

Dual Inheritance, Ecological Peril, & the Morality of Procreation

*Chris Jensen, Associate Professor
Department of Mathematics & Science, Pratt Institute*

A scientist among creatives



I have taught courses in:

- ★ Ecology
- ★ Evolution
- ★ The Evolution of Cooperation
- ★ The Evolution of Sex
- ★ The Evolution of Play
- ★ The Evolution of Music
- ★ Behavioral Ecology
- ★ Human Evolution

Pratt

*School of Liberal Arts & Sciences
Department of Mathematics & Science*

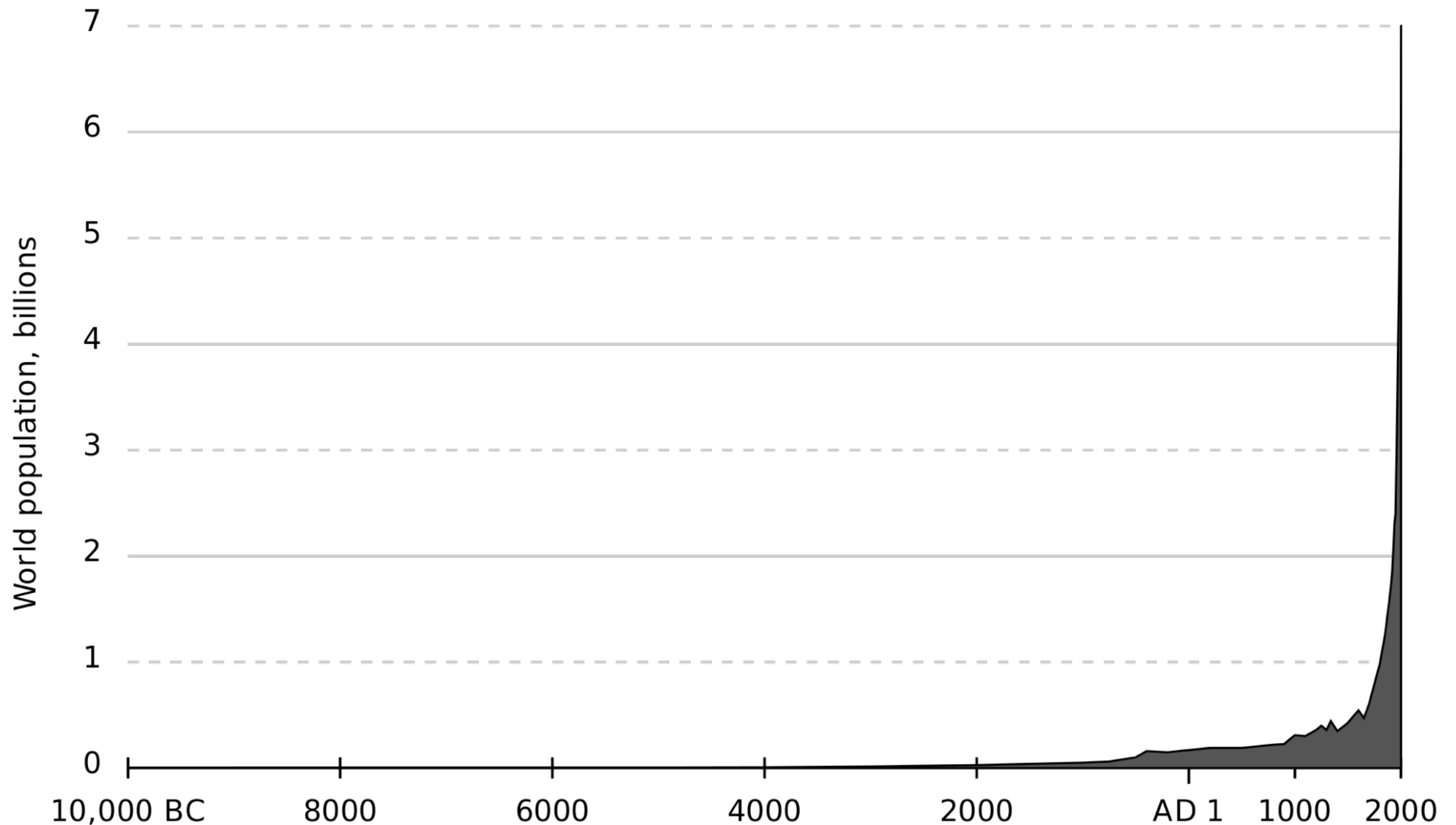
I'm a breeder!



*Leaving aside the question of conscious belief or personal opinion about one's goals or intentions, there is every reason to accept that **humans, like other organisms, are so evolved that their "interests" are reproductive.***

