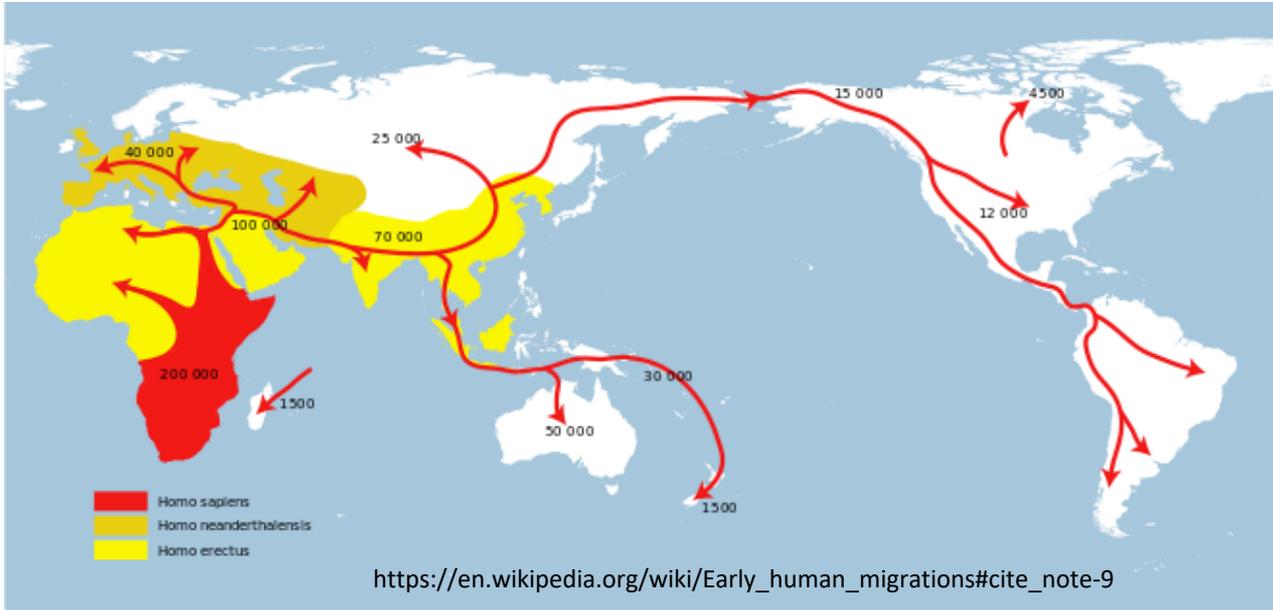
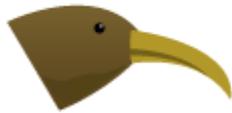


Human origins and
cultural evolution

Celebrating the 150th
anniversary of the *Descent
of Man*



**insects
and food**



nectar



seeds



fruit



BEHAVIOR

Local convergence of behavior across species

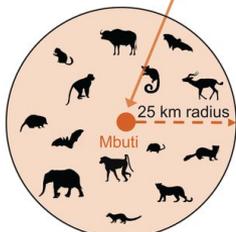
Toman Barsbai^{1,2*}†, Dieter Lukas^{3*}†, Andreas Ponderfer^{4,5*}†



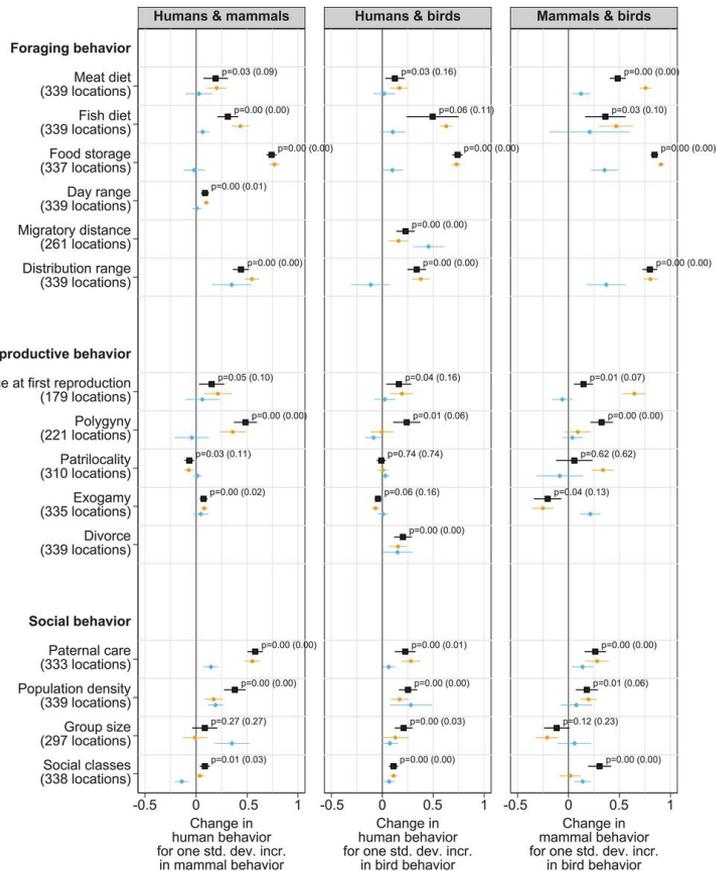
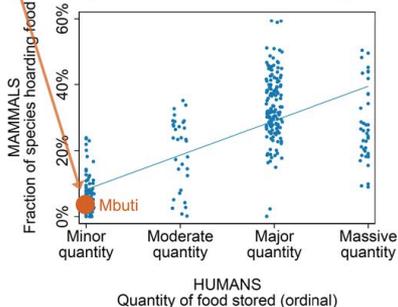
Mbuti population, Ituri Forest



