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## Preface

For nearly 15 years, social simulation and computational approaches for understanding social phenomena has reached a rapidly growing audience from very different disciplines. Some researchers are attracted by new tools, methods or even paradigms to understand their object of research as is the case in sociology, economics or psychology. Others have found in simulation an interesting tool with which to communicate, negotiate or to support stakeholders' decision-making. This is the case in some political sciences, in management, and with the participative modelling approach for resource-management. Other researchers, mainly modellers, are interested by the richness of social phenomena and the challenges it presents in trying to capture even a small subset of this complexity with simple models; such is the case for computer scientists or physicists. ESSA'07, the fourth edition of the annual conference of the European Social Simulation Association (<http://www.essa.eu.org>) following the other editions is a meeting place at the crossroad of all these disciplines and motivations. The articles that will be presented during the conference are at the same at a very valuable level in their own disciplinary domain but are also accessible to a wider audience and bring then inspiration to other scientists.

These proceedings contain the papers presented during this conference held in Toulouse, France, September 10-14, 2007. The increasing popularity of the ESSA conferences enables this year to receive more papers than usual and then to increase the scientific quality of the conference. As an indicator, the selection rate for presentations is nearly 50% this year.

Finally, special thanks are due to the numerous researchers who submitted their best works to ESSA'07, presented a tutorial, reviewed submissions or volunteered their time in any other way.

**Frédéric Amblard**  
*Editor*



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# Modelling Primate Social Order: Ultimate Causation of Social Evolution

Hagen Lehmann and Joanna J. Bryson

Department of Computer Science, University of Bath, Bath BA2 7AY, United Kingdom

H.Lehmann@bath.ac.uk, J.J.Bryson@bath.ac.uk

The objective of our work is to understand the selective pressures that result in different social organisations in primates. We approach this by means of Agent Based Modelling. We here introduce a simulation which models the changes of social styles in the genus *macaca* depending on environmental factors such as predation and food distribution.

For many species of primates, arguably including humans, social behaviour can be characterised along an axis usually described as running from *egalitarian* to *despotic*. Despotic societies are characterised by a strict hierarchy with very few aggressive interactions, but where aggression occurs it is typically violent and usually unilateral from dominant to subordinate. Egalitarian societies have less well-defined hierarchies; frequent, bilateral, but less violent aggression, and a large repertoire of reconciliation behaviours.

We model the closely related species in the genus *macaca* and the environmental pressures working on their social organisation. To simplify the problem we have split the modelling into the ultimate and proximate cause of behaviour. In ethology ultimate causation explains an animal's behaviour based on evolution, while proximate causation explains an animal's behaviour based on trigger stimuli and internal mechanisms.

Our present simulation focuses on the ultimate causation. We represent two groups of macaques differing in their social style. One group is egalitarian, the other despotic. The social styles are defined by the way the animals interact and the average distance between them. Different experimental conditions require changing the environmental setups these groups are confronted with. Conditions represent either environments with high predation pressure and restricted food access, high predation pressure and high food access, low predation pressure and high access to food or low predation pressure and low food access. We then measure which group was more successful in which environment. The success of a group was defined as the number of offspring.

Our results correspond to empirical findings from primate field research. The group with egalitarian social structure did significantly better in conditions with predation pressure and high access to food and the despotic groups did better in environments with low predation pressure and low food access.

Our work provides additional evidence for currently discussed theories in evolutionary socio-biology, and provides a tool for testing these theories.