Human origins and cultural evolution

Celebrating the 150th anniversary of the *Descent of Man*
Local convergence of behavior across species

Fermentation, Smoking, Salting and Curing
Aboriginal Processing

• Grind, leach, heat and use mussel shell spoon
• Grind, leach, bake in ash

Poisoned and starved on a full stomach
Why could any local adolescent survive easily, but Burke and Will could not?

Morton Bay Chestnut
Success of humans not explained by “intelligence” relative to other apes.

Also:
- Working Memory
- Strategic thinking

We humans get much smarter from 2.5 to 25. Apes do not. Why?
Culture makes us ‘smarter’

Pink, circle, freedom

Oksapmin count to 27
The secret of our success

- It’s not our intelligence.
- **Culture**: we depend on cumulative bodies of cultural information—*cultural adaptations*.
- **Collective Brains**: larger, more interconnected populations generate more complex repertoires and larger toolkits
  - High fidelity cultural transmission—good copiers
  - Sociality
- **Culture-driven genetic evolution**
Genetic Evolution
Natural Selection

Vs.

Culture and
Cultural Evolution

Psychological capacities for cultural learning
How might natural selection have shaped our cognition to best exploit the socially-available info

Psychological Mechanism of Cultural Learning

- Model-based mechanisms: from whom to learn?
- Content-based mechanisms
  - Food, fire, artifacts
  - Living kinds (danger info)
  - Norms, social groups

Logic of Natural Selection

Formally modeled
Model-based Selective Cultural Learning

- What cues should learners use to assess who is most likely to possess information useful/adaptive to the learner.
  - Skill/competence
  - Success
  - Prestige (cues of attention, deference)
  - Age—older children & older people
  - Self-similarity: sex & ethnicity/dialect

Vast array of domains
- Food preferences
- # of children (realized fertility)
- Mate choice
- Technological adoptions
- Word meaning, dialect
- Economic strategies
- Suicide
- Beliefs (e.g., invisible agents)
- Cognitive strategies and biases
- Reputational content
- Social motivations (fairness & punishment)

Reliably develops, relatively early, automatically, and remain unconscious
Cultural Adaptations

Genetic Evolution
Natural Selection

Psychological capacities for cultural learning

Cultural Adaptations

Spices

Pregnancy taboos in Fiji

- Non-conscious
- No causal understanding
- Causal understanding negative

Nixtamalization

Hadza Bow
Cultural evolutionary psychology

Genetic Evolution
Natural Selection

Psychological capacities for cultural learning

Other Evolved Aspects of Psychology

Cultural Adaptations (Cultural Products)

Complex Tools
Practices Rituals
Social Norms Institutions
Languages

Cultural Psychologies
• Visual processing
• Conformity
• Numeracy
• Prosocial motivations
• Spatial Cog
Culturally-evolved cognitive adaptations

• Cultural systems harness innate mental capacities to yield specialized cultural-cognitive abilities.

• Numerals & spatial reference systems
  – Left vs. Right.
  – Mental abacus—extraordinary computation abilities
  – Real abacus—harnesses visio-spatial abilities, object tracking & grouping.
“Natural selection is the only known causal process capable of producing complex functional organic mechanisms” (Buss, Haselton, Shackelford, et al. 1998)

- Nope
- Cultural evolution, driven by unconscious selective attention, can also generate complex function units that appear designed to solve specific problems.
  - Spice tastes and recipes
  - Nardoo and Nixtamalization
  - Numbers (zero), writing systems, abacus (neurological changes)
- Also, natural selection can act on cultural variation.
half hitch  overhand  slip knot
ring  roof  egg chamber
antechamber  entrance
built by selection-driven genetic evolution

snow knife
soap stone lamp
seal gut
built by selection-driven cultural evolution

dug out entrance
block construction
Larger and more interconnected populations

COLLECTIVE BRAIN
Population Size and Tool Complexity

• **10 societies, Oceania**

Does population predict the size and complexity of toolkits?

