TRUGSCHLUSS

Anpassen, Dominieren, Kontrollieren

Überleben durch Ressourcen-Kontrolle

Marcus Clauss

Zürich, Biologie und Erkrankungen der Wildtiere 2019

University of Zurich[UZH]

Clinic of Zoo Animals, Exotic Pets and Wildlife

‘Evolutionary progress’ – directional evolution

Biol. Rev. (1987), **62**, *pp.* 305–338

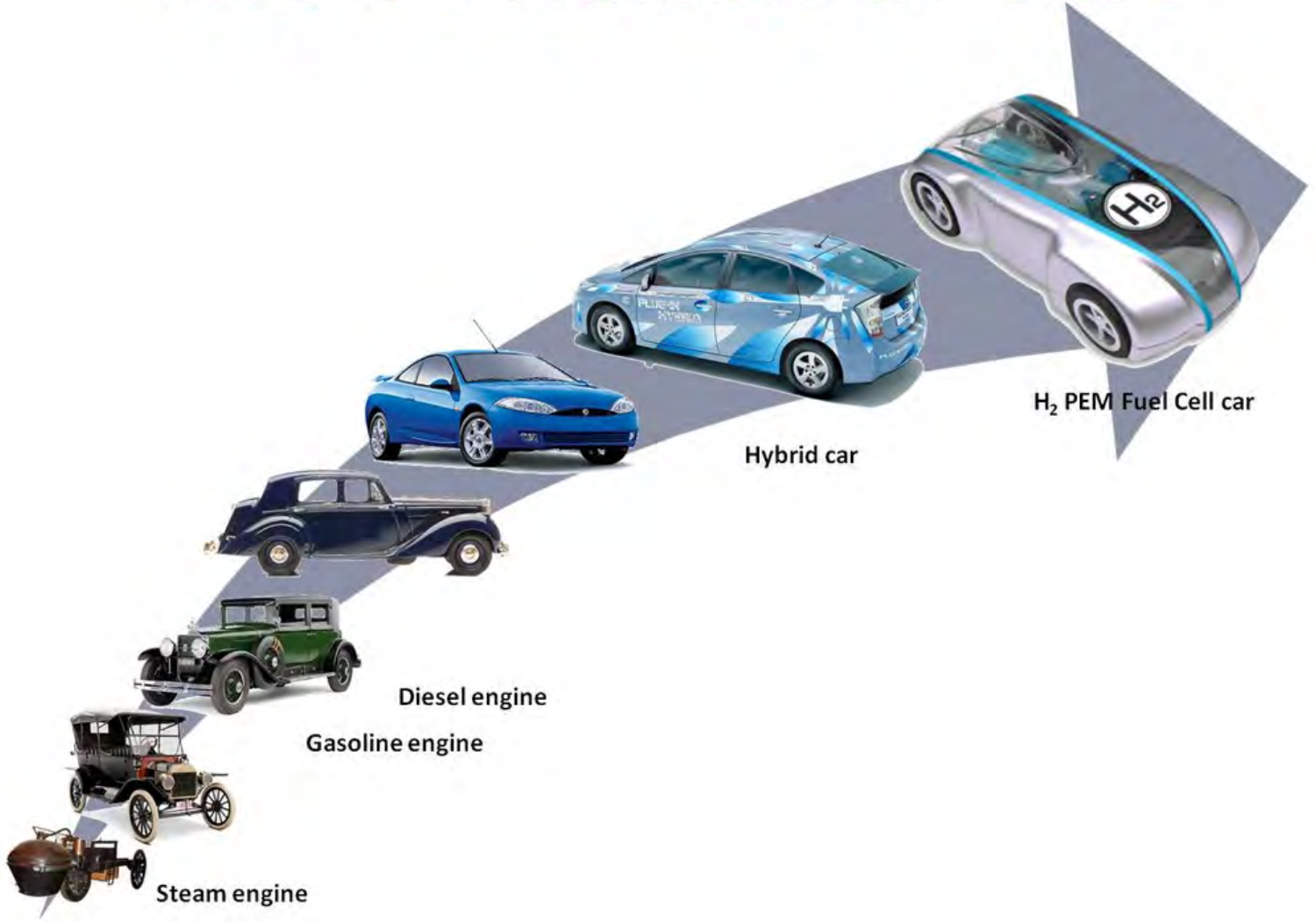
PROGRESS AND COMPETITION IN MACROEVOLUTION

By MICHAEL J. BENTON

It is merely a tautology to identify the later animal (the ‘winner’) as a ‘superior competitor’ in the absence of any other evidence (Schopf, 1979).

it is hard to envisage a constant competitive advantage that lasted so long and persistently favoured all of the species of one large taxon against all of the species of another in all environments.

The evolution of cars



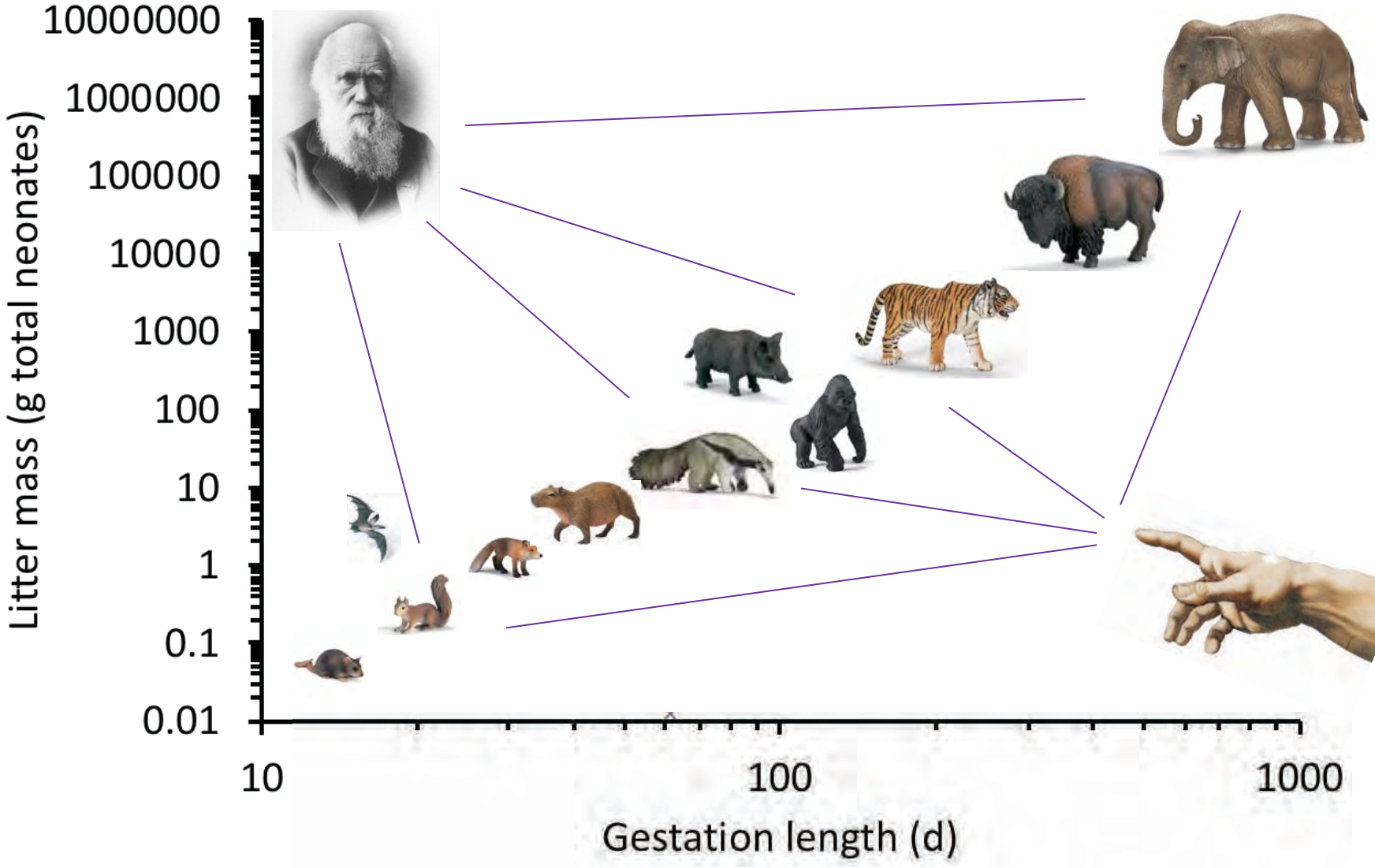
YEP, CHICKENS ARE BIGGER TODAY

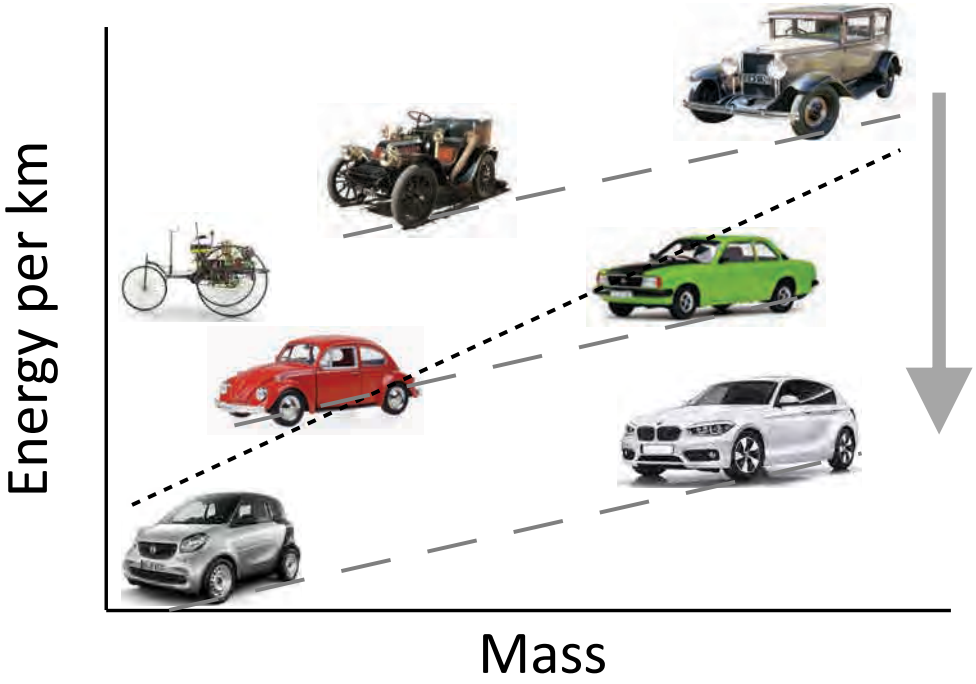
	1957	1978	2005
0 DAYS	This chick was 4x as likely to die during its first 7 days than its modern counterpart		This chick was vaccinated against disease and will be under the care of a veterinarian its whole life
	 34g	 42g	 44g
28 DAYS	This chicken used 2x as much feed, land, water and fuel to produce 1lb of meat		This chicken lives in a climate-controlled barn, protected from predators and is fed by a certified nutritionist
	 316g	 632g	 1,396g
56 DAYS	This chicken still has 12 days until it's market-ready, and could only feed 2 people		This chicken was bred to have strong legs, has never been given hormones and can feed six people
	 905g	 1,808g	 4,202g

It's no secret that today's chickens are bigger than in years past. They're also the healthiest they've ever been. Find out how at chickencheck.in

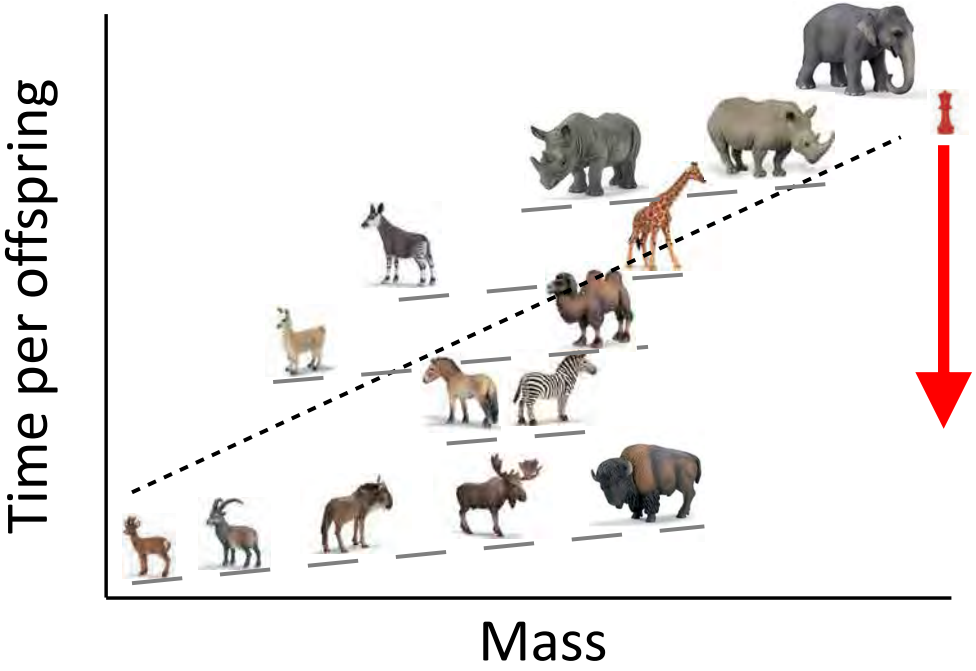
Chicken CHECK IN

Biology: fixed laws ?

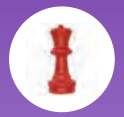




You would not consider the overall pattern a fixed law, but consider it with respect to technical progress.



Why would you consider this a pattern due to fixed life history tradeoff laws, and not rather a ***snapshot*** *in a process of optimization?*

Probabilistic directionality in evolution

A priori conditions and their consequences

Life requires input of resources.

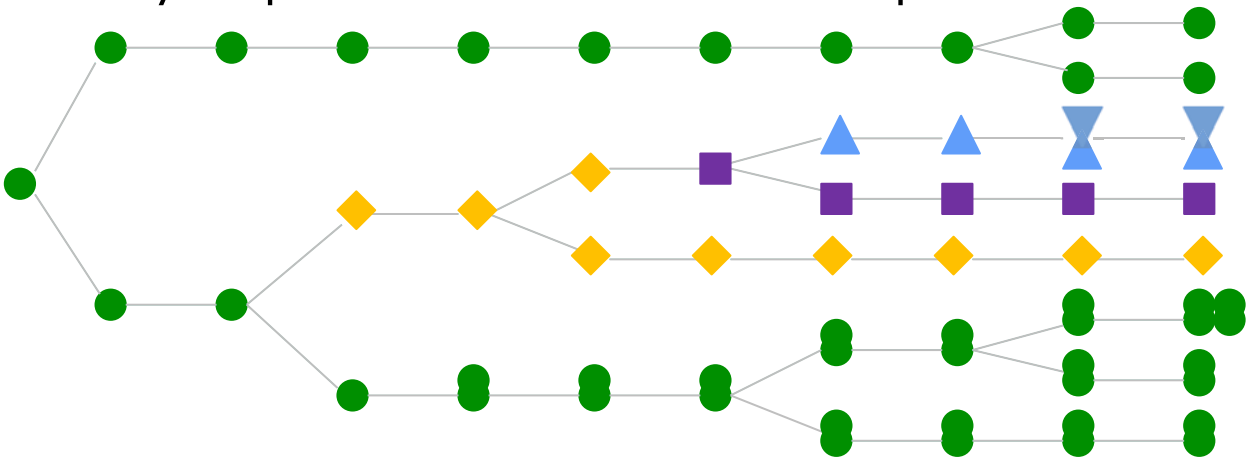
Life starts simple (non-complex).

Life means reproduction.

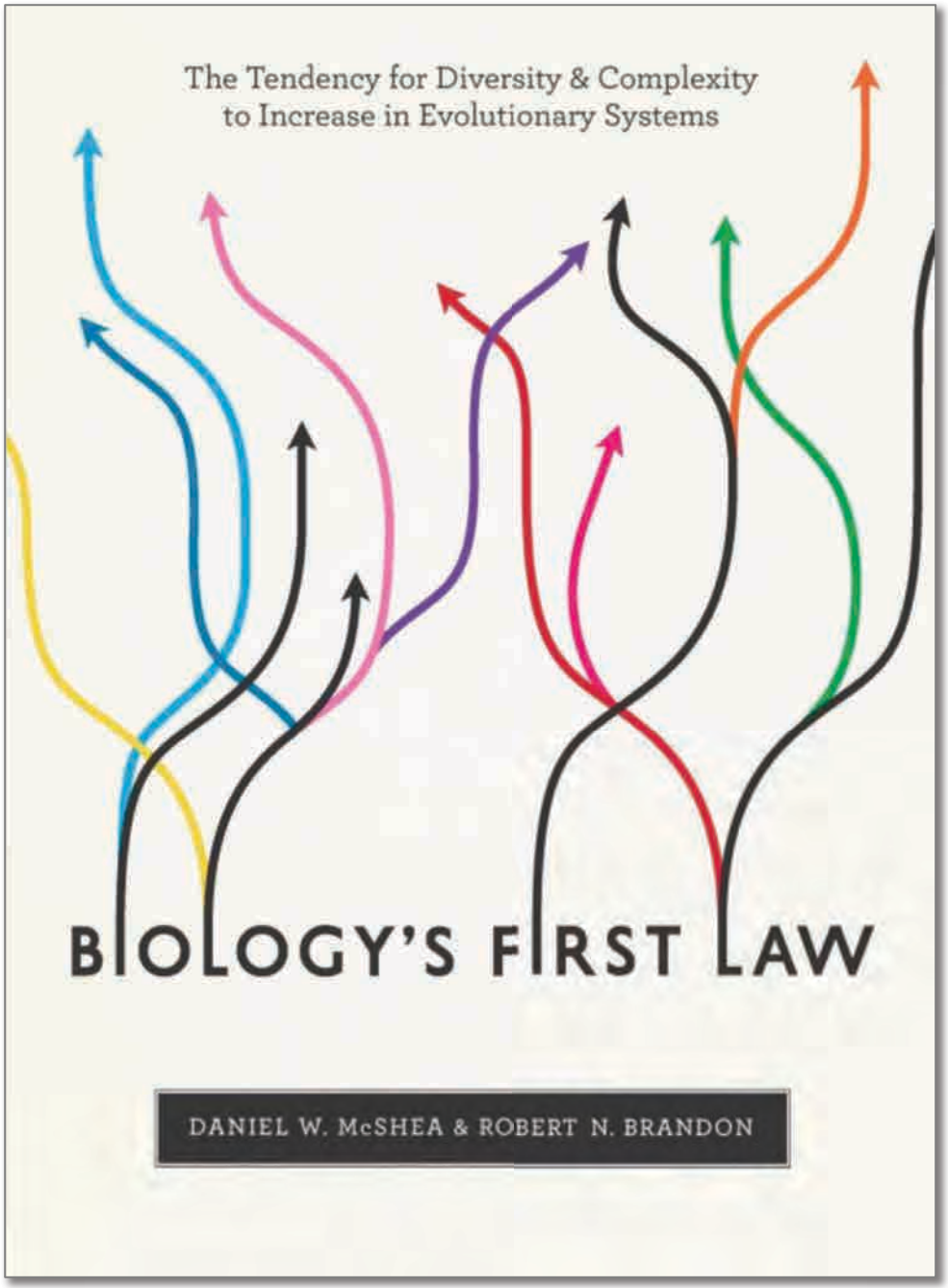
- spontaneously occurring yet heritable variability

Probabilistic directionality I: towards non-stasis

- not only replacement but multiplication

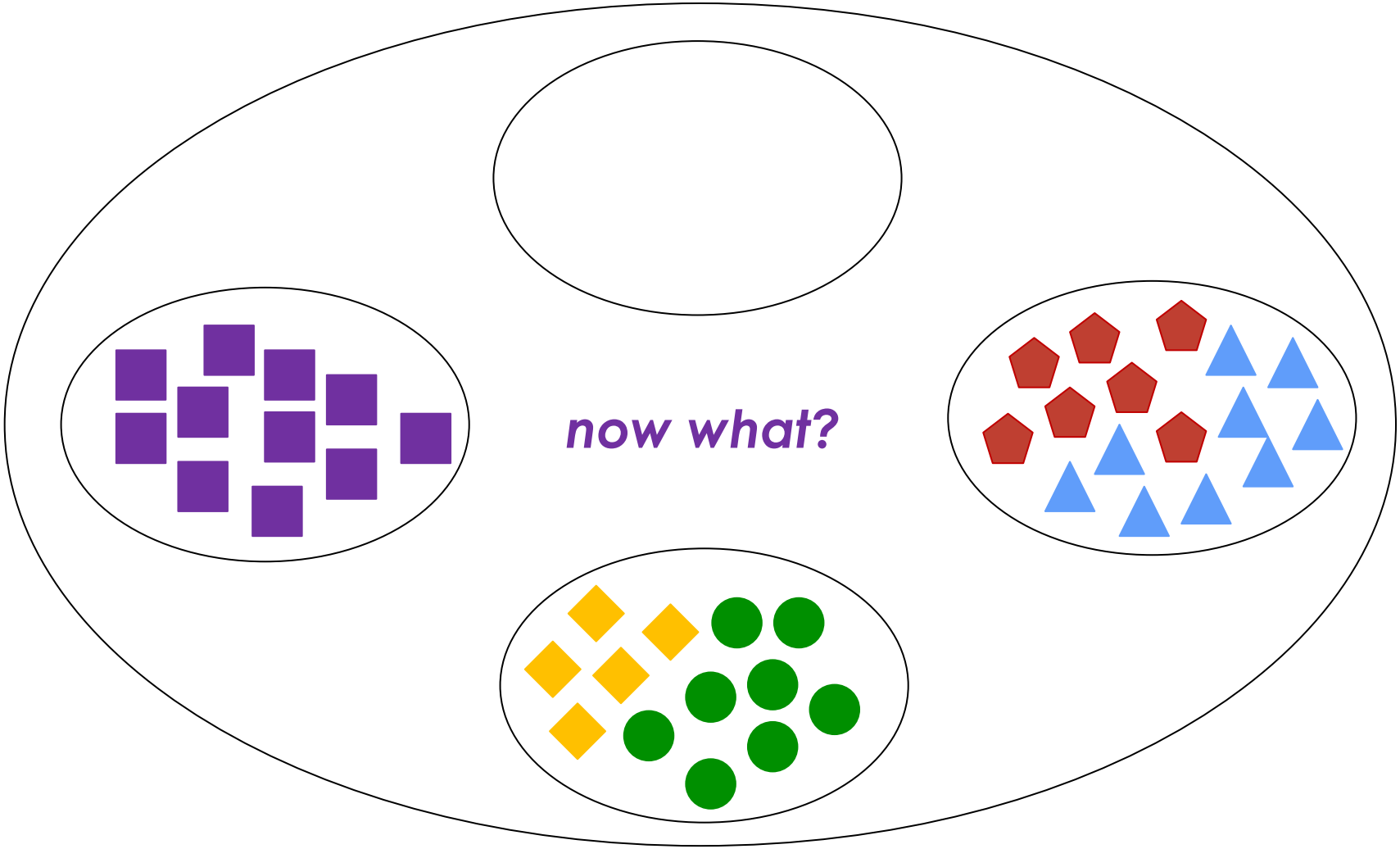


Probabilistic directionality II: more diversity & complexity


The Tendency for Diversity & Complexity
to Increase in Evolutionary Systems
BIOLOGY'S FIRST LAW
DANIEL W. McSHEA & ROBERT N. BRANDON

A priori conditions and their consequences

Resources are finite.



