors contributing to a mix of universal and diversity in development is the key to understand children's naïve psychology.

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POSTER Nº 6

WHY DO YOUNG CHILDREN TRUST MISLEADING INFORMANTS?

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Humans' faith in the word of others is an important underpinning of cultural transmission. Recently developmental psychologists have started to investigate the origins of this trust. Many studies have tested how children ponder conflicting inputs coming from various communicators (e.g. (1)). These researches show that children do not trust communication blindly (contra (2), p.422). However, they focus on whether children trust more certain types of informants than others. They do not test children's tendency to trust communication, as opposed to generally doubt it, or disregard it. To test human's trust in communication, one should focus on situations in which a single speaker provides a testimony, and see whether this testimony is trusted, doubted, or simply ignored. In studies using this type of procedure, a striking pattern of answers was found: Young preschoolers tend to trust single informants, even if they happen to be repeatedly misleading (e.g. (3-5)). In here, we report several experiments that were designed to investigate this phenomenon. It was hypothesized that young preschoolers' trust comes from their propensity to frame communicative interactions as informative.

STUDY 1.

Study tested whether young children's trust comes from their inability to treat communicated information as false. Young children may be unable to refrain from accepting what is said by a single confident informant, possibly or executive reasons (3). Or they may lack the capacities to represent communicated information as false (6). An alternative possibility is that children can treat communicated information as false, but simply do not it because they are trustful. Study 1 attempted to disentangle these three alternatives.

Twenty three-year-old children had to use a misleading testimony to locate a coin which could be hidden in one of two boxes. In the "*false communication task"* the experimenter explicitly said that the testimony was false: e.g. telling the child "The frog says that the coin is in the white box, but she is mistaken!". The "*true communication task",* was identical, except that experimenter said that the testimony was true.

Children performed significantly above chance in the false and true communication tasks. In similar tasks for which children had to be vigilant towards deceptive informants, three-year-olds tended to fail. These results suggest that three-year-olds are able to treat communicated information as false, and yet are trustful. Study 2 tested whether three-year-olds are only trustful hearers, or whether they also have a tendency to be honest speakers.

STUDY 2.

Eighteen 3- and 18 4-year-old children had to deceive an opponent. In the *"box"* condition, a coin was placed in one of two boxes, and children had to make the opponent believe that it was in the opposite box. Only four-year-olds succeeded on this task. In the "*hand*" condition, the coin was hidden in the child's hands. In this condition also, children had to make the opponent believe that the coin was in one of the two boxes. But here children were forced to choose between communicating one of two lies (i.e. saying that the coin was in one box or saying that it was in the other box, whereas the two boxes were empty). In this condition, even 3-year-olds succeeded. These results indicate that 3-year-old children can use communication to manipulate beliefs, but favour honesty over deception.

STUDY 3.

Study 3 allowed to test whether children's trustfulness and honesty share common underpinnings. Four-year-old children were presented with tasks in which they had to mislead an opponent, and with symmetrical tasks in which they had to be vigilant towards deception. This age group was selected because it is around four-year-olds that children start to pass these tasks. Children's performance in deceiving and in being vigilant towards deception were significantly correlated, even after controlling for the effect of age (*rho* =.77).

GENERAL DISCUSSION.

The results presented in this paper suggest that young children expect communicative interactions to be honest, and that this expectation can bias the assessment of communicated information, and of informants.

Interestingly, children did not appear to learn from being exposed to misleading instances of communication, contra the idea that human's trust in communication is acquired by experiencing repeated evidence of reliable communicated information (7). Rather, they appeared to neglect the possibility to mislead, and to be misled, although they appeared to have to have some of the abilities do so. The importance of such an initial faith in speakers for cultural transmission is likely to be crucial for acquiring linguistic competence (8), and more generally, for the transmission of cultural knowledge (9).

After the age of four children show a higher vigilance towards the possibility of being deceived. It also around this age that children appear to be ready to acquire certain types of cultural knowledge: appropriately playing hide-and-seek (10), playing deceptive games (11), or understanding deception in stories (12). This developmental trend may correspond to the extension of their social world, which leads them to interact more with peers (4).

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POSTER Nº 4

THE ORIGINS OF SOCIAL COGNITION: FROM THEORY OF MIND TO VICARIOUS PERCEPTION

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We attribute mental states to others all the time: if I know that my wife wants diamonds for her birthday, or that my daughter knows how to open her bedroom door, this may influence my actions. Our the ability to attribute mental states – beliefs, desires, wishes, etc – to others, which is known as '**theory of mind**', is taken to be the central concept in understanding how we are trying to make sense of others: how we engage cognitively with other agents.

