

# cultural evolution in the field



Kathryn Demps



Sarah Mathew



Susan Perry

# keep it in the family



what the  
heck are you doing  
over there?

remember your  
roots!

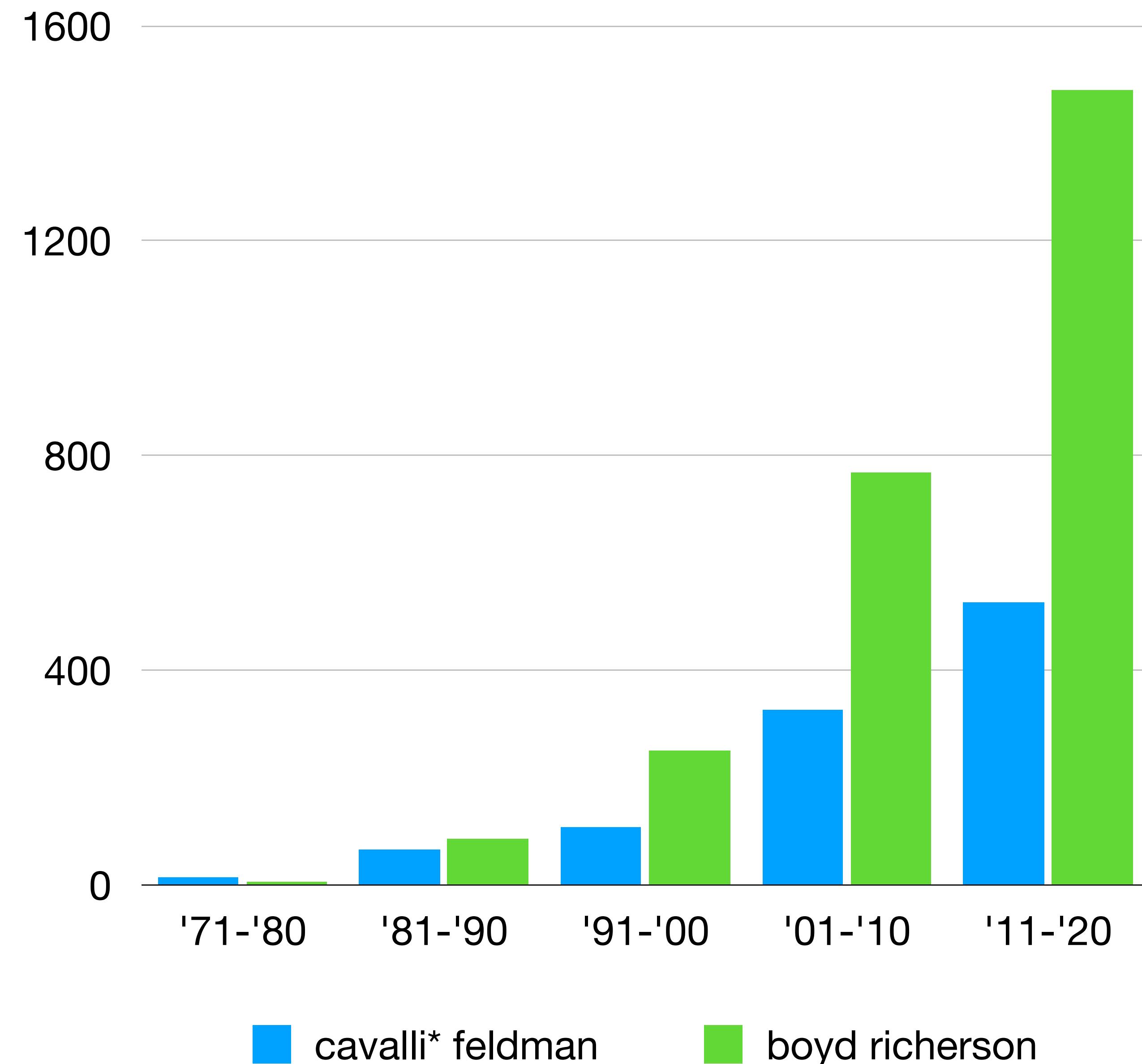
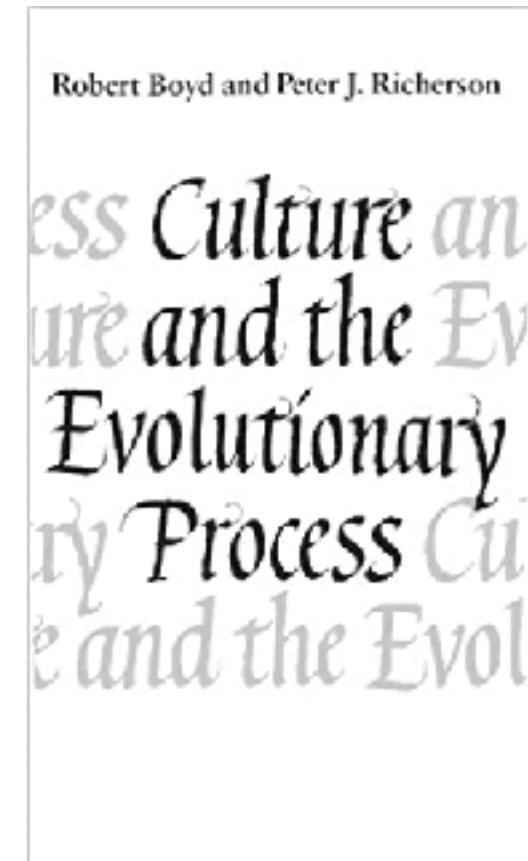
you should update

can I go play  
games now?

saw this coming  
a mile away

# growth of cultural evolution still in the family?

GOOGLE SCHOLAR SEARCH (Oct 23)  
fieldwork\* cultur\* evolution cavalli\* feldman  
fieldwork\* cultur\* evolution boyd richerson



# a fieldworker's dialogue with models

**Me:** hey! look what parameter  $m$  (migration, globalization) is doing to the world!

**Me (again):** yeah, but look how  $N$  (population size) influences  $m$ , scandalous!

weak



strong

e.g. inspired by a model; theoretical holes; other concerns (measurement)