A priori conditions and their consequences

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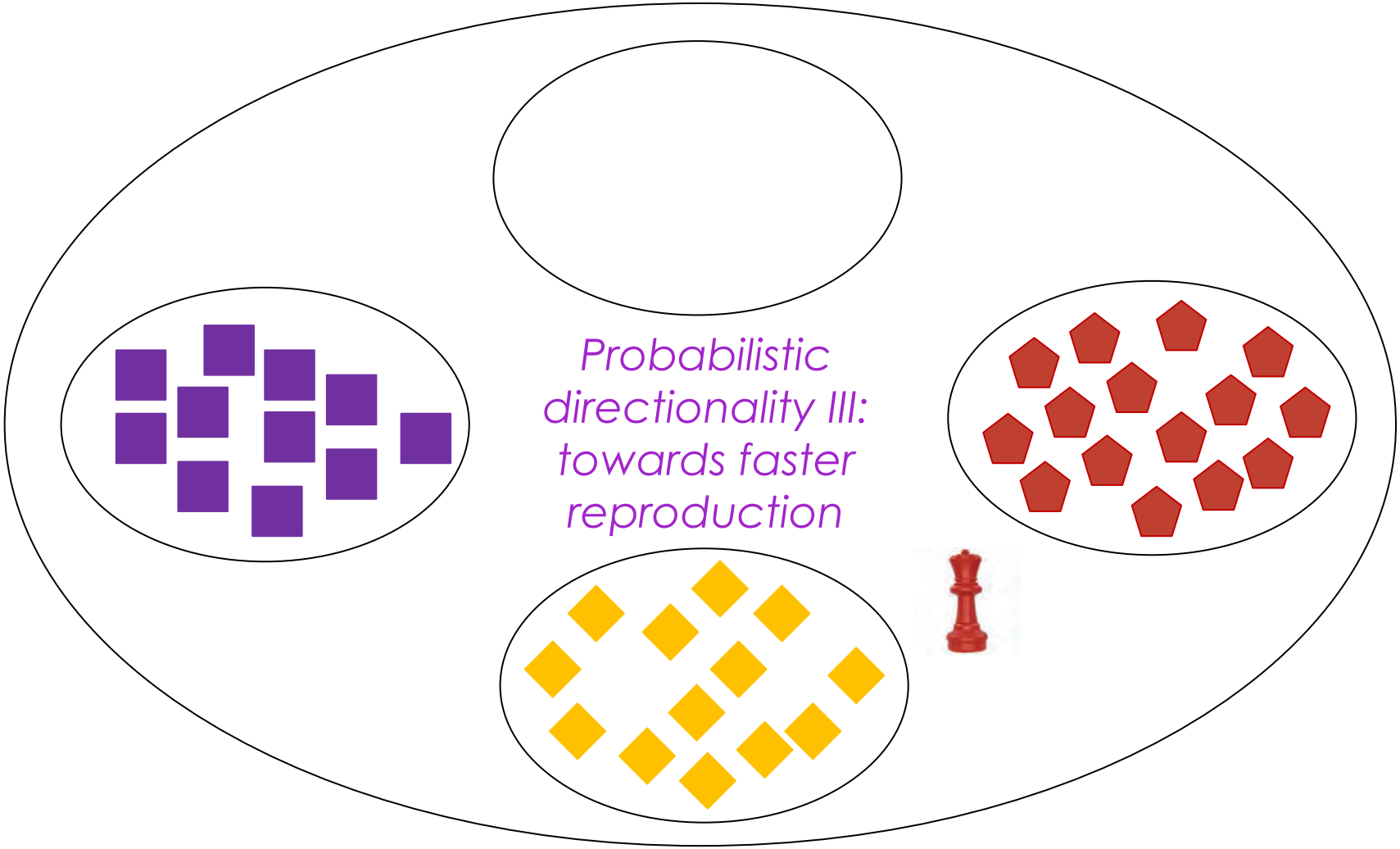
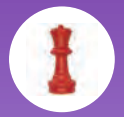
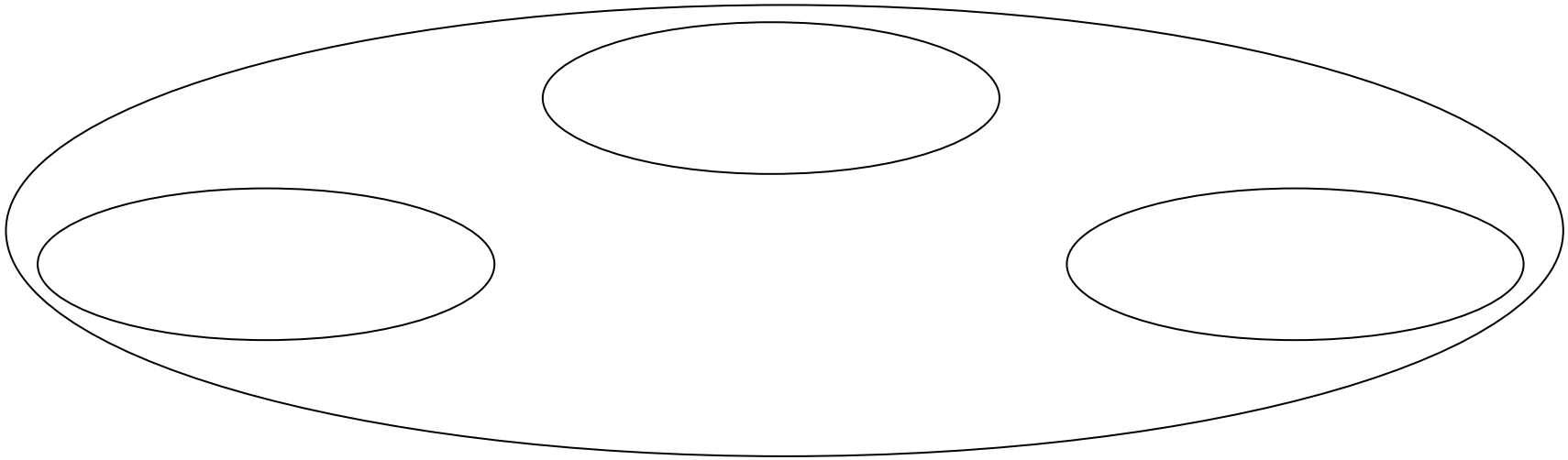
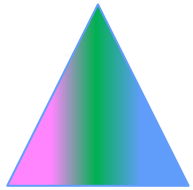