In the last three decades, the concept of 'theory of mind' has been at the center of interest in philosophy of mind, psychology and primatology. Some important questions about 'theory of mind' are the following:

(I) Do non-human animals have theory of mind?
(II) How does theory of mind develop in ontogeny?
(III) What mental processes make theory of mind possible in humans?
(IV) What are the neural underpinnings of theory of mind?

I argue that the emphasis on theory of mind is a methodological mistake and that the empirical findings from developmental psychology and primatology , as well as some philosophical arguments, point to a possible alternative, **vicarious perception**.

We experience objects as having a variety of properties. When I'm looking at the water bottle in front of me, I experience it as having a certain shape, size and color. On some occasion, for example, when I am thirsty, I also experience the water in it as drinkable or as affording drinking. When I am running to catch my bus,

I experience the lampposts, people and phone boxes as potential obstacles to the action I'm performing. In short, under some circumstances, we experience objects as edible, climbable, or Q-able in general, as affording actions or as potential obstacles to our actions. Our experiences are sometimes action-oriented.

Importantly, sometimes, we experience objects as affording actions not for ourselves, but for someone else. Sometimes we see an apple as edible not for myself but for you. This is the phenomenon I call 'vicarious perception'. Vicarious perception is a simpler, and more basic, way of engaging with others cognitively than theory of mind.

Here is an example. I am sitting in my armchair looking out of my window. I see my neighbor running to catch her bus. There are lots of people in the street and my neighbor is zigzagging around them on her way to the bus that is about to leave. How will I experience the lamppost in my neighbor's way? I will not see it as affording an action to me: I am not about to perform any action, let alone an action that would involve the lamppost. But I don't see it in a detached, action-neutral way either: I see it as affording an action (of bumping into) to my neighbor: as an obstacle to the successful performance of her action of catching the bus. I experience the lamppost as having a property that cannot be fully characterized without reference to action, but this action is not my action, but my neighbor's. I experience it as an obstacle to her action, not mine.

I argue that while questions (I) – (IV) are difficult to tackle (and ambiguously formulated) as long as they are about 'theory of mind', if we take them to be about vicarious perception (and not theory of mind), we get straightforward answers. More specifically, it can be shown that all experiments that are supposed to show that non-human primates have theory of mind in fact demonstrate that they are capable of vicarious perception. The same goes for the experiments about the theory of mind of less than 12 month old infants. If we shift the emphasis from theory of mind to vicarious perception, we can make real advances in understanding the origins of social cognition.

Let us take (II) as an example: My suggestion is that all the relevant experimental findings that are supposed to demonstrate that one year old and younger infants display the capacity to attribute mental states to others (Song et al 2005, Gergely et al. 1995, Csibra et al 1999, Csibra 2008, Kuhlmeier et al. 2003, Hamlin et al. 2007) are in fact instances of vicarious perception. The question about the development of theory of mind may or may not have a straightforward answer, but we can use these experiments to give a fairly precise answer to the question about the development of the most rudimentary ability to engage with others, if we take this rudimentary form of social cognition to be vicarious perception. We have reason to believe then that the capacity for vicarious perception develops somewhere between six and nine months.

Finally, let us take (I): the question about whether non-human primates are capable of attributing mental states to others. This question has recently taken the form of a debate about whether chimpanzees can attribute perceptual states to others and whereas some experiments (esp. Hare et al. 2001, 2002, 2006, Tomasello et al. 2003, Brauer et al. 2007) seem to confirm that chimpanzees have this capacity, other experiments (esp. Povinelli & Vonk 2003, Povinelli & Eddy 1996, Penn & Povinelli 2007) seem to disconfirm this. My claim is that the reason for this is that the Hare et al. experiments are all in fact experiments about the chimpanzees' capacity for vicarious perception – they demonstrate that chimpanzees are in fact capable of seeing objects as affording actions to others. The Povinelli et al. experiments, in contrast, are about instances of attributing perceptual states that are not vicarious perception: they demonstrate that chimpanzees are probably not capable of attributing perceptual states to others. Putting the two sets of experiments together, we get a picture that chimpanzees are capable of, and only capable of, one form of social cognition: vicarious perception – and this finding is an important step in understanding the origins of social cognition.

POSTER Nº 8

MARSHALL MCLUHAN'S GLOBAL VILLAGE: MEDIA MANIPULATION OR BIOLOGICAL NECESSITY?