The Mbuti population stores minor quantities of food



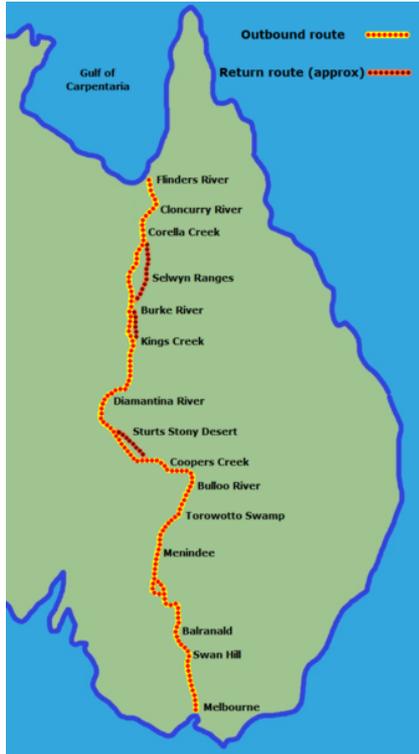
4% of mammals (7 out of 171 species) hoard food



■ Animals 25km radius (default)
 ■ Animals from ecologically similar areas
 ◆ Animals 25km, ecological controls

Fermentation, Smoking, Salting and Curing

LOST EUROPEAN EXPLORERS



Escaped

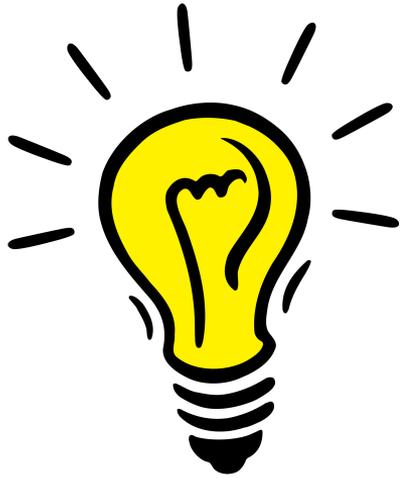
Aboriginal Processing

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



Poisoned and starved on a full stomach

60,000 years



Morton Bay Chestnut



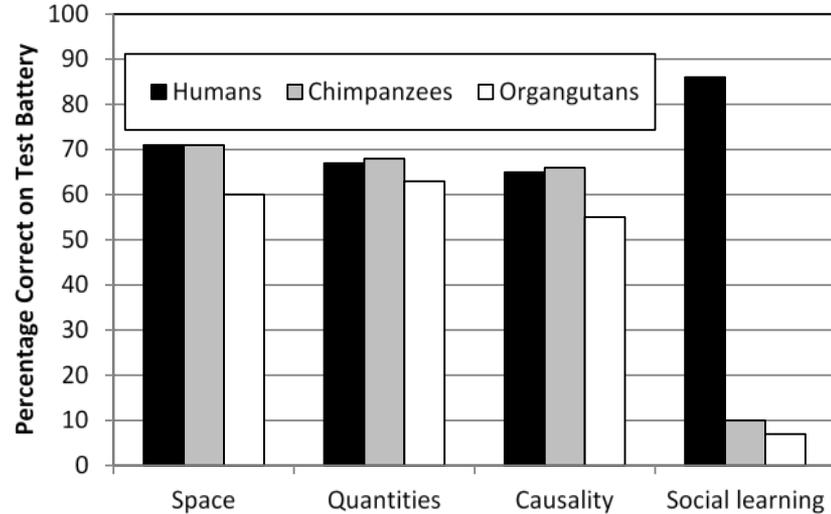
Why could any local adolescent survive easily, but Burke and Will could not?

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?