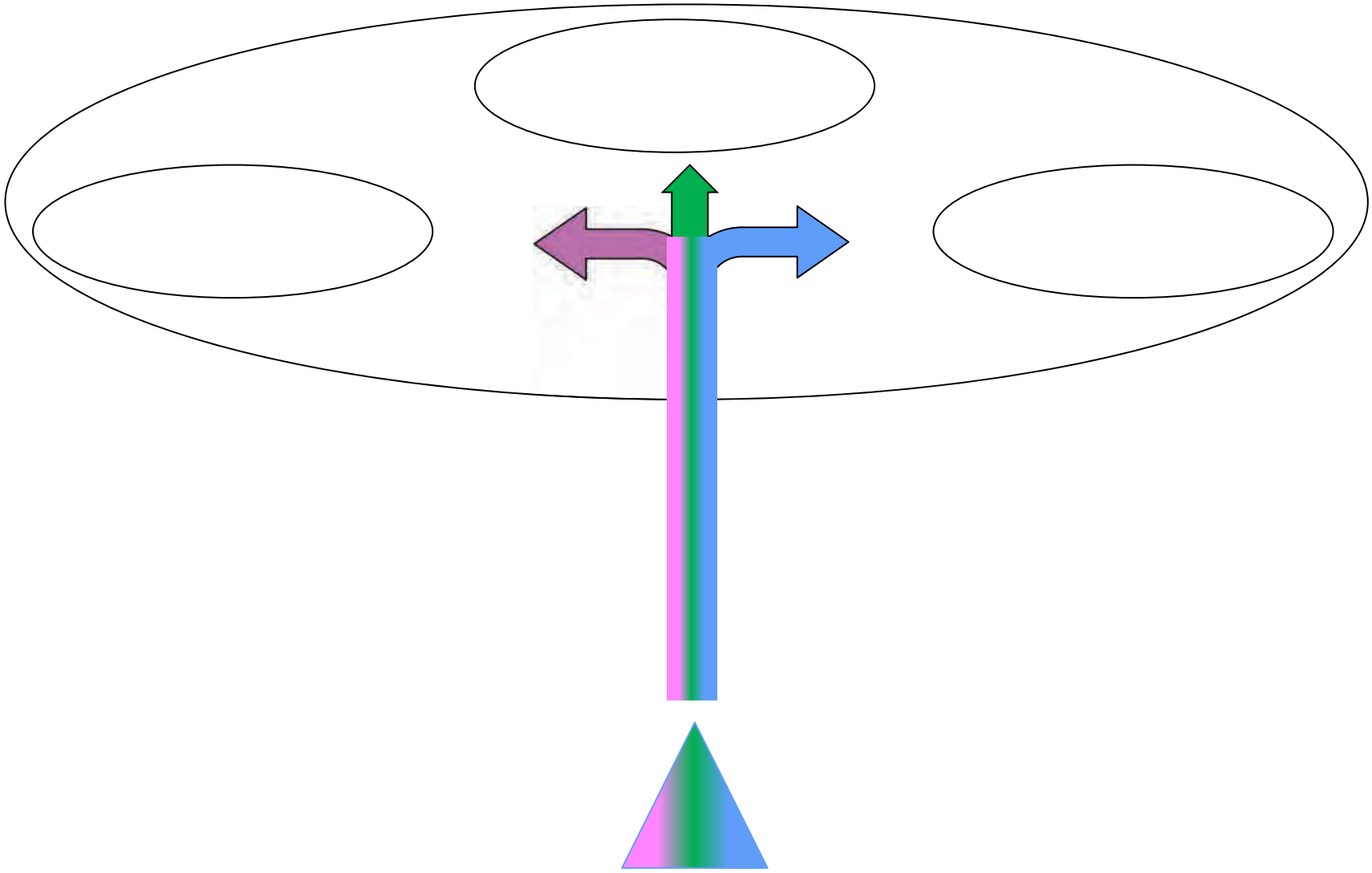
Bursts of adaptive radiation

Radiation into ***new*** niches

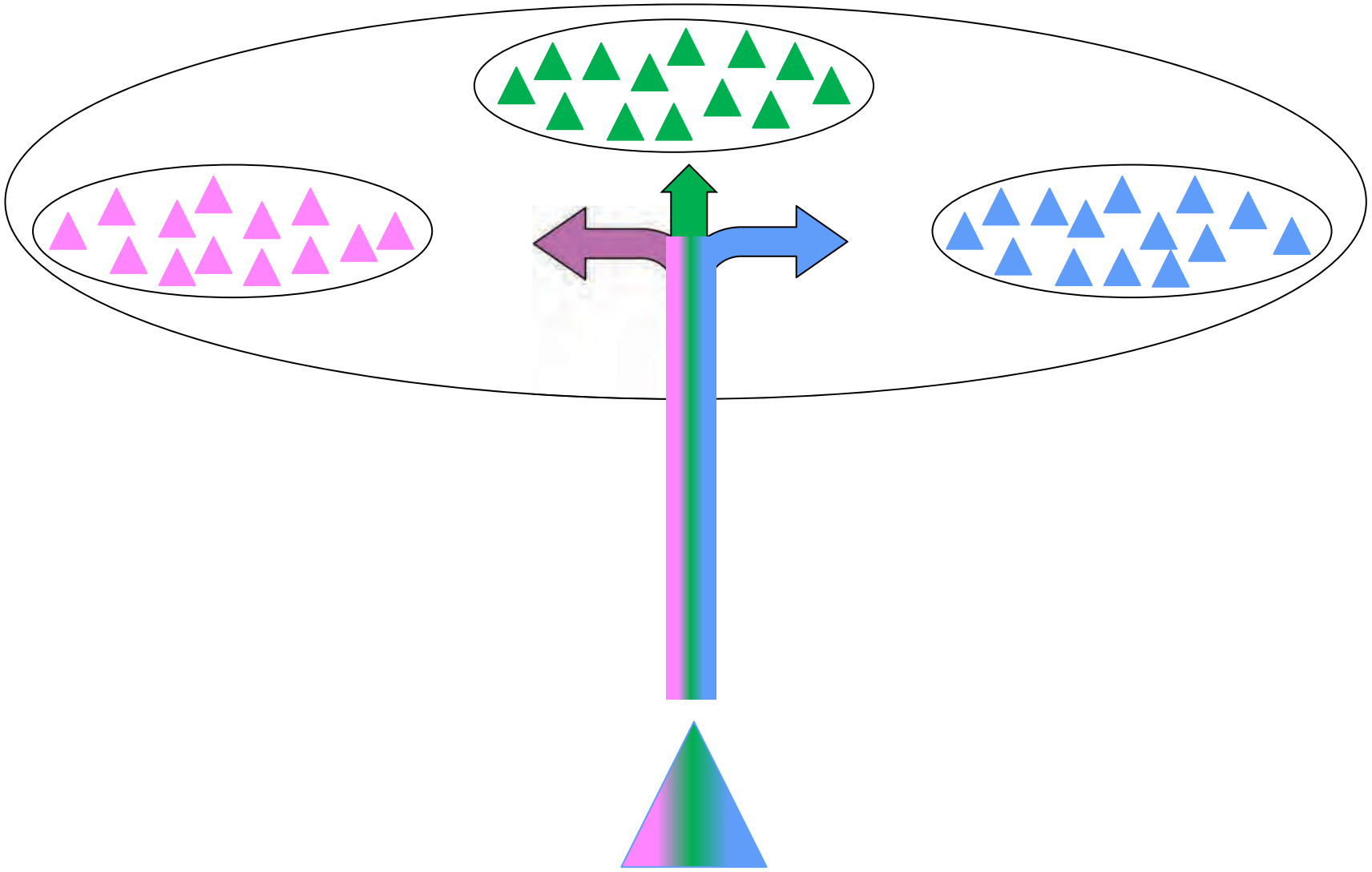




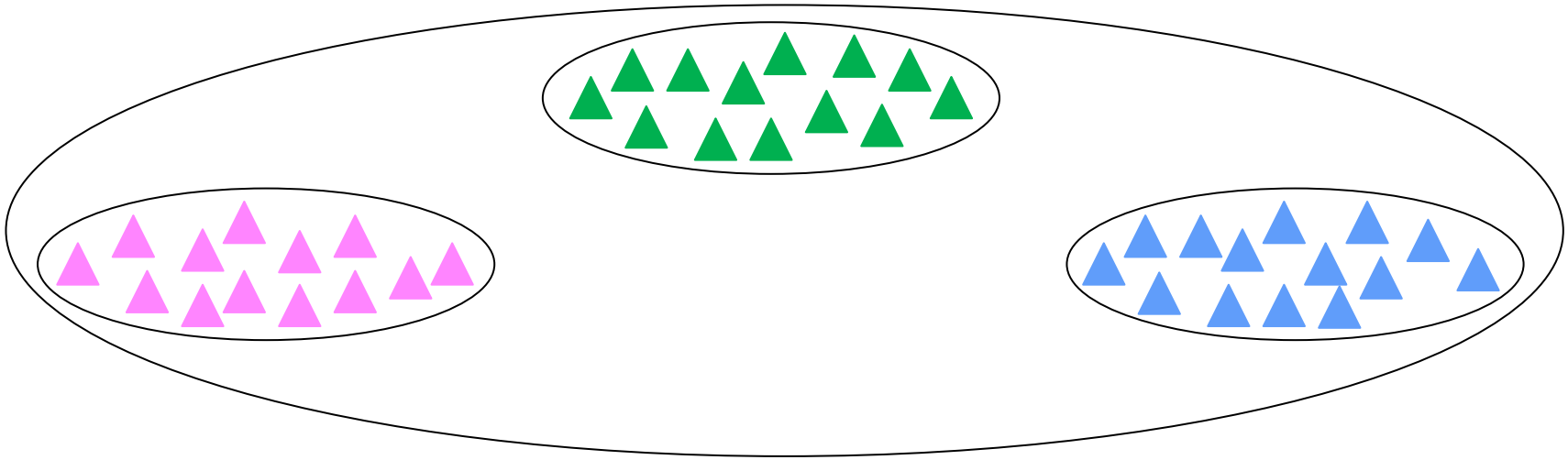
Radiation into ***new*** niches

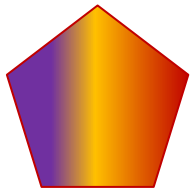


Radiation into ***new*** niches

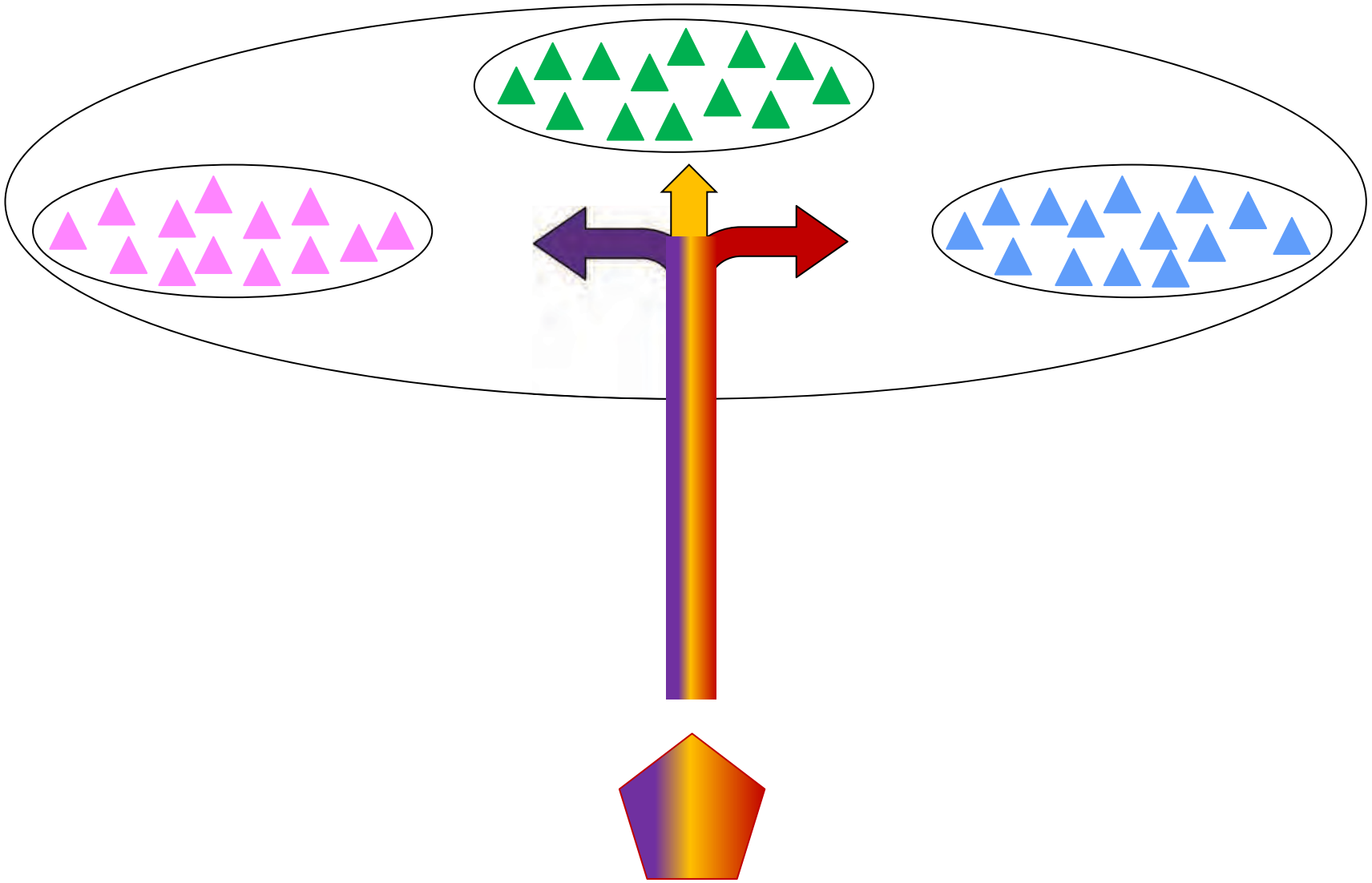


Radiation into ***new or old*** niches

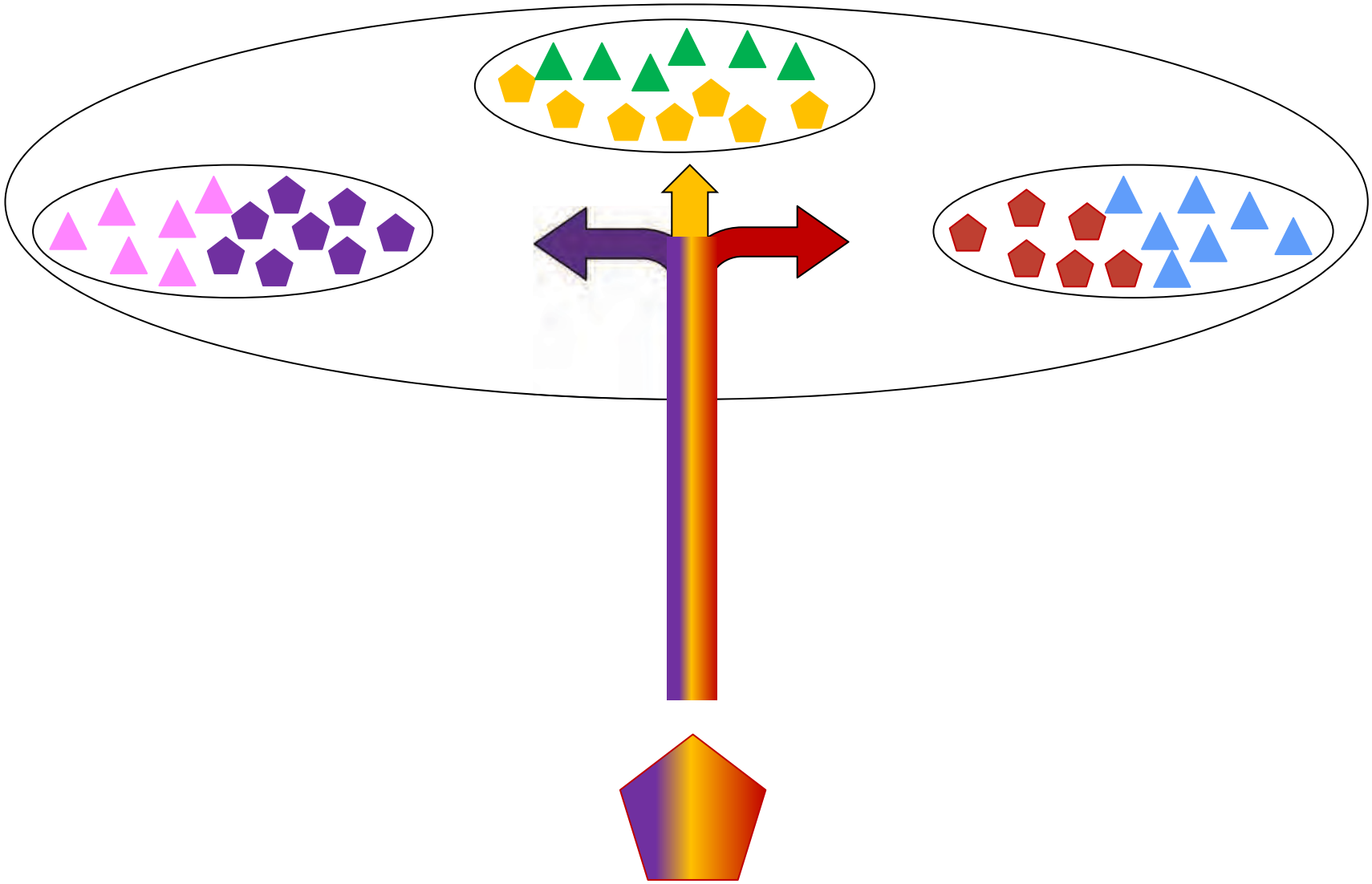




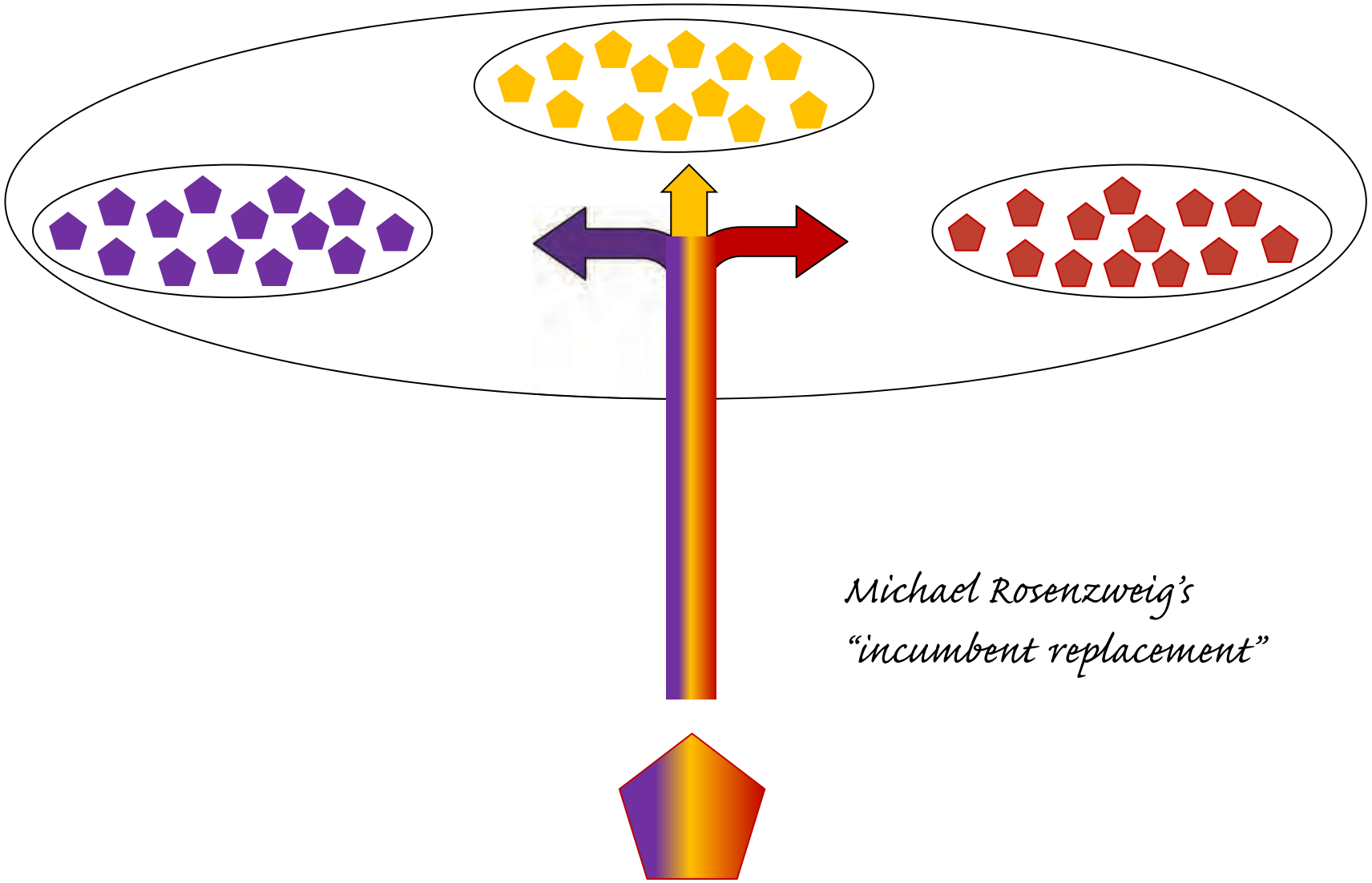
Radiation into ***new or old*** niches



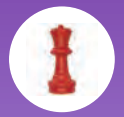
Radiation into ***new or old*** niches



Radiation into ***new or old*** niches

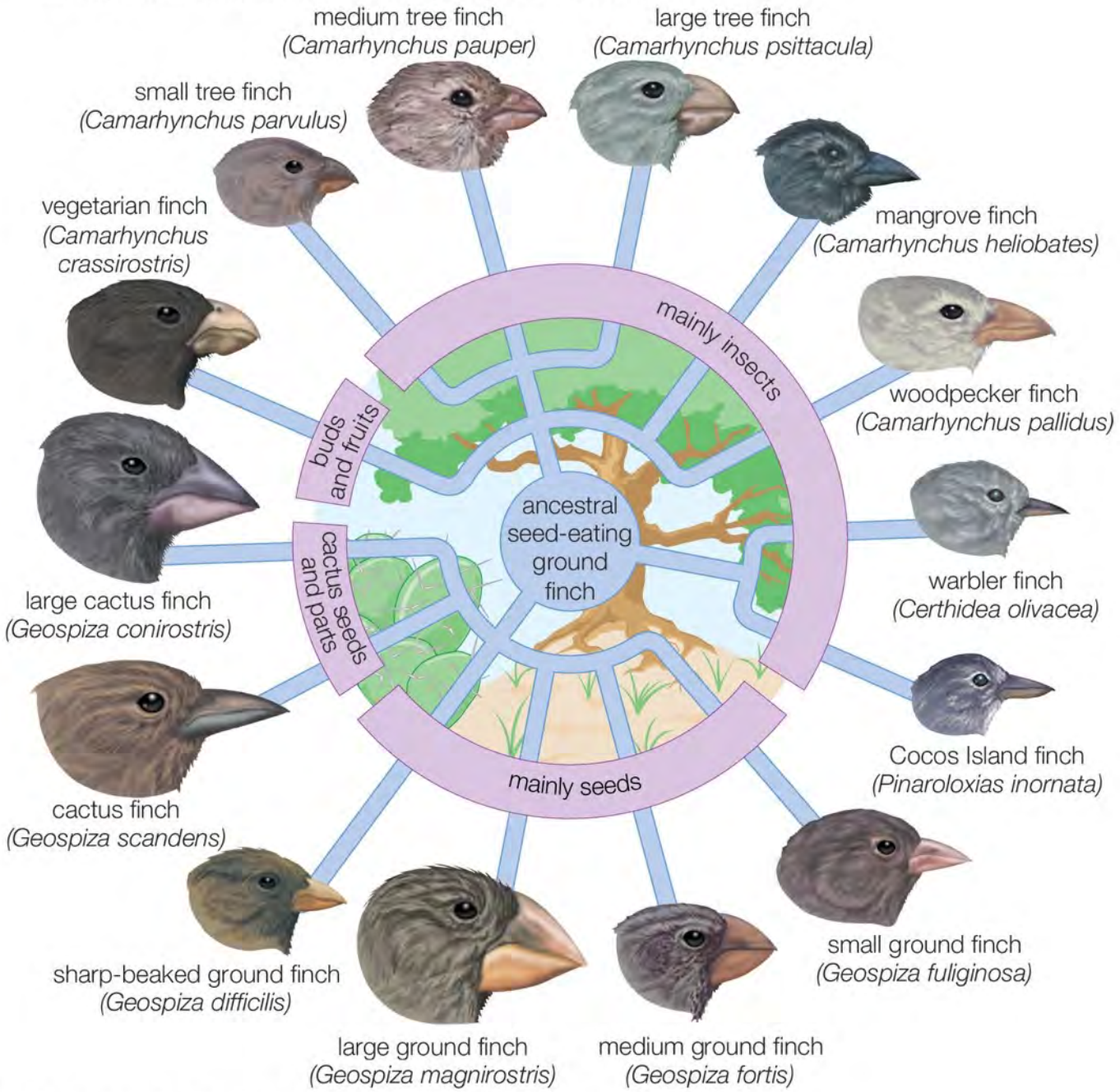


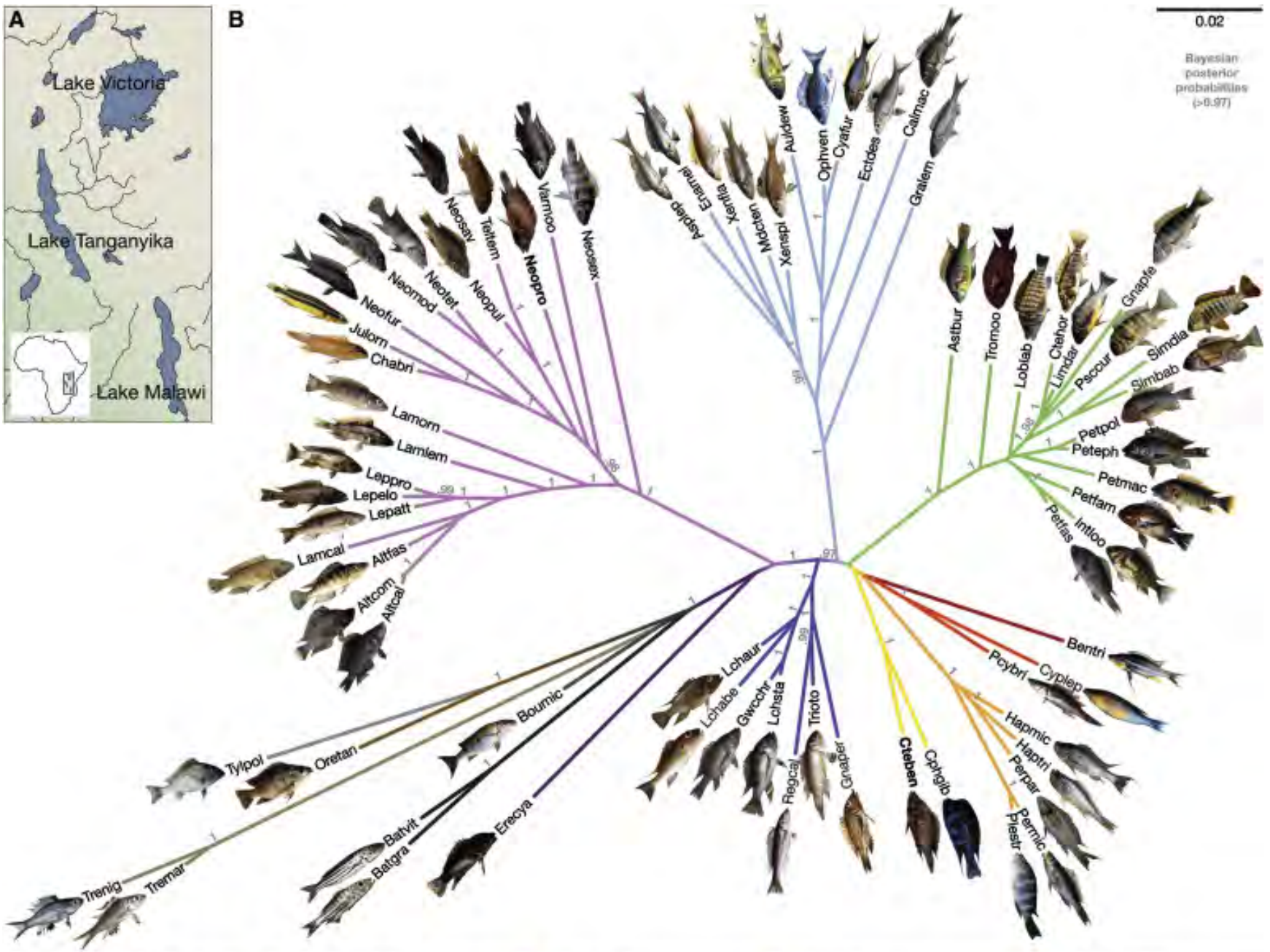
Michael Rosenzweig's "incumbent replacement"



Evolution is
life's permanent suggestion
of new solutions
to the question of life itself.

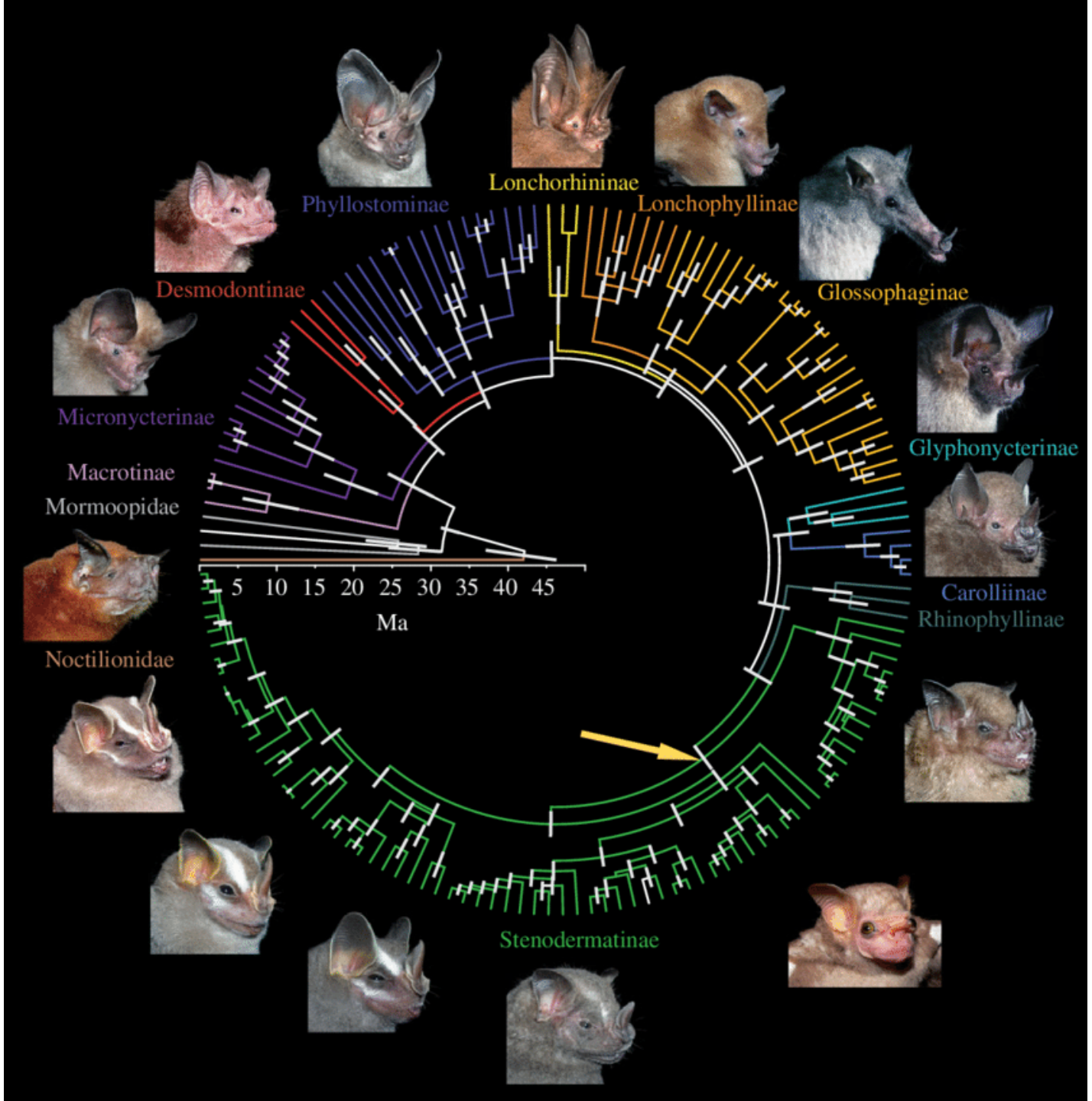
Bursts of radiation occur when a life form meets a series of niches that is not occupied/ occupied by a lesser solution.