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Marshall McLuhan, a Canadian thinker known by works like The Gutenberg Galaxy: The Making of Typographic Man (1962) or Understanding Media (1964), believes that communication technology affects cognitive organization and has profound ramifications in the social environment. Since the implementation of the alphabet, McLuhan detects cognitive changes that transform society from an aural/oral culture to a visual and print culture consolidated by Gutenberg's printing press. For McLuhan, printing technology changes perceptual habits and therefore social interactions, making possible the construction of the Modern Western world trends: individualism, democracy, protestantism, capitalism and nationalism.

All these trends are necessarily built around a principle of visual quantification that segments actions and rationalizes experiences; this principle, contained in the normalization of the book as an object of knowledge and consumption, boosts individuality and helps to create at the same time a national uniformity where all human beings are logical, explicit and literal. Dehumanization is accepted and mechanics are imposed in a society where the sense of sight has for the first time a primary function above and separated from the rest of senses.

However, the society described above comes to an end with the emergence of new technologies that substitute print culture for an electronic interdependence that brings back an aural/oral society with a tribal base. This new era is known as "Global Village", a term that McLuhan popularized in The Gutenberg Galaxy: The Making of Typographic Man (1962). By means of electronic technology, McLuhan believes that the world has been contracted into a village where information is instantly shared by everyone. This new panorama changes again human's perceptual habits and therefore social interactions: if the printing press boosted an individualistic culture, new technologies embrace a former aural/oral society defined by a collective identity.

In the electronic age, mass media promote a total interdependence and a superimposed co-existence. Society is unaware of the mechanisms through which media manipulate the individual's consciousness and personality; technology becomes biology and new media are natural extensions of the human body and senses. Therefore, new technologies disrupt the psyche and have subliminal effects on human experience creating new and unknown environments that transmit different kinds of messages and conform the individual's mindset.

In order to overcome media manipulation, McLuhan affirms that society must be aware of the fact that environments are processes and not containers; in this regard, social 'surfing' and surviving depends on a good understanding of these processes and on the knowledge about the environmental cycles created by human innovation. It is the task of the artist to unravel this "silence grammar" of media by creating counter-environments that question the present and attempt to achieve individual freedom. In this sense, the Canadian thinker believes that only the poetic process is capable of giving meaning to the technological society and to reconstruct historically mass media. The artist becomes a hero in the "Global Village" that overcomes the sound of the "tribal drums" and preserves beauty by means of a creativity and a new sense of individualism.

In conclusion, according to McLuhan, it seems that the environment has become artificial and a technological extension has been added to human biology. But does this technological attachment stems from new media or from an inner biological need for communication? In this regard, McLuhan's ideas about the evolution of societies from an aural/oral culture to a visual one, and then to an aural/oral again, may not be exclusively shaped by cultural patterns but by biological ones.

If language learning has an innate structure in the human brain, it does not seem unreasonable to think that the learning environment is constrained by biological patterns. Just as artificial selection was used thousands of years ago to take advantage of natural selection in order to domesticate animals and adapt natural circumstances to human necessities, in "The Gutenberg Galaxy" language and communication seem not to depend any more on the environment since printed books are meant to transmit knowledge and culture.

But what happens in the "Global Village"? Assuming that language is innate, maybe all the media manipulation that McLuhan suggests could be understood as a natural demand of the human mind for communication based on orality and connectivity. Therefore, present technological evolution could form part of an inner biological necessity of connectivity, from which only artists and thinkers, according to McLuhan, could be detached.

Whereas the "Global Village" has emerged due to cultural shaping or biological constrains, it is a fact that new technologies have revolutionized communication and therefore the social environment in which we live. This poster, taking as its point of departure McLuhan's ideas about cultural and social evolution, aims to discuss how both culture and biology have played a role in the construction of the contemporary world, called by McLuhan the "Global Village".

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POSTER Nº 9

ADAPTATION AS A REASON FOR THE NEOLITHIZATION? CASE STUDY FROM THE PRESENT DAY CROATIA.