e.g. estimating model parameters

# Estimating parameters cultural complexity



# Estimating parameters cultural complexity

Current Anthropology Volume 56, Number 2, April 2015

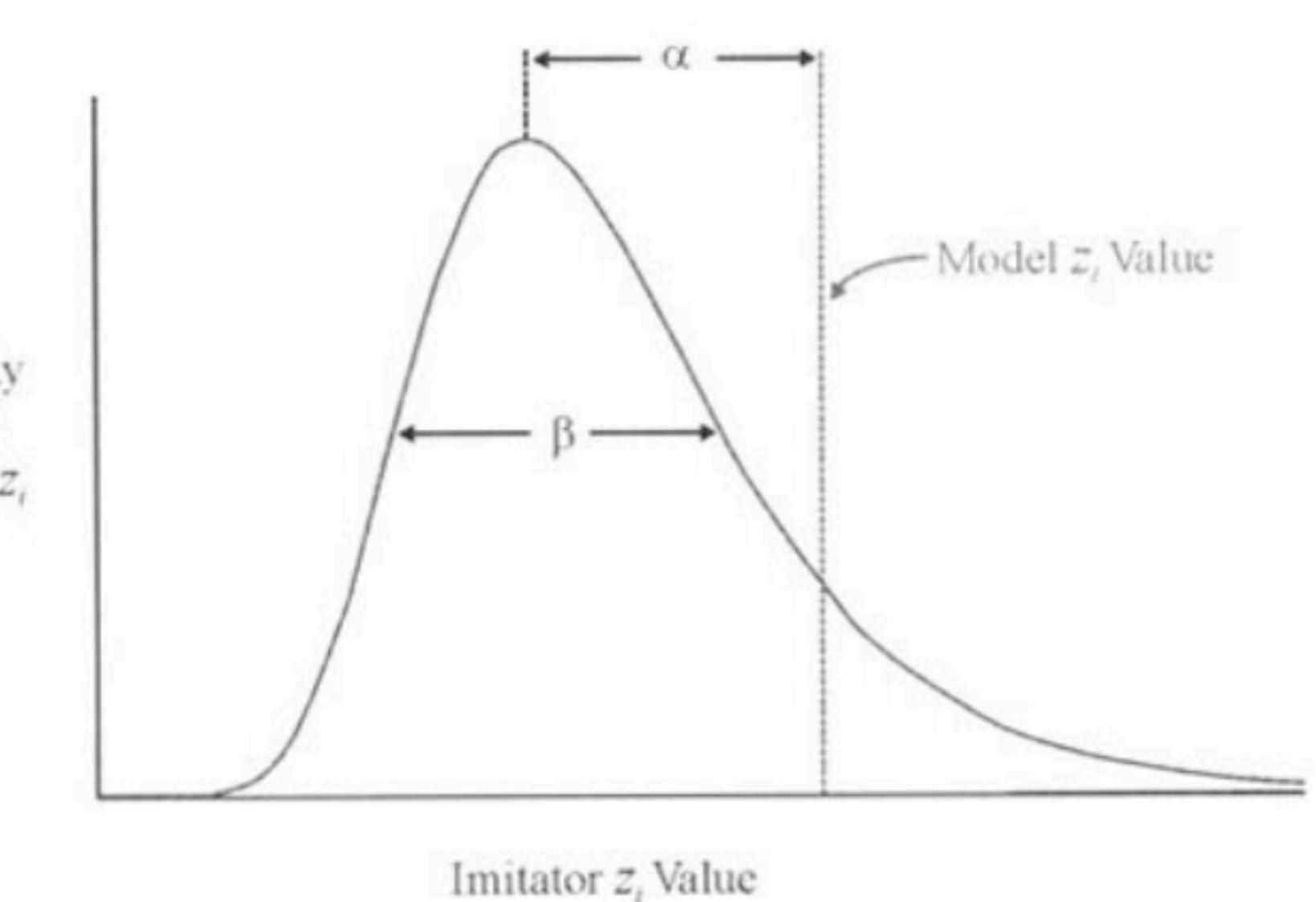
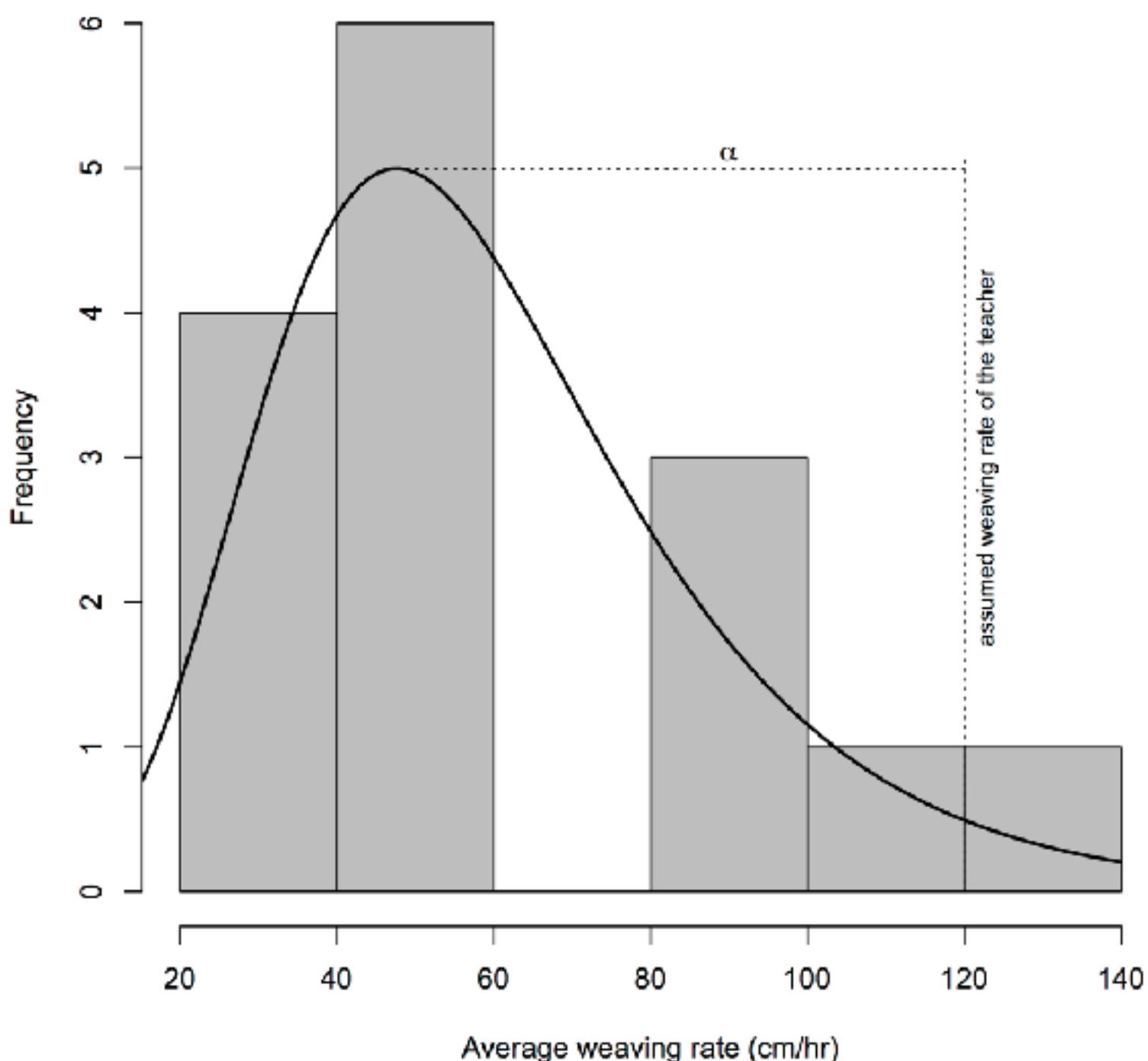
## Reports

### Linking Observed Learning Patterns to the Evolution of Cultural Complexity

Adrian Viliami Bell

Department of Anthropology, University of Utah, 270 S.  
1400 E., Room 213H, Salt Lake City, Utah 84112, U.S.A.  
(adrian.bell@anthro.utah.edu). This paper was submitted 21  
III 14, accepted 14 V 14, and electronically published 26  
II 15.