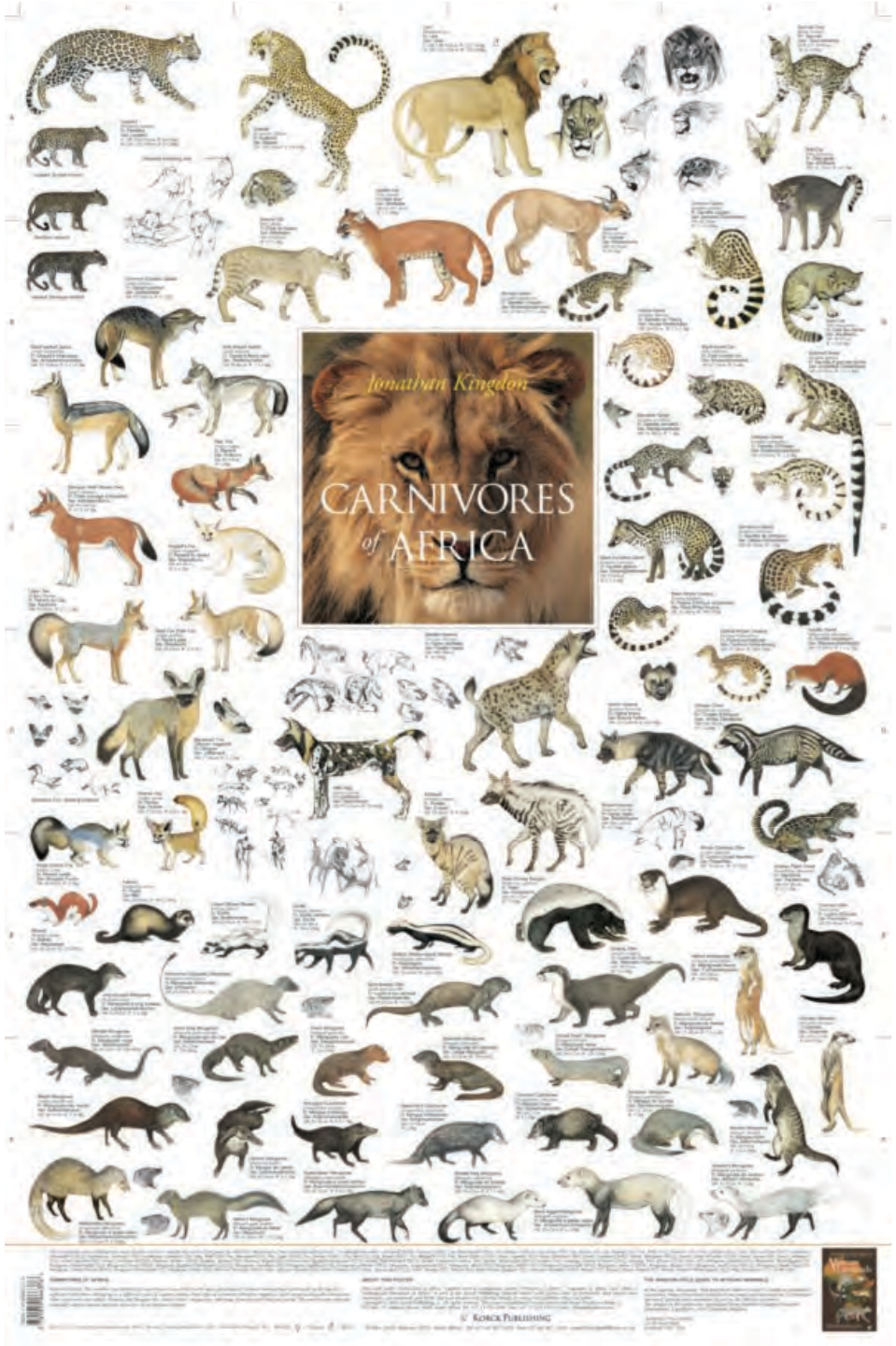


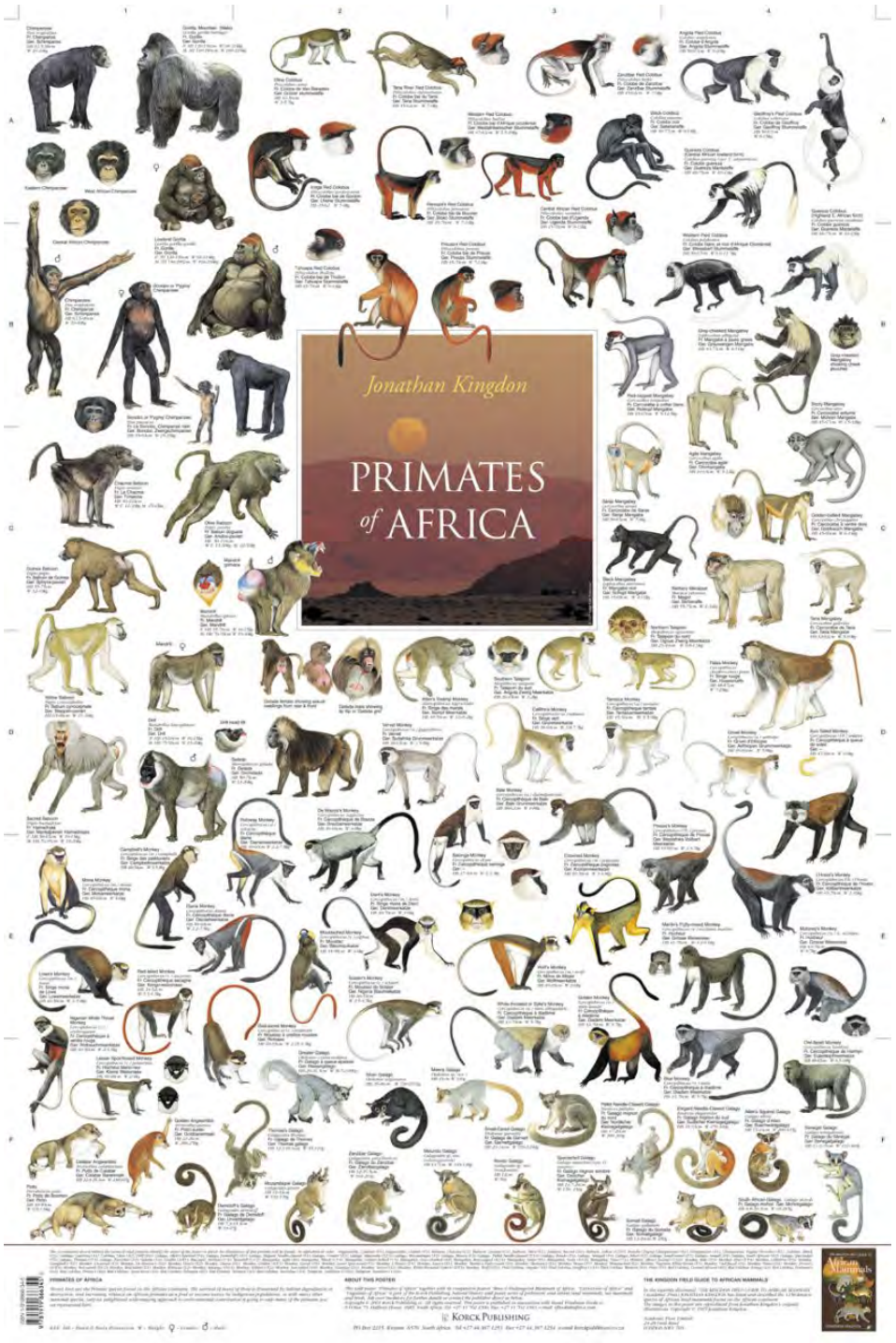


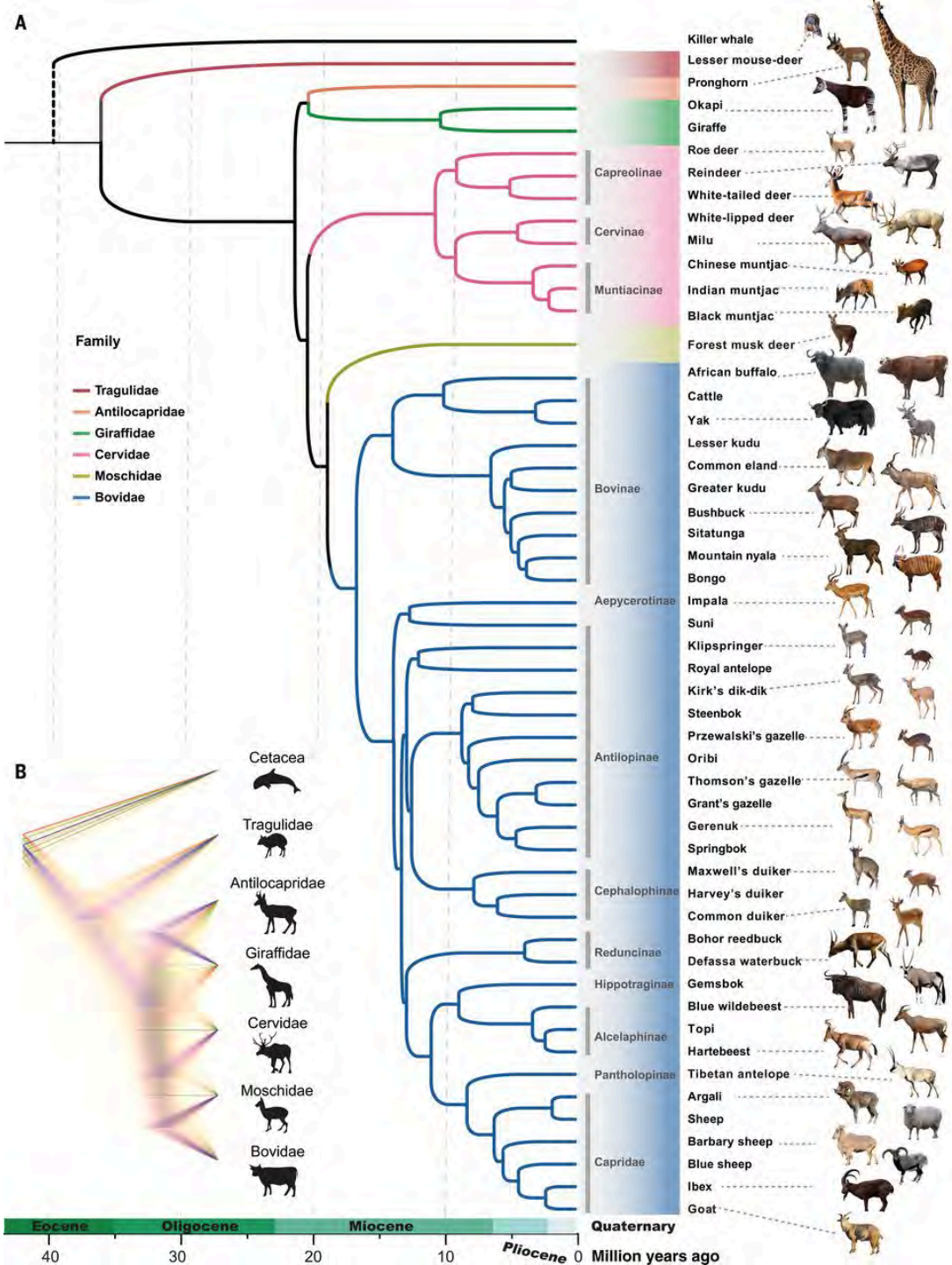
Tanganyikan cichlid tribes:

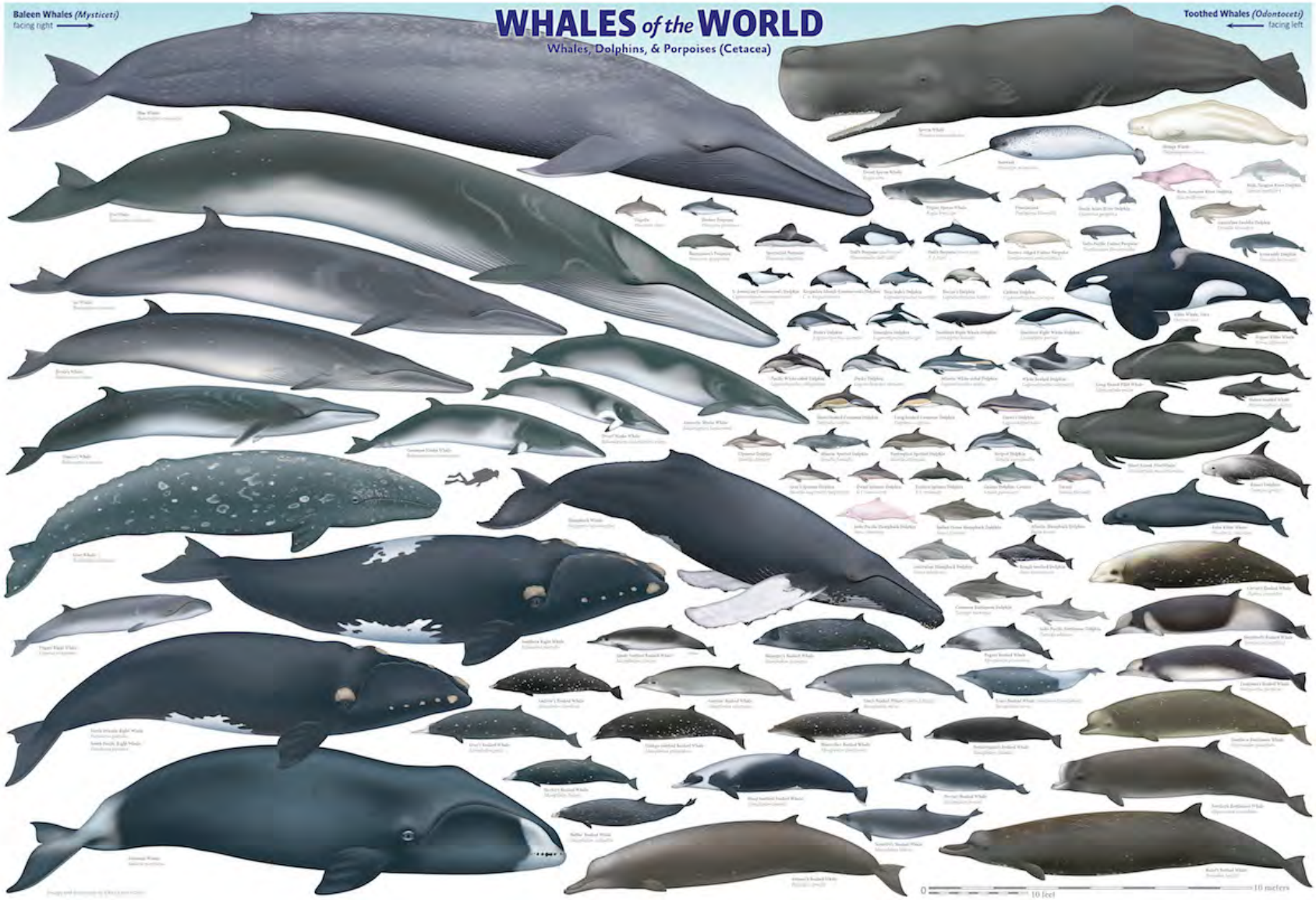
- Bathybatini
- Boulengerochromini
- Tylochromini
- Tilapiini
- Trematocarini
- Eretmodini
- Lamprologini
- Limnochromini
- Ectodini
- Tropheini (Haplochromini)
- Cyphotilapiini
- Perissodini
- Cyprichromini
- Benthochromini


Phyllostominae
Lonchorhininae
Lonchophyllinae
Glossophaginae
Desmodontinae
Micronycterinae
Glyphonycterinae
Macrotinae
Mormoopidae
Carolliinae
Rhinophyllinae
Noctilionidae
Stenodermatinae
5 10 15 20 25 30 35 40 45
Ma


Jonathan Kingdon
CARNIVORES
of AFRICA


Jonathan Kingdon
PRIMATES of AFRICA
KORCK PUBLISHING

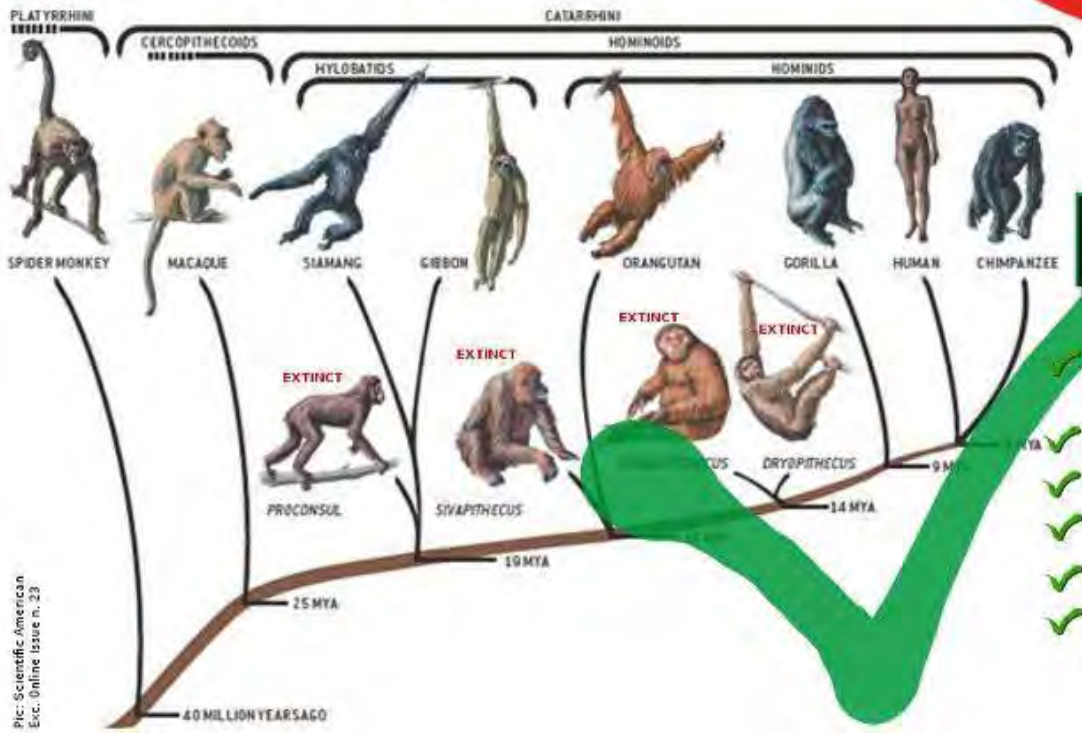

A
Killer whale
Lesser mouse-deer
Pronghorn
Okapi
Giraffe
Roe deer
Reindeer
White-tailed deer
White-lipped deer
Milu
Chinese muntjac
Indian muntjac
Black muntjac
Forest musk deer
African buffalo
Cattle
Yak
Lesser kudu
Common eland
Greater kudu
Bushbuck
Sitatunga
Mountain nyala
Bongo
Impala
Suni
Klipspringer
Royal antelope
Kirk's dik-dik
Steenbok
Przewalski's gazelle
Oribi
Thomson's gazelle
Grant's gazelle
Gerenuk
Springbok
Maxwell's duiker
Harvey's duiker
Common duiker
Bohor reedbuck
Defassa waterbuck
Gemsbok
Blue wildebeest
Topi
Hartebeest
Tibetan antelope
Argali
Sheep
Barbary sheep
Blue sheep
Ibex
Goat
Capreolinae
Cervinae
Muntiacinae
Bovinae
Aepycerotinae
Antilopinae
Cephalophinae
Reduncinae
Hippotraginae
Alcelaphinae
Pantholopinae
Caprinae
Family
Tragulidae
Antilocapridae
Giraffidae
Cervidae
Moschidae
Bovidae
B
Cetacea
Tragulidae
Antilocapridae
Giraffidae
Cervidae
Moschidae
Bovidae
Eocene
Oligocene
Miocene
Pliocene
Quaternary
40
30
20
10
0
Million years ago


WHALES of the WORLD
Whales, Dolphins, & Porpoises (Cetacea)
Baleen Whales (Mysticeti)
facing right
Toothed Whales (Odontoceti)
facing left
0
10 feet
10 meters

Looking at human evolution

THIS IS NOT EVOLUTION

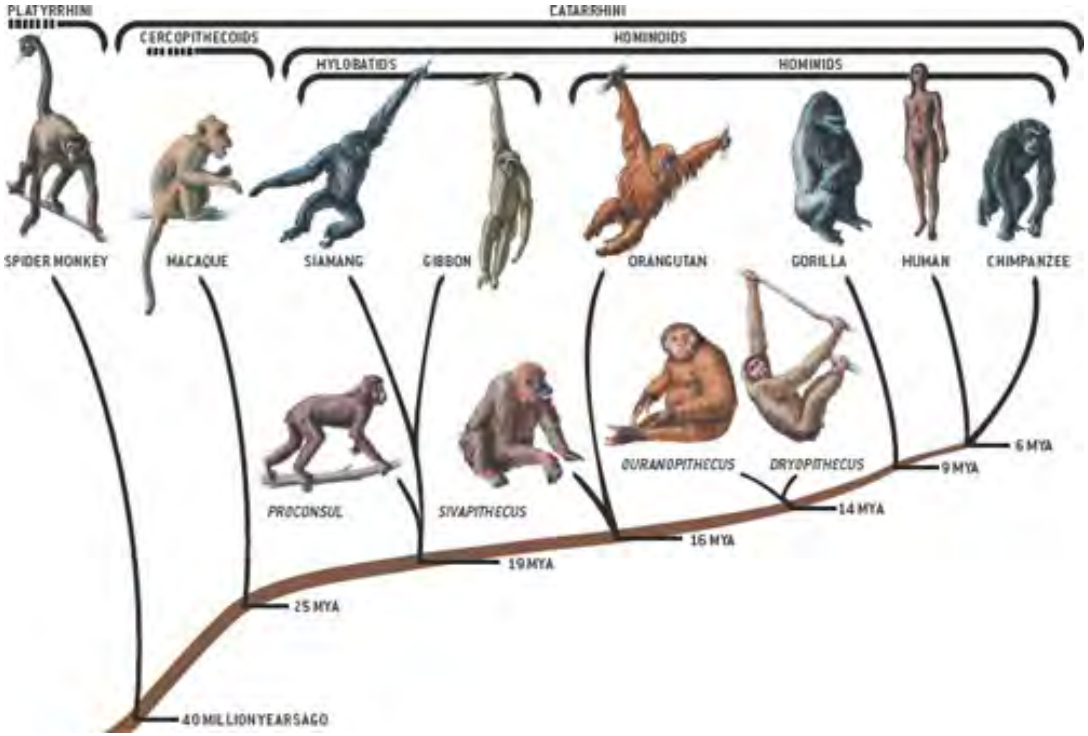
- This is *Scala Naturae*, an incorrect pre-evolutionary concept
- ⊘ Suggests progress, not adaptation
- ⊘ Human is a target, superior being
- ⊘ Ancestor being resembles a chimp
- ⊘ No branches or extinctions



THIS IS EVOLUTION

- ✓ Humans are not special. Just a species, not superior, "more evolved" or a target.
- ✓ Some species become extinct (99% of them)
- ✓ Chimps are not portraited as ancestors
- ✓ Individual beings do not change. Populations do
- ✓ Ancestor species branches into other species
- ✓ Adaptations might lead to smaller size, loss of unused features and extinction

suggests humans are not special but just another species













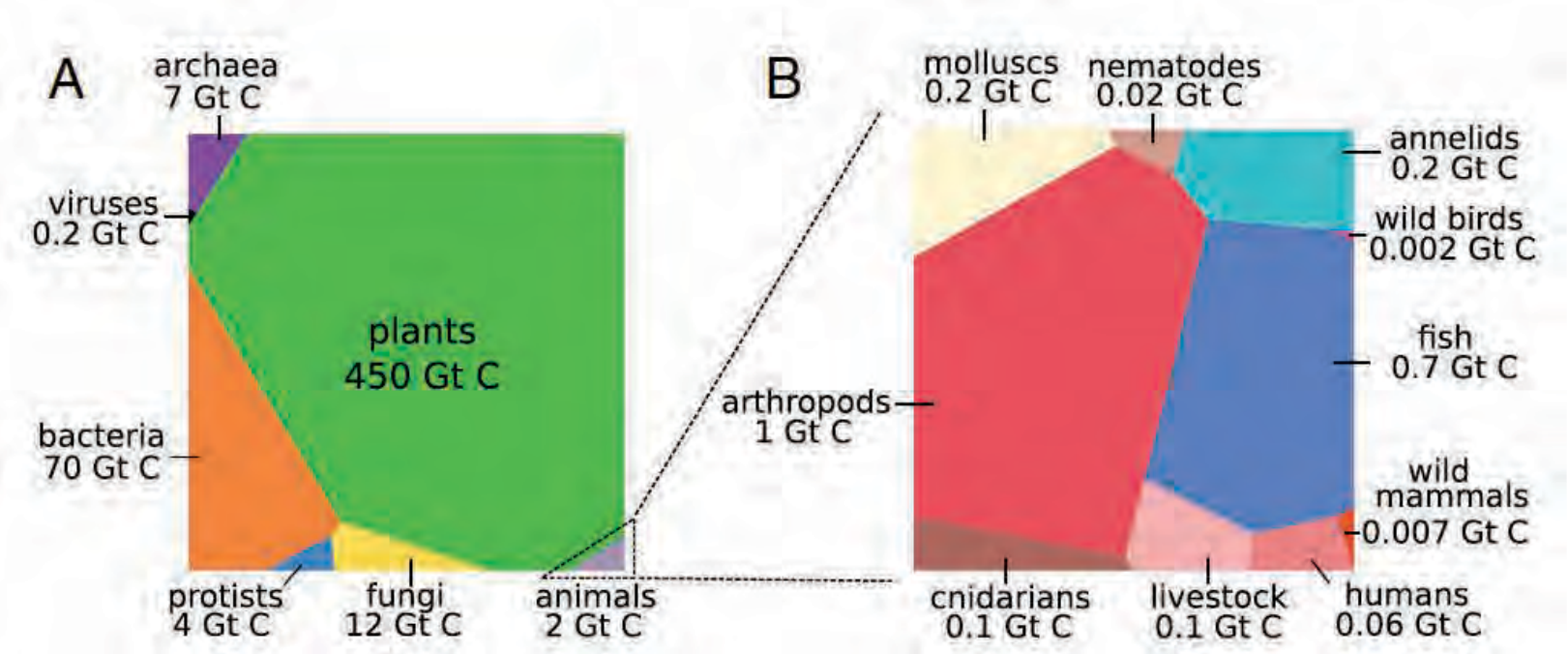


The state of the planet

The biomass distribution on Earth

Yinon M. Bar-On[a], Rob Phillips[b,c], and Ron Milo[a,1]

www.pnas.org/cgi/doi/10.1073/pnas.1711842115



estimate for reptiles similar magnitude as wild birds (but more assumptions; estimate for amphibians not possible)

The state of the planet

The biomass distribution on Earth

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www.pnas.org/cgi/doi/10.1073/pnas.1711842115