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Effects of environment influence on human behavior and material culture has been one of the main aspects of archaeological theory in the past 50 years. During the period known as the „new archaeology“ a strong emphasis was put on the interaction between humans and their environment, and the effect that the environment had on the human behavior in general was considered as the main reason for the cultural change (for example, Binford 1962, Binford & Binford 1968). This approach was highly influenced by the work of anthropologists such as J. Steward (1955). The culture was observed as the equal part of the ecosystem. As a general trend, in the last 30 years archaeology offered a different approach to explaining human behavior and cultural diversities in periods concerning archaeology. The crucial role of environmental conditions was abandoned as opposed to significance of symbolism, individualism and the importance of human mind (Hodder 1982). According to this, so called "postprocesual" approach, culture is considered to be more than just adaptation to the nature (Hodder 1982). Although both phases are now regarded as the past ones, role of environment in human culture is to this day subject of scientific debates on almost any geographical area and archaeological period. The ideas and main trends are always affected by the contemporary society and the values and ideas incorporated in it as well as the contemporary geopolitical situation. In this poster I will try to present both approaches to the research of neolithization of the Northern Balkans. The Northern Balkans is an area with a very long history defined by conflicts. Once (sometimes even today) called a border zone between "Eastern" and "Western" civilization, this area was a contact zone between two great empires, then consecutively fragmented and changed in the period of time of less than 100 years. This fragmentation occurred parallel with the development of archaeology in this part of the world. There was a lot of explanation for the position of the present day borders, including assumed ones from the distant past. During prehistory, especially during the period of introduction of sedentism and agriculture in this part of Europe the real border zone was not defined by some visible natural barrier such as rivers or mountains, to the North and to the West; it was in the areas quite easy to cross. Nevertheless, first wave of Neolithisation stopped somewhere in the Middle of the Great Hungarian Plain and to the West around 100 km to the east from the present day Zagreb. The Northern border is called "ecological barrier" in the archaeological literature, and the same model can be applied to the western border where there was far less research. Beside ecological explanation, there are also theories that diminish the environmental causes in account to aspect such as human choices etc. (Raczky et al. 2010). The research of influence of the various aspects of the environment on the past cultures is important not only to get answers to scientific questions but in order to try to explain to the broader community the complexity and diversities of different cultures and cultural processes.

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POSTER N^{O} 13

CONSPECIFICS` BEHAVIOUR MAY INDUCE COOPERATIVE CHOICES IN JACKDAWS, *CORVUS MONEDULA*

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Human culture is to a large extent characterized by cooperation between individuals. The evolutionary roots of cooperation are presently a topic of intense discussion in diverse disciplines and their investigation will give some insight also into the cultural evolution in humans. So far, experimentally investigating cooperation in animals is mainly focused on non-human primates, following either the assumption that cooperative behaviour has its evolutionary roots in the primate line and may be a shared trait of humans and their closest living relatives or, that cooperative breeders, such as humans, are motivated and psychologically predisposed to act cooperatively. However, what has been neglected so far is the influence conspecifics may have on cooperative decisions of actor individuals. We tested this influence in jackdaws, *Corvus monedula*, and asked if the birds show other-regarding preferences that are considered a crucial prerequisite of cooperation, i.e. if the birds show prosocial (providing benefits to others at no costs for oneself) and altruistic behaviour (providing benefits to others while incurring costs).

Birds were tested with both sibling and non-sibling recipients. In the prosocial condition, actors could choose between a box that was baited on the actor`s and the recipient`s side and a second box that provided food only for the actor. In the altruistic condition, a box contained food either for the actor or the recipient. Focusing solely on the actor`s behaviour, jackdaws made more selfish than prosocial/altruistic choices. However, the more often recipients positioned themselves at the baited box prior to the actor`s arrival at the boxes the more often actors chose prosocially for both siblings and non-siblings but chose the altruistic option more often only for siblings. Hence, at no costs for the actor all recipients could significantly influence actors' choices but at high costs they could do so only when they were kin. Actors obviously took into account the other's identity and the costs associated with their choices in the different conditions. With high costs for themselves, the underlying enhancement mechanism seems too weak to induce altruistic behaviour towards non-kin but at low costs actors can be influenced to make prosocial choices towards kin as well as non-kin which suggests that cooperative behaviour may be induced by low-cognitive mechanisms and conspecifics` behaviour.

POSTER Nº 10

LAMARCKIAN VS WEISMANNIAN INHERITANCE

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There is a long controversy about the nature and the units of cultural reproduction and inheritance [1-8]. One problem is whether cultural reproduction is Lamarckian, under which most authors mean the inheritance of acquired characters, or Darwinian, under which the opposite of Lamarckian inheritance is meant, that is, "hard" inheritance, where variation is random and acquired characters cannot be inherited. In this sense it would be more appropriate to call this type as Weismannian, because Weismann was the first to argue convincingly against the inheritance of acquired characters. The general conclusion is that cultural replication is inherently Lamarckian of nature ([2,5,9] but see [10] for a counterargument), although there is no clear consensus about what exactly Lamarckian inheritance means [11].