Demographic effects on cultural complexity are controversial. Some view the arguments for cultural drift and similar mechanisms as overstating the importance of difficulty in learning, socially or individually. Others stress that social learning is vital, and larger social groups with active cultural transmission yield greater cultural complexity. Using ethnographic data collected among women weavers in the South Pacific, I advance the debate by estimating learning parameters directly relevant to a theoretical model of the evolution of cultural complexity. Through a sensitivity analysis of the estimated



Henrich (2004)



one year later...

# Estimating parameters cultural change



Identity and Change in Tongan Society since European Contact\*

by Futa HELU\*\*

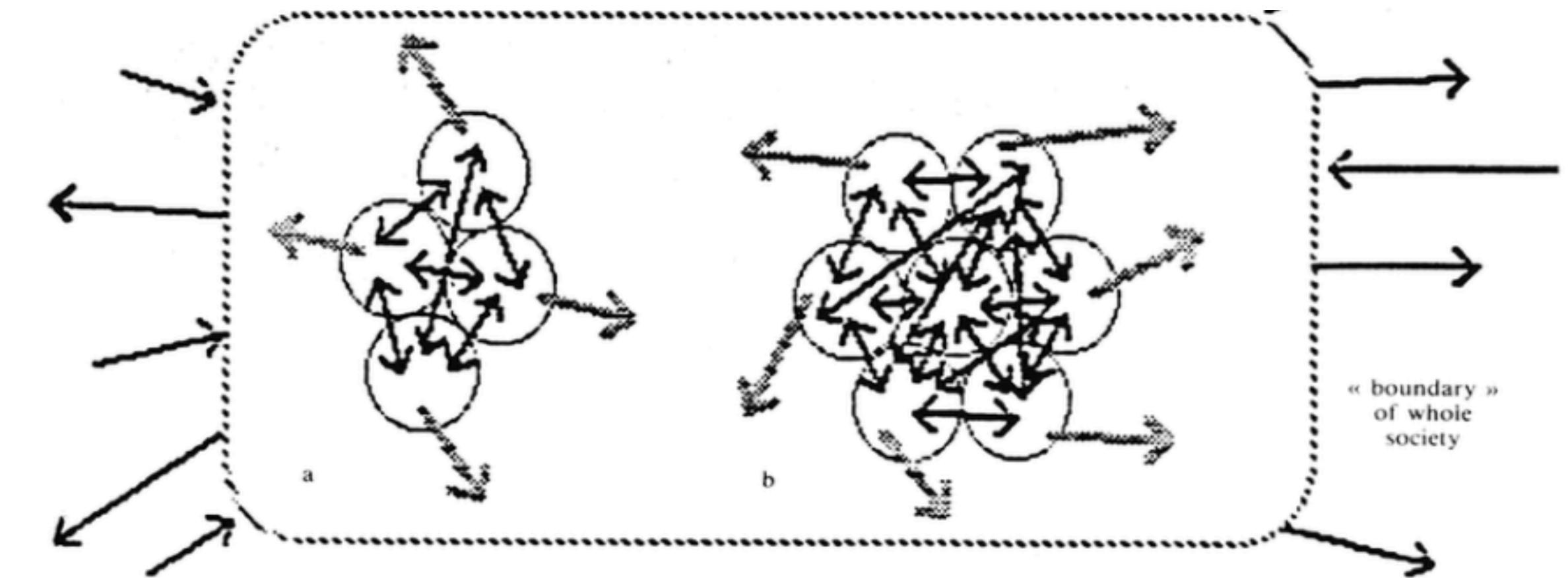


FIGURE 1. — Social molecules and rates of change (Molecule b will change faster than molecule a).

\*. A lecture given at Maison des Sciences de l'Homme, Paris, France, Oct. 1991.

\*\*. Atenisi Institute, Nukualofa, Tonga.



© Matangitonga.to

Futa Helu

# Estimating parameters cultural change

Cavalli-Sforza & Feldman (1981)

## Migration-Assimilation Model of Diaspora Culture

$$p(t + 1) = (1 - \alpha)(1 - m)p(t) + (1 - \gamma)mq$$

diaspora contribution      recent migrant contribution



Original Article

**The dynamics of culture lost and conserved: demic migration as a force in new diaspora communities**

Adrian V. Bell

Department of Anthropology, University of Utah, SLC, UT 84112, USA

### ARTICLE INFO

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Final revision received 18 August 2012

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### ABSTRACT

Migration is a major feature of past and especially today's globalized cultures, and understanding how migration shapes cultural groups is key to the empirical applications of cultural transmission theory. Developed here is a migration-assimilation model describing the population-level dynamics of diaspora culture. Using ethnographic data collected from 2009 to 2010 in the Kingdom of Tonga and a Tongan diaspora community, key parameters of the model were estimated and the fitted model simulated to describe diaspora

Cultural trait $x$	Possible values	$\alpha$	$\gamma$	$q$	Description
First Sunday	0,1	0.54	0.35 (0.09, 0.66)	0.94 (0.89, 0.98)	Participation in a traditional Tongan marriage event.
Make kava	0-3	0.59	0.047 (4.2e-08, 0.37)	2.2 (1.9, 2.4)	How well can you make kava?
Father's sister	0,1	0.31	0.012 (1.1e-14, 0.13)	0.93 (0.88, 0.98)	My father's sister has an important role in my family.
King in politics	0,1	0.41	0.079 (0.0003, 0.35)	0.93 (0.88, 0.96)	The King of Tonga should always have an important role in Tonga politics.
Sibling adoption	0,1	0.0084	0.34 (0.33, 0.35)	0.74 (0.68, 0.80)	It is good to give your young child to your brother or sister for adoption if he/she asks for the child.
Democratic reform good	0,1	-0.038	-0.42 (-0.48, -0.35)	0.56 (0.49, 0.65)	A move toward democratic reform will be better for Tonga.
Rank families	0,1	0.87	0.39 (0.066, 0.85)	0.80 (0.40)	It is important to recognize which Tongan family is more highly ranked than another Tongan family.
Tongan language	0-8	0.41	0.12 (0.0031, 0.39)	8	How well can you read and write in the Tongan language?

