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**evolutionary transitions and
semiotic systems**

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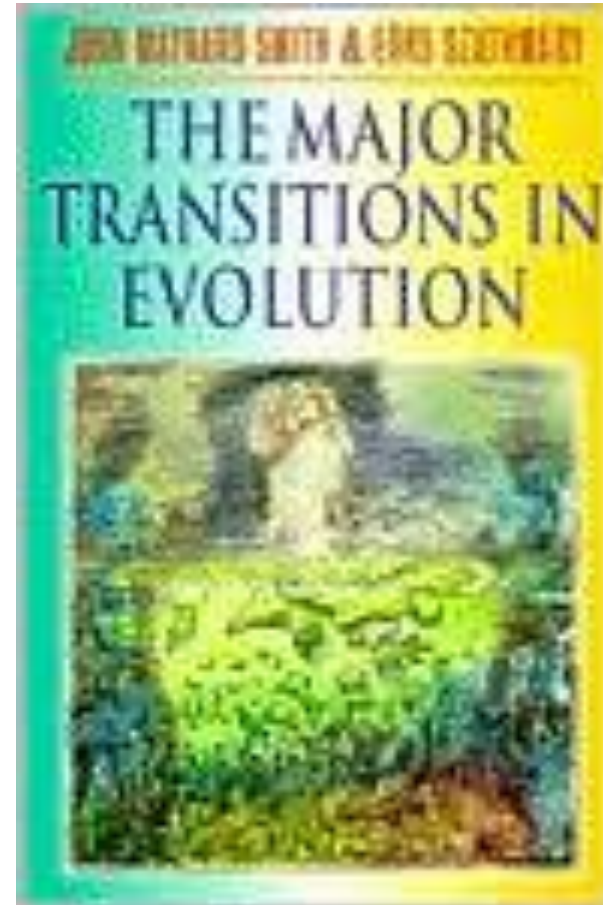
relevance

- > evolution of semiotic complexity is a central theme for evolution of language research, biosemiotics, and cognitive semiotics
- > it is a consensus that complexity has increased in information living systems giving rise to
 - > symbolic process, grammar, syntax, (semiotic) social systems of higher complexity

Concretely, many questions related to the evolution of semiotic complexity can be asked:

1. What is semiotic complexity?
2. How can growth of semiotic complexity be measured?
3. How can existing data be brought to bear on the study of this issue?
4. What are the main hypotheses about semiotic complexity that can actually be tested today?
5. Are the principles of natural selection sufficient to explain the evolution of semiotic complexity?
6. What are the environmental and other constraints on the evolution of semiotic complexity in living systems?
7. What is the role of developmental mechanisms in the evolution of semiotic complexity in living systems?
8. What conditions could reduce semiotic complexity in living systems?
9. What factors allow the evolution of semiotic complexity in living systems to be manipulated and controlled?
10. What models are most appropriate for understanding the evolution of semiotic complexity?

This presentation is related to this book and it is very specifically related to the “nature” and the “limits” of the modeling proposed by Maynard-Smith & Szathmary, and “revised” by Eva Jablonka.



transitions

biological innovation are called transitions

- > they emphasize the emergence of new systemic levels of complexity

about transitions

The emergence and evolution of new kinds of biological information systems have received a great deal of attention.

- > It is the case that the evolutionary history of life strongly depends on the evolution of different ways of storing, transmitting, and interpreting information

Maynard Smith & Szathmary

> from replicating molecules to populations of molecules in compartments (protocells) > from independent genes to chromosomes > from RNA as both an information carrier and enzyme to DNA as the carrier of information and proteins as the enzymes > from prokaryotes to eukaryotes > from asexual clones to sexual populations > from single-cell eukaryotes to multicellular organisms with differentiated cells > from solitary individuals to colonies with non-reproductive castes and > from primate societies to human societies with language.

problems

What is biological information?
How can this be theorized?

There are no agreement about the status and form of biological information [or bio-semiotic process] as a fundamental ingredient

problematic assumption

information is a *fundamental* ingredient

semiosis is a *fundamental* ingredient

there is a consensus that biology needs to employ a richer concept of information (not a Shannon model) to describe biosemiotic processes, and complexification of biosemiotic processes

- > formal definitions borrowed from math communication theory do not apply to organismic biology

Jablonka > biological information

‘We believe that **biological information should be seen in terms of the interpretation (or processing) of inputs**, rather than as an inherent property of inputs, and is best defined in terms of the receiver system: a source becomes an informational input when an interpreting receiver can react to the form of the source (and variations in this form) in a functional manner’

Jablonka > Peirce

This definition is very consistent with Peircean pragmatic conceptualization of semiosis as a process through which a 'form' is communicated from a source to the receiver through the sign.

Peirce (MS 793:1-3)

**‘a Sign may be defined as a
Medium for the communication
of a Form’**

> form

> form is nothing like a ‘thing’

> ‘being of predicate’

> ‘habit, ‘rule of action’,
‘disposition’, ‘real potential’

Peirce + Jablonka

- > semiosis/information will most often be an interpreter-dependent process
- > it cannot be dissociated from the notion of a situated (and distributed) communicational agent
 - > semiotic systems!
 - > iconic systems
 - > indexical systems
 - > symbolic systems

Peirce > Jablonka > Fetzer

- > For James Fetzer, cognitive systems develop three radically distinct modalities of semiotic behavior
 - > corresponding to the capacity to be causally affected by signs of qualities, events and laws
 - > iconic systems
 - > indexical systems
 - > symbolic systems

Any description of the emergence and evolution of different types of biosemiotic systems and processes must be supported by a theoretical framework which makes it possible to understand the nature and dynamics of such processes

theoretical framework

- > We argue that a basis for developing such a framework is found in Peirce's philosophy of signs.
 - > Fetzer's interpretation
 - > morphological space of semiotic processes into which cognitive systems are embedded include classes of proto-symbols (quasi-symbolic processes) and variations of indexical signs, beside symbolic, indexical and iconic processes

big omission > material semiotic artifacts

- > design semiotic artifacts
 - > semiotic structures available in the environment, produce a very distinct type of 'cognitive niche'
 - > second-order semiotic dynamics
 - > self-evaluation, self-criticism
- > They make complex semiotic processes available to attention, perception, etc, opening new range of semiotic operation; permitting self-inspection of semiotic complex processes

symbolic technology

We can hold that a qualitative change, a critical turn in evolution of tool technologies, took place with the appearance of symbolic systems.

After all, a system which is capable of interpreting the material world through the mediation of law-like signs evolves in a manner which is determined by the fact that they are capable of using law-like *regularities* to obtain information about the [environment/ niche] in such a way that those signs perform functions favoring their survival.

major transition!

- > Many authors have emphasized analogous aspects:
 - > Clark's thesis
 - > 'Language is an artifact, providing human users with unprecedented cognitive skills'
 - > transforming and reconstituting neural circuitries and structures/architectures dedicated to language processing

A semiotic systems approach

In a Peircean approach, ‘information’ is strongly associated with the concepts of meaning, semiosis, and semiotic systems.

- > **evolution** of information systems
- > **complexification** of semiotic systems

gracias!

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