Most authors would also agree that cultural evolution is faster than its biological counterpart, and the main reason behind this difference is that Lamarckian inheritance allows for a faster rate of evolution. Despite the importance of the issue there is only a handful of studies investigating this issue [12,13]. The general conclusion is that while Lamarckian populations indeed adapt faster to new environments, dynamically changing (oscillating) environments favour Wesmannian inheritance [12,13]. This conclusion is in contrast with the notion that on the one hand, cultural change is fast and not strictly directional, and on the other hand, it is mostly powered by Lamarckian inheritance. Here we investigate this issue with the help of a genetic algorithm that allows inheritance to be fine tuned between strict Weismannian and strict Lamarckian opposites. We investigate the effects of different types of environments ranging from static, oscillating, random through any combination of these types, and the effects of competition between different types of inheritance in these environments.

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POSTER Nº 15

WHAT CAN INFANTS LEARN FROM CONTINGENTLY REACTING ENTITIES?

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Young infants are equipped with a sensitive contingency detection mechanism to identify different levels of social contingencies from very early on (Gergely and Watson, 1996), often ascribing communicative agency to the entities they interact with (Movellan and Watson, 2002; Johnson, Slaughter and Carey, 1998).

In a series of experiments with 12-month-old infants we investigated whether contingent reactivity triggers inferences related to the referential nature of communication. In an eye-tracker paradigm we find that contingent reactivity elicited by infants' incidental leg kicking is interpreted as cue for communicative intention. Infants followed the orientation change of objects significantly more often if these objects were reacting contingently to their behavior than that of non-contingent objects. In a subsequent study we explored whether the orientation of the contingently moving objects is interpreted referentially. Recent findings (Yoon, Johnson and Csibra, 2008) demonstrated a striking effect of ostensive-referential cues (eg. human pointing) on infants' object representation. In a change blindness paradigm, the communicative context made infants more sensitive to changes in the identity of objects than to location changes. We applied a similar manipulation to our leg-kicking procedure and after the object change we measured infants' looking time. Our studies involving a contingently reacting entity lead to a looking time pattern analog to those reported in situations involving human communicative partners. Infants demonstrated a differential sensitivity to the different kinds of changes: if the change followed the orientation change of a contingent entity, infants were more sensitive to the identity changes of the object than to changes in location, and reacted with longer looking time. However, this was not the case for situations involving non-contingent entities.

Our data show that detecting and interpreting contingent reactivity has a specific role in infants' early interactions. Infants did not only follow the orientation of contingently moving objects but they also showed an encoding bias specific to ostensive-referential communication, even though no human agent was actually present. Thus, infants seem to have access to a dedicated system that is able to process amodal cues signaling interactions, conveying this way a great flexibility in identifying communicative partners.

POSTER Nº 11

BORN TO BUILD? A COMPARATIVE ANALYSIS OF ARCHITECTURE AND BUILDING BEHAVIOUR ACROSS SPECIES

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Despite its important impact on the course of recent human history, human architecture has been a topic almost wholly neglected by evolutionarily-inspired researchers. Moreover, among architectural theorists it is often assumed that architecture is a unique human cultural invention that is closely linked to sedentary living. Biologists have however shown that building behaviour and architectural structures are taxonomically widely distributed in the animal kingdom. A preliminary analysis already points out that human architecture shares a number of important characteristics with non-human architecture. First, the most common function of animal architecture is to protect against biotic and abiotic hostile forces, which is arguably an important aspect of human architecture as well. Second, some animal constructions match, or even challenge the high level of complexity of human architectural achievements. Third, some of these animal structures (e.g., bowers of bowerbirds) are built for intraspecies signalling purposes and exhibit culturally transmitted styles just like many instances of human architecture. Finally, just like humans, most animal builders do not possess specific anatomical adaptations for building behaviour. Based on Tinbergen's four questions, we will review the possible proximate and ultimate factors of building behaviour in both human and nonhuman animals. This broad and interdisciplinary inquiry should not only allow us to spell out more clearly the similarities and differences between human and animal architecture, we expect it will also shed further light on the evolutionary origins and (cultural) evolution of human architecture. We also anticipate some "blind spots" regarding the proximate and ultimate causes of human building behaviour and we will therefore propose new avenues for future research that could address these voids.

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