Figure 3.1: Performance on four sets of cognitive test with chimpanzees, orangutans and toddlers (data from Herrmann et. al. 2007)



human

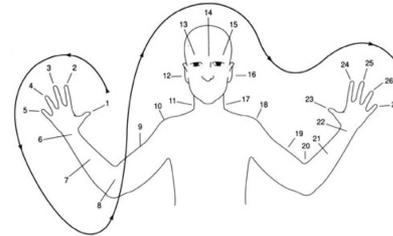
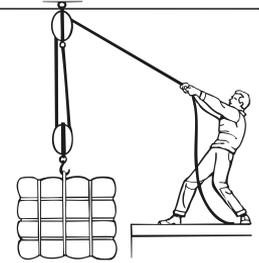


chimpanzee



orangutan

Culture makes us 'smarter'



Oksapmin count to 27



Pink, circle, freedom

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

Genetic Evolution
Natural Selection



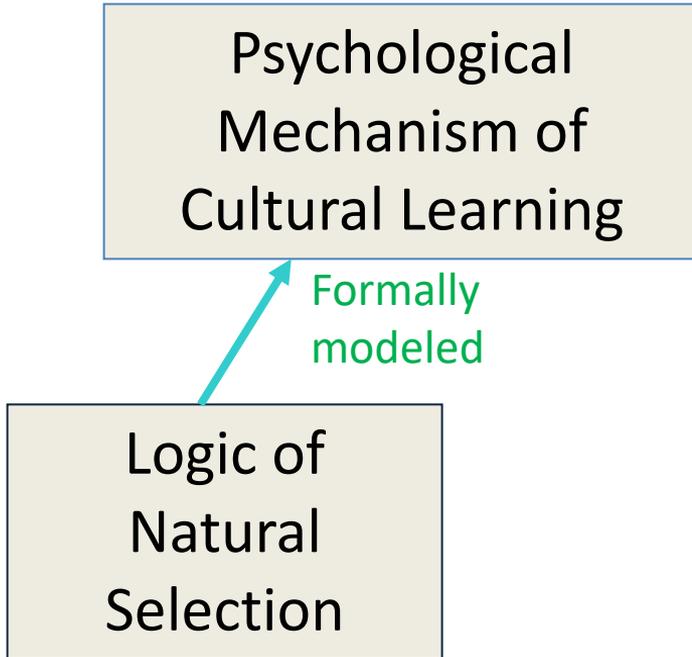
Culture and
Cultural Evolution



Psychological
capacities for
cultural learning



How might natural selection have shaped our cognition to best exploit the socially-available info



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

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



Pregnancy taboos in Fiji

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



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

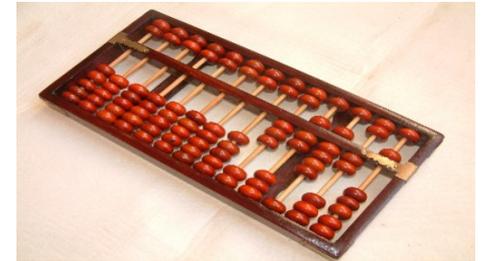
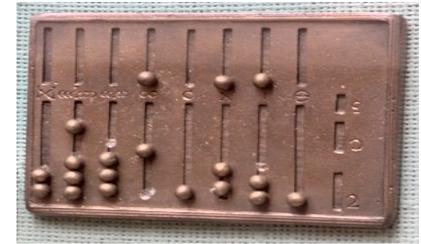
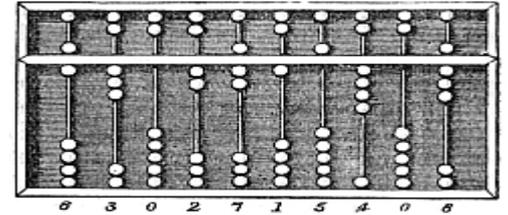
Languages

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.

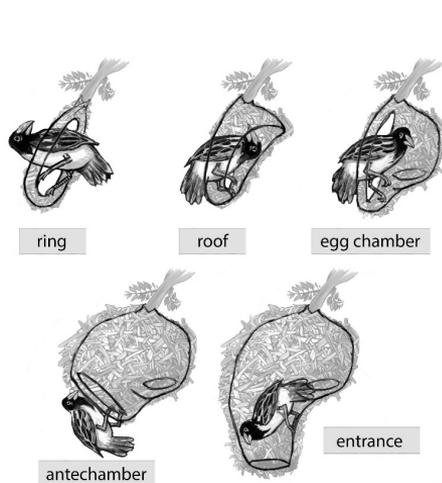
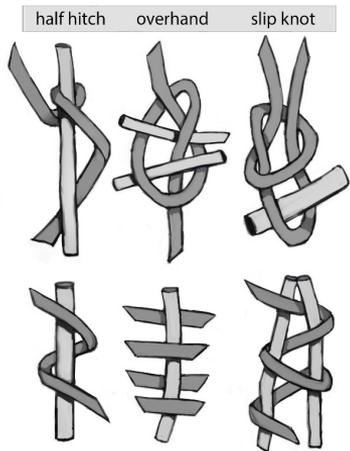




