Multiple inheritance systems, niche construction and the importance of active agency in the evolution of language.

James Thomas

School of Informatics and Language Evolution and Computation Research Unit, University of Edinburgh

Email: J.G.Thomas@sms.ed.ac.uk

Our view of language evolution is grounded in our view of evolution in general. In turn, our view of evolution is grounded in our view of the nature of life and the nature of heredity. One ancient view, dating back at least as far as Aristotle, is that life can be conceived of as a union between matter and form. Today we might say that while living things are made of the same kind of matter as non-living things, it is their particular organisation or form that marks them out as special. Variations in that organisation or form are inherited. Evolutionary biology has traditionally studied the system of genetic inheritance which underlies the heritable variation in organisms' forms or phenotypes. Much of modern biology characterises that inherited variation in terms of information, with the 'major transitions' in evolution being related to changes in the storage and transmission of that information between generations (Maynard-Smith & Szathmary, 1995).

However, recent theoretical and empirical work suggests that there is more to inheritance than the genetic system alone (Jablonka & Lamb, 2005): Information is also transmitted between generations via the epigenetic, behavioural and symbolic inheritance systems. All four of these systems have their own properties, and all four can potentially interact. In this talk I will focus on the differing degrees to which these four systems allow organisms to niche construct: that is, to modify their own selective environments through their active choices, behaviours and metabolism (Odling-Smee et al., 2003). The behavioural and symbolic inheritance systems are particularly powerful in this regard.

However, the really powerful evolutionary effects may occur when the niche constructing potential of these inheritance systems interacts with the genetic system. In a series of recent publications, Terrance Deacon (Deacon, 2003; Wiles et al., 2005) has argued that such interactions have the potential to drive coordinated changes in whole suites of seemingly unrelated traits, resulting in increased functional complexity. In particular, Deacon has argued that the evolution of the human language faculty – comprised as it is of an unlikely suite of neurological, anatomical and cognitive traits – may be the result of just such an interaction-driven evolutionary process. I will present this theoretical background and discuss how I intend to go about modelling some of these processes.

Deacon, T. W. (2003). *Multilevel Selection in a Complex Adaptive System: the problem of language origins*. In B. H. Weber & D.J. Depew (Eds.), Evolution and Learning: the Baldwin effect reconsidered. MIT Press.

Jablonka, E., & Lamb, M. J. (2005). *Evolution in four dimensions: Genetic, epigenetic, behavioral, and symbolic variation in the history of life*. MIT Press.

Maynard-Smith, J., & Szathmáry, E. (1995). *The major transitions in evolution*. Oxford University Press, USA.

Odling-Smee, F., Laland, K. N., & Feldman, M. W. (2003). *Niche Construction: The Neglected Process in Evolution*. Princeton University Press.

Wiles, J., Watson, J., Tonkes, B., & Deacon, T. (2005). Transient Phenomena in Learning and Evolution: Genetic Assimilation and Genetic Redistribution. *Artificial Life*, *11*(1-2), 177-188.