# Estimating parameters cooperation

$$\frac{\text{Group benefit}}{\text{Individual cost}} > \frac{1 - F_{ST}}{F_{ST}}$$



Carla Handley



Sarah Mathew



# Estimating parameters cooperation



ARTICLE

<https://doi.org/10.1038/s41467-020-14416-8>

OPEN

## Human large-scale cooperation as a product of competition between cultural groups

Carla Handley<sup>1,2</sup> & Sarah Mathew<sup>1,2\*</sup>

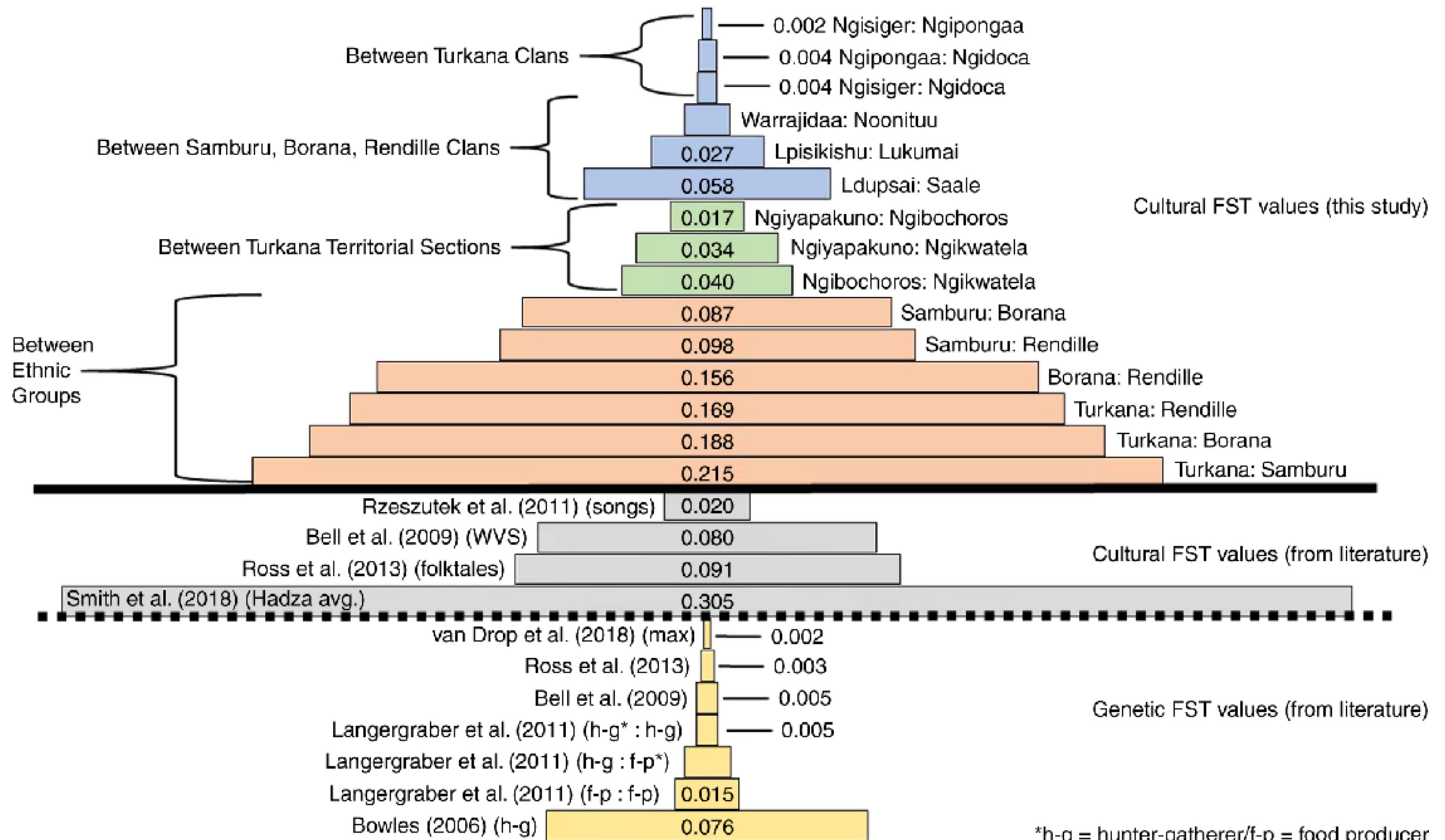
A fundamental puzzle of human evolution is how we evolved to cooperate with genetically unrelated strangers in transient interactions. Group-level selection on culturally differentiated populations is one proposed explanation. We evaluate a central untested prediction of Cultural Group Selection theory, by assessing whether readiness to cooperate between individuals from different groups corresponds to the degree of cultural similarity between those groups. We documented the normative beliefs and cooperative dispositions of 759 indi-



