Animal Cultures - Core Discoveries and New Horizons

IMPLICATIONS FOR UNDERSTANDING THE EVOLUTION OF HUMAN CULTURE

Andrew Whiten ~ Centre for Social Learning and Cognitive Evolution
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1. Phylogeny of culture
2. Convergent cultural evolution
Review

The scope of culture in chimpanzees, humans and ancestral apes

Andrew Whiten*

Culture Evolves

Papers of a Discussion Meeting issue organized and edited by Andrew Whiten, Robert A. Hinde, Christopher B. Stringer and Kevin N. Laland

The world’s first science journal

12 April 2011
Review

The scope of culture in chimpanzees, humans and ancestral apes

Andrew Whiten*
from:
*The Ancestor's Tale*
Dawkins, 2004
after Stewart & Disotell, 1998
Does species ‘X’ “have culture”?

YES? NO?
DISSECTING CULTURE

Population level patterning

Cultural contents

Transmission mechanisms

Whiten, A. The Second Inheritance System of Chimpanzees and Humans
Nature, 2005
Population level patterning

Cultural contents

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Transmission mechanisms
Population level patterning

Cultural contents

Transmission mechanisms
Population level patterning

Multiple diverse traditions
- Food processing
- Tool use
- Social behaviour
- Grooming style
- Courtship

Communities with unique arrays of traditions
Traditions may be long lasting

Cultures in chimpanzees

A. Whiten*, J. Goodall†, W. C. McGrew‡, T. Nishida§, V. Reynolds¶, Y. Sugiyama¶, C. E. G. Tutin**, R. W. Wrangham** & C. Boesch††

Orangutan Cultures and the Evolution of Material Culture

Carel P. van Schaik,†‡ Marc Ancrenaz,‡ Gwendolyn Borgen,† Birute Galdikas,†‡ Cheryl D. Knott,‡ Ian Singleton,§ Akira Suzuki,‡ Sri Suci Utami,§,‖ Michelle Merrill†‡

4,300-Year-old chimpanzee sites and the origins of percussive stone technology

Julio Mercader†, Huw Barton‡, Jason Gillespie‡, Jack Harris, Steven Kuhn, Robert Tyler‡, and Christophe Boesch†

Behavioral Variation in Gorillas: Evidence of Potential Cultural Traits

Martha M. Robbins1*, Chieko Ando2, Katherine A. Fawcett3, Cyril C. Gruter1,4, Daniela Hedwig1, Yuji Iwata2, Jessica L. Lodwick2, Shelly Masi5, Roberta Salmi6, Tara S. Stoinski5, Angelique Todd4, Veronica Vercellio3, Jüli Chi Yamagishi5
Traditions may be long lasting

Traditions may evolve like a branching tree
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Traditions may evolve like a branching tree
after A. Sleicher 1863 --- ‘Die Darwinische Theorie und die Sprachwissenschaft’
Traditions may evolve like a branching tree

I. Temkin & N. Eldredge
Current Anthropology 2007

Figure 2. Evolutionary tree of cornets. The relationships among different models (M) are calibrated against the timeline so that the vertical branches correspond to periods of manufacture of particular models. Shaded left and non-shaded right areas, instruments equipped with Stölzel and Périnet valves.
Nut-cracking recorded at eight sites in West Africa across ~500 Km (S. Carvalho & McGrew 2010)

No nut-cracking, but presence of all necessary raw materials confirmed

C. Boesch et al. 1994

W. McGrew et al. 1997

after A. Whiten, PNAS 2017
Chimpanzee Nut-cracking

- Tool types
- Species of nut
- Type of rock
- Tool transport
- Tool re-use
- Terrestrial/arboreal
Evidence for Cultural Differences between Neighboring Chimpanzee Communities

Lydia V. Luncz,¹* Roger Mundry,¹ and Christophe Boesch¹
¹Department of Primatology, Max Planck Institute for Evolutionary Anthropology, Leipzig 04103, Germany
Traditions may be long lasting
Traditions may evolve like a branching tree
Traditions may evolve cumulatively

Cultural learning

Ratcheting up the ratchet: on the evolution of cumulative culture
Claudio Tennie*, Josep Call and Michael Tomasello
Cumulative Culture in apes?

Population level patterning

Multiple Diverse Traditions
Communities have unique traditions arrays
Traditions may be long lasting
Traditions may evolve like a branching tree
Traditions may evolve cumulatively
Population level patterning

Transmission mechanisms

Innovation

Transmission processes

Social learning

Teaching
Can chimpanzees sustain (multiple) traditions?

An ‘open diffusion’ experiment
Whiten, Horner & de Waal
*Nature* 2005
Whiten, A., Spiteri, A. et al. (2007)
Transmission of multiple traditions within and between chimpanzee groups. *Current Biology* 17, 1038-43
Whiten, A., Spiteri, A. et al. (2007)
Transmission of multiple traditions within and between chimpanzee groups. *Current Biology* 17, 1038-43
Have apes the capacities to sustain cumulative culture?
3 groups seeded with LBT expert

7/18 successfully created and used LBT
12/18 used LBT as straw
18/18 attempted using functional LBT
23 valves opened / 93 LBT uses as straw

3 groups with no expert

2/25 created LBT but failed to use it
0/25 used LBT as straw
0/25 attempted using functional LBT
3 valves opened / 0 LBT uses as straw

Asocial controls

LBT-only controls
Phase 1
10 hours
NI unscrews

Phase 2
10 hours
NI unscrews

TA unscrews

TA unscrews

BN *sucks* juice through TA’s modified LBT

CE observes BN *suck* juice through the long bendy tool

*Sucks* juice through TA’s modified long bendy tool
Phase 1
10 hours
NI unscrews

Phase 2
10 hours
NI unscrews

Phase 3
10 hours
BN observes NI unscrew x 3
BN unscrews
Performs known suck behavior with new unscrew behavior