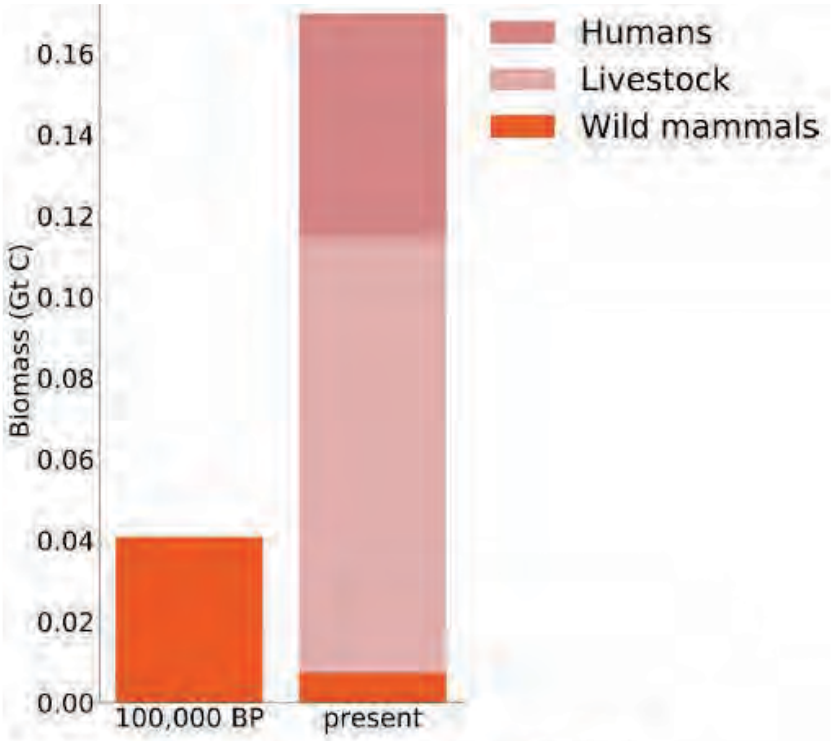
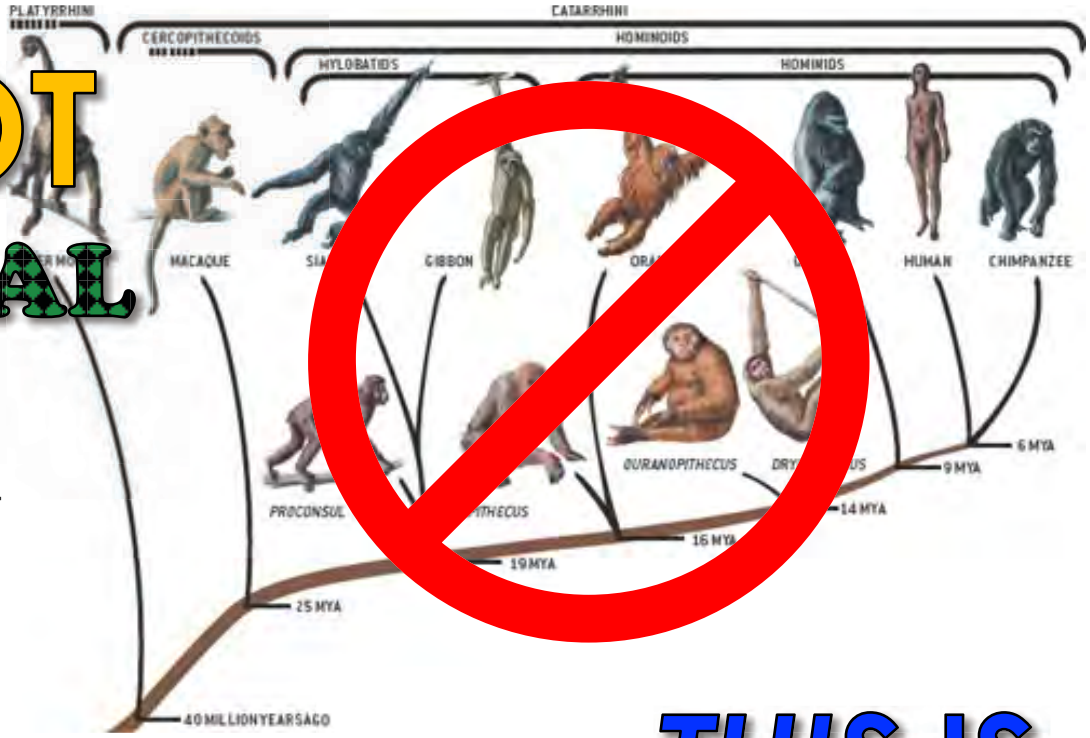


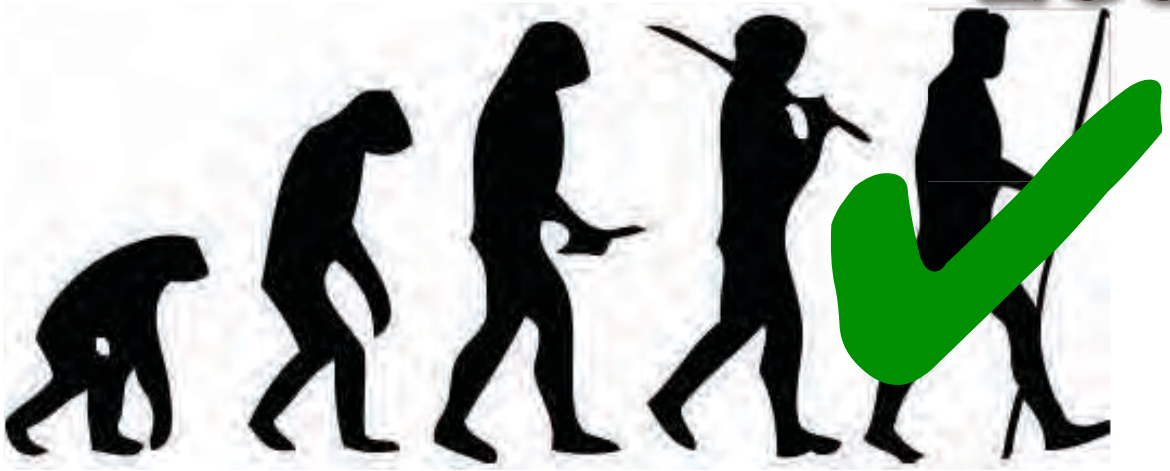
Fig. S5. The impact of human civilization on the biomass of mammals.

THIS IS NOT ECOLOGICAL REALITY



⊘ suggests humans are not special but just another species

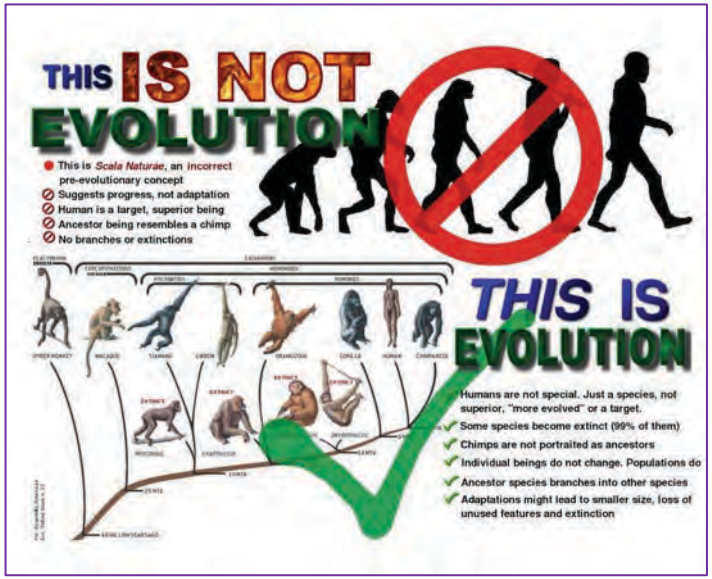
THIS IS ECOLOGICAL REALITY

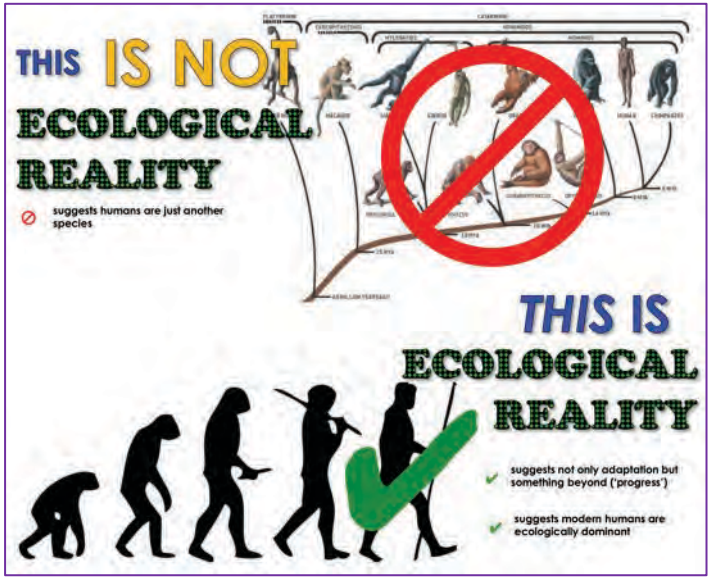


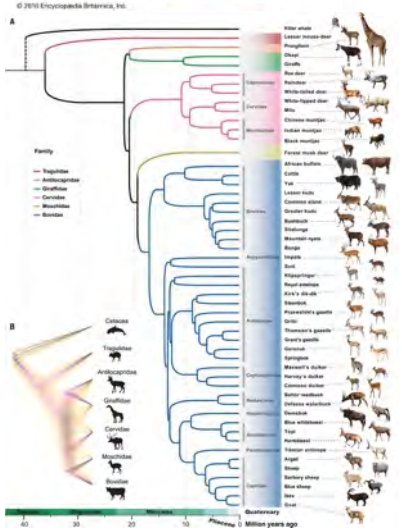
✔ suggests not only adaptation but something beyond ('progress')

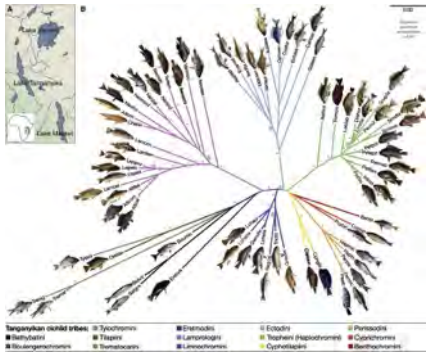
✔ suggests modern humans are ecologically dominant

The evolution of ecological dominance









Chimpanzees

Bonobos

Sahelanthropus tchadensis

Orrorin tugenensis

Ardipithecus

Australopithecus anamensis

Australopithecus afarensis

Adaptations for walking bipedally, smaller canine teeth

Australopithecus garhi

Enlarged cheek teeth and jaws

Australopithecus africanus

Paranthropus

Massive cheek teeth and jaws, enlarged chewing muscles

Homo habilis

Slightly larger brain (600 cc), more vertical face without a snout, fingers capable of precision grip, ability to make simple stone tools for processing food including meat

Homo erectus

Smaller jaws and cheek teeth, long legs and arched feet well-suited for long-distance walking and running, larger brain (Homo erectus brains range from 650 cc to 1200 cc)

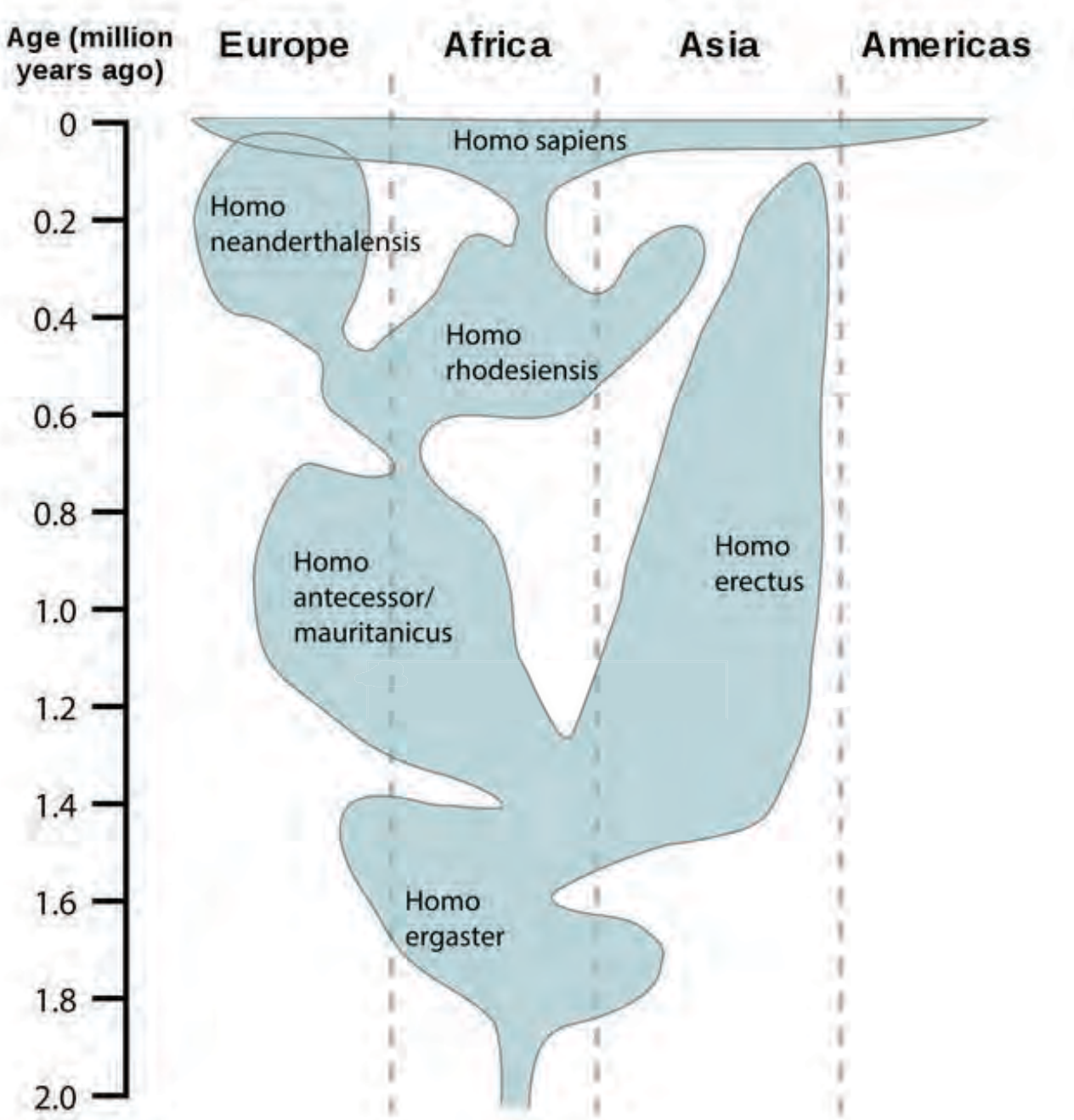
Homo neanderthalensis

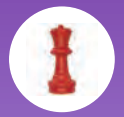
Homo heidelbergensis

Sophisticated stone flakes, tools for hunting, brain size increases to 1200 cc

Homo sapiens

Large brain (1400 cc), small face tucked below brain case, rounded cranial vault, small brow-ridges, capacity for art, symbolic thought, full-blown language


Age (million years ago)
Europe
Africa
Asia
Americas
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Homo sapiens
Homo neanderthalensis
Homo rhodesiensis
Homo antecessor/ mauritanicus
Homo erectus
Homo ergaster



Bursts of radiation occur when a life form meets ***a series of niches*** *that is not occupied/ occupied by a lesser solution.*

The niche concept

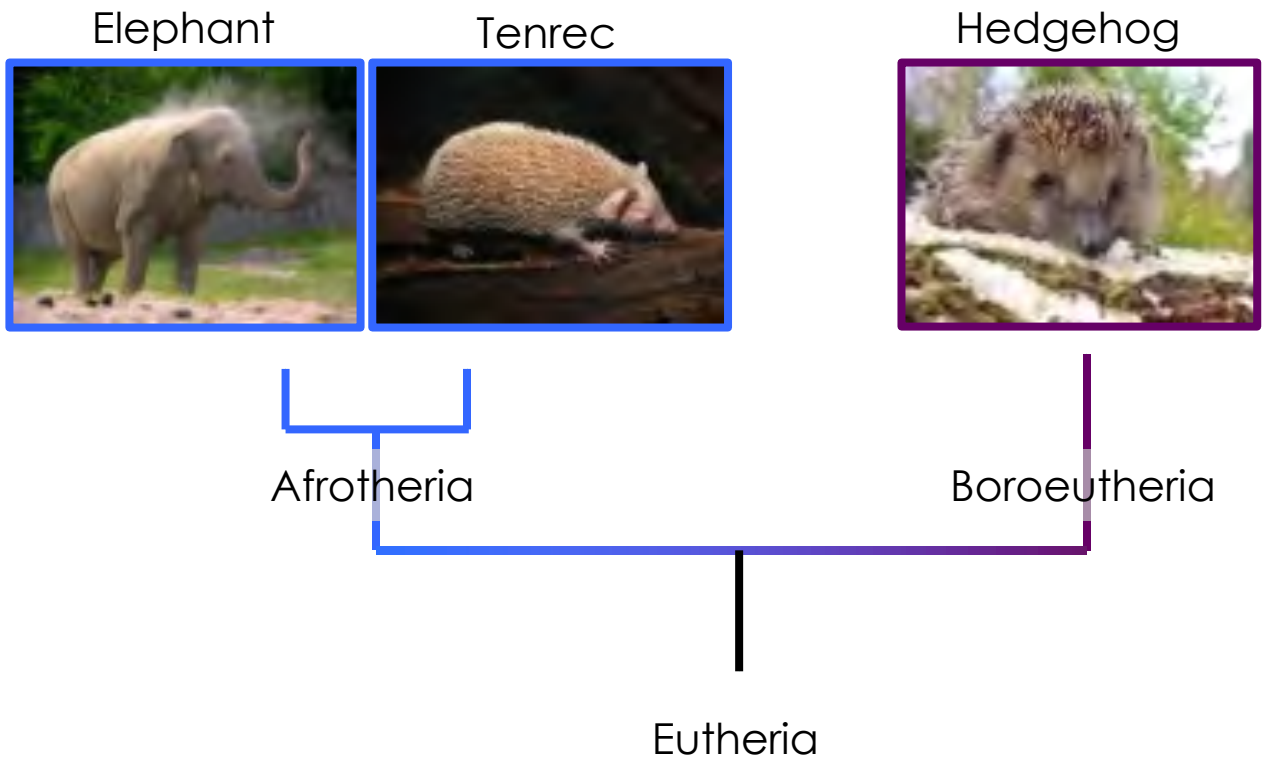
Who is the odd one out?

Elephant

Tenrec

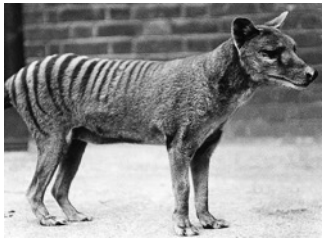
Hedgehog

Ecological niches!



Marsupials	Afrotheria	Boroeutheria
		
		
		
		
		

Marsupials Afrotheria Boroeutheria



Dealing with resources

By which means can organisms become more efficient?

adapting to optimal resource use
(niche specificity)

The Human Ecological Niche

DONALD L. HARDESTY

AMERICAN ANTHROPOLOGIST

1972

Man is not specialized for a specific physical environment;

Dealing with resources

By which means can organisms become more efficient?

adapting to optimal resource use ***(niche specificity)***

The Niche Concept: Suggestions for Its Use in Human Ecology

Donald L. Hardesty[1]

Human Ecology, Vol. 3, No. 2, 1975

The calculation of niche width from subsistence data is discussed, and examples are given from several human groups with reference to total resource variety, resource variety in space, and resource variety in time.

Dealing with resources

By which means can organisms become more efficient?

adapting to optimal resource use
(niche specificity)

The Human Ecological Niche

"generalism"
"cooperation"
"culture"

?

Dealing with resources

By which means can organisms become more efficient?

adapting to optimal resource use
(niche specificity)

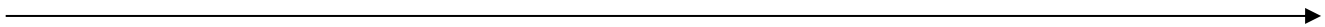
controlling a broad set of resources
(niche generalism)
"super-niche" emergence

Dealing with resources

By which means can organisms become more efficient?

adapting to optimal resource use
(niche specificity)

controlling a broad set of resources
(niche generalism)
"super-niche" emergence



Probabilistic directionality IV: from use towards control

Hypothesis:
The characteristics required to facilitate 'resource control' are of such a generic nature, and independent of any specific resource itself, that ***no several 'control niches' exist****.*
There is no room for several species.

Changing the taxonomic level

adapting to optimal resource use
(niche specificity)

controlling a broad set of resources
(niche generalism)
"super-niche" emergence

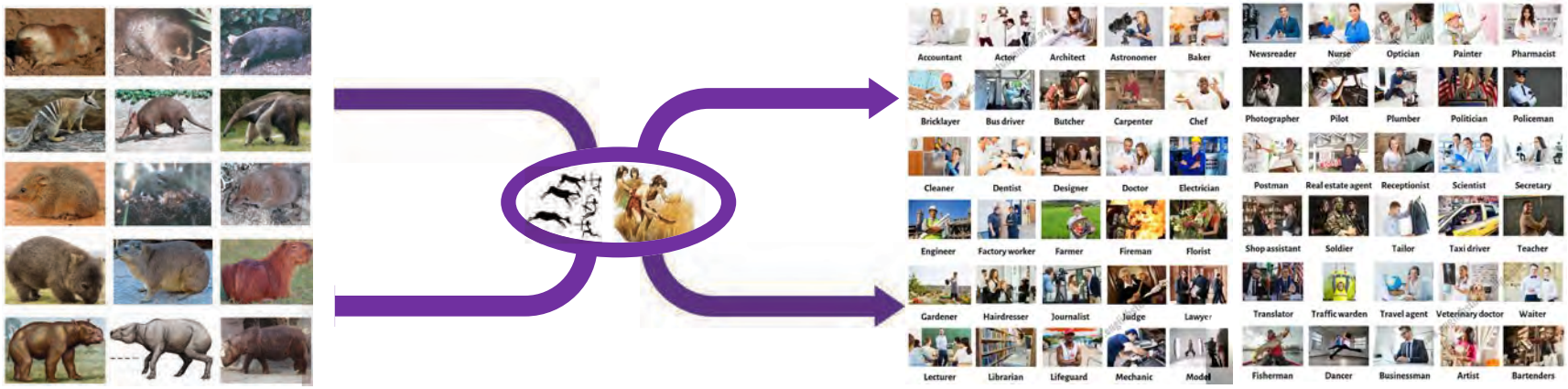
niche specificity between species

niche specificity within the single species

Changing the taxonomic level

adapting to optimal resource use
(niche specificity)

controlling a broad set of resources
(niche generalism)
"super-niche" emergence



niche specificity between species

niche specificity within the single species

Adaptation ➟ ➟ ➟ ➟ ➟ ➟ Control

adapting to resource use
(niche specificity)

(general and)
specific
- energetics
- locomotion
- feeding apparatus
- insulation
- surface color/pattern
- digestion / detox enzymes
- behavioural cues

resource control
(niche generalism)

- territory / mate defence






Adaptation ➟ ➟ ➟ ➟ ➟ ➟ Control

adapting to resource use
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resource control
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- territory / mate defence
- den / nest / bed






Adaptation ➟ ➟ ➟ ➟ ➟ ➟ Control

adapting to resource use *(niche specificity)*

(general and)
specific
- energetics
- locomotion
- feeding apparatus
- insulation
- surface color/pattern
- digestion / detox enzymes
- behavioural cues

resource control *(niche generalism)*

- territory / mate defence
- den / nest / bed
- storage / caching






Adaptation ➟ ➟ ➟ ➟ ➟ ➟ Control

adapting to resource use *(niche specificity)*

(general and)
specific
- energetics
- locomotion
- feeding apparatus
- insulation
- surface color/pattern
- digestion / detox enzymes
- behavioural cues

