

Communication



Learning by imitation

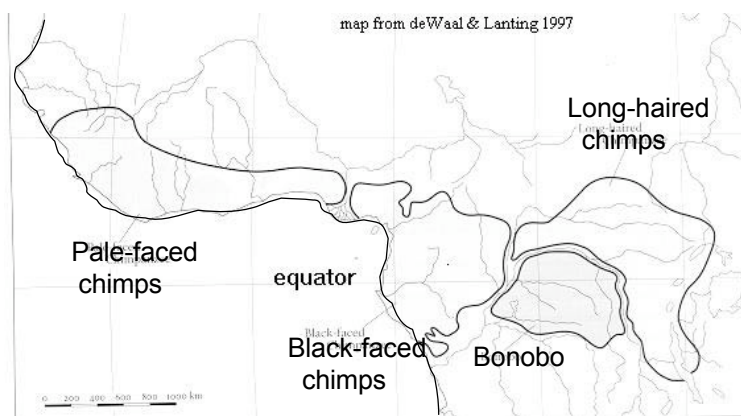


Termite sticks

Summary: Mental traits that are shared by human and non-human primates

- Intelligence
- Spectrum of temperaments
- Dependence on nurture for mental development
- Social, political, hierarchical orientations
- Pro-social emotions -- e.g. empathy, reconciliation
- Communication
- Learning by imitation

Endangered status of the chimps



Endangered status of the gorillas

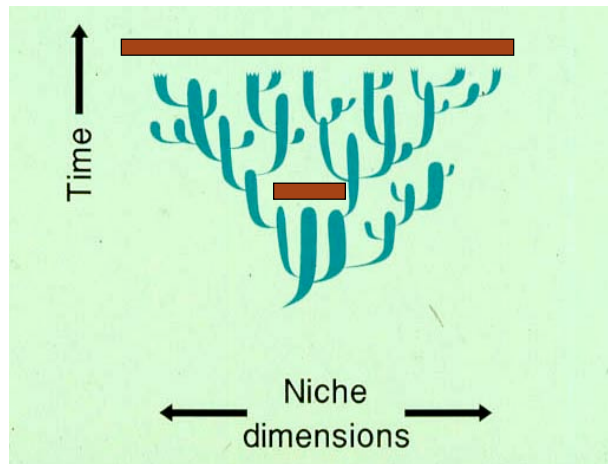
<http://williamcalvin.com/portraits/index.htm>



Endangered status of the orangs



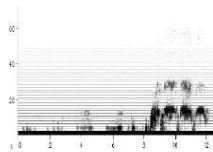
The all-too-common human footprint



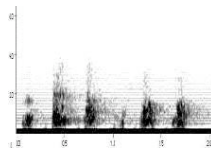
Core premise of evolutionary theory: Common descent

- Traits shared by groups of modern organisms were likely present in their common ancestor
- Traits unique to modern organisms are likely of recent origin.
- Distinctive human trait: Learn by by accessing information from language-based cultures and teaching this information to others.

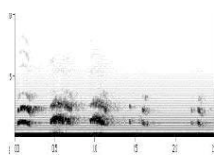
Ape communication -->
human symbol/syntax-based language



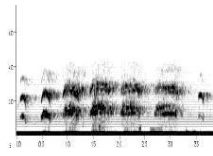
Panthoot



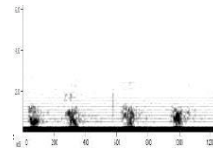
Pantbark



Copulation scream



Scream



Pantgrunt/submissive

Ape learning by imitation -->
human learning via culture-based
understandings taught via language



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The proposal: A three-way
co-evolution of culture, language and brain:

- Human culture is encoded in, acquired, and transmitted via languages.
- Languages have been selected for their ability to be learnable by children's brains.
- Children's brains have been selected for their ability to learn languages.
- Therefore, the acquisition of language-encoded cultural understandings has co-evolved with the emergence of "language-based minds."

•Time-scale for the transition

- Language-competent brains are estimated to have started showing up ~2 million years ago (*H. habilis*) based on analyses of neck anatomy.
- This corresponds to ~70,000 generations ago.

Scenarios for how the co-evolution has played out

- 1) Niche construction:
Model for how language and culture came to co-evolve.
- 2) Masking, degradation, and reconfiguring:
Model for how language-competent minds emerged from ape minds.
- 3) Possible role for sexual selection

Niche construction:
How the beaver helps us think about the human



Humans, like beavers, are adapted to niches of
their own construction

Beavers:

- Construct dams
- Selected for their capacity to construct, and thrive in, dam-created aquatic niches

Humans:

- Construct cultures
- Selected for their capacity to construct, and thrive in, culture-created mental niches

Model for how language-competent minds emerged from ape minds

- Cultural information masked the need for certain “hard-wired” ape-brain pathways (“instincts”), and these tended to degrade.
- The freed-up “brain space” was reconfigured to generate minds adept at learning language and hence acquiring cultural information.