Carla Handley



Sarah Mathew



\*h-g = hunter-gatherer/f-p = food producer

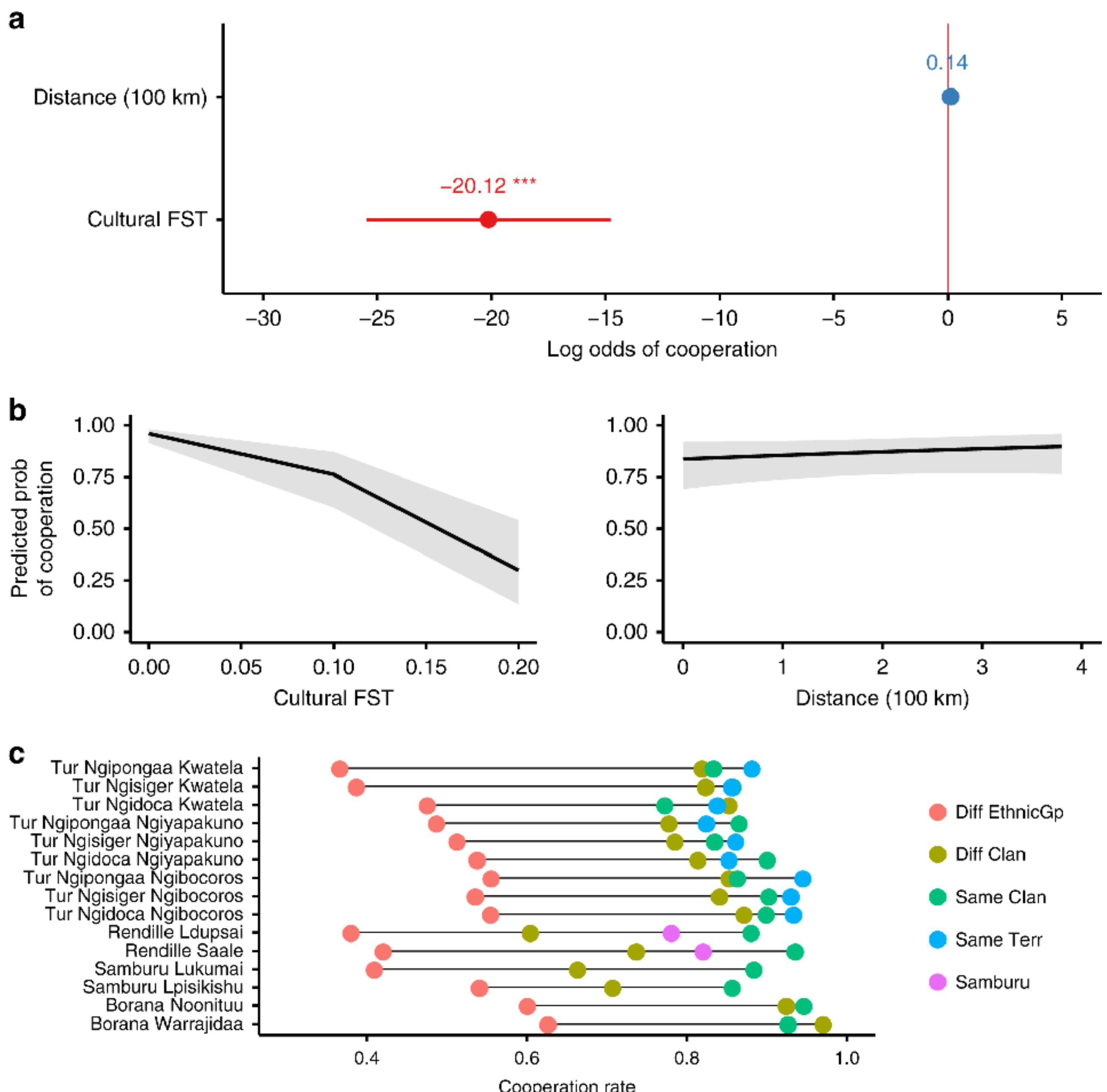
# Estimating parameters of cooperation



Carla Handley



Sarah Mathew



# Model inspired transmission pathways

TABLE 3.1.1. Transmission rules for vertical and oblique transmission of a 2-state trait. Frequencies  $u_t$  and  $v_t = 1 - u_t$  refer to the  $t^{\text{th}}$  generation. Assortative mating occurs with correlation  $m$  between mates.

Mating	Frequency of Mating ( $p_i$ )	Probability of $H$ Progeny	Probability of $h$ Progeny
$\text{♀ } \delta$			
$H \times H$	$u_t^2 + mu_tv_t$	$1 - (1 - b_3)(1 - fu_t)$	$(1 - b_3)(1 - fu_t)$
$H \times h$	$u_tv_t(1 - m)$	$1 - (1 - b_2)(1 - fu_t)$	$(1 - b_2)(1 - fu_t)$
$h \times H$	$u_tv_t(1 - m)$	$1 - (1 - b_1)(1 - fu_t)$	$(1 - b_1)(1 - fu_t)$
$h \times h$	$v_t^2 + mu_tv_t$	$1 - (1 - b_0)(1 - fu_t)$	$(1 - b_0)(1 - fu_t)$

Cavalli-Sforza & Feldman (1981)



honey collection



Kathryn Demps

# Model inspired transmission pathways

honey collection



ELSEVIER

Evolution and Human Behavior 33 (2012) 460–470

Original Article

Social learning across the life cycle: cultural knowledge acquisition for honey collection among the Jenu Kuruba, India

Kathryn Demps<sup>a,\*</sup>, Francisco Zorondo-Rodríguez<sup>b</sup>, Claude García<sup>c,e</sup>, Victoria Reyes-García<sup>d</sup>

<sup>a</sup>University of California, Davis

<sup>b</sup>Institut de Ciència i Tecnologia Ambientals, Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona, Spain

<sup>c</sup>CIRAD, Ressources forestières et politiques publiques, Montpellier 34398, France

<sup>d</sup>ICREA and Institut de Ciència i Tecnologia Ambientals, Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona, Spain

<sup>e</sup>CIFOR, Environmental Services and Sustainable Use of Forest Programme, Bogor Barat 16115, Indonesia

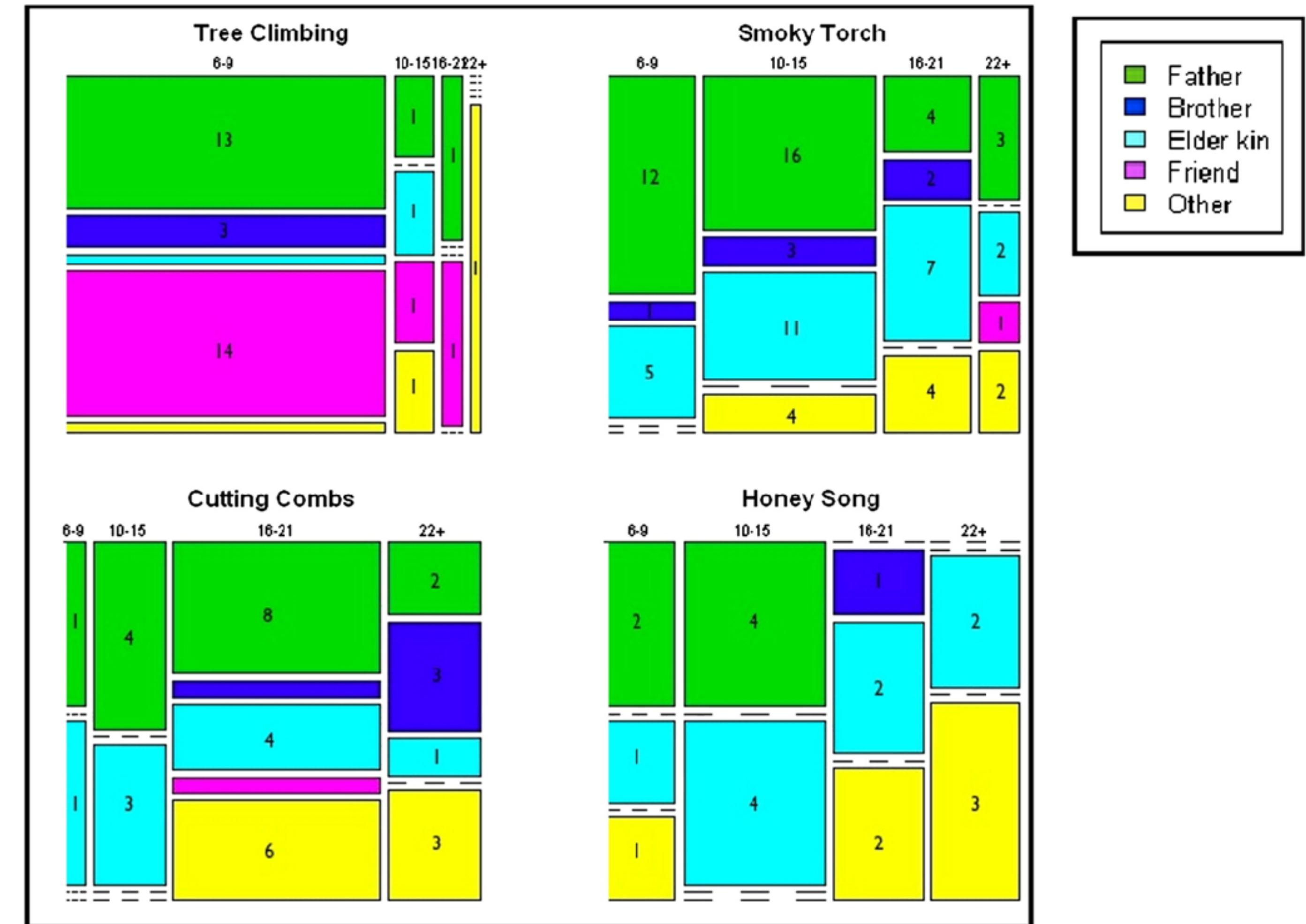
Initial receipt 16 May 2011; final revision received 20 December 2011