Marine foraging tool complexity

Kline and Boyd 2010
Technological variety and complexity

Larger islands had larger populations, more tools, and greater tool complexity. This all occurred in a few thousand years. Stands up to many control variables (ecological variables).

\[ \beta = 0.805 \]
\[ p = 0.005 \]

\[ \beta = 0.706 \]
\[ p = 0.022 \]

Innately less smart?
Can sociality influence skill?

- Replicate target image
- Time limit
- Paid for own and student’s performance.
- Access 1 or 5 models
- After task: can write up to 2 pages for “student”
- Next generation gets the (1) model’s product, (2) write-up and (3) target

Muthukrishna et. al. 2013
Mean Image Rating = 6.9*Generation + 23.5

Mean Image Rating = -1.2*Generation + 48.9

1 Model

5 Models

Linear (1 Model)

Linear (5 Models)
The data

In Generation 10
Everyone in 5-Model treatment is more skilled than the best guys in the 1-Model treatment.
Just copying the best?

• For 5 model treatment:
• Broke image down in binary elements
• Use t-1 generation ‘teachers’ elements to predict presence of elements in learners.

<table>
<thead>
<tr>
<th>Experiment 1</th>
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<tbody>
<tr>
<td>Model1</td>
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<tr>
<td>Model2</td>
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<td>Model3</td>
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<td>Model4</td>
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<td>Model5</td>
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<tr>
<td>Pseudo $R^2$</td>
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<tr>
<td>$N$</td>
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</tbody>
</table>

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Logistic regression

Recombination from multiple models → innovation without invention
Does the transmission of causal understand matter?

No effect of opportunities for transmitting causal understanding. Theory contains search.

Angular momentum
Potential energy

Causal understanding is not necessary for the improvement of culturally evolving technology

Maxime Derex, Jean-François Bornefon, Robert Boyd, and Alex Mesoudi
Tools and rules for communication

• Languages are products of cultural evolution, sets of tools and rules.
  – Adaptations for communication
    • Sign, whistle and human languages—locally adapted
    • Warmer climates have more sonorous languages

• Ergo, the same predictions apply
  – Larger speaker communities have
    ✓ More words—gain & loss, Polynesia (Bromham et. al.).
    ✓ More phonemes
    ✓ Informationally more efficient
Culture-Driven Genetic Evolution

Genetic Evolution

Larger Brains

Even larger brains

Hits the stops

Cultural Evolution

Tools
Fire
cooking

Tracking
Food
processing

Shelter
Clothing
Med
plants
Fancy
tools

Intertwined Dual Inheritance system

1st Division of labor/information: male/female
Recurrent features of ancestral selective environments created by cultural evolution

Psychological mechanisms of cultural learning

Logic of Natural Selection

Cult. Evol.
- Fire, Cooking
- Folkbiological knowledge
- Tracking, water containers
- Artifacts Tool/weapons
- Tap uneven distrub of skill
- Norms Institutions

Short colons, stomach, etc. Interest in fire
- Hierarchical tax
  - Cat.-based induct.
  - Essentialism, sel. att.
  - Tax. inheritance

Running adaptations
- Springy arches, sweat

Artifact cognition
- Functional stance
- Overimitation

Prestige status & ethology
- Two prides

Norms psychology
- Ontology→ social rules
- Prosociality
Cultural Brain Hypothesis

Predicts our specializations & oddities

- Explains rapid expansion of our brains, and large size.
- Account for many features of human anatomy/psychology
- Cognitive differences between species
- Cultural learning, over-imitation
- Extended childhoods
- Menopause
• Culture is the primary adaptive mechanism that explains our convergence of other species.
  • It’s why human behavioral ecology is a useful benchmark.
• Culture has been the primary driver of our genetic evolution for over a million years.
• Can’t do evolutionary psychology without doing culture-gene coevolutionary psychology.