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### **Cognitive Neuroscience**

## ***Cultural Learning, Imitation, and Articraft Understanding: A Comparative Perspective July 4 - 15, 2005***

**Course Directors:** **Josep Call**, Max-Planck Institute for Evolutionary Anthropology  
**György Gergely**, Hungarian Academy of Sciences, Developmental Research  
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**Faculty:** **Paul Bloom**, Yale University, Department of Psychology  
**Malinda Carpenter**, Max-Planck Institute for Evolutionary Anthropology  
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**Ádám Miklósi**, ELTE, Department of Ethology  
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### ***INTRODUCTION AND AIMS***

The summer course will provide a state-of-the-art cutting-edge scientific and research-oriented training for post-doctoral young researchers and highly promising pre-doctoral students on a currently central and heavily investigated interdisciplinary research topic that integrates several different, but partially overlapping fields of knowledge and scientific inquiry. These include human anthropology, social theories of culture, evolutionary and developmental psychology, the psychology of social cognition, cognitive development, and comparative and ethological studies of human and animal cultures. The course will be taught by a faculty consisting of internationally acknowledged leading experts of these fields from a variety of European countries (England, Germany, Hungary) as well as from the United States.

### **Human culture versus population-specific behavioral traditions of non-human animal communities**

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Is culture specific to humans? Well, yes and no, depending on one's definition of what 'culture' is. One can, for example, define culture as a set of relatively stable population-specific traditional behavioral practices that are cross-generationally transmitted through some form(s) of social learning processes. In this case the answer is clearly 'no', as many field researchers (e. g., Byrne & Byrne, 1993; Boesch, 1993; Goodall, 1986; McGrew, 1992; Nishida, 1987) have documented population-specific behavioral traditions of animal 'cultures' (e.g., examples of tool use such as nut-cracking, termite fishing in chimpanzees or potato washing in Japanese macaques, forms of gestural communication such as leaf clipping or grooming hand clasp in chimpanzees, or

techniques of food-preparation such as different modes of leaf-gathering skills in mountain gorillas) that are transmitted through social observation of the behaviors of other conspecifics in a particular community (for reviews, see McGrew, 1992; Tomasello, 1996; Tomasello & Call, 1997). Indeed, these cases have often been (somewhat loosely) referred to as examples of ‘animal culture’.

However, it can be argued that this terminology is strictly speaking inaccurate and potentially misleading from the scientific point of view. This may be so because the physical and social environment in which human infants are brought up seems to differ qualitatively enough along a number of significant dimensions from other, non-human population-specific behavioral traditions to suggest that both the origins of human culture and the nature of the processes of inter-generational cultural transmission and maintenance are unique to humans and are based on human-specific adaptations. Thus, in contrast to the severely restricted range, complexity, and kind of population-specific behavioral traditions of non-human communities, human environment is massively populated by a practically endless range of ‘artificial’ products of man-made culture that include a multitude of artifacts, knowledge of their proper functions, stereotypic procedures for their efficient functional use, conventional behavioral routines such as social habits, customs, and rituals, arbitrary symbolic signs and gestures and knowledge of their meanings, including words and language and their complex rules of generative combinatorial use, conventional gestures for communication, culturally transmitted knowledge about valence information concerning objects, food items, situations, animals and specific individuals, belief systems including myths of origin, non-visible fictional entities such as fairies, god(s), boogymen and devils, abstract and arbitrary rules of games and social behavioral conduct, display rules for emotion expressions, social institutions, systems of kinship, etc.

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**Mechanisms of learning, transmission and maintenance of cultural forms in human vs. population-specific animal cultures: The role of imitation.**

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Historically, *imitation* has frequently been proposed as the central mechanism mediating cultural learning and transmission by numerous researchers of often rather different theoretical persuasion who were interested in explaining the origins and processes of transmission and stabilization of cultural phenomena either in population-specific behavioral traditions found in non-human animal species or in human cultures or both (e. g., Baldwin, 1894; Bandura, 1986; Blackmore, 1999; Byrne & Russon, 1996; Dawkins, 1976; Dennett, 1991; Meltzoff, 1996; Tomasello, Kruger, & Rutner, 1993; Tomasello, 1999; Whiten & Cusance, 1996) . The aim of the summer school is to survey recent theoretical models (coming from memetics, cultural theory, evolutionary psychology, developmental psychology, and comparative ethology) and empirical work on *imitative learning* vs. *emulation learning* in humans as well as in different animal species (such as non-human primates, birds, and domesticated dogs). The course will provide an interdisciplinary overview of some of the puzzles raised by cultural phenomena and the related empirical and theoretical considerations that led to different theoretical proposals concerning the nature and role of imitation vs. other forms of social learning in the transmission and stabilization of cultural forms.