- Richard D. Alexander, Zygon 1985

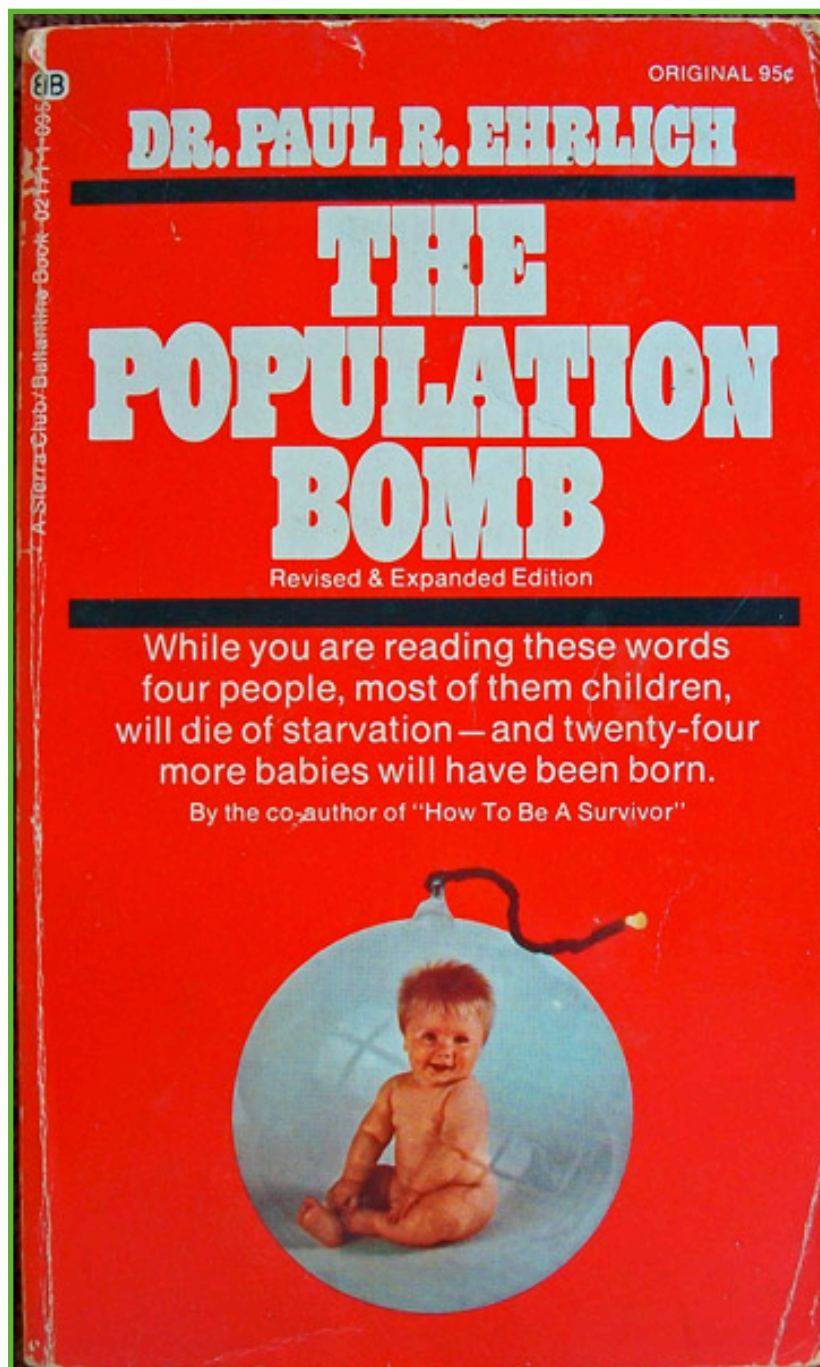
Human population growth



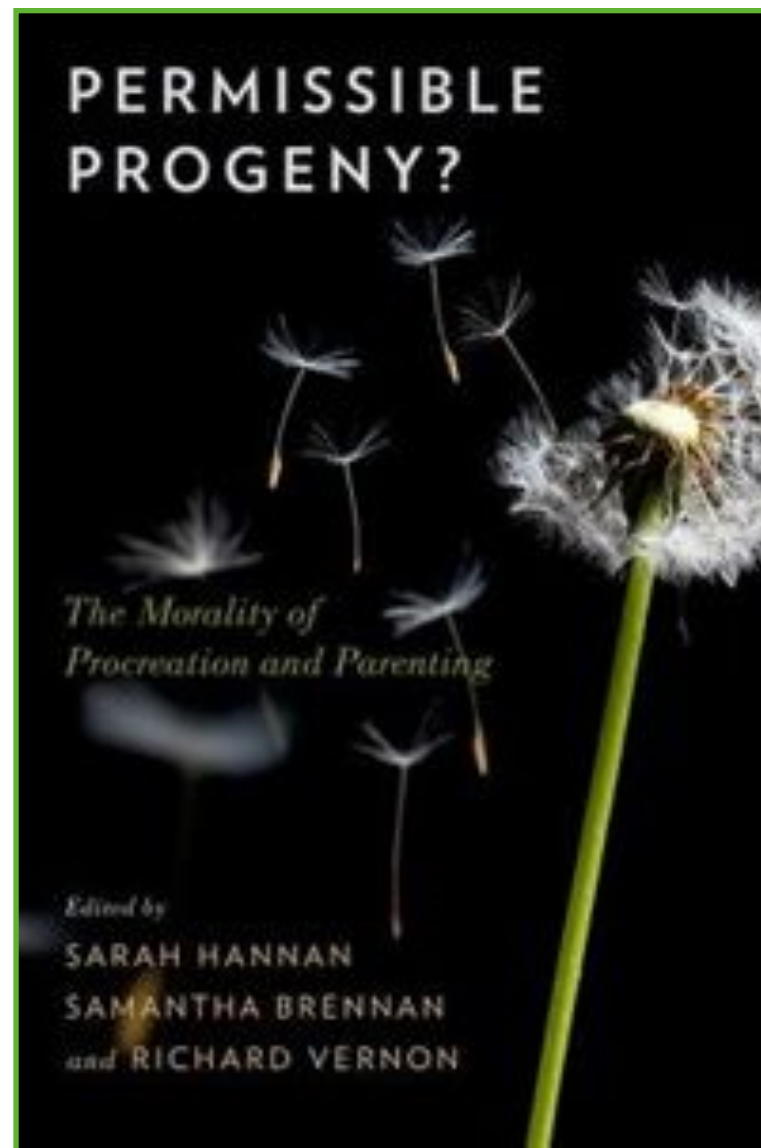
“planetary boundaries”
of the *Stockholm
Resilience Center*



The moral implications of procreation



The moral implications of procreation



2015

Procreation or Appropriation?