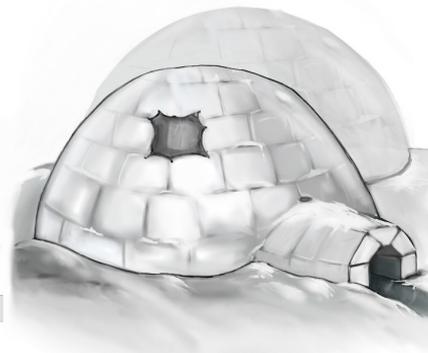
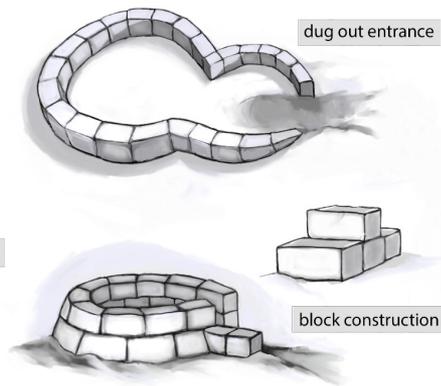
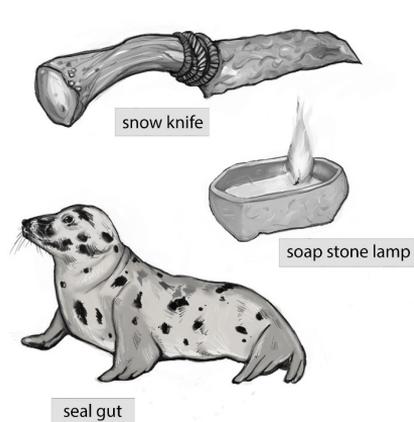
Point

“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.