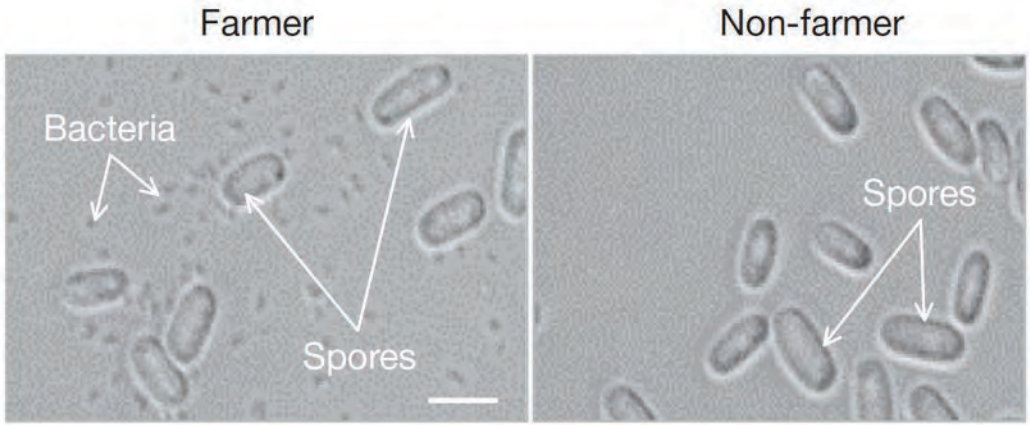
resource control *(niche generalism)*

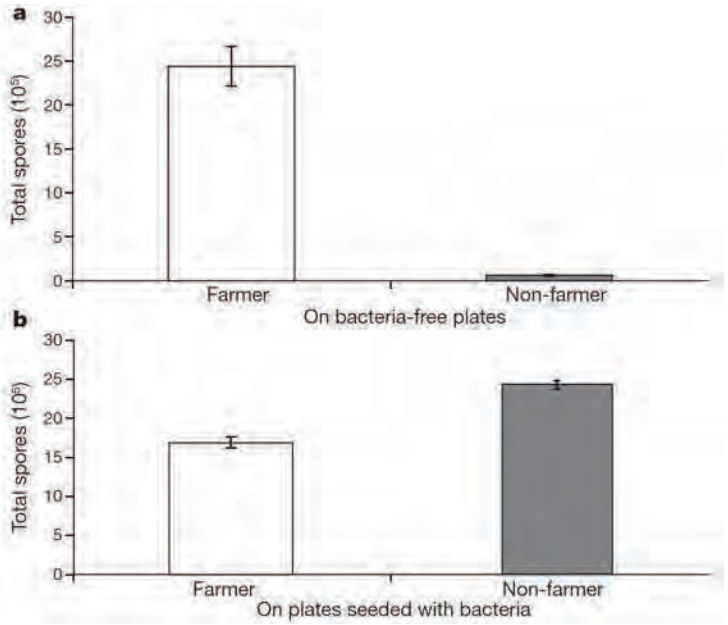
- territory / mate defence
- den / nest / bed
- storage / caching
- agriculture

Primitive agriculture in a social amoeba

Debra A. Brock[1], Tracy E. Douglas[1], David C. Queller[1] & Joan E. Strassmann[1]

20 JANUARY 2011 | VOL 469 | NATURE | 393

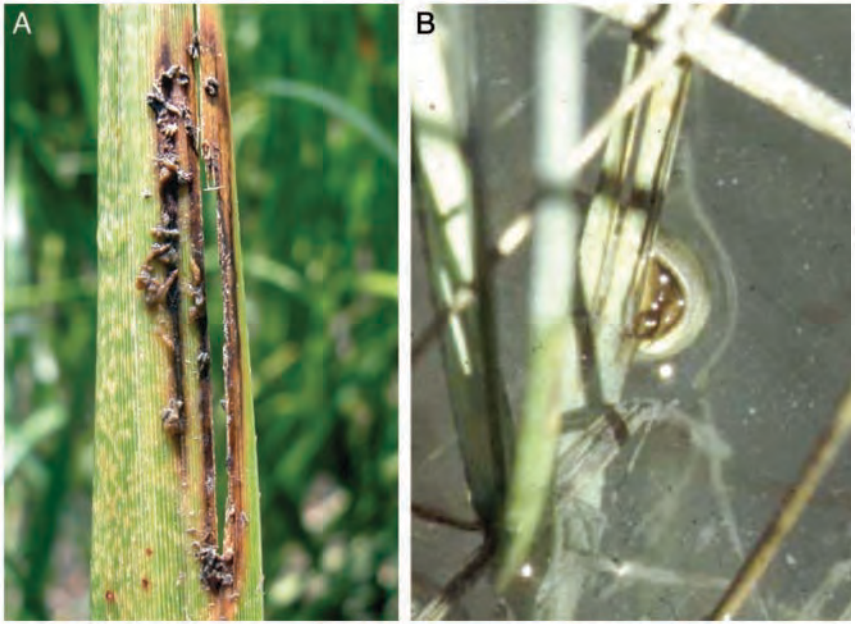


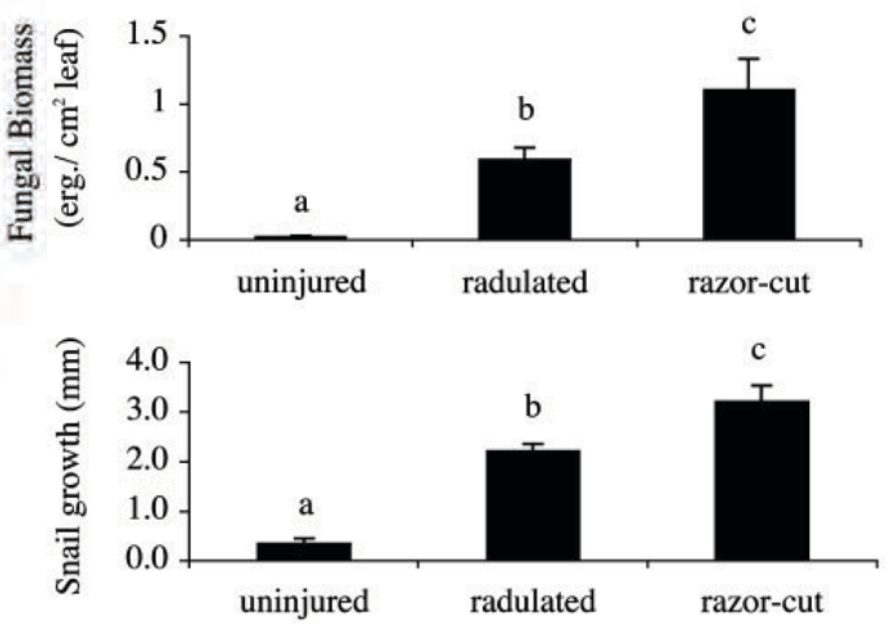


Fungal farming in a snail

Brian R. Silliman*† and Steven Y. Newell‡

PNAS | December 23, 2003 | vol. 100 | no. 26 | 15643–15648

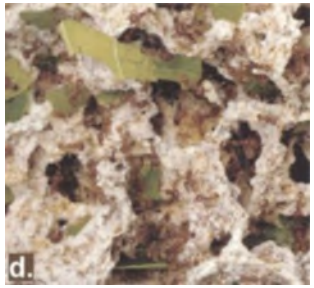




The Evolution of Agriculture in Insects

Ulrich G. Mueller,[1,2] Nicole M. Gerardo,[1,2,3]
Duur K. Aanen,[4] Diana L. Six,[5] and Ted R. Schultz[6]

Annu. Rev. Ecol. Evol. Syst. 2005. 36:563–95

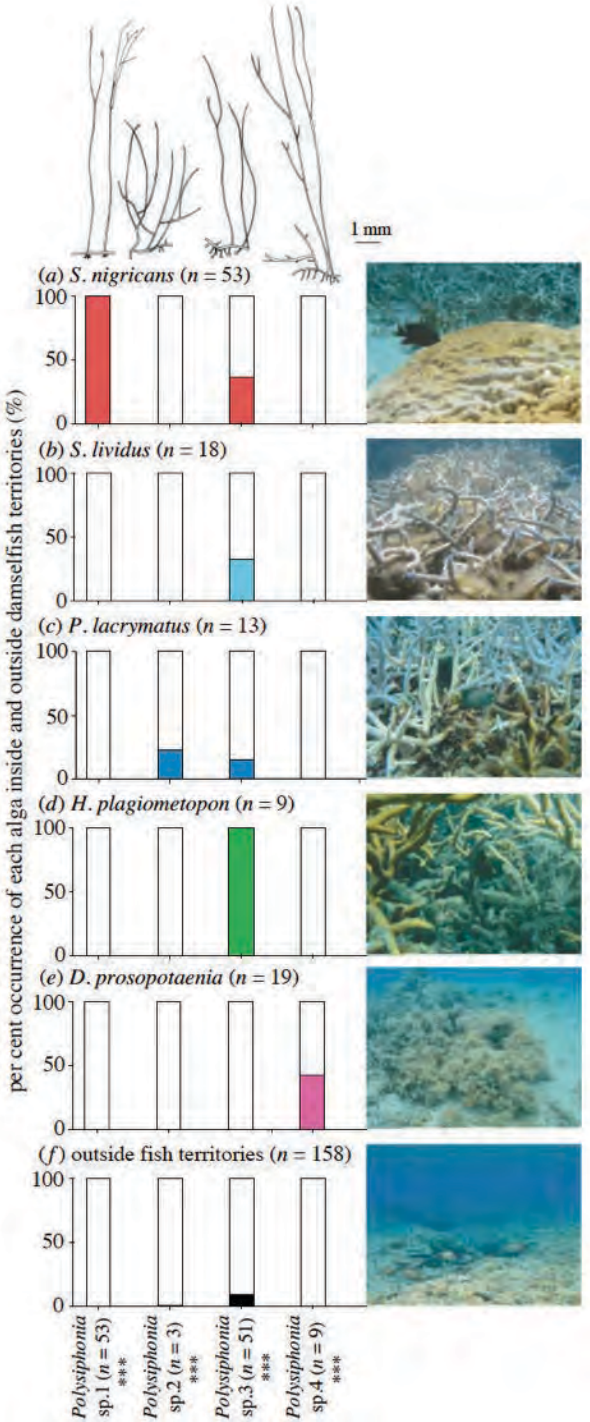


biology letters

Biol. Lett. (2006) **2**, 593–596
doi:10.1098/rsbl.2006.0528
Published online 7 August 2006

A novel obligate cultivation mutualism between damselfish and *Polysiphonia* algae

Hiroki Hata[†,*] **and Makoto Kato**



Adaptation ➟ ➟ ➟ ➟ ➟ ➟ Control

adapting to optimal resource use
(niche specificity)

resource control
(niche generalism)

HOW DID HUMANS EVOLVE?

Reflections on the Uniquely Unique Species

Richard D. Alexander
MUSEUM OF ZOOLOGY, THE UNIVERSITY OF MICHIGAN
SPECIAL PUBLICATION NO. 1
1990

The Importance of Ecological Dominance

Anthropologists have long described humans as the species that, rather than simply living in a certain environment, or choosing one, most explicitly creates its own environment. And they have also noted that, as a result, humans have long been able to live almost anywhere they pleased on the face of the earth. In other words, the human species is so ecologically dominant that it can mold, manipulate, or even remove aspects of its environment—including other living forms—more or less at will. This is just another way of saying that humans have so reduced the significance of what Darwin saw as the external "hostile forces of nature," or the forces of natural selection, that other humans very well could have assumed the role of the principal "hostile force of nature," at least most of the time and insofar as evolution of the intellect is concerned (see also Alexander, 1989b).

Ecological dominance, social competition, and coalitionary arms races: Why humans evolved extraordinary intelligence

Mark V. Flinn[a,b,*], David C. Geary[b], Carol V. Ward[a,c]

Evolution and Human Behavior 26 (2005) 10–46

Richard Alexander proposed a comprehensive integrated explanation. He argued that as our hominin ancestors became increasing able to master the traditional "hostile forces of nature," selective pressures resulting from competition among conspecifics became increasingly important, particularly in regard to social competencies.

via cooperation

We term this scenario the "ecological dominance–social competition" (EDSC) model

via cooperation

Attributes of humans that may provide clues to our evolution

I. Unusual speciation and extinction pattern

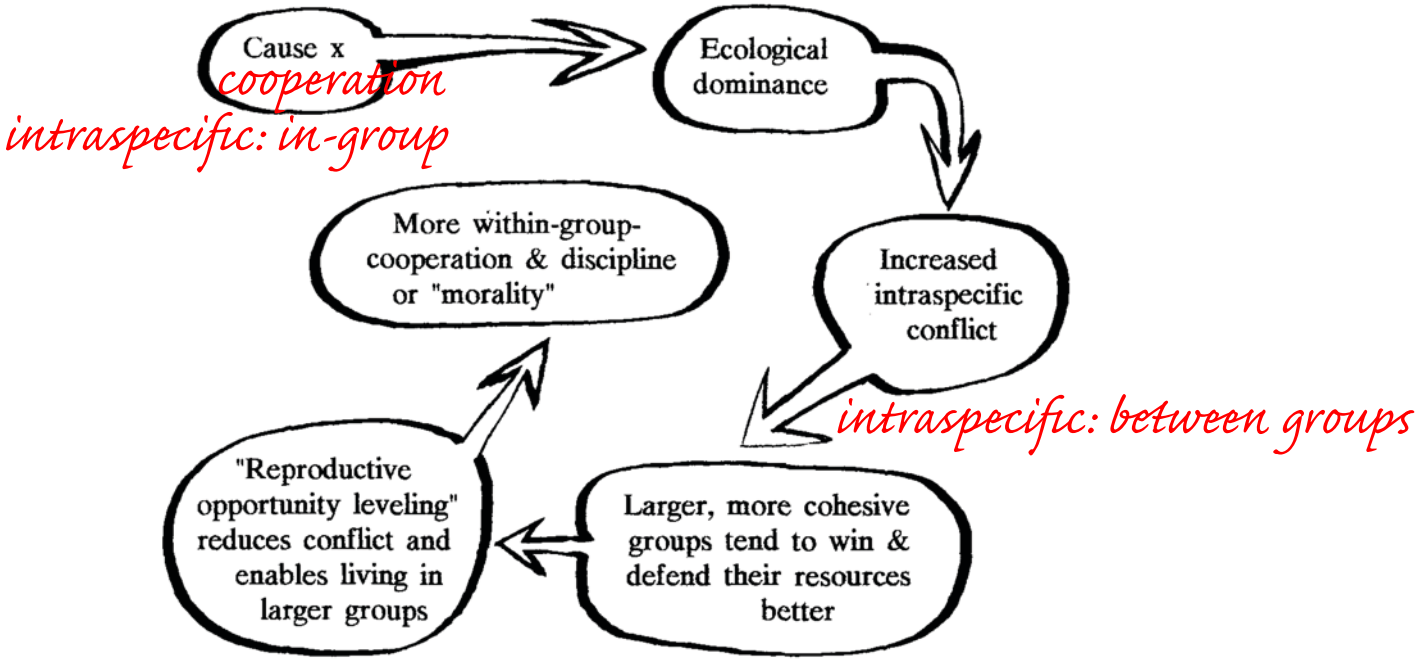
A. No remaining ancestral species or side branches; absence of adaptive radiation in Homo (White, 2003) despite rapid evolutionary change.

Ecological Dominance and the Final Sprint in Hominid Evolution

HUMAN EVOLUTION
Vol. 8 - N. 4 (265-273) - 1993

P. Slurink

Alexander does not make clear *what* (cause X) made our ancestors "ecologically dominant" and *when*.



It should become clear what enabled them to become "ecologically dominant"

Ecological dominance, social competition, and coalitionary arms races: Why humans evolved extraordinary intelligence

Mark V. Flinn[a,b,*], David C. Geary[b], Carol V. Ward[a,c]

Evolution and Human Behavior 26 (2005) 10–46

Although our hominin ancestors were not equipped with exceptional teeth, horns, strength, armor, speed, or size, at some point, they nonetheless may have begun achieving relative freedom from the traditional hostile forces of nature, perhaps even more so than our hominoid relatives, the gorillas and chimpanzees. The means by which hominins increased ecological dominance probably involved behavioral adaptations (e.g., tool use and projectile weapons; see *Hominin fossil record* below).

cooperation

Adaptation ➟ Ecological Dominance ➟ Control

adapting to optimal resource use
(niche specificity)

ultimate predator
(by cooperation, fire, distance weaponry)

resource control
(niche generalism)


5

Adaptation ➟ Ecological Dominance ➟ Control

adapting to optimal resource use ***(niche specificity)***

ultimate predator
(by cooperation, fire, distance weaponry)

resource control ***(niche generalism)***

Evolution of Coalitionary Killing

RICHARD W. WRANGHAM

YEARBOOK OF PHYSICAL ANTHROPOLOGY 42:1-30 (1999)

BORN TO THROW: THE ECOLOGICAL CAUSES THAT SHAPED THE EVOLUTION OF THROWING IN HUMANS

MICHAEL P. LOMBARDO ROBERT O. DEANER

The Quarterly Review of Biology, March 2018 Vol. 93, No. 1

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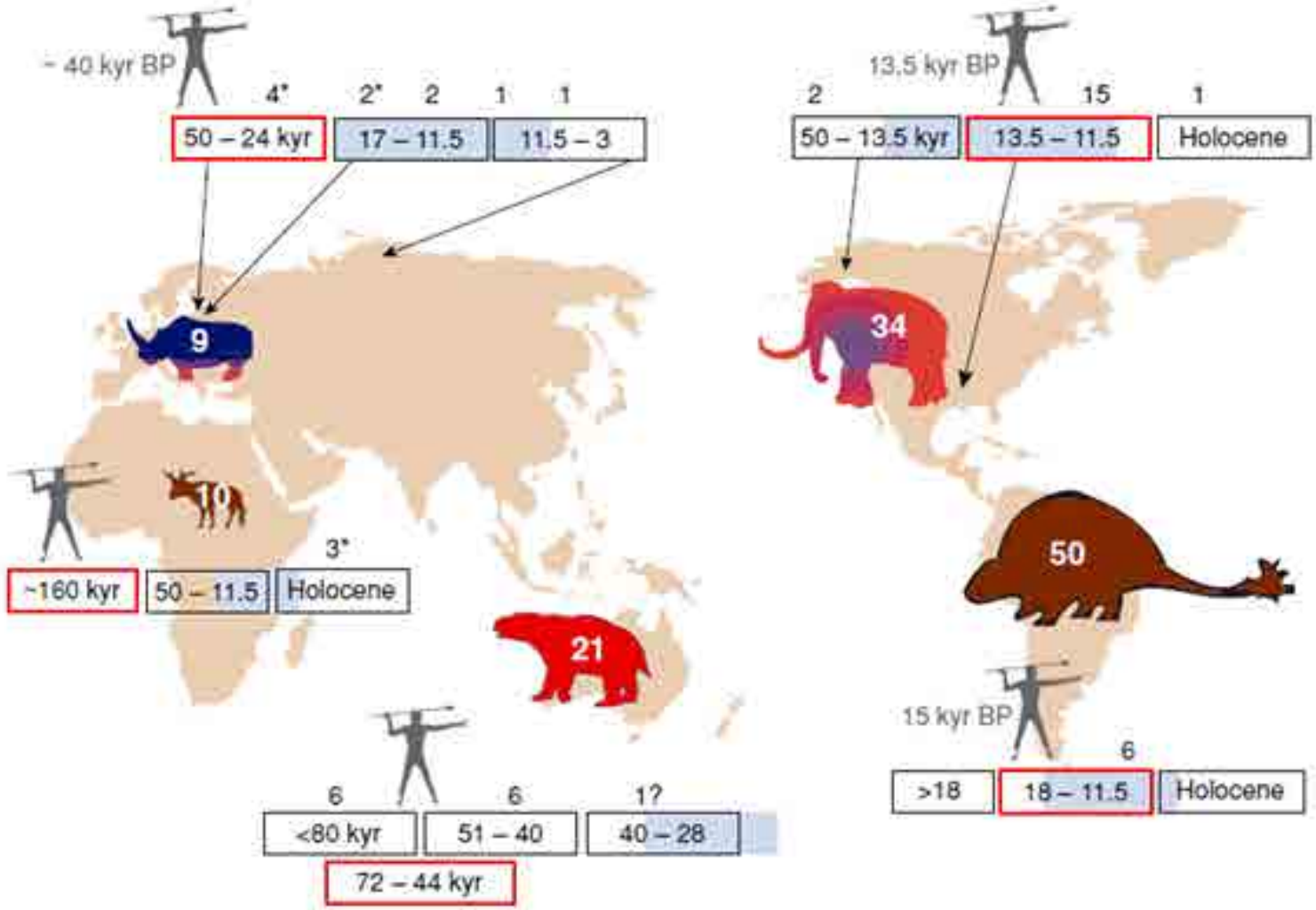
The Quarterly Review of Biology, March 2018 Vol. 93, No. 1

Human Evolution and Human History: A Complete Theory

PAUL M. BINGHAM

Evolutionary Anthropology 2000

Remote killing competence allows many animals to attack a target animal simultaneously. Under these special conditions, the risk to individual attackers is reduced as the square of their number.



Causes of extinction

- Humans
- Climate
- Insufficient data

Relative size of extinct-taxon icon corresponds to relative magnitude of extinction. Number of extinct genera is listed on each icon.

Correlations in time

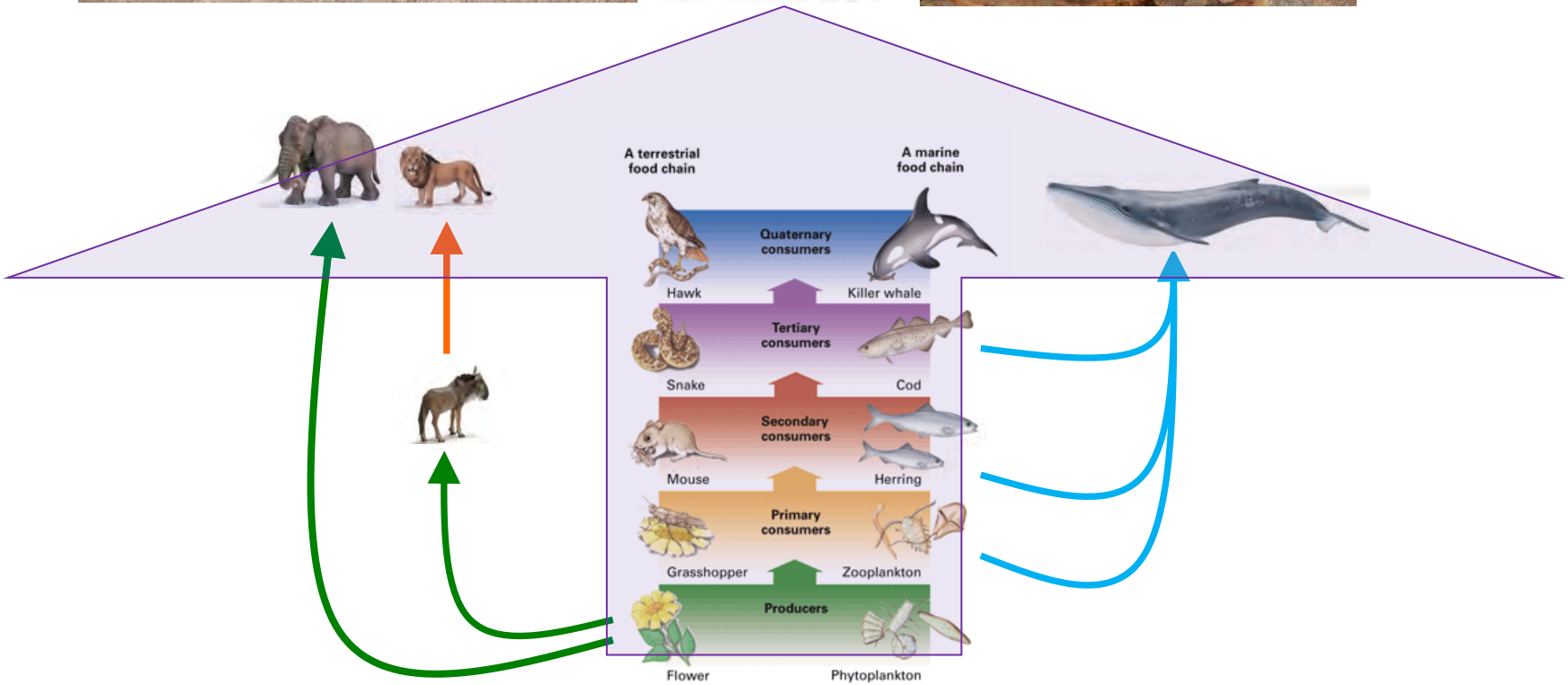
- Humans arrive
- Climatic change

Numbers indicate how many genera have robust dating control evidence except as indicated:

- * Provisional evidence
- ? Needs more work

Banorsky et al. (2004)

Food chain dominance



Adaptation ➟ Ecological Dominance Social Competition ➟ Control

adapting to optimal resource use
(niche specificity)

ultimate predator
(by cooperation, fire, distance weaponry)

resource control
(niche generalism)

Evolution of Coalitionary Killing

RICHARD W. WRANGHAM

YEARBOOK OF PHYSICAL ANTHROPOLOGY 42:1-30 (1999)

The evolution of lethal intergroup violence

Raymond C. Kelly*

PNAS | October 25, 2005 | vol. 102 | no. 43

resources.[7] Thus, although intercommunity dominance "tends to lead to increased fitness of the killers through improved access to resources such as food, females, or safety" (ref. 6, p. 12), territorial gain is the critical ingredient for the realization of this fitness enhancement.