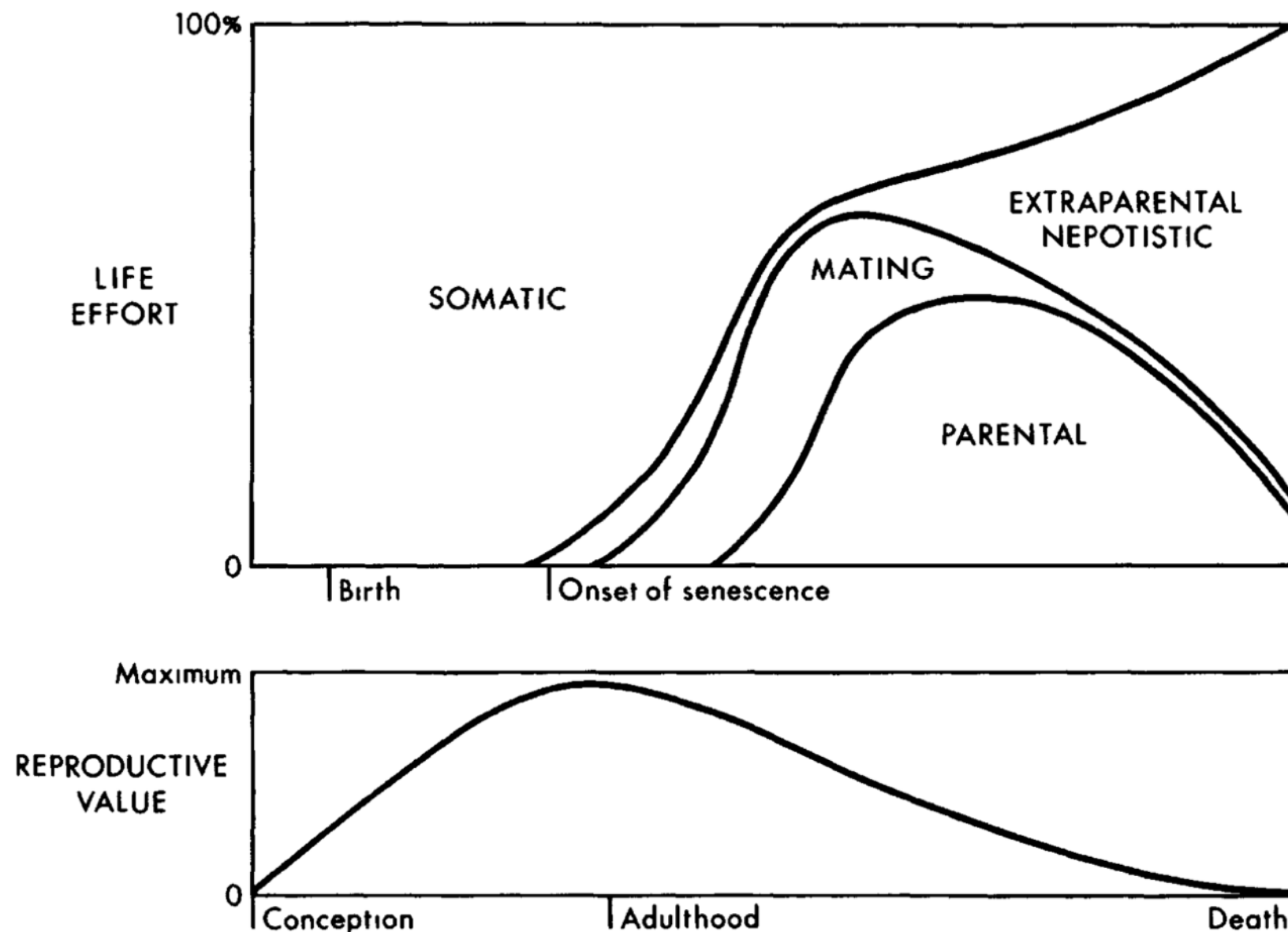
Corey MacIver

DOI:10.1093/acprof:oso/9780199378111.003.0005

Abstract and Keywords

This chapter argues that the standard dichotomy between “procreation” and “consumption” should be collapsed. Procreative choices cannot be materially differentiated from other voluntary choices with environmental consequences. As such, the impacts associated with procreation should be understood as part of the “ecological footprint” of parents—a conceptual distinction that has significant consequences for how we attribute moral responsibility for environmental degradation. Perhaps more importantly, if and when procreation threatens or compromises the material interests of others, it is legitimately subject to moral scrutiny or even intervention by third parties. The idea that procreative decisions are private or pre-political cannot be sustained in a materially finite world.

Figure 1 of Richard D. Alexander's 1985 *Zygon* paper



Are we genetically programmed to do something that's destroying the ecosystems upon which our species depends?

Can we be held morally responsible for what is a biologically-evolved instinct?

Does this figure truly capture human "life effort"?