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**Tool use and artifact understanding in non-human vs. human cultures: Teleo-functional mode of construal and the origins and development of the ‘design stance’ in understanding artifacts in humans.**

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The other major focus of the course will be the origins and nature of understanding *artifacts* and their functions in non-human versus human cultures. Current theorizing and research will be reviewed on the much debated questions of emulation and physical affordance understanding in animal tool use (Tomasello, Call), the development of essentialist and functionalist

understanding of artifacts in human infants (Keil), the relationship between theory of mind development and the causal-historical understanding of derived intentionality of artifact functions in humans (Bloom, Kelemen), the construal of the 'design stance' (Dennett), the phenomenon of 'functional fixedness' (German, Kelemen), and the role of the teleological and the pedagogical stance (Csibra, Gergely) in construing artifact understanding.

Participants will be required to be able to present their on-going (or recently finished) research to the Faculty for discussion. These works should be of sufficiently high quality to promise publication in peer-reviewed intentional journals.

### ***THE FACULTY AND THEIR AREAS OF CONTRIBUTION***

**MALINDA CARPENTER**

MAX-PLANCK INSTITUTE FOR EVOLUTIONARY ANTHROPOLOGY, GERMANY

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#### **Social and Cultural Learning in Infancy**

I will talk briefly about the classic social learning mechanisms (imitation, emulation, mimicking, etc.) and then present another way of looking at the chemistry of social learning, that is, dividing demonstrations into actions, goals, and results, and seeing which of these components learners reproduce. I will present developmental evidence for each component in infancy, reviewing the important studies. I will argue that identifying and reproducing others' goals and intentions is the basis of human social and cultural learning, and I will discuss cues infants use to infer others' unobservable goals during a demonstration. Then I will talk about aspects of social learning that are apparently unique to humans and already present in infancy, including 1) reproduction of others' intentions (over and above their goals) and 2) the social (as opposed to instrumental) function of imitation, including copying the particular way or 'style' in which someone does something. I will conclude with a discussion of the flexibility of human social learning and its implications for human culture.

**JOSEP CALL**

MAX-PLANCK INSTITUTE FOR EVOLUTIONARY ANTHROPOLOGY, GERMANY

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#### **TAKING A COMPARATIVE PSYCHOLOGICAL STANCE: HOW APES AND DOGS INTERPRET THE PERCEPTIONS AND ACTIONS OF OTHERS**

There is ample evidence that animals react and adjust to the behavior of their conspecifics. Much less is known about whether animals also react and adjust to the psychological states of their conspecifics. Apes and dogs have received a considerable amount of research attention regarding their social cognition. There is a substantial body of evidence that suggests that apes and dogs interpret the perceptions of others from a psychological perspective and they are capable of at least level I perspective taking. Some recent evidence also suggests that chimpanzees seem to know what others intend. I will argue that these data are not easily explained by invoking a purely behavioral dimension based on detecting behavioral cues and statistical regularities. But at the same time, they do not necessarily constitute evidence of a mentalistic dimension based on metarepresentational mechanisms such as false belief attribution.

**GERGELY CSIBRA**

CENTRE FOR BRAIN AND COGNITIVE DEVELOPMENT, BIRKBECK COLLEGE, LONDON, UK

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### LEARNING AND SOCIAL COGNITION: THE CASE OF PEDAGOGY

Many theorists have proposed that human culture was made possible by one or more specific evolutionary adaptations that radically changed the cognitive capacities of humans, such as tool making, linguistic communication, or theory of mind. My talks will describe a new theoretical proposal (Csibra and Gergely, 2004) according to which a further human-specific ability, namely pedagogy, plays an even more fundamental role in the evolution and ontogenesis of individuals living in rich cultural environments. Pedagogy is a teacher-guided learning process whereby arbitrary associations, a characteristic of most cultural knowledge, can be formed quickly and effectively. We argue that the human-specific inclination to teach each other (i.e., to transmit relevant knowledge to conspecifics) is complemented by a human-specific receptivity to benefit from teaching. Human infants are equipped with specialized cognitive resources that enable them to learn from infant-directed teaching: they are sensitive to cues that indicate teaching contexts, they tend to interpret actions occurring in these contexts as referential, they expect the "teacher" to provide relevant information about referents, and they fast-map such information to the referred object. Many phenomena of early social cognition, like proto-conversations, gaze following, pointing, social referencing, or imitative learning can be re-conceptualized in this framework. Furthermore, while these phenomena are usually interpreted as manifestations, or precursors, of mentalistic interpretation of others, which then allow the child to engage in communication, we argue that the early ability to expect and receive information by teaching, or more generally, to exchange information with others, forms one of the sources for the later developing theory of mind.