Masking and degradation: How they work

- 1) A species is genetically programmed (“hard-wired”) to carry out some function necessary to its lifestyle.
- 2) The function becomes available to the species from an outside source.
- 3) Result: Any mutations that compromise the hard-wired program are masked from natural selection because the outside source “covers” the function.
- 4) Over time, therefore, the hard-wired program tends to become degraded.

An example of masking:
How ascorbic acid became vitamin C

- Most organisms are genetically programmed to synthesize ascorbic acid, which is necessary for survival.
- Apes started eating fruit, rich in ascorbic acid.
- Result: Mutations in enzymes involved in the synthesis of ascorbic acid were masked from natural selection, and the pathway has degraded in both chimps and humans.
- Ascorbic acid has thus become a vitamin: Chimps and humans must obtain it from the outside; we're addicted to it.

Another example of masking:
Sexual pheromones

- In rodents, urinary pheromones bind to receptors in the vomeronasal organ (VNO) of the brain and mediate gender discrimination.
- In gorillas, chimps, and humans, the VNO forms and then degrades during fetal development, suggesting that reliance on other sexual cues has masked selection to maintain the pheromone system.

Hypothesis: “Cultural masking”
→ **hominid cultural dependence**

- Culture started providing hominids with useful information from the outside.
- Hard-wired programs specifying redundant information systems in the brain were masked from selection by culture and therefore became vulnerable to degradation.
- Hominids therefore came to be dependent on culture, indeed, addicted to culture, for survival.

Candidate example of “cultural masking”:
the Moro reflex

- Trait: Infant apes instinctively cling to the fur of their mothers' bodies.
 - Humans learn, via their cultures, to carry their infants in arms and papooses; hence there is no selection to maintain the trait.
 - The human infant displays a degraded version of this trait, called the Moro reflex, that disappears within a few months after birth.
- > Human infant survival is now dependent on cultural understandings.

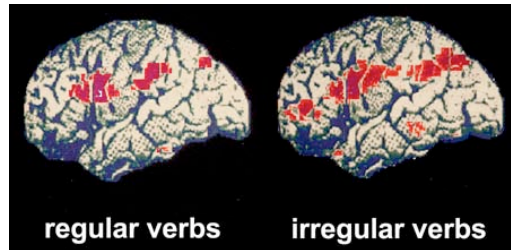
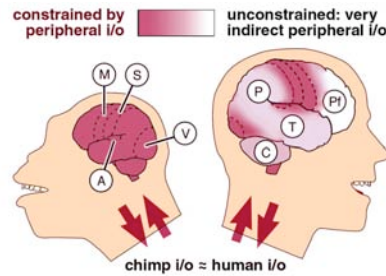
Where we are in the argument

- Niche construction: Select for linguistic “culture constructors”
- Masking: Culture masks certain behavioral traits from selection
- Degradation: Unselected traits degrade over time
- Reconfiguration: Degraded brain pathways are utilized for linguistic capacities that allow access to cultural understandings.

Hypothesis: The degraded brain programs were re-configured for language learning

- Given the underdetermined nature of mammalian brain development, degraded brain programs are readily re-configured (recall the blind mole rat)
- Any improved language skills resulting from such re-configurations would allow better access to the cultures on which hominids had become dependent.
- Therefore, such degradation/reconfiguration cycles would be adaptive and selected.

Outcome: Language-competent brain



Relation between languages and language-competent brains

- Languages have been selected for their ability to be learnable by children's brains.
- Children's brains have been selected for their ability to learn languages.

Relation between languages and cultures

- Access to culture requires language.
- Language is taught by language-users:
Children can only learn language in the context of culture.
- Cultures store and transmit information, valuable to the human, that is encoded in language.
- Cultures evolve <--> Languages evolve.

Scenarios for how the transition played out

- 1) Niche construction:
Model for how language and culture came to co-evolve.
- 2) Masking, degradation, and refiguring:
Model for how language-competent minds emerged from ape minds.
- 3) Possible role for sexual selection

A role for sexual selection?



The argument that sexual selection may have contributed to this story

- The evolution of language facility has been very rapid, a hallmark of sexual selection.
- Language plays a dominant role in courtship.
- Language facility is a good “fitness indicator” because it’s hard to pull off.
- “Choosiness” for language facility may have played a role in selecting for language competence.

Goefrey Miller, *The Mating Mind: How Sexual Choice Shaped the Evolution of Human Nature* (Doubleday, 2000)