Dual Inheritance Theory

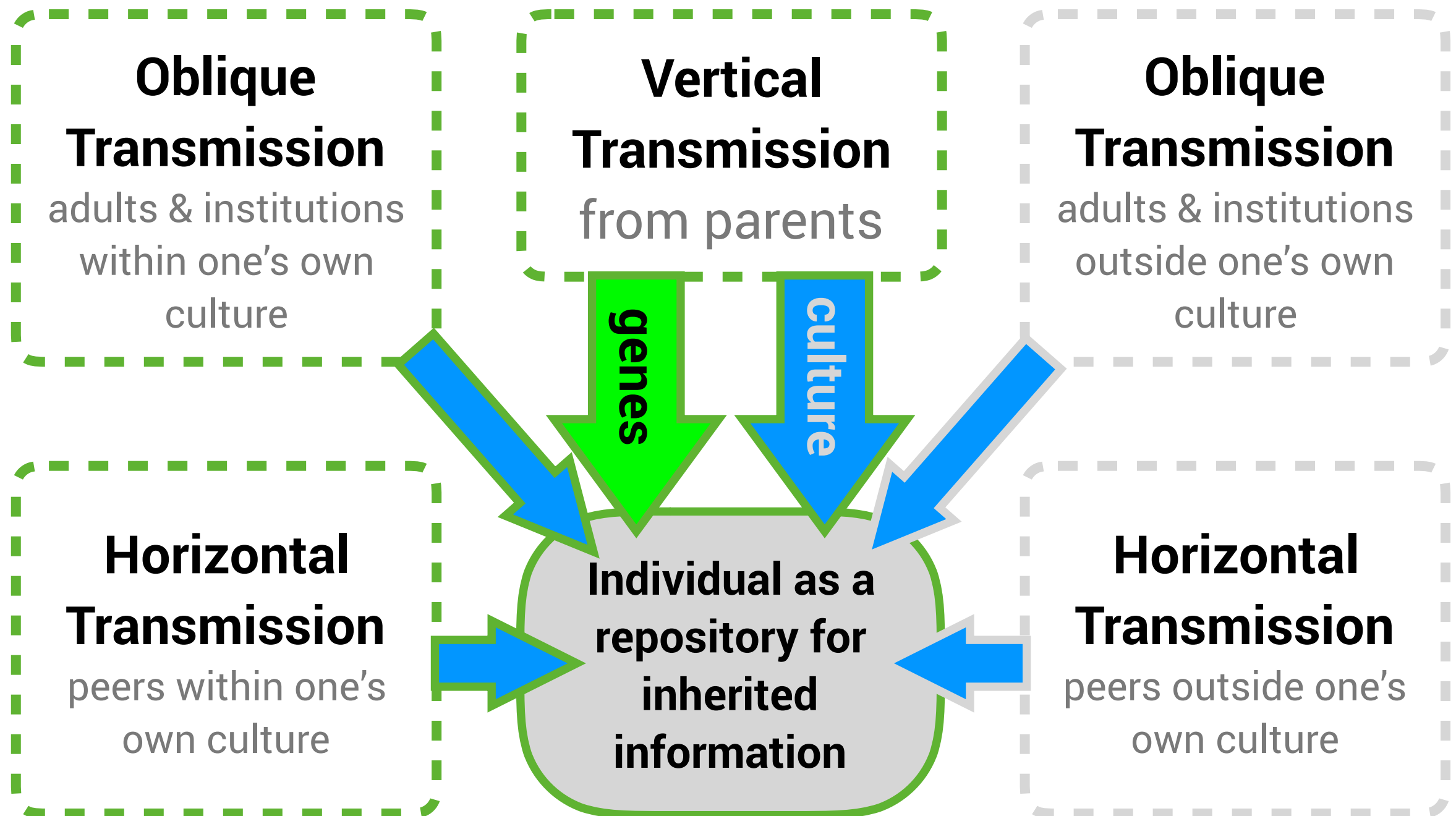


diagram after Berry & Georgas 2009

Three evolutionarily significant human (re)productive behaviors

- B** Breeding
- P** Propagating
- C** Creating

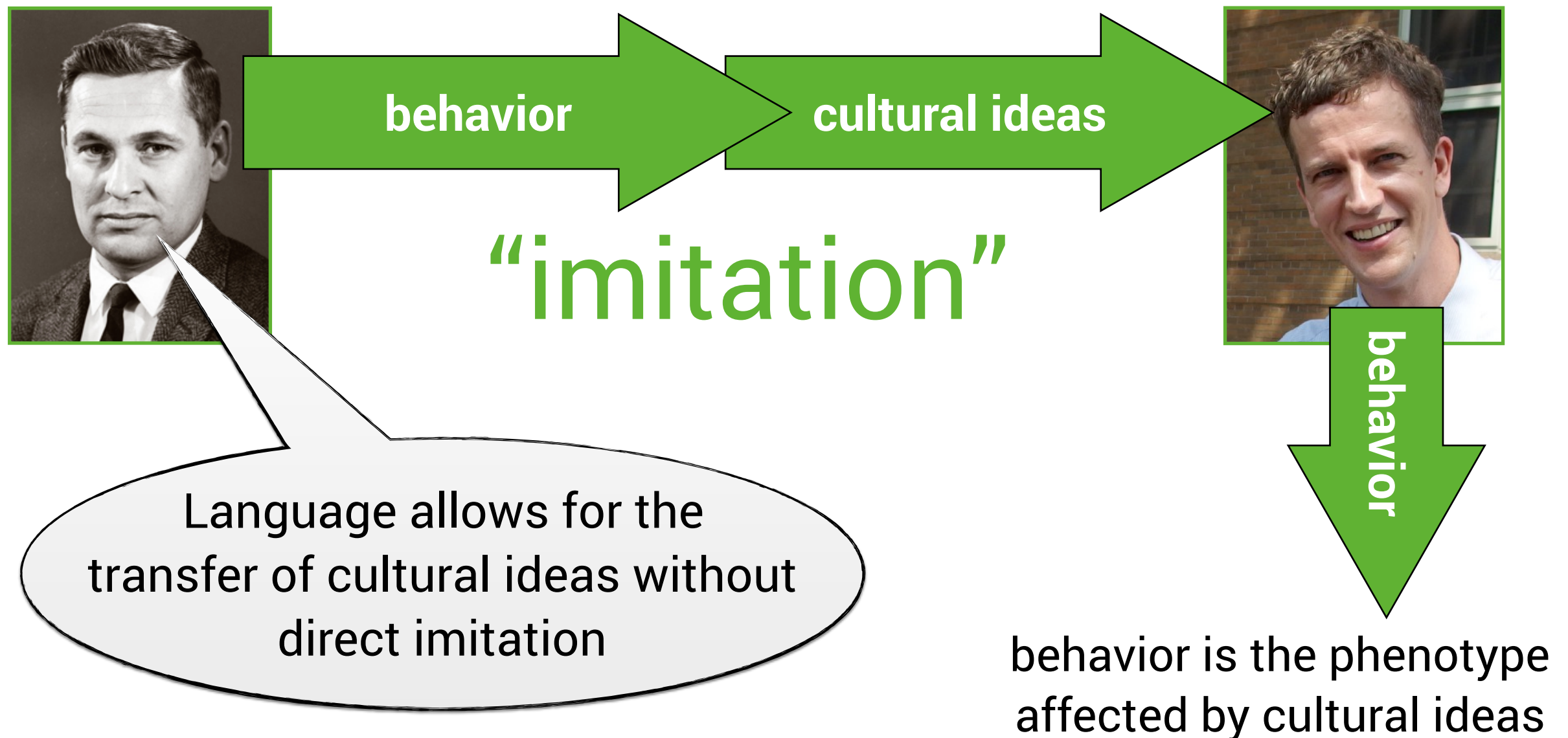
Breeding



“breeding” is about passing on genes

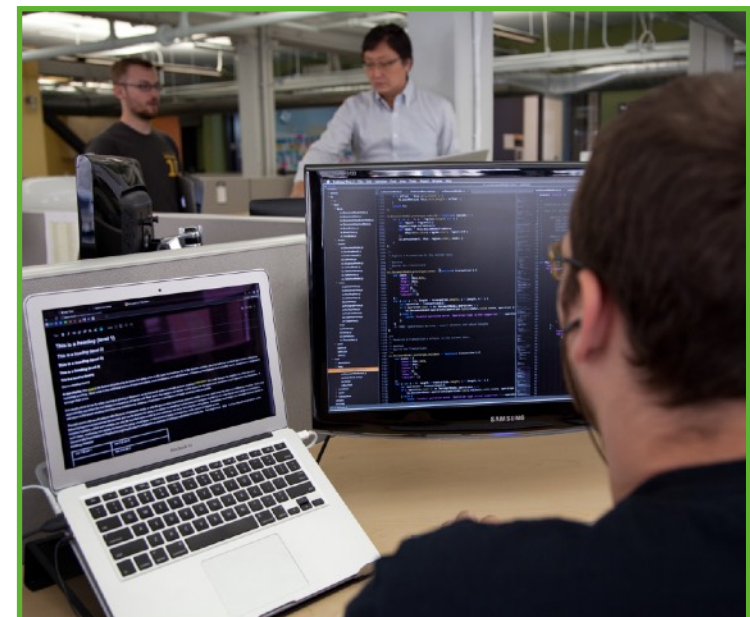
Propagating

What is culture? Where is culture?



Creating

“Creative” behaviors
contribute new cultural ideas



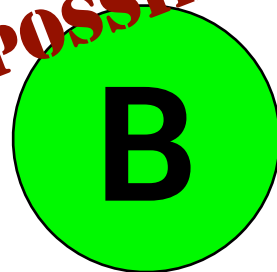
A behavioral trade-off

Limited
resources

How to spend limited resources?
(time, materials, social connections)