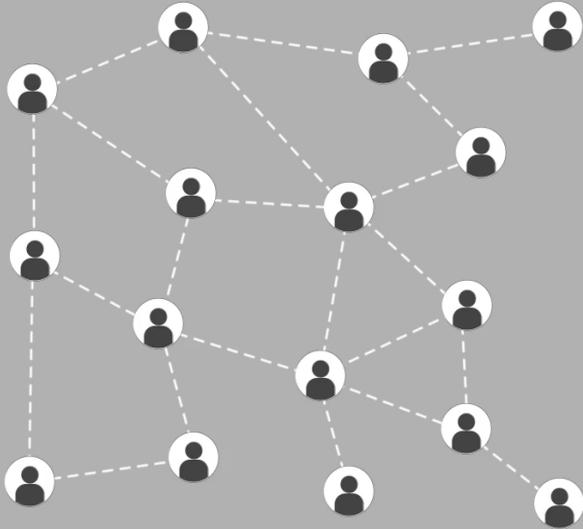


built by selection-driven genetic evolution

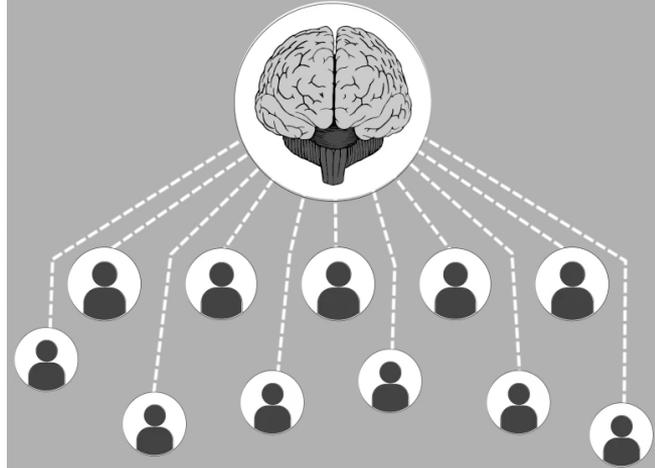


built by selection-driven cultural evolution

Larger and more interconnected
populations

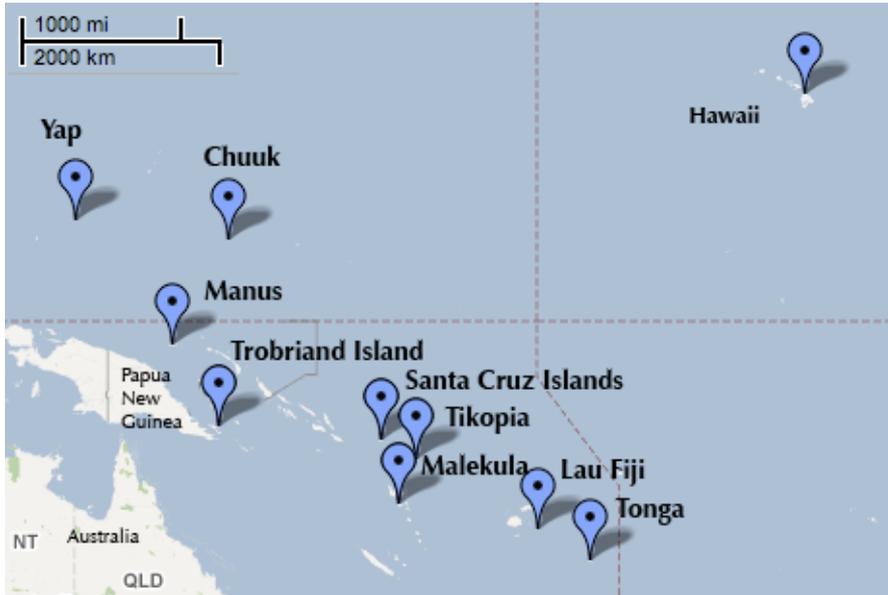


COLLECTIVE BRAIN



Population Size and Tool Complexity

- 10 societies, Oceania

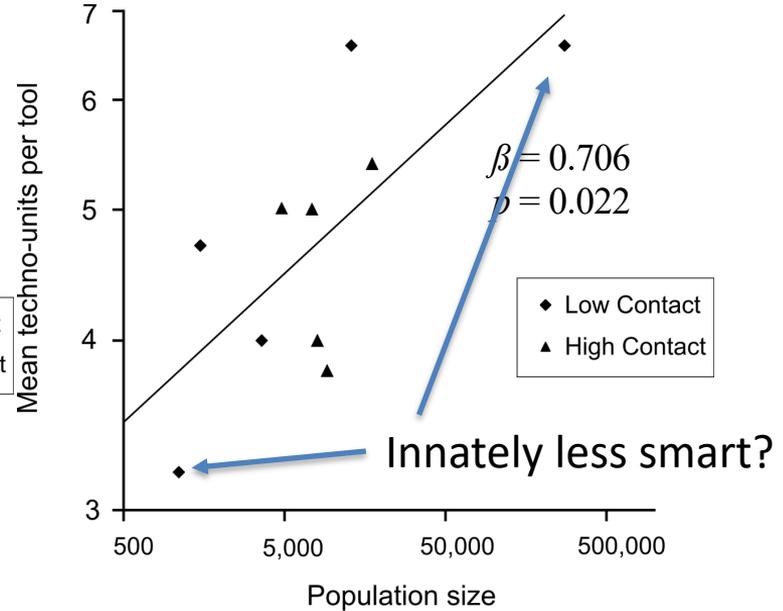
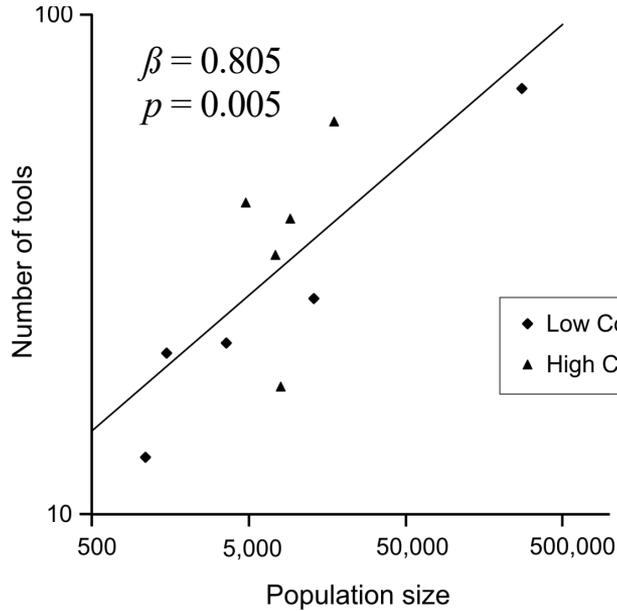


Does population predict the size and complexity of toolkits?

Marine foraging
tool complexity

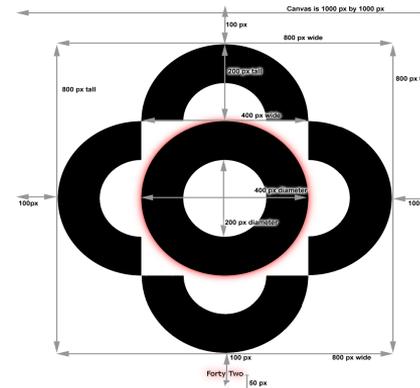
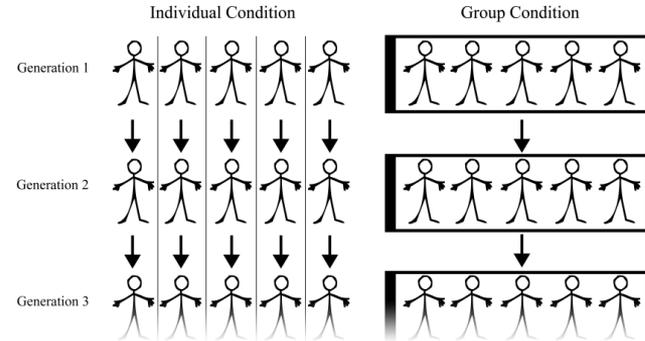
Kline and Boyd 2010