**GYÖRGY GERGELY**

INSTITUTE FOR PSYCHOLOGICAL RESEARCH OF THE HUNGARIAN ACADEMY OF SCIENCES

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### Cultural learning, artifact understanding, imitation and pedagogy: the origins of human culture

My talks will review recent models and supporting empirical evidence suggesting that imitative learning is a primary adaptation underlying cultural learning in humans. Studies investigating the role of imitation or behavioral 'copying' in animal learning will be discussed and contrasted with the higher-order interpretative processes characteristic of human imitative learning. Different forms of social learning processes (such as stimulus enhancement, response facilitation, and emulation learning) underlying population-specific behavioural traditions in animal 'cultures' (such as in groups of primates or monkeys) will be considered and contrasted with the characteristics of human cultural learning that involves the higher-order human-specific adaptation of pedagogy that recruits the general capacity to imitate in the service of the fast and efficient acquisition, and transmission of complex forms of human culture. Archeological evidence from early *hominid* cultures from 2.5 to 1.5 million years ago will be reviewed and it will be argued that the stone tools, their inferable functional characteristics, and their manufacturing process implies a highly sophisticated technological and teleo-functional conceptual understanding that is qualitatively different from the population-specific tool use and understanding characteristic of primate 'cultures'. It will be argued that the teleo-functional cultural proliferation of artifact culture in our early *hominid* ancestors have provided selective

pressure for the evolution of higher-order forms of cultural learning such as pedagogy and imitative learning that allowed for the fast and efficient acquisition, and high-fidelity transmission of complex and often cognitively 'opaque' cultural forms in humans.

**ÁDÁM MIKLÓSI**

DEPARTMENT OF ETHOLOGY, EÖTVÖS UNIVERSITY, BUDAPEST, HUNGARY

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### **Understanding culture across species: Innovation, function, and cognitive aspects of tool use**

For many culture is THE phenomenon that distinguishes animals from men. However, there have been recent claims that animals might also have "culture". Recently a group of researchers joint forces and instead of trying to find a dividing line along which human and animal culture can be distinguished, they looked for a general framework in which all cultures of the animal kingdom (including humans) can be understood (Byrne et al 2004). Here we present an overview of this approach and extend this by discussing in detail the relationship between innovation and culture and the cognitive aspects of tool use.

We will explore six views of culture (culture as a pattern, culture as a sign of mind, culture as a bonus, culture as inefficiency, culture as a physical product, culture as meaning) and try to show the fundamental contrast of whether culture evolves as a by-product of cumulative change in cognitive mechanisms, or whether it is actively selected for its advantages.

**JÓZSEF TOPÁL**

DEPARTMENT OF ETHOLOGY, EÖTVÖS UNIVERSITY, BUDAPEST, HUNGARY

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### **Ethological and evolutionary aspects of social learning and imitation**

Social learning, more specifically imitation, has long been regarded as unique features of human behaviour, and it has been assumed that imitation plays also a crucial role in the emergence of culture. In recent years, however, it has become clear that the analysis of social learning in human has to be put in an evolutionary framework. Detailed ethological observations on wild animals (monkeys, apes, dolphins and many species of birds etc) suggested that animals of different species might be able to learn by observing the behaviour of the other. Later this has also been supported by controlled laboratory experiments involving a wide range of animal species. Today there are two different approaches based on the comparative and developmental psychological tradition. The first is interested in understanding the mechanisms of social learning by using categories like social facilitation, response facilitation, observational learning and imitation. The difficulty of this approach is that the definitions for such categories are not widely accepted, and make the interpretation of complex behaviours very difficult. Researchers favouring the second approach restrict they interest to study the social learning abilities of infants and young children in humans. Although such research could be very fruitful without the comparative evolutionary framework the function of social learning in humans remains to be difficult to interpret. We would like to emphasise a third line of investigations that is based on ethological approach. In this case the main emphasis is on understanding the function of social learning in a broad range of species by asking what are the advantages to learn social in comparison to asocial learning. We think that such an investigation leads to new questions and experimental work that could help to understand the evolution of various forms of social learning.

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