“we infer age-dependent transmission pathways at different stages in the life cycle”

Kathryn Demps

Evolution  
and Human  
Behavior



# Model inspired innovation

10 years, 10 groups, 234 wild capuchin monkeys

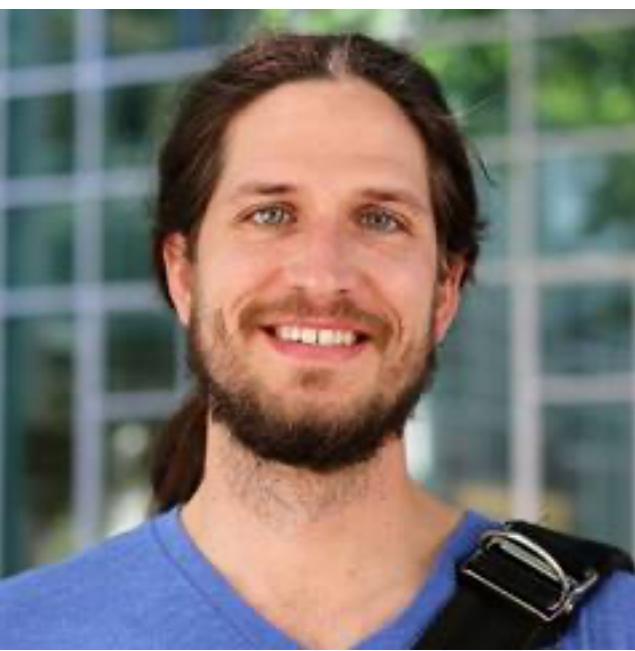
“In general, there are few strong theoretical expectations about how age, sex, rank, and sociality affect innovation rates; we need natural history and observational studies to help guide theory.“



dipping tail in  
tree hole to  
access water



Susan Perry



Brendan Barrett



Irene Godoy

- **foraging** — drinking water and processing food
- **self-directed** — enhancing comfort, dental hygiene, self-soothing, self stimulation
- **social** — forms of social interaction
- **investigative** — manipulations of objects (e.g. leaves, sand, porcupines, turtles)

# Model inspired innovation

- 187 innovations
  - 127 performed once
  - 41 performed by others in the same group
- domains
  - 54 investigative
  - 47 social
  - 9 self-directed
  - 17 foraging