Human Evolution and Human History: A Complete Theory

PAUL M. BINGHAM

Evolutionary Anthropology 2000

. . . weaponry innovations are not merely permissive here. They actually drive the emergence of a new scale or level of social cooperation . . .

Adaptation ➟ Ecological Dominance Social Competition ➟ Control

adapting to optimal resource use
(niche specificity)

more efficient threat to other groups

ultimate predator

(by cooperation, fire, distance weaponry)

less intra-group violence

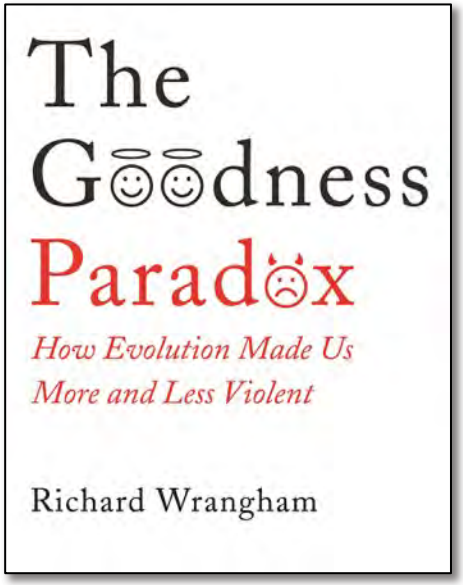
better cooperation

resource control
(niche generalism)

Two types of aggression in human evolution

Richard W. Wrangham[a,1]

PNAS | January 9, 2018 | vol. 115 | no. 2 | 245–253



"A hydrogen bomb is an example of mankind's enormous capacity for friendly cooperation."

Bigelow (1968)


Volleyball

Adaptation ➟ Ecological Dominance Social Competition ➟ Control

adapting to optimal resource use
(niche specificity)

ultimate predator
(by cooperation, fire, distance weaponry)

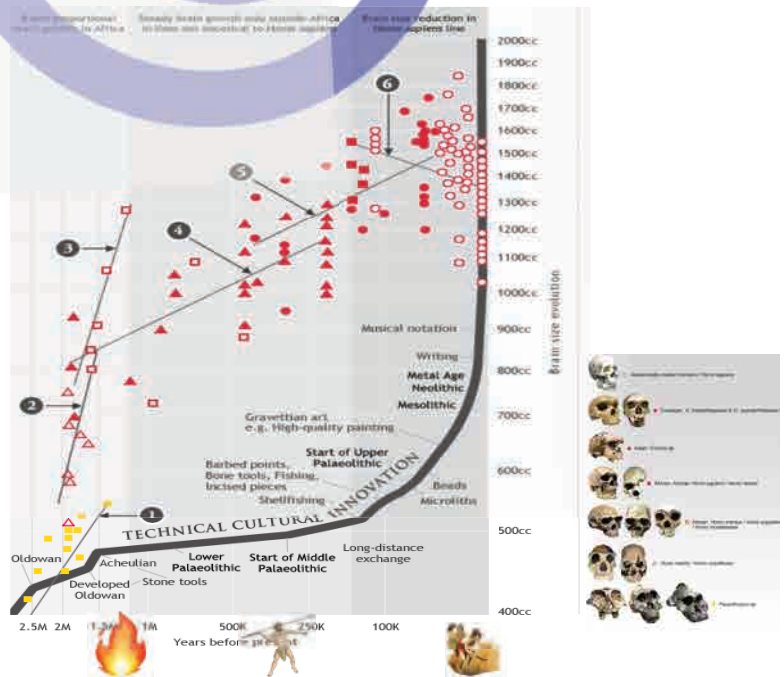
resource control
(niche generalism)

Adaptation ➟ Ecological Dominance Social Competition ➟ Control

adapting to optimal resource use ***(niche specificity)***

ultimate predator
(by cooperation, fire, distance weaponry)

resource control ***(niche generalism)***



Adaptation ➟ Ecological Dominance Social Competition ➟ Control

adapting to optimal resource use ***(niche specificity)***

ultimate predator
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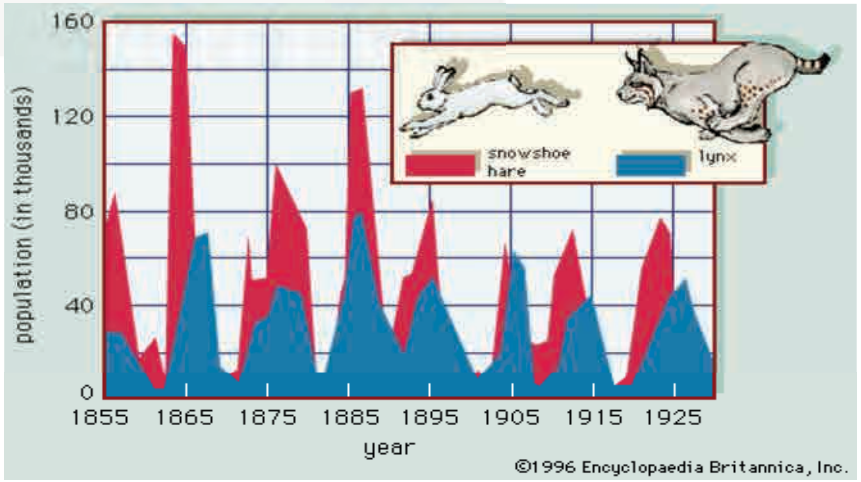
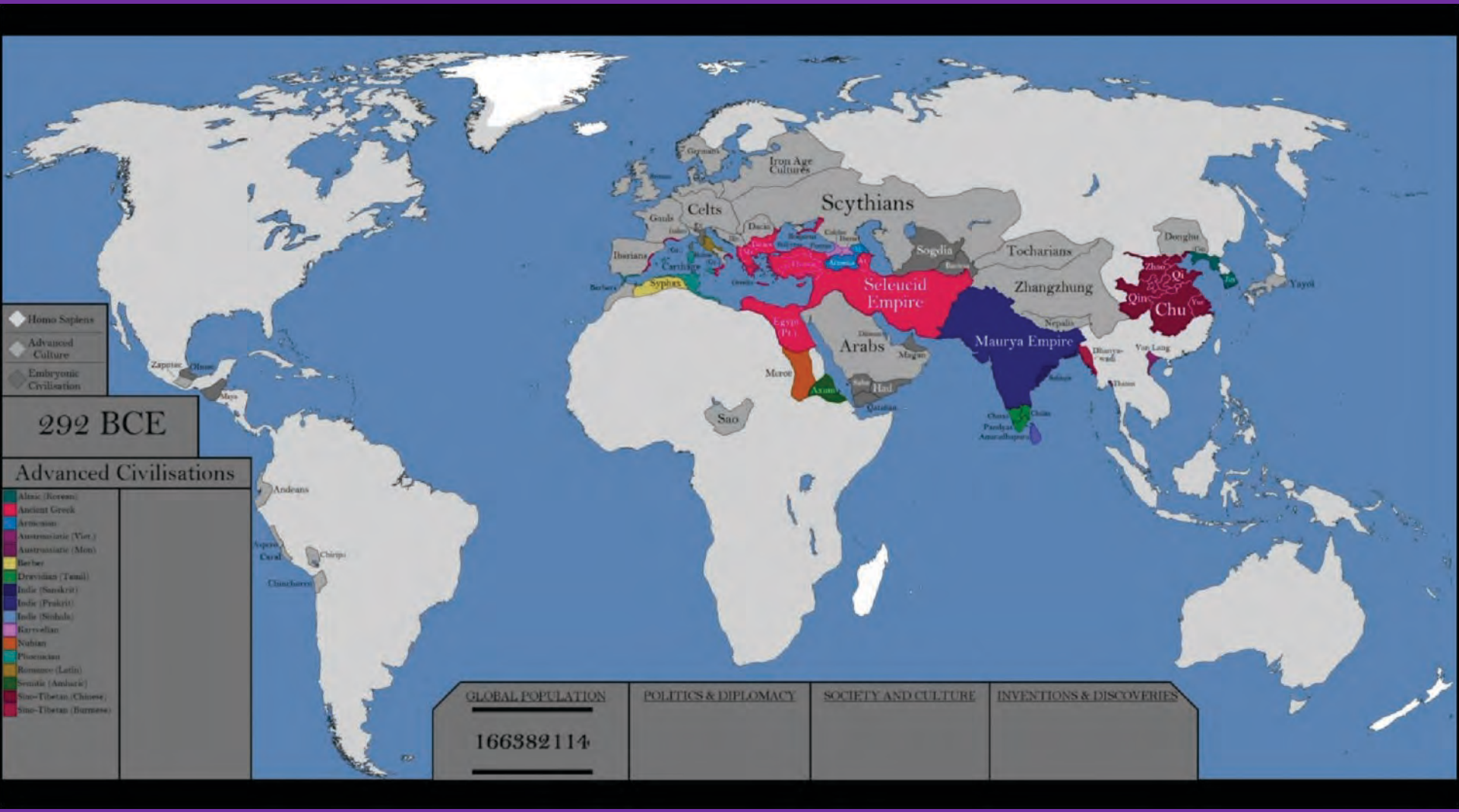
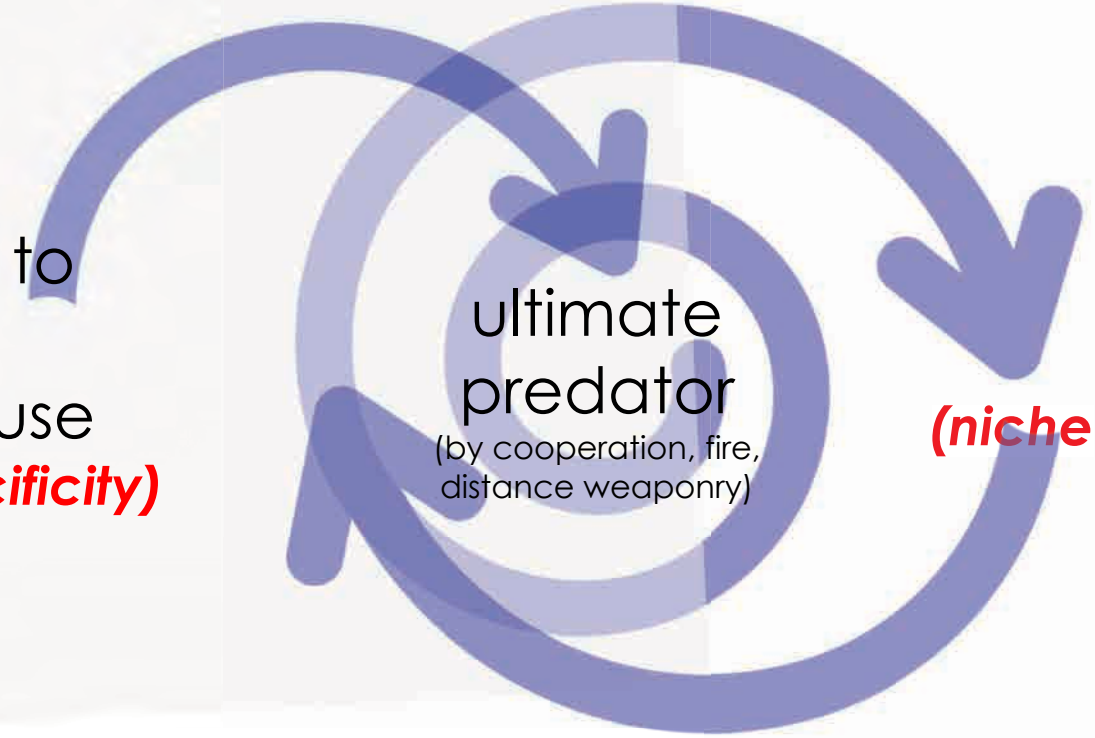


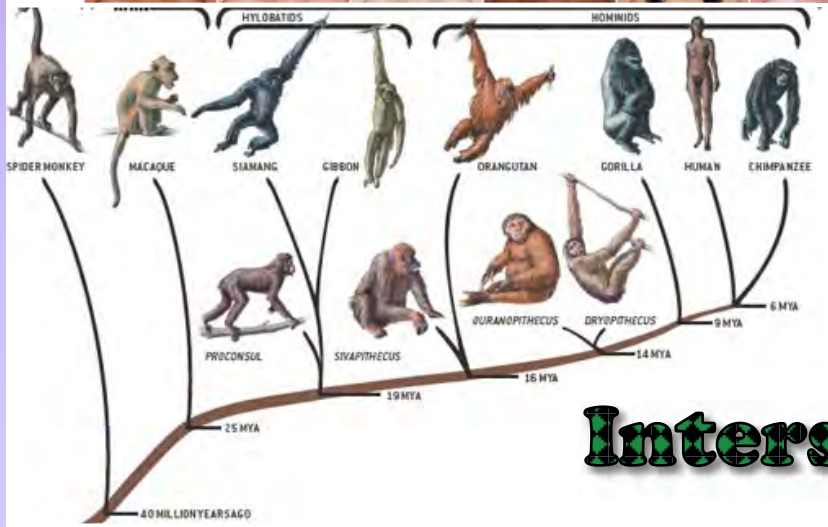

Homo Sapiens
Advanced Culture
Embryonic Civilisation
292 BCE
Advanced Civilisations
Ainu (Korean)
Ancient Greek
Armenian
Austroasiatic (Viet.)
Austronesiatic (Mon)
Berber
Dravidian (Tamil)
Indic (Sanskrit)
Indic (Prakrit)
Indic (Sinhala)
Kartvelian
Nubian
Phoenician
Romance (Latin)
Semitic (Amharic)
Sino-Tibetan (Chinese)
Sino-Tibetan (Burmese)
Iron Age Cultures
Celts
Scythians
Seleucid Empire
Arabs
Maurya Empire
Sogdia
Tocharians
Zhangzhung
Chu
Qin
Sao
Andeans
GLOBAL POPULATION
166382114
POLITICS & DIPLOMACY
SOCIETY AND CULTURE
INVENTIONS & DISCOVERIES

Adaptation ➟ Ecological Dominance Social Competition ➟ Control

adapting to optimal resource use
(niche specificity)

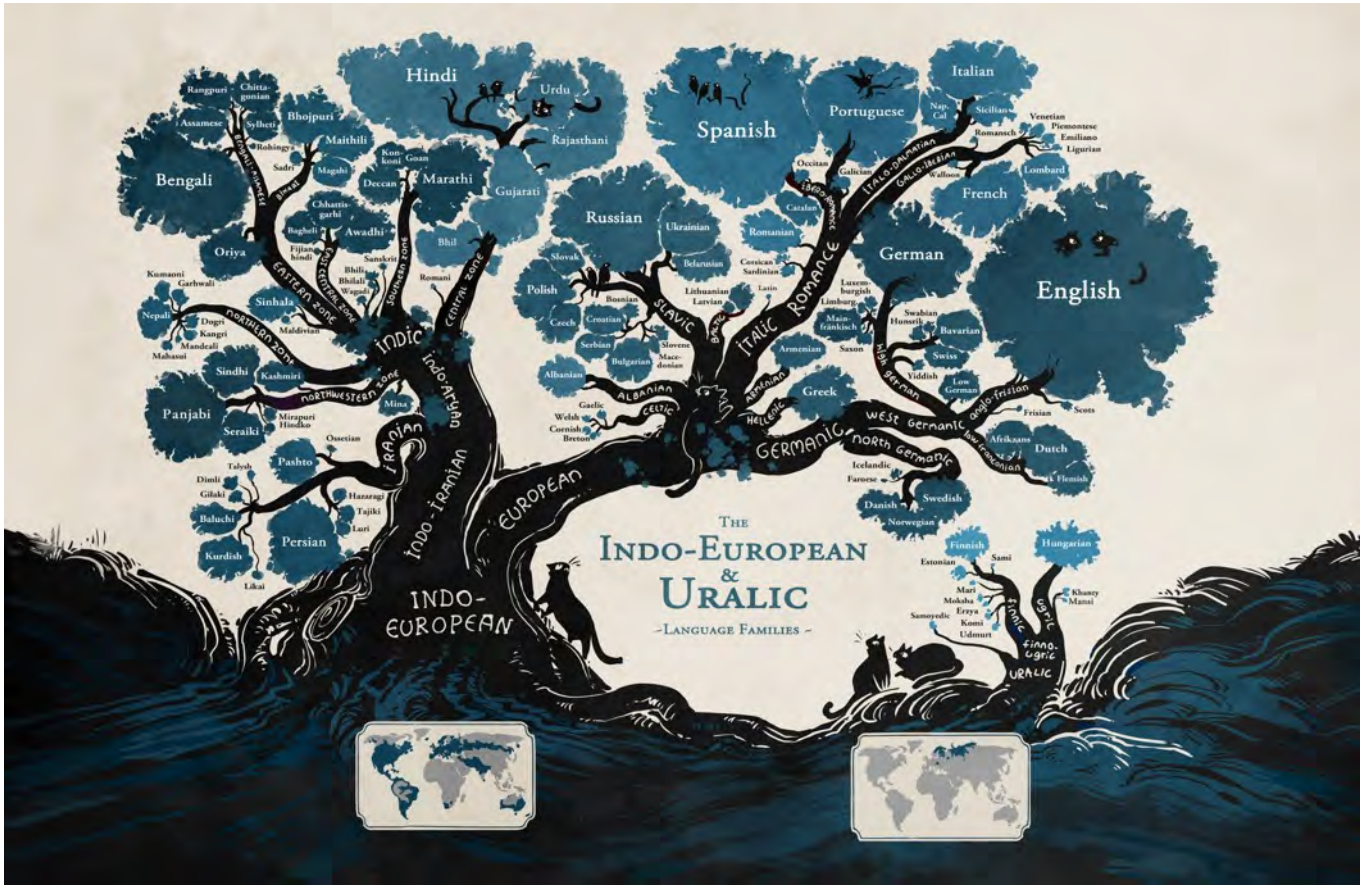


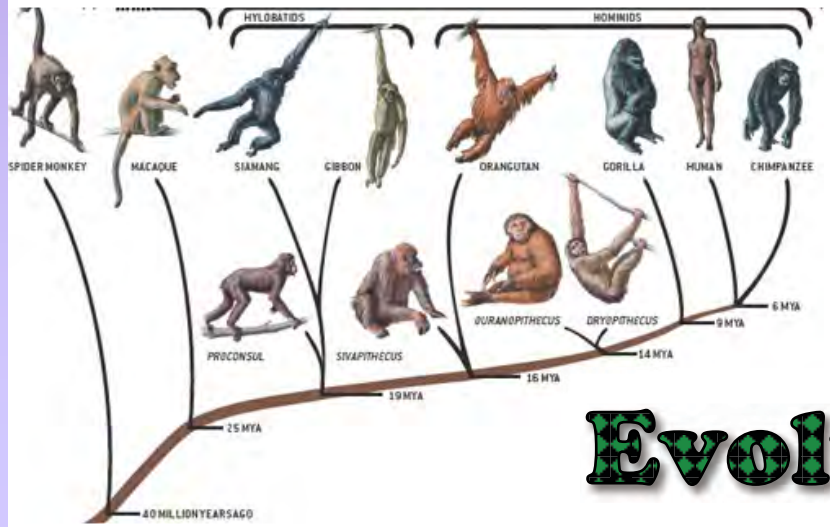
resource control
(niche generalism)



... becomes intraspecific biology

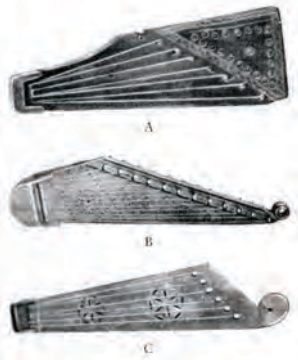
Interspecific biology ...

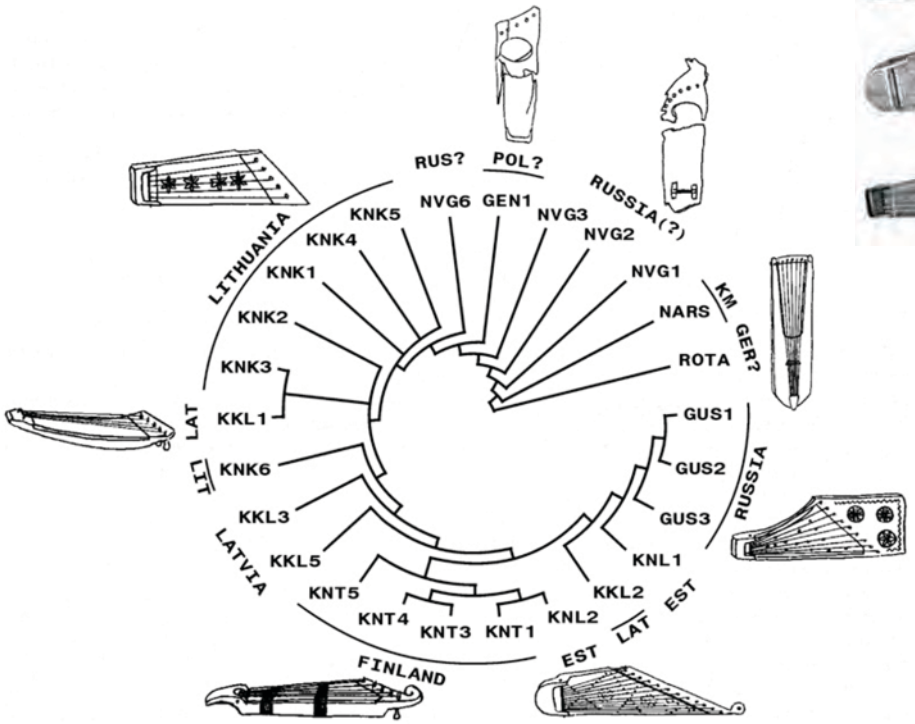


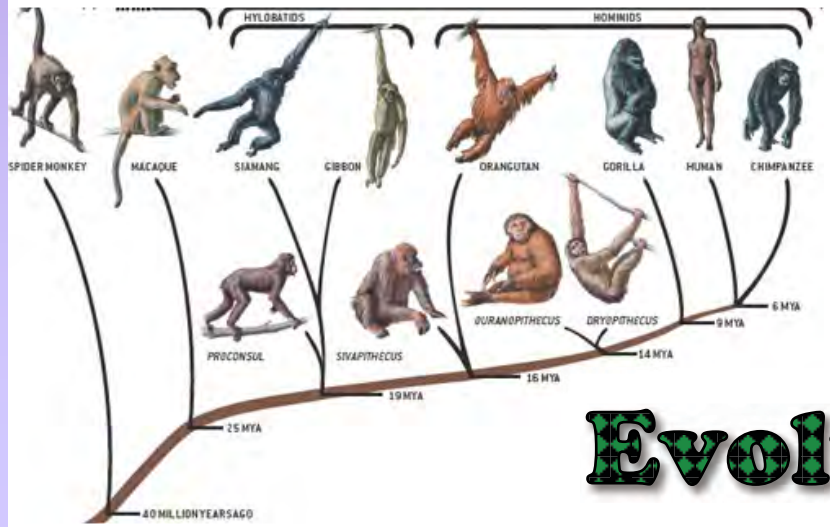


... becomes Linguistics

Evolution ...

