

Making of Humanities: Biological Roots of Mathematics and Cooperation
- **A joint workshop of Social Psychology and Neuroethology**

Date: July 28, 2014

Tentative time table: 9:30am – 11:30am (session 1), 13:00pm – 15:00pm (session 2)

Venue: Hokkaido University, School of Medicine (Sapporo)

Organizers: Toshiya Matsushima (Department of Biology, Faculty of Science), Tatsuya Kameda (Center for Experimental Research in Social Sciences, Faculty of Letters) and Maki Tanaka (School of Medicine) in Hokkaido University

Perspectives:

This workshop aims at integrative bio-psychological approaches toward understanding of human beings in terms of their “sunny sides” of intelligence. Particular attentions will be focused on two domains: Mathematics and large-scale Cooperation. To address these topics, we will adopt traditional strategy of ethology, that is the “Tinbergen’s four questions.” Through understanding of evolution, development, function and mechanism, we would expect to gain comprehensive views.

People often say that mathematics is the Queen of sciences. Actually, numerical accountings could underlie our reasoning in many aspects. However, biology / psychology could predate instead, and mathematical thinking could originate from ancestral mental representation of magnitudes. Questions are therefore, how our sense of number is shared among animals of diverse phylogeny and how it is formed.

In the morning session 1, **Giorgio Vallortigara (Univ Trento, Italy)** will tell us how newly hatched domestic chicks count number and do arithmetic, stressing the core knowledge possibly shared by animals and humans. **Elisabeth Brannon (Duke Univ, USA)** will tell us how 6 months old human infants sense numbers and how their sense develops to mathematical thinking and argue that non-verbal origins of number representations. **Tetsuro Matsuzawa (Kyoto Univ, Japan)** will tell us how chimpanzees form working memory of numerical order, and discuss why they often predominate humans. **Shinsuke Shimojo (Cal Tech, USA)** is expected to give comments on these topical talks, addressing the underlying perceptive mechanisms of modality-independent sense of time and frequency.

Similarly, the order of human social life is characterized by large-scale cooperation

which is often reflected in our sense of justice, or empathetic concern that accommodates morality. The cooperation has dynamics that is often shared among diverse cultures, thus could also have bio-psychological basis. Such collective behaviors could generate through interactions of individuals which have only short-sighted egocentric behavioral rules.

In the afternoon session 2, [Shinya Yamamoto \(Kobe Univ, Japan\)](#) will tell us how helping behavior and its cognition evolved based on empirical studies with chimpanzees and bonobos. [Naoki Masuda \(Univ Tokyo, Japan\)](#) will tell us how large-scale cooperation among non-kin members may be evolutionarily stable using a game-theoretic model. [Tatsuya Kameda \(Hokkaido Univ, Japan\)](#) will tell us how empathic concern may shape our sense of justice in distribution of resources among non-kin. Commentaries by [Michael Platt \(Duke Univ, USA\)](#) on these three topics are expected to address the link between the neural mechanisms and the evolution of large-scale cooperation.

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