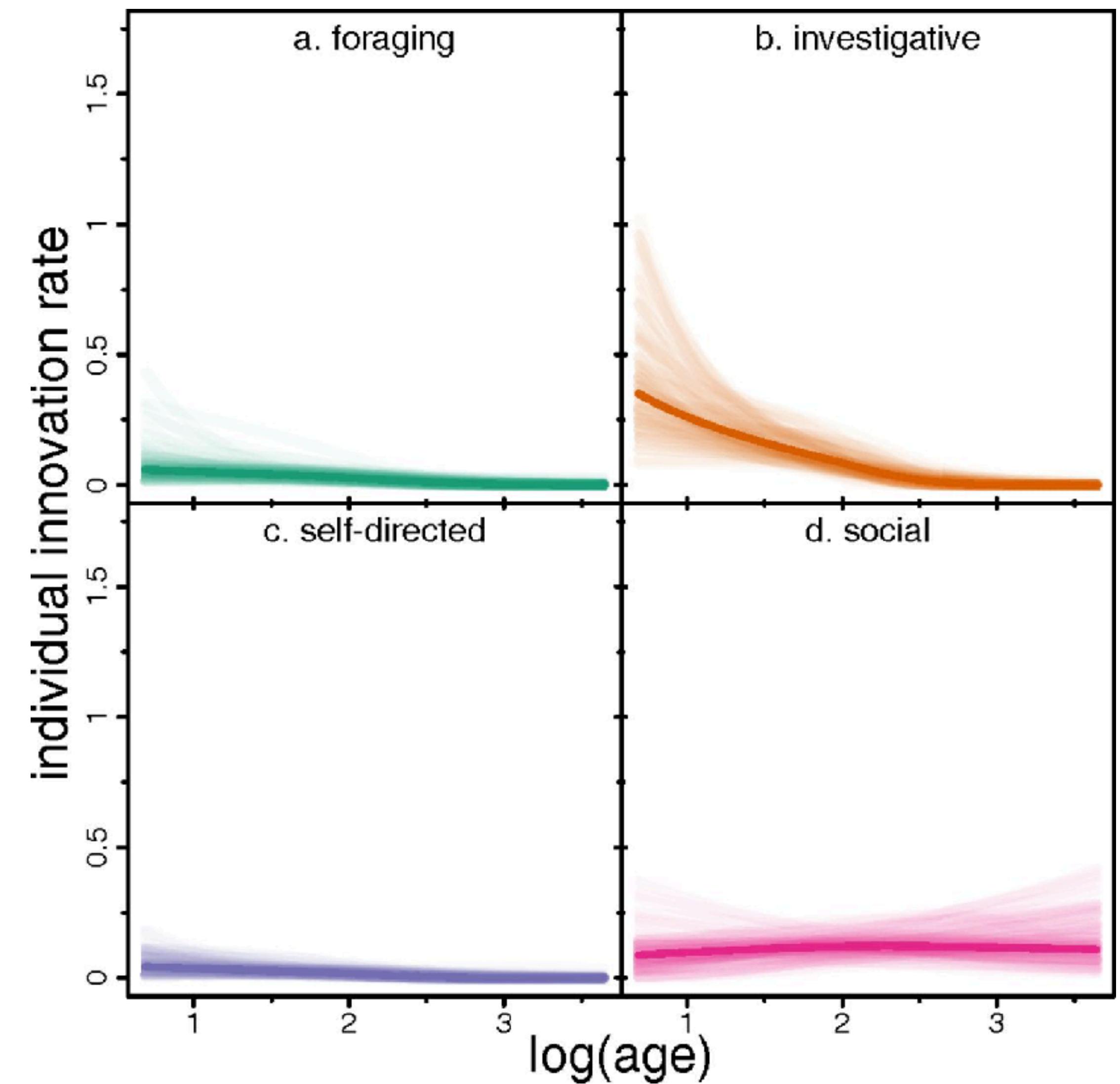
Susan Perry



Brendan Barrett



Irene Godoy



# Model inspired innovation

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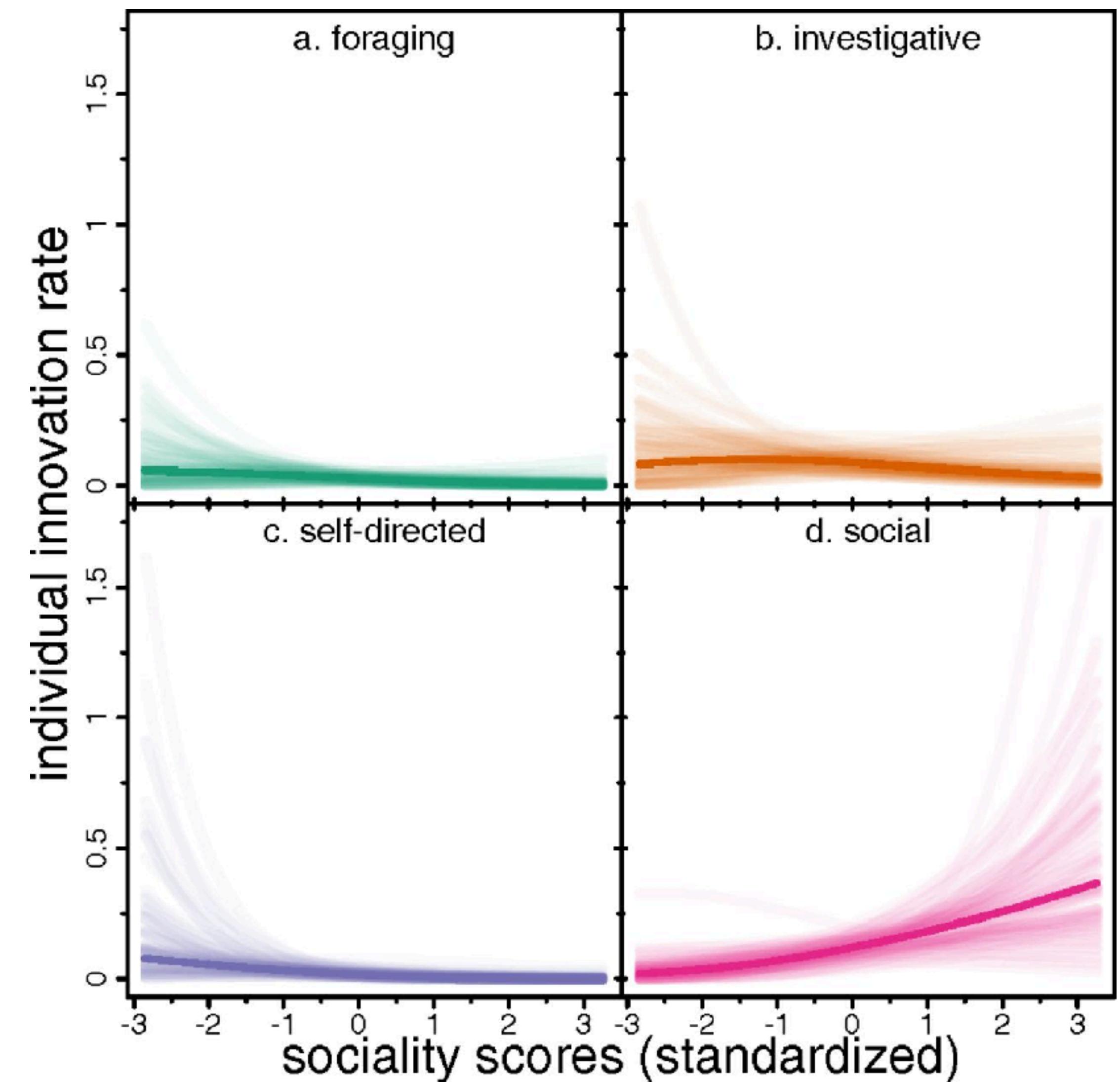
Susan Perry



Brendan Barrett



Irene Godoy



# a fieldworker's dialogue with models

**Me:** hey! look what parameter  $m$  (migration, globalization) is doing to the world!

**Me (again):** yeah, but look how  $N$  (population size) influences  $m$ , scandalous!



**more fieldwork  $\leq \geq$  more models**

# A dialogue with models

## CES Online Learning Tutorials

# Foundations of Cultural Evolution – A Question + Tool Approach

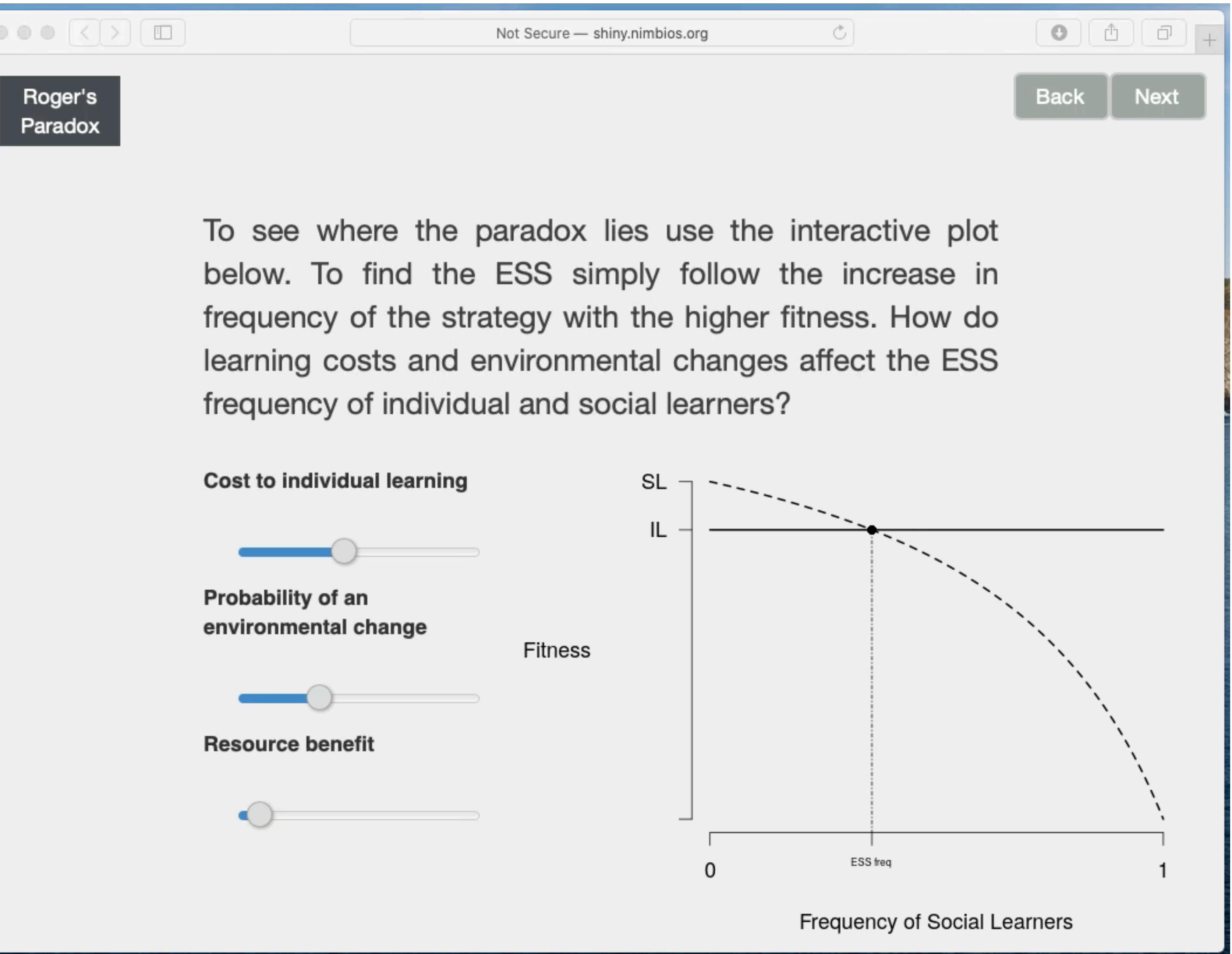
This online guide introduces the body of formal theory used in the study of cultural evolution. Through interactive computer simulations, participants will experience the basic machinery of dynamic models and tour key results from topics including social learning strategies, transmission pathways, cumulative culture, cooperation, group selection, and socio-political evolution.