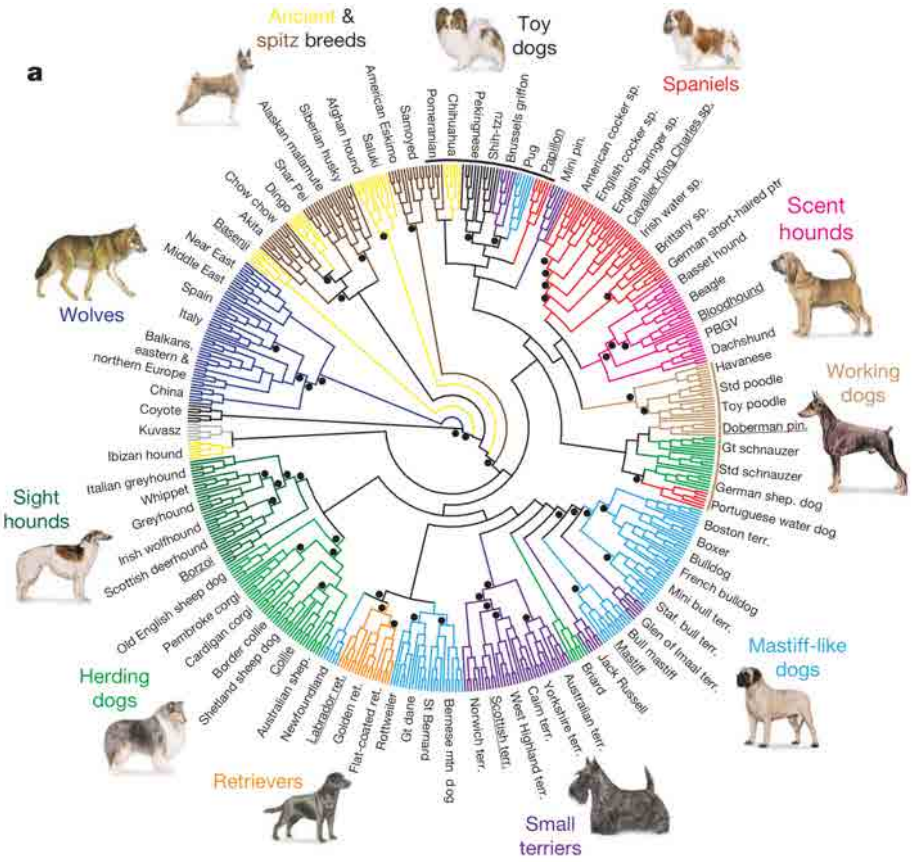


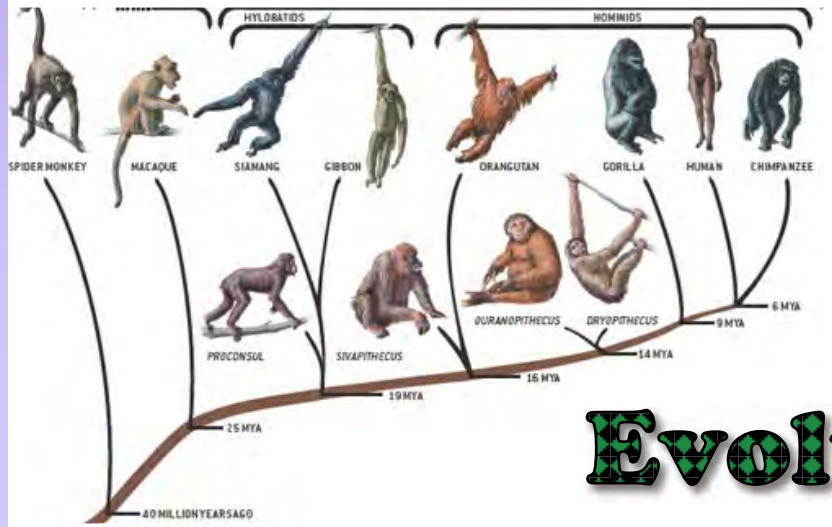




Evolution ...

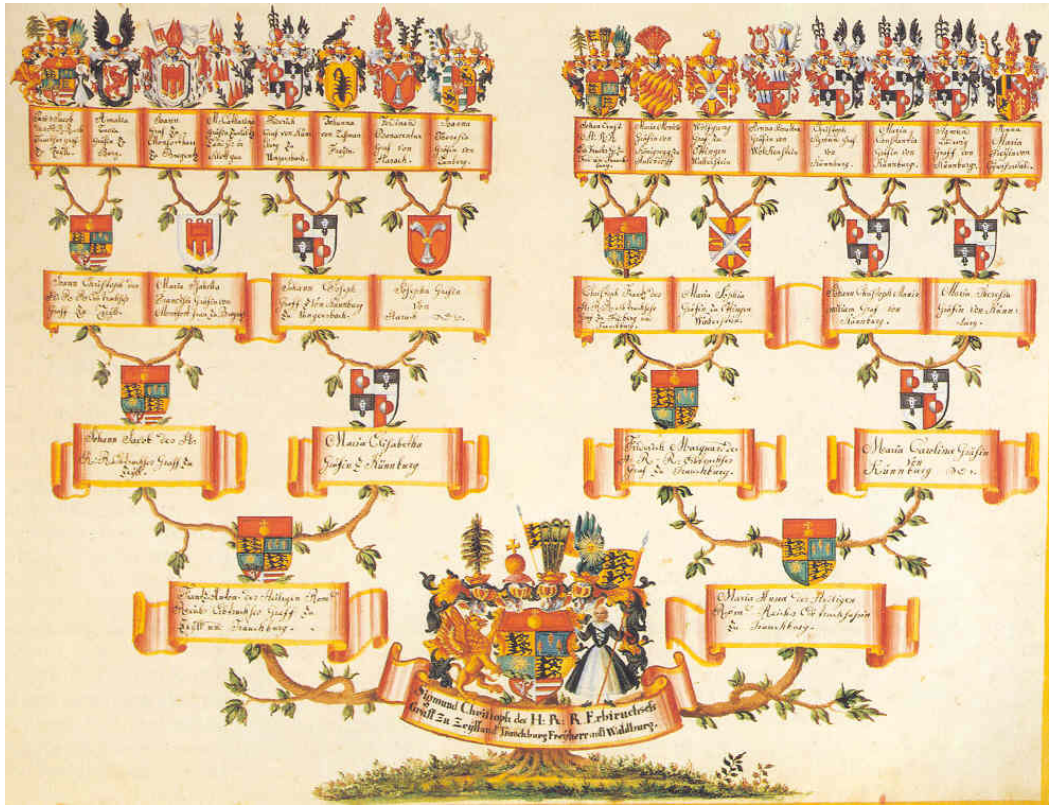
... becomes Culture

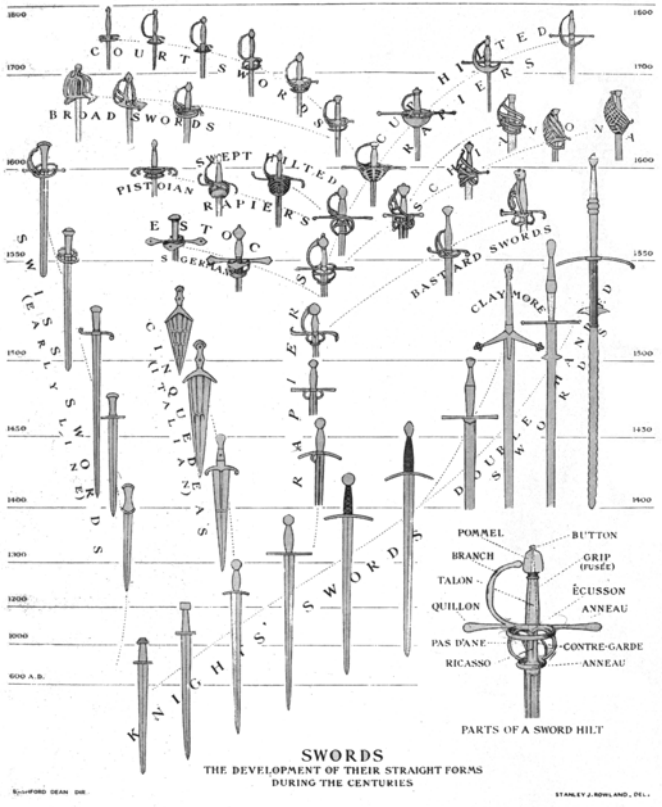


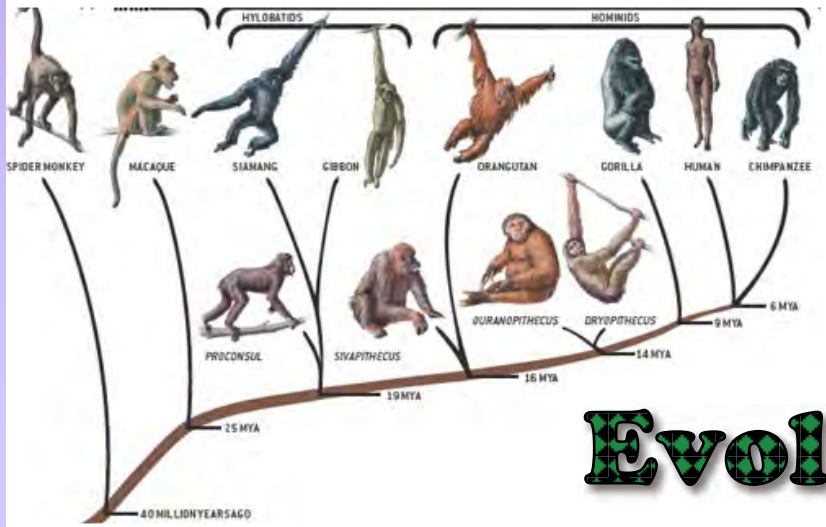


… becomes Domestication

Evolution …



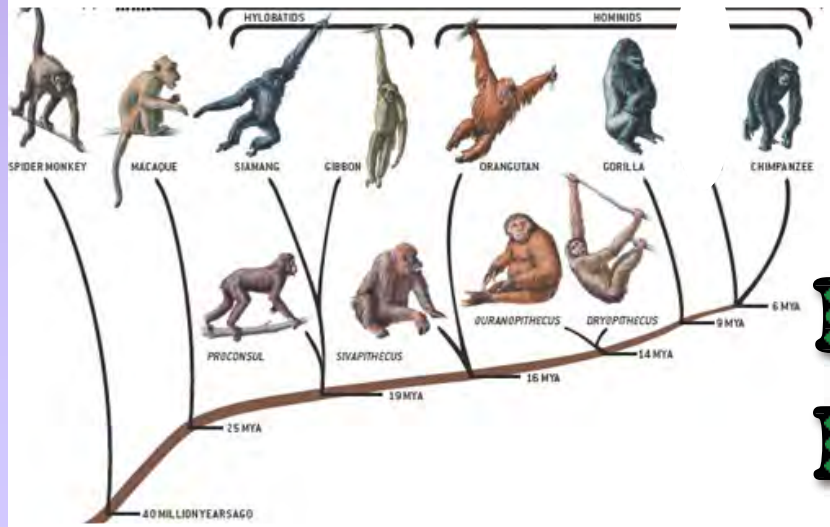




... becomes History

Evolution ...

... becomes Conservation

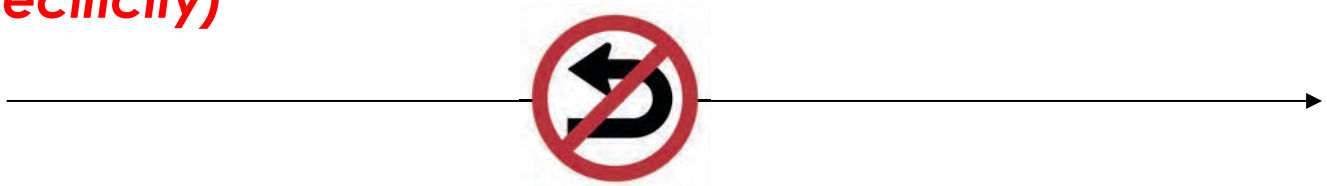


Non-human Evolution ...

Adaptation ➟ Ecological Dominance Social Competition ➟ Control

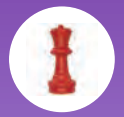
adapting to optimal resource use
(niche specificity)

resource control
(niche generalism)



Probabilistic directionality IV: from use towards control

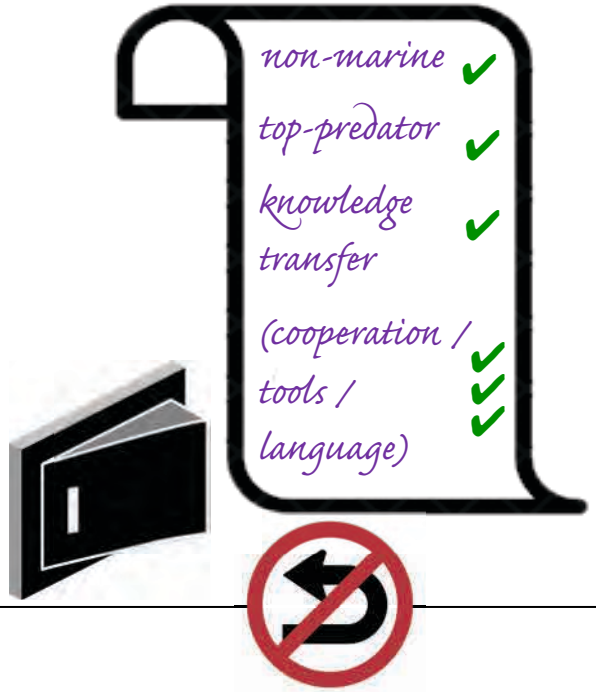
once control evolves,
there is no turning back



Evolution is
life's permanent suggestion
of new solutions
to the question of itself.

Adaptation ➟ Ecological Dominance Social Competition ➟ Control

adapting to optimal resource use



resource control

Probabilistic directionality IV: from use towards control

once control evolves,
there is no turning back

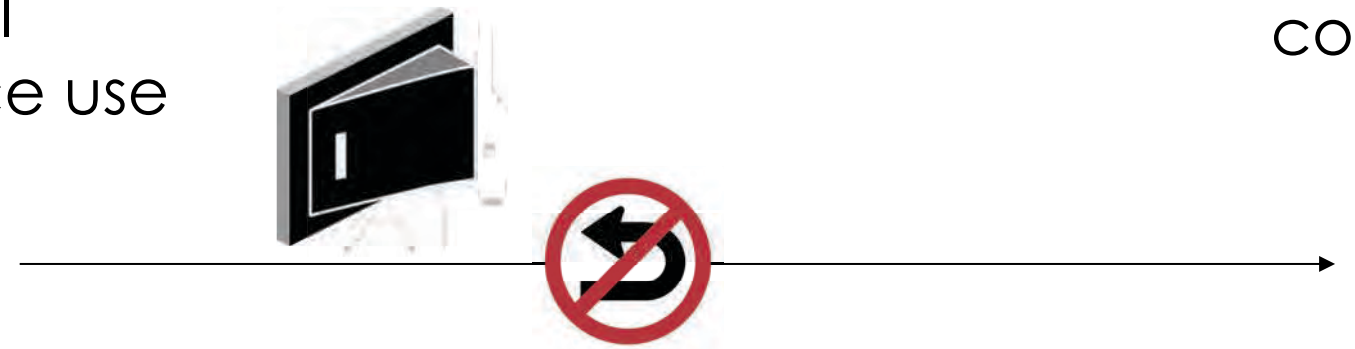
Potential Candidates ?

You can't fill a niche that is already taken (unless you are more efficient).

Adaptation ➟ Ecological Dominance Social Competition ➟ Control

adapting to optimal resource use

resource control



Probabilistic directionality IV: from use towards control

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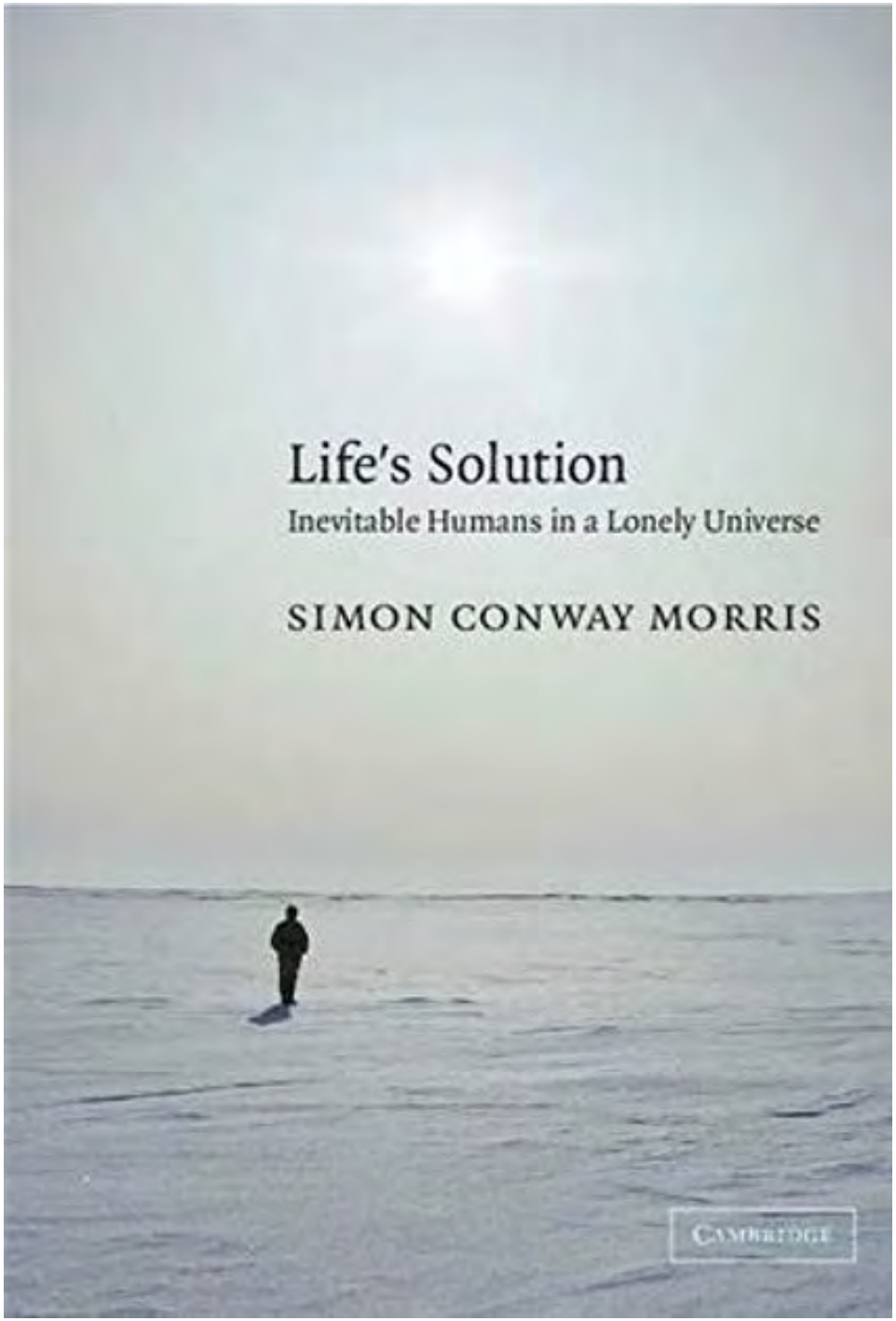

Life's Solution
Inevitable Humans in a Lonely Universe
SIMON CONWAY MORRIS
CAMBRIDGE

Adaptation ➟ Ecological Dominance Social Competition ➟ Control

adapting to optimal resource use

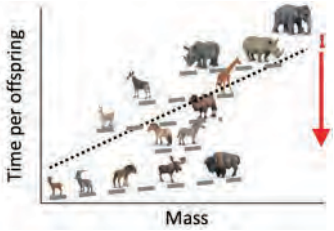
resource control

Probabilistic directionality IV: from use towards control

once control evolves,
there is no turning back

Summary

The system of life evolution contains directional elements that do not represent a plan but inevitability.

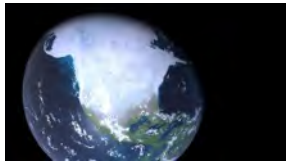


Summary

The system of life evolution contains directional elements that do not represent a plan but inevitability.

Cosmic / planetary / localised events may disrupt that course but not shut it down.



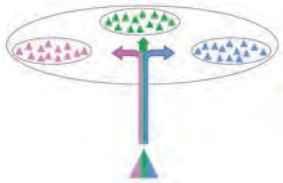



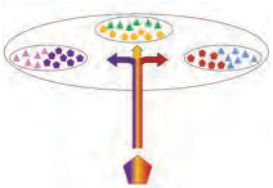
Summary

The system of life evolution contains directional elements that do not represent a plan but inevitability.

Cosmic / planetary / localised events may disrupt that course but not shut it down.

Niches exist and are filled by organisms evolving into them (at increasing efficiency).





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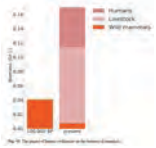

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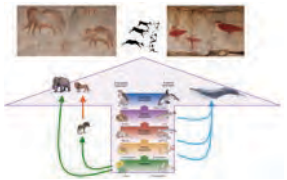

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The probably most feasible way to become ecologically dominant is via cooperation (supplemented by tool use).

thank you for your attention