Technological variety and complexity

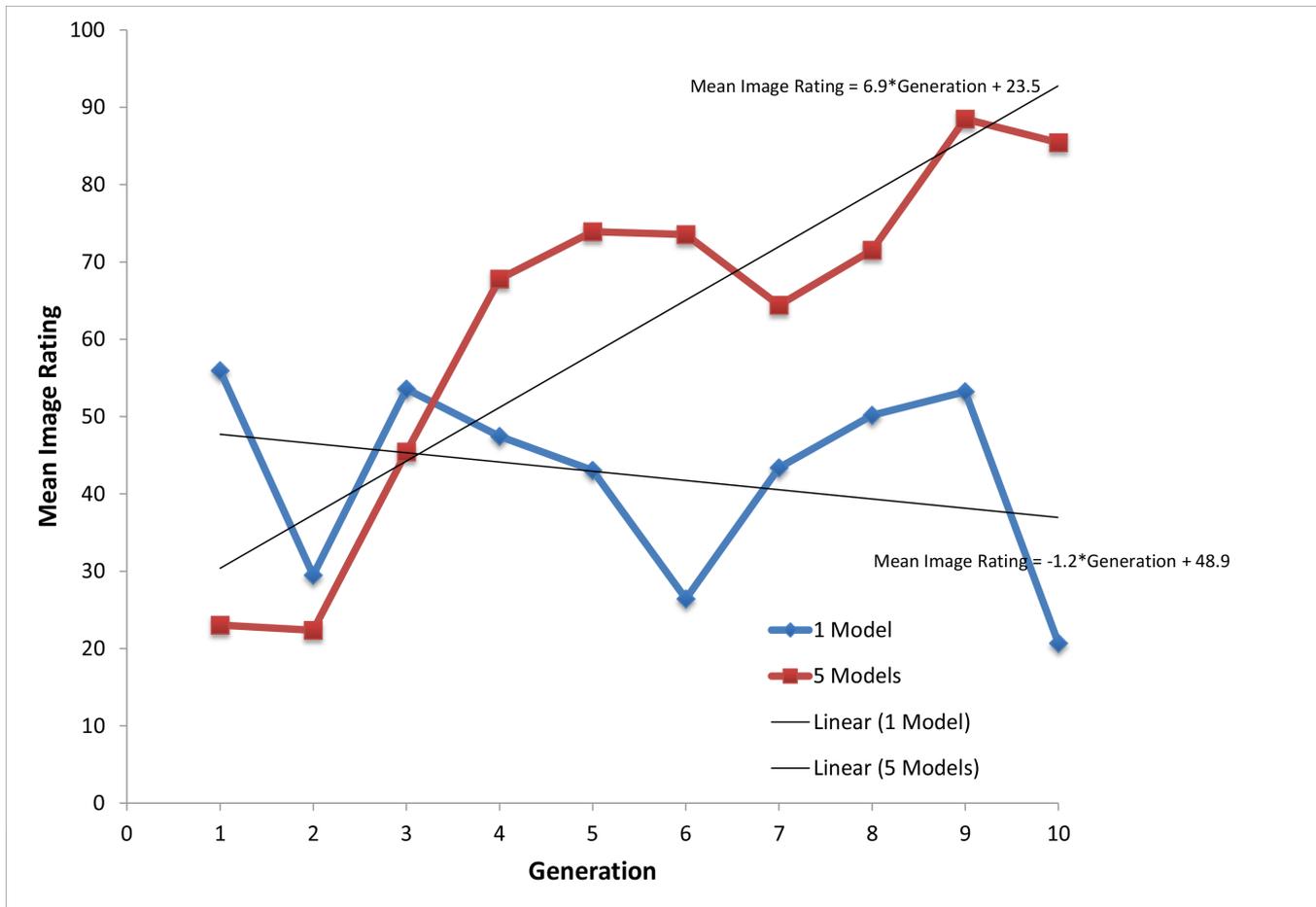


Can sociality influence skill?

- 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



Target Image

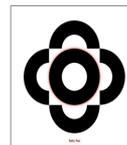


The data

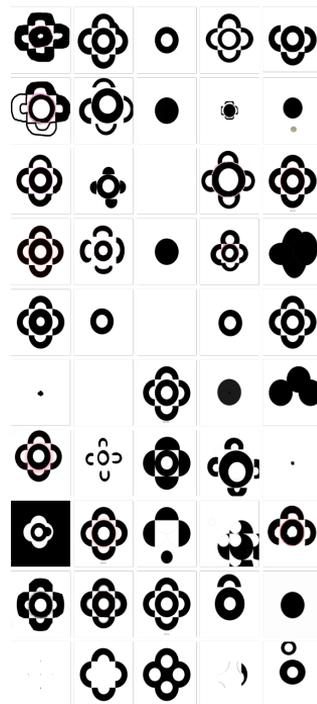
In Generation 10

Everyone in 5-Model treatment is more skilled than the best guys in the 1-Model treatment.

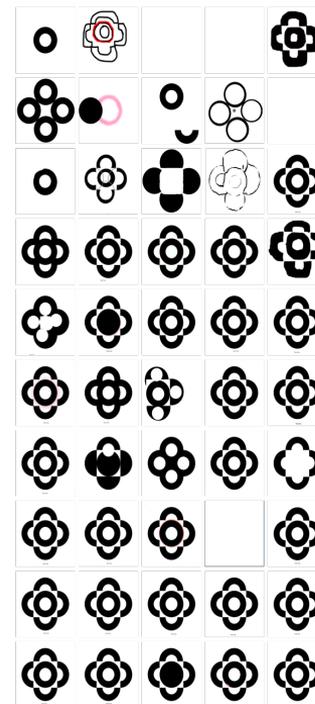
Target Image



1-Model



5-Model



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.