*“pure”
strategies*

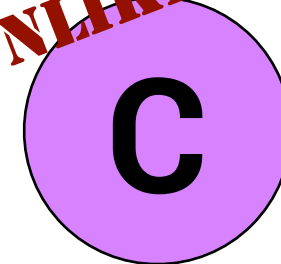
IMPOSSIBLE



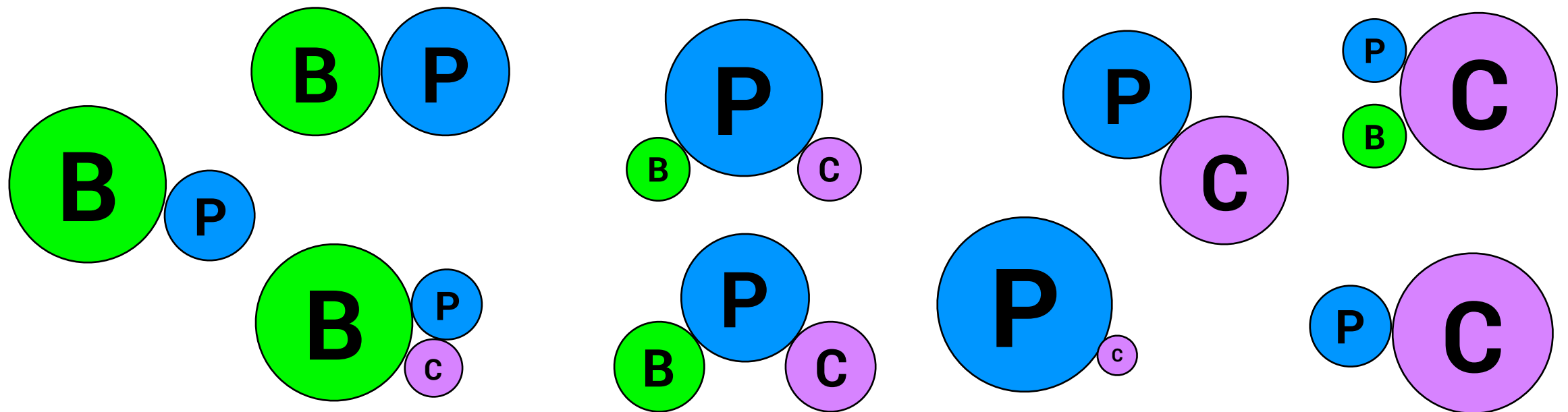
MAYBE?