Each research question is accompanied with a reference to an analytical tool. As the modules build from techniques found in prior modules, the novice should approach these topics in the order below. To begin, simply click on your first topic.

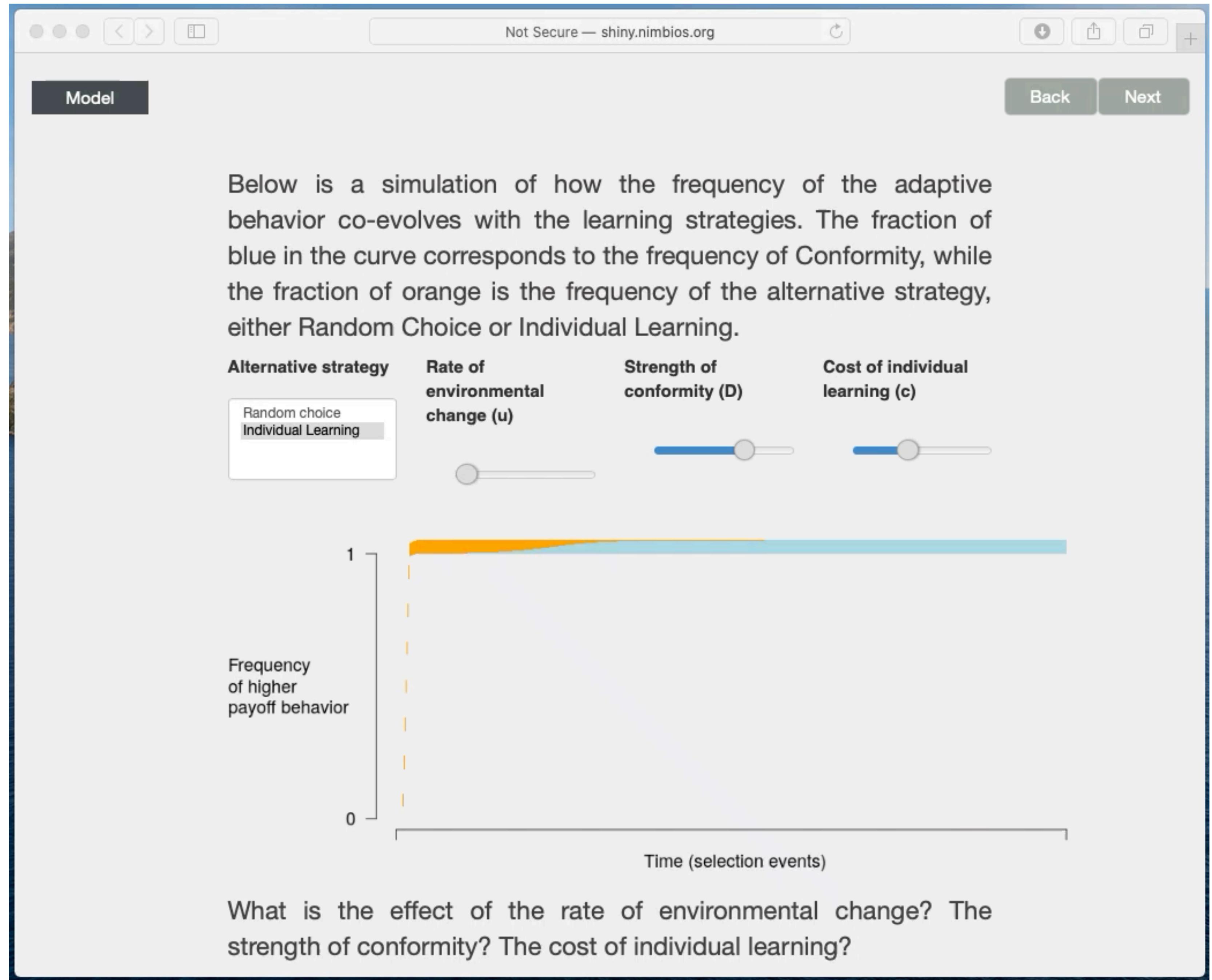


1. [Why learn from others?](#) A graphical approach to frequency-dependent fitness.
2. [Should learning be directed toward specific individuals?](#) Building recursions for evolutionary simulation.
3. [Should cultural traits be adopted because of their prevalence?](#) Introducing more complex conditions in your evolutionary simulation.
4. [Does culture have its own dynamics?](#) Tables and transition matrices.
5. [Does learning change over the life cycle?](#) Life cycles in evolutionary models.
6. [What is learned from others?](#) Introducing data into your evolutionary model.
7. [How do innovations spread?](#) How to change the shape of diffusion curves.
8. [How adaptable are cultural species?](#) Difference equations and conditions of increase.
9. [Does selection work on groups?](#) Selection operating on multiple evolutionary stable strategies.
10. [Does culture influence prosociality?](#) Mechanisms of group selection.
11. [Do socio-political cultural systems evolve?](#) Cyclic dynamics in cultural evolution.

# Why learn from others?



# Should cultural traits be adopted because of their prevalence?



# How do innovations spread?