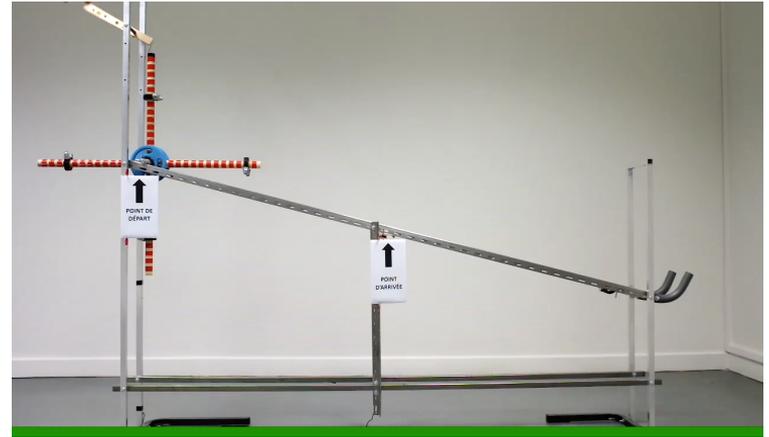
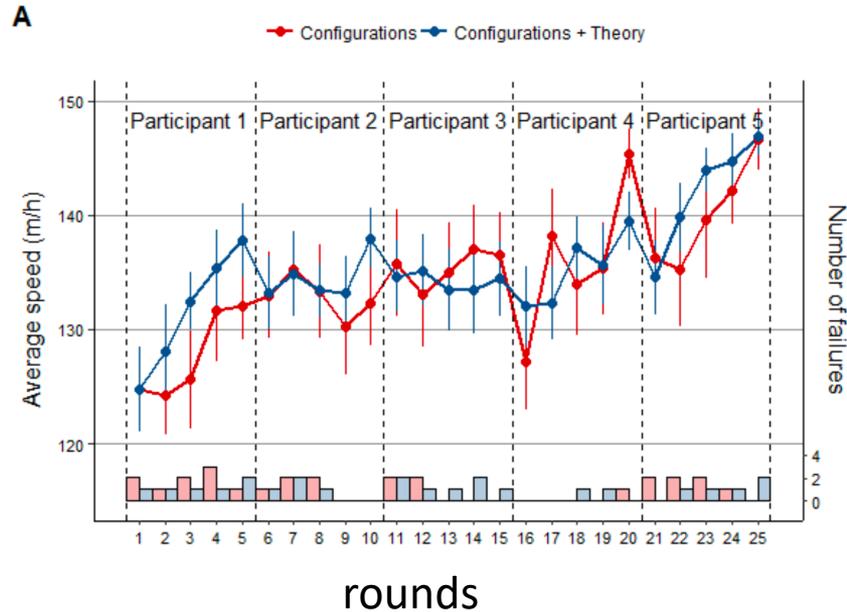
Experiment 1	
Model1	3.910*** (1.258)
Model2	2.481*** (0.867)
Model3	1.747* (0.557)
Model4	2.187*** (0.583)
Model5	0.893 (0.260)
Pseudo R^2	0.283
N	810 (45 clusters)

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?



Angular momentum
Potential energy

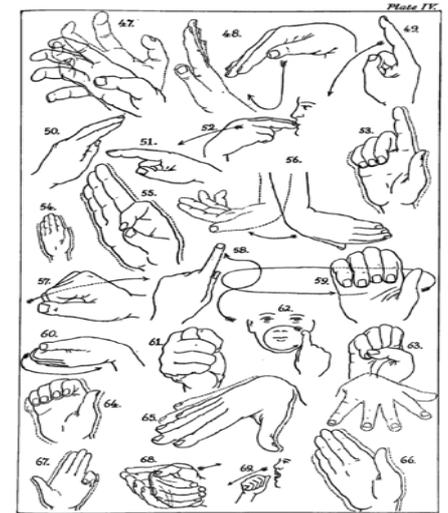
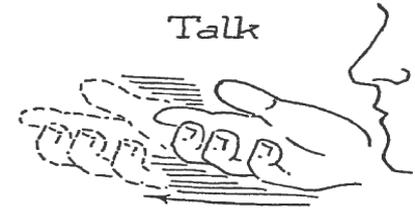
No effect of opportunities for transmitting causal understanding. Theory contains search.

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

Maxime Derex^{1,2*}, Jean-François Bonnefon³, Robert Boyd^{4,5} and Alex Mesoudi¹