UNLIKELY

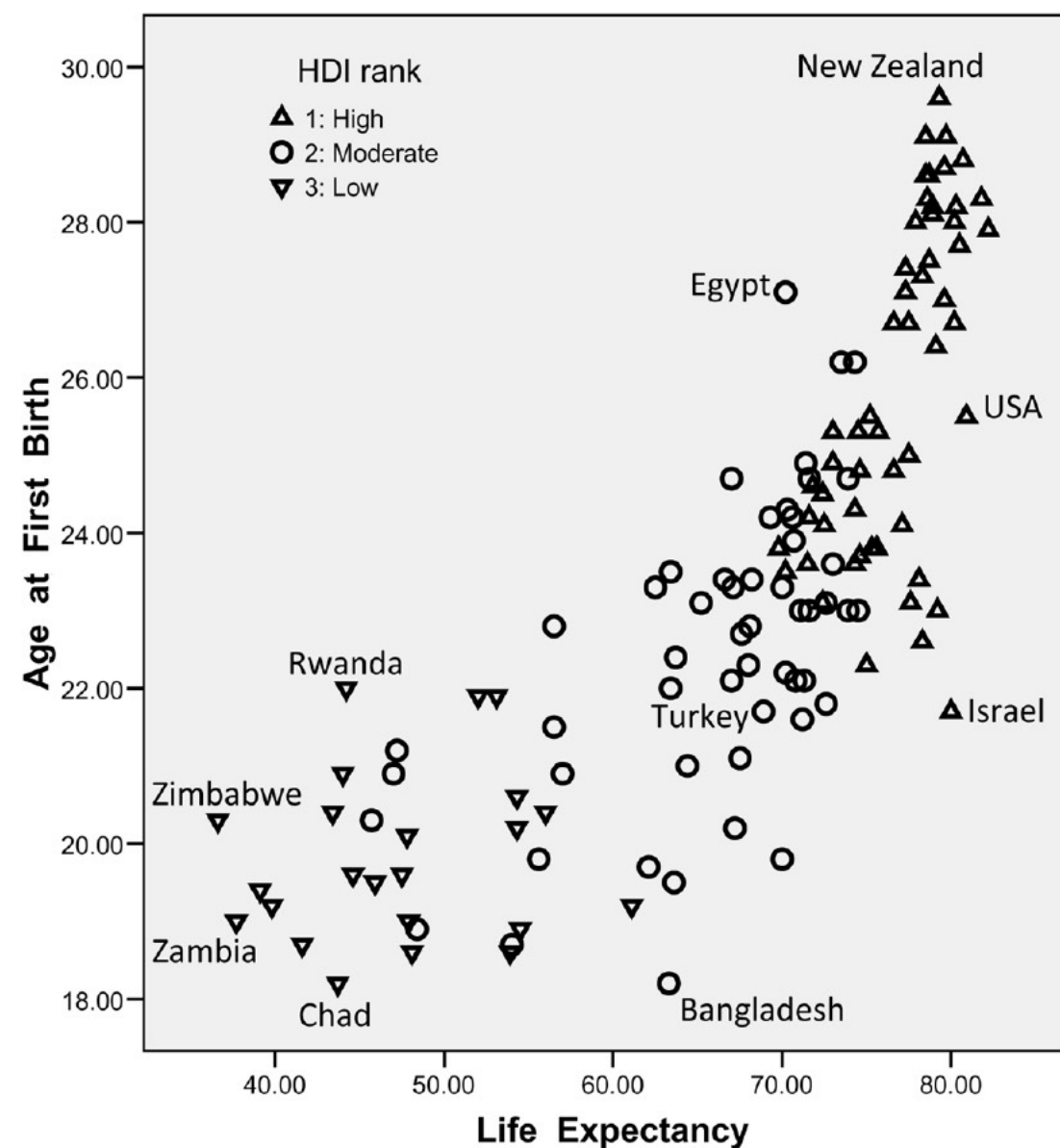


“mixed” strategies



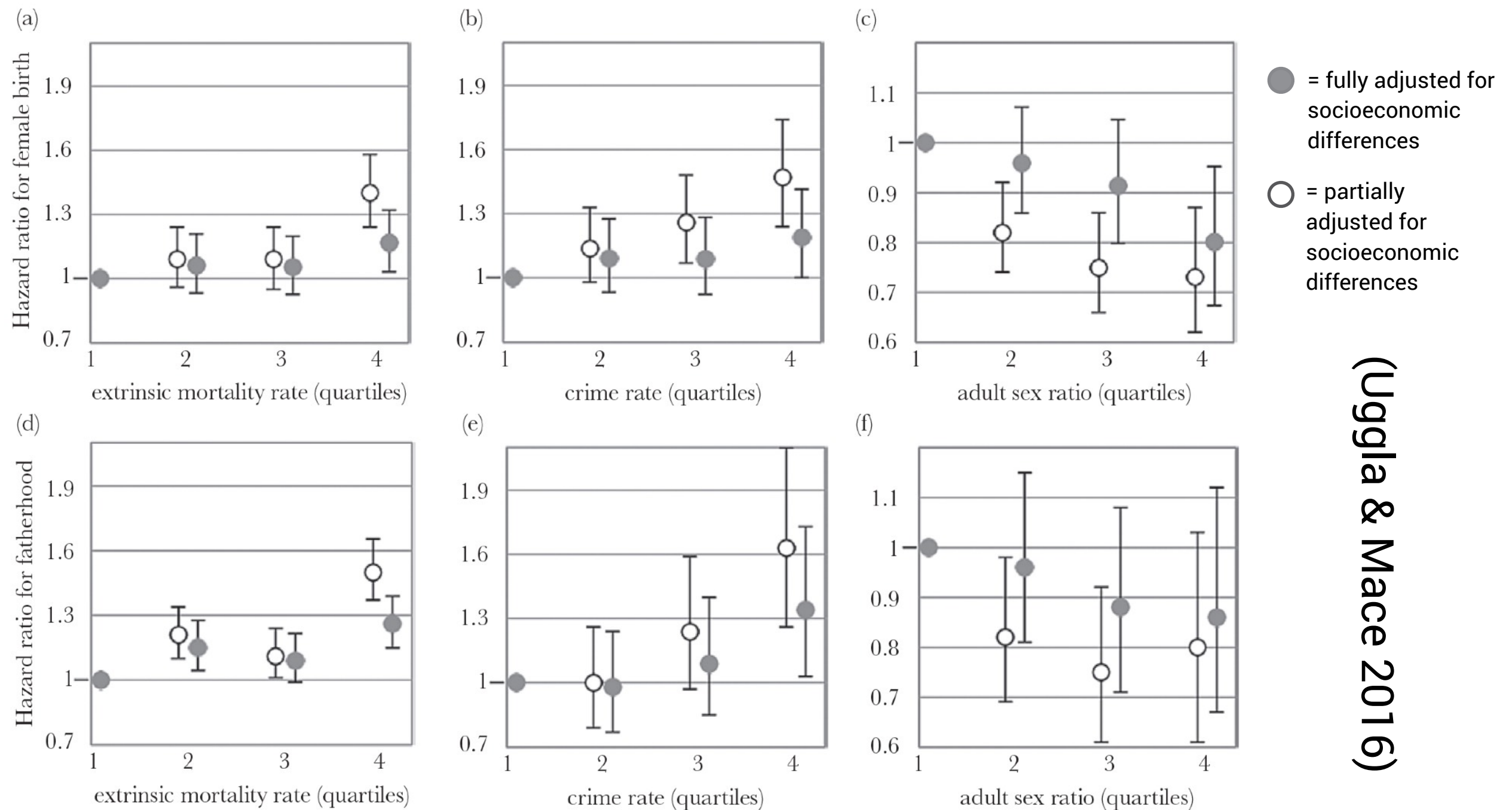
Environment Interacts with Genes

Women's Age at First Birth Increases Nonlinearly With Life Expectancy at Birth (Smoothing Spline Fit, $\bullet = 2,000$; $R^2 = 0.677$)



(Low *et al.* 2008)

Environment Interacts with Genes



(Ugla & Mace 2016)

Effect of “local ecology” on birth rates in Northern Ireland

Culture Competes with Genes

“Eighty-three countries had below-replacement fertility during 2010-2015, and in 25 of those countries, fertility was below 1.5 children per woman.”

- U.N. World Population Prospects Report

2014
birth rates

South Korea = 1.25

Singapore = 0.80

Cuba = 1.46

Ukraine = 1.30

Denmark = 1.73

Costa Rica = 1.91

Japan = 1.40

Azerbaijan = 1.91

U.K. = 1.90

Iran = 1.85

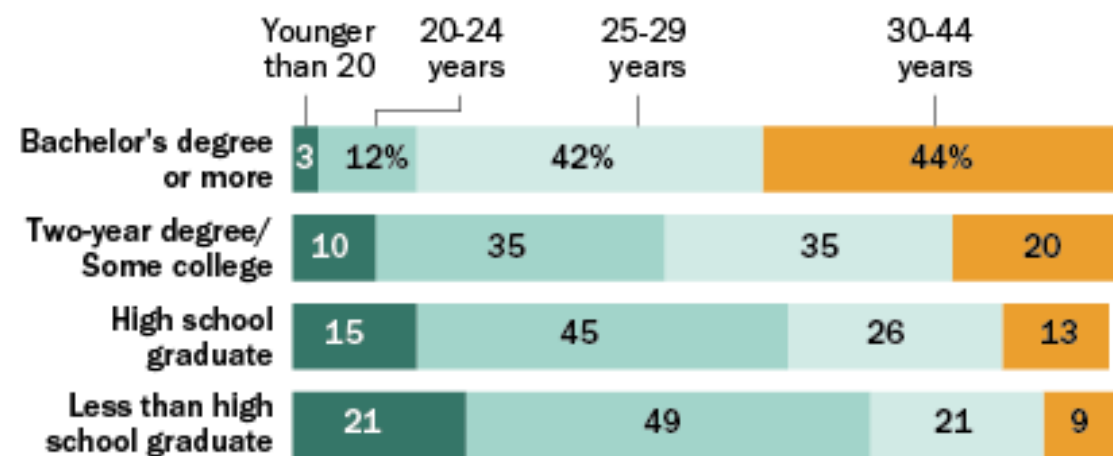
Paraguay = 1.96

China = 1.55

Culture Competes with Genes

For More Educated Men, Fatherhood Starts Later

Share of men by age at birth of their first child and by educational attainment

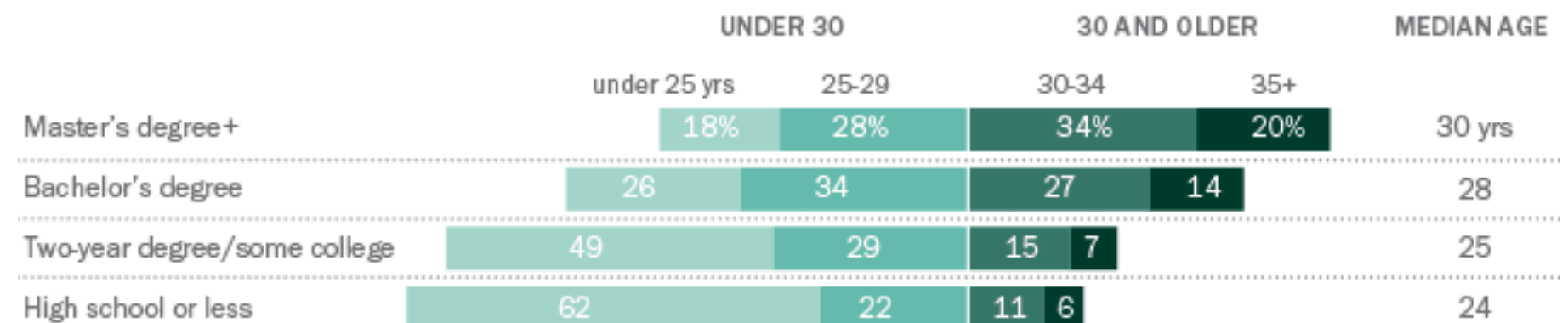


Educational attainment is a strong predictor of both later reproduction and lower overall reproductive output...

Why?