TA unscrews
TA unscrews

BN sucks juice through TA’s modified LBT

NI observes BN suck
Performs known unscrew with suck behavior

CE observes BN suck juice through the long bendy tool
Sucks juice through TA’s modified long bendy tool
CUMULATIVE CULTURAL CHANGE: EFFECTIVE FACTORS

social group + asocial controls

opportunities for cumulative, progressive learning

partial knowledge + socially learned addition

integration → novel combination = ‘invention’

social learning by others

culturally transmitted ‘innovation’

BN observes NI unscrew x 3
BN unscrews
Performing known suck behavior with new unscrew behavior

NI observes BN suck
Performs known unscrew with suck behavior
Are chimpanzees essentially emulators rather than imitators?
‘WHAT IS LEARNED?’ EXPERIMENTS

GHOST CONDITION STUDIES
L. Hopper et al. (2007) Animal Behaviour 73, 1021-32
HOW SOCIAL IS THE SOCIAL LEARNING? EXPERIMENTS

GHOST CONDITION STUDIES

‘HOW SOCIAL IS THE SOCIAL LEARNING?’ EXPERIMENTS

Claudio Tennie, Josep Call, Michael Tomasello (2010, *PLOS ONE*)

“Evidence for emulation learning in social settings using the floating peanut task”
Imitative ‘mirroring’

J. Comp. Psychol. 122, 186-194
Synchronicity (interval comparisons)
  between \( (p=0.001) > \) within \( (p=0.88) \)

Cross correlations (Monte Carlo)
  within \( (p=0.02) > \) between

Granger causality analysis
  model → observer \( (p=0.014) \)
Majority-Biased Transmission in Chimpanzees and Human Children, but Not Orangutans

Daniel B.M. Haun, Yvonne Rekers & Michael Tomasello

*Current Biology* 2013

Conformity and over-imitation: an integrative review of variant forms of hyper-reliance on social learning.

Andrew Whiten

*Advances in the Study of Behavior* 2019
Social learning processes

IMITATION IN A HOME-RAISED CHIMPANZEE
KEITH J. HAYES AND CATHERINE HAYES
Yerkes Laboratories of Primate Biology

SUMMARY

The imitative ability of a three-year-old chimpanzee, who has been raised in a human environment, was found in a variety of situations to be very similar to that of three-year-old human children.

IMITATION
 copying the form of an action

recognition of ‘copying’

CAN YOUNG CHIMPANZEEs (PAN TROGLODYTES) IMITATE ARBITRARY ACTIONS? HAYES & HAYES (1952) REVISITED

by

DEBORAH M. CUSTANCE1), ANDREW WHITEN1) and KIM A. BARD3,4)

Behaviour, 1995
### TABLE 1

Matching Acts Identified in the Do-As-I-Do Experiment

| Touch in sight | Shoulder | ** | Elbow | *** | Stomach | * | Thigh | * | Foot | * |
|----------------|----------|----|-------|-----|---------|   |       |    |      |    |
| Touch out of sight | Back of head | *** | Top of head | ** | Nose | *** | Ear | * |       |    |
| Symm. hand | Clap | ** | All digit touch | *** | Interlink fingers | *** | Roll fists | ** | Peekaboo | * |
| Asymm. hand | Clap back of hand | *** | Clap two digits | * | Grab thumb | *** |       |    |       |    |
| Single hand | Open hand | ** | Wiggle fingers | ** | Wave stiffly | ** | Arch fingers | ** |       |    |
| Facial | Protrude lips | * | Lip smack | *** | Teeth chatter | ** | Puff cheeks | * |       |    |
| Face-head | Mouth pop | ** | Lip wobble | ** | Pull mouth sides | * | Look up | ** | Look right | * |
| Whole body | Jump | * | Flap arms | ** | Hug self | *** | Foot to foot | ** |       |    |

**Note.** Descriptions given here are intended to convey the range of action presented. Comprehensive descriptions are offered in Custance et al. (1995).

Table includes all actions identified at least once:

- * Identified for at least one subject, one coder's second guess.
- ** Identified for one subject by at least one coder.
- *** Identified for both subjects by at least one coder.
Social learning processes

Tool transfers are a form of teaching among chimpanzees
Stephanie Musgrave1, David Morgan1,2, Elizabeth Lonsdorf3, Roger Mundry3 & Crickette Sanz1,3

Teaching varies with task complexity in wild chimpanzees
Stephanie Musgrave1, Elizabeth Lonsdorf1,2, David Morgan4, Madison Prestipino3, Laura Bernstein-Kurtycz4,5, Roger Mundry6, and Crickette Sanz1,3
Social learning processes – what do apes share?

Fidelity adequate to sustain traditions long-term

Some degree of cumulative culture

‘Portfolio’ of learning processes including enhancement, emulation and imitation

Social learning biases including conformity and others

Recognition of what it is to imitate

Teaching at the level of tolerant ‘scaffolding’
Shared cultural contents – tool use extensive in chimpanzee material culture

- Nut hammer, anvil
- Pestle pound
- Lever
- Club
- Stab weapon
- Termite puncture w stick
- Termite fish w stem
- Ant dip wand
- Fly-whisk
- Marrow-pick
- Leaf sponge
- Leaf napkin clean
- Leaf dab wound
- Leaf seat
- Leaf-clip courtship

A Whiten, Schick and Toth
The evolution and cultural transmission of percussive technology: integrating evidence from paleoanthropology and primatology. *J Human Evolution 2009*
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Communities have unique traditions arrays

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