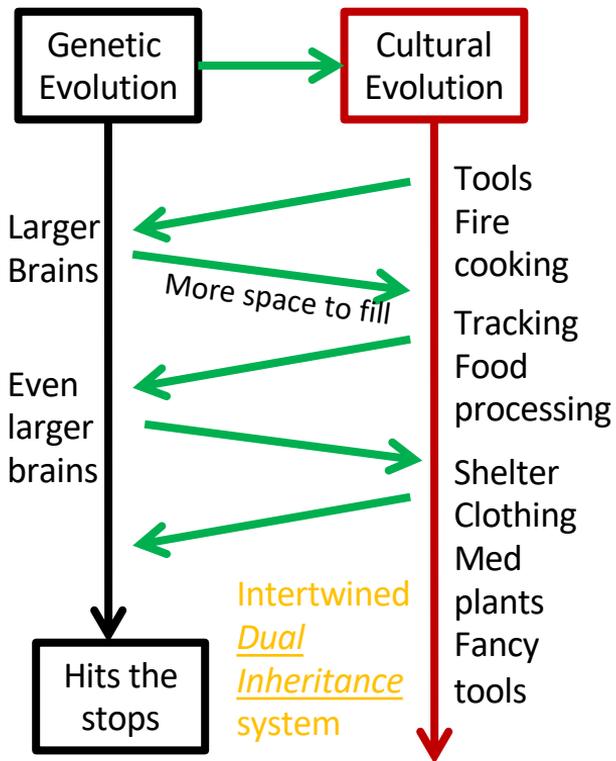
Tools and rules for communication

- 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*



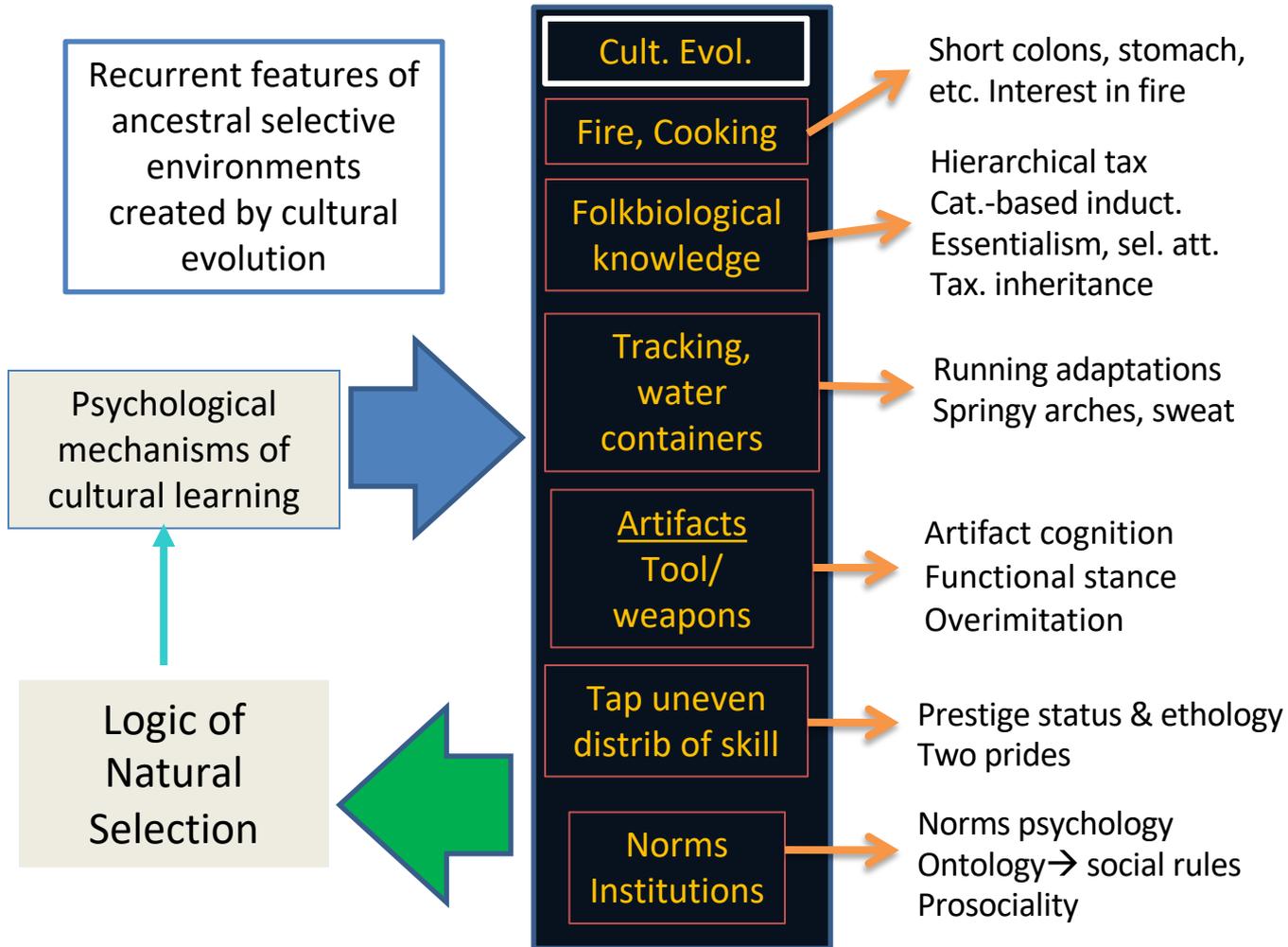
Sign Language (cont.) Figs. 47-52, Birds, Figs. 53-63, Reptiles, Figs. 64-66, Fish.

Culture-Driven Genetic Evolution



1st Division of labor/information: male/female





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