For Most Highly Educated Women, Motherhood Begins in the Thirties

Age at birth of first child, by educational attainment



Pew
Research
Center

The IPAT equation

$$I = P \times A \times T$$

Impact

Total impact of humans on natural systems

Population

Number of humans on the earth

Affluence

Average per capita resource consumption

Technology

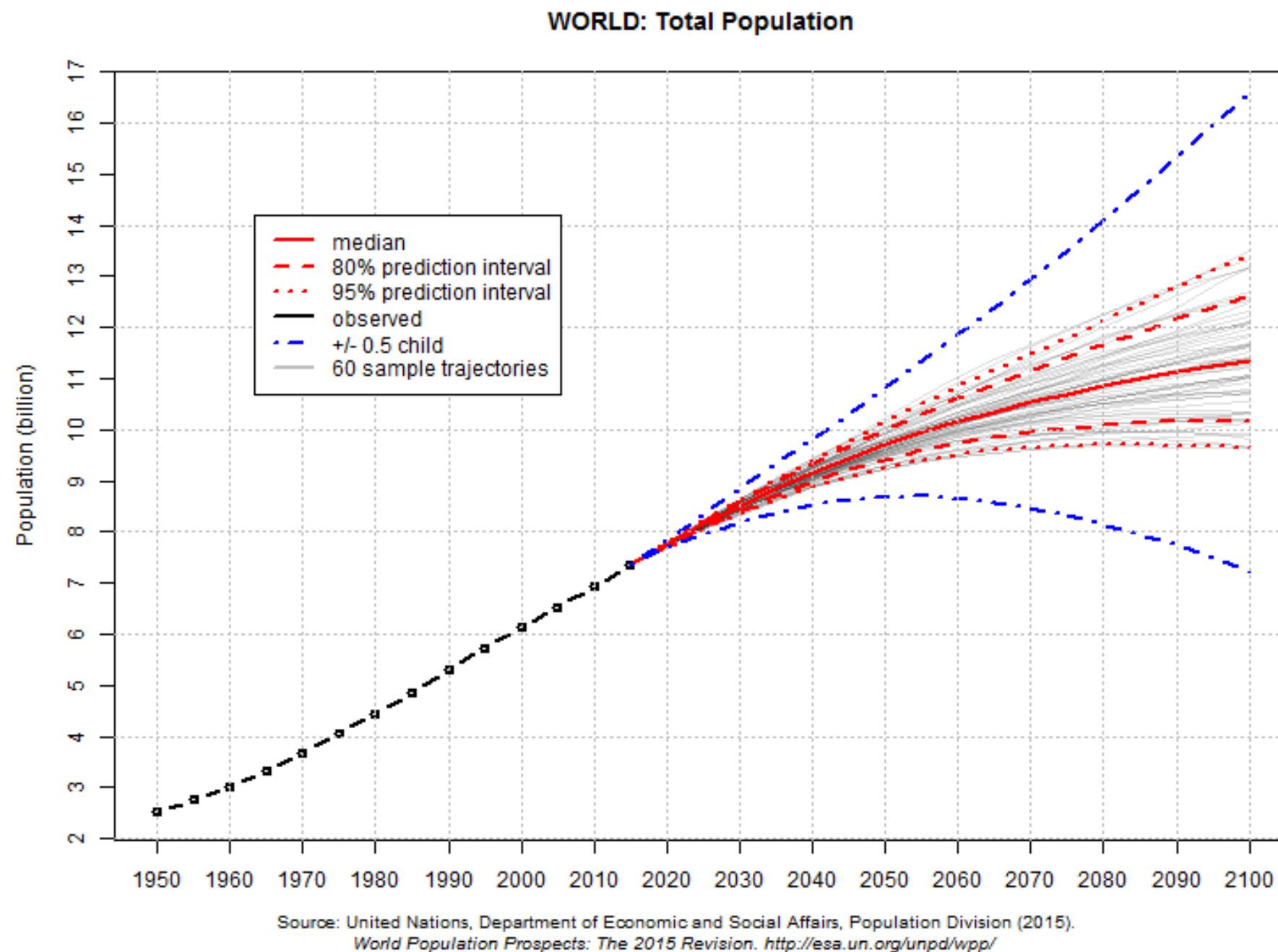
Average impact of human technologies

with
strong cultural
influence!

a product of
biological evolution

a product of cultural evolution

Moral questions about the sustainability of procreation



How many children are we bringing into this world?

Moral questions about the sustainability of procreation



How much will future generations consume?

Moral questions about the sustainability of procreation



What technologies will deliver resources to future generations?

Moral questions about the sustainability of procreation

HEXAPOD

BEE FORAGE PLANTER

Hexapod is a modular planter that provides food for bees in urban settings. The planter is rotationally molded PETE plastic from recycled water bottles and has a hexagonal shape for easy arrangement on any sized rooftop.

FUNCTIONS OF HEXAPOD



BEE FORAGING

Urban bee populations have not been able to grow due to lack of plant food in cities. Adding Hexapods to rooftops will add to the available forage for urban bee populations to grow and thrive in cities.



HUMAN HEALTH

By going outside to tend to their hexapod gardens, urban dwellers will do more exercise, get more sunlight, and spend more time outdoors, which is beneficial to all aspects of human health.



CARBON EMISSIONS

More hexapods means more plants in cities. Plants capture carbon dioxide that contributes to climate change. Making cities more green will help counteract climate change.



HEAT ISLAND EFFECT

Hexapods and plants will help insulate rooftops and retain heat to make buildings more efficient and reduce the heat island effect in cities.

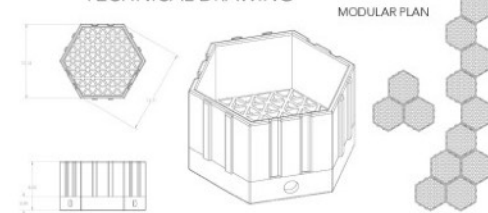


WATER EUTROPHICATION

Hexapods allow water from water towers to filter through a plant, soil, and polyurethane layer which will fix nitrogen compounds that lead to water eutrophication. The plants will require less fertilizer and purify water in the process.



TECHNICAL DRAWING



THE PLANTS

These plants are able to survive and thrive in the un-natural environments of cities and attract bees and butterflies.



THE MATERIAL

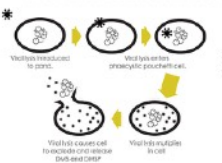
Plastic water bottles are made of a lightweight thermoplastic called Polyethylene terephthalate. By collecting post consumer plastic water bottles and repurposing them to make Hexapods, the planters pose a much lower environmental impact in the raw material and manufacturing stage of the Life Cycle Assessment (LCA).



AUDREY KRUMENACKER | MSC1 270 ECOLOGY | PROF. CHRIS JENSEN | FALL 2016

Complex Integrated Farming System

Production of DMS and DMSP

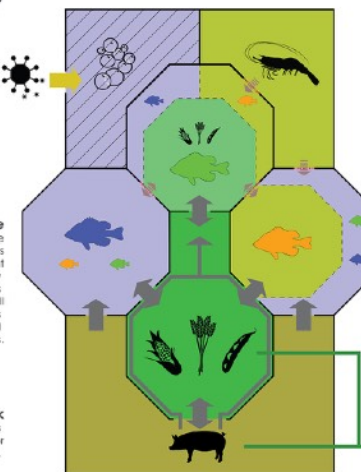


Open Water Produce

Bluegill Sunfish grow to their maximum size cultivated in competition with its similar species in open water. Due to greater efficiency of foraging in open water it will outgrow all other species. Nutrients from pig's manure and and crops will flow into the pond to act as feed for fish, whilst fertilized soil from fish compost will be fed to the crops.

Pig Stock

Pig livestock are specifically selected for this farm because their manure can be used for both soil fertilizer and fish feed.



Myxid Shrimp Stock

Myxids are filter feeders. They are cultivated in order to manage algal blooms in the different fish ponds. Algal blooms are caused by the excessive load of nutrients in these ponds, and act as deoxygenators that can turn these ponds into deadzones. In order to prevent this myxid shrimps will be flowed into the ponds in controlled quantities to filter the waters. Once the waters are cleared, the fish can then feed on the myxid shrimps for more nutrients.

Pond Vegetation Produce

Green sunfish have been found to grow 44% larger than a bluegill sunfish when coexisting with its rival species. Instead of 24% larger when living by itself. This pond will have all 3 habitats with a dominant habitat being vegetation in order to have green sunfish grow to its maximum size. Different species of crops like rice can also be grown in pond vegetations.

Pond Sediment Produce

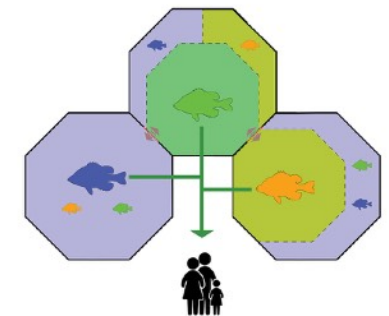
Pumpkinseed sunfish are known to grow largest when competing with bluegill and green sunfish in sediment and open water habitats.

Crop Stock

Crop soil can be fertilized through pig manure and fish compost. Portions of cropstock can be used to feed pig stock and fish stock.



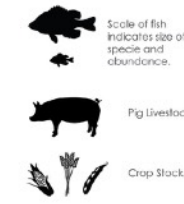
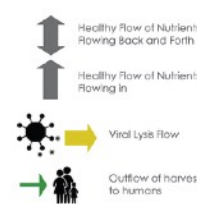
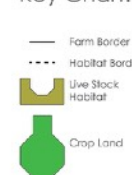
Jae-Hyun An
Ecology
Professor Christopher Jensen
4/23/2017



Cycling of Fish Stock

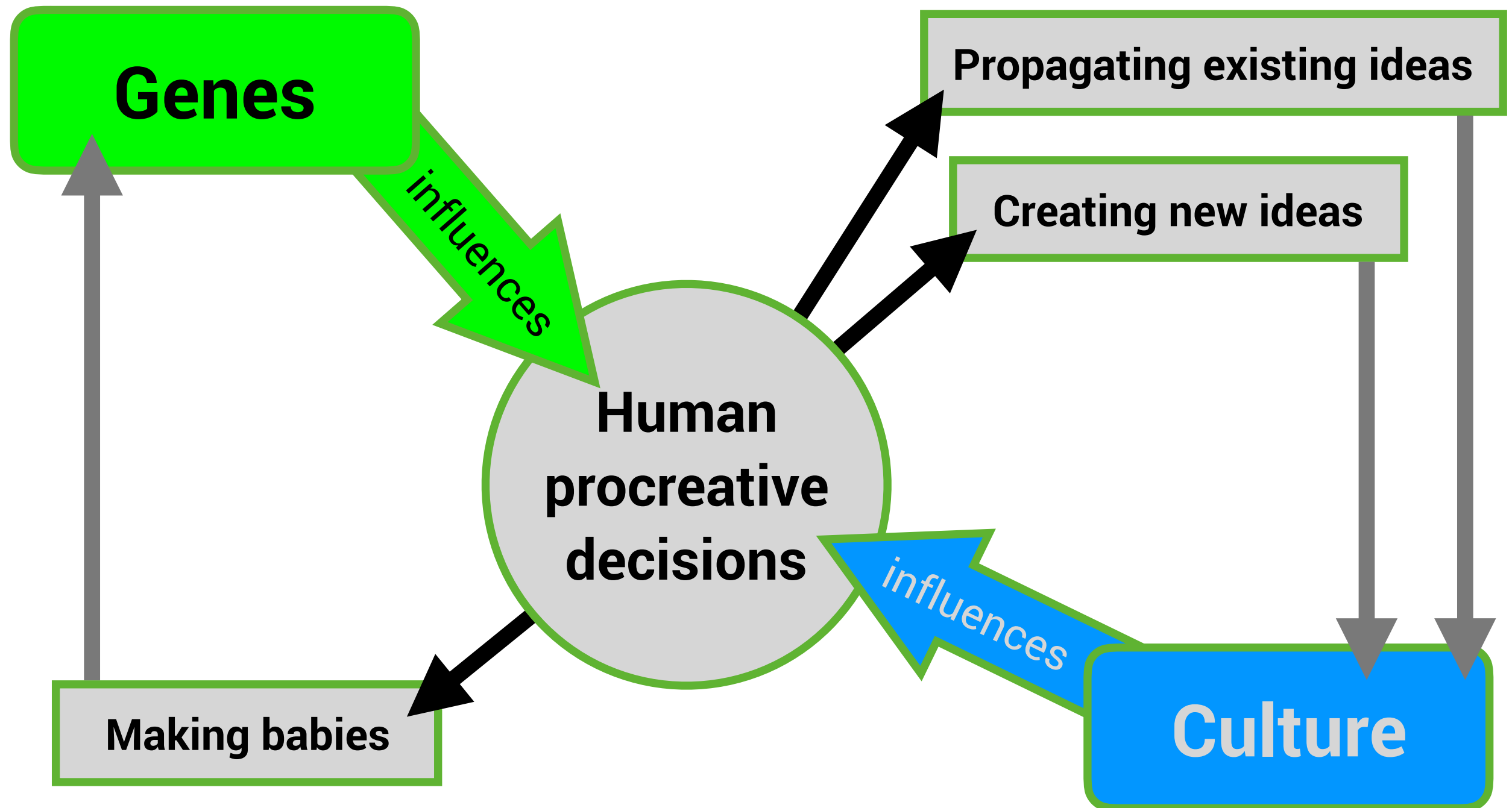
Every couple of months the largest of the dominant species in each pond will be harvested. The other species that have not grown to their full potential yet will be cycled to a different pond to continue their maturity to their maximum size in their dominant habitat.

Key Chart:



What kind of culture is the current generation creating?

Potential for Consilience?



Thank you!

*I look forward to the panel
discussion with all of you!*

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