

# Entomophagy and Evolution: Eating Insects Past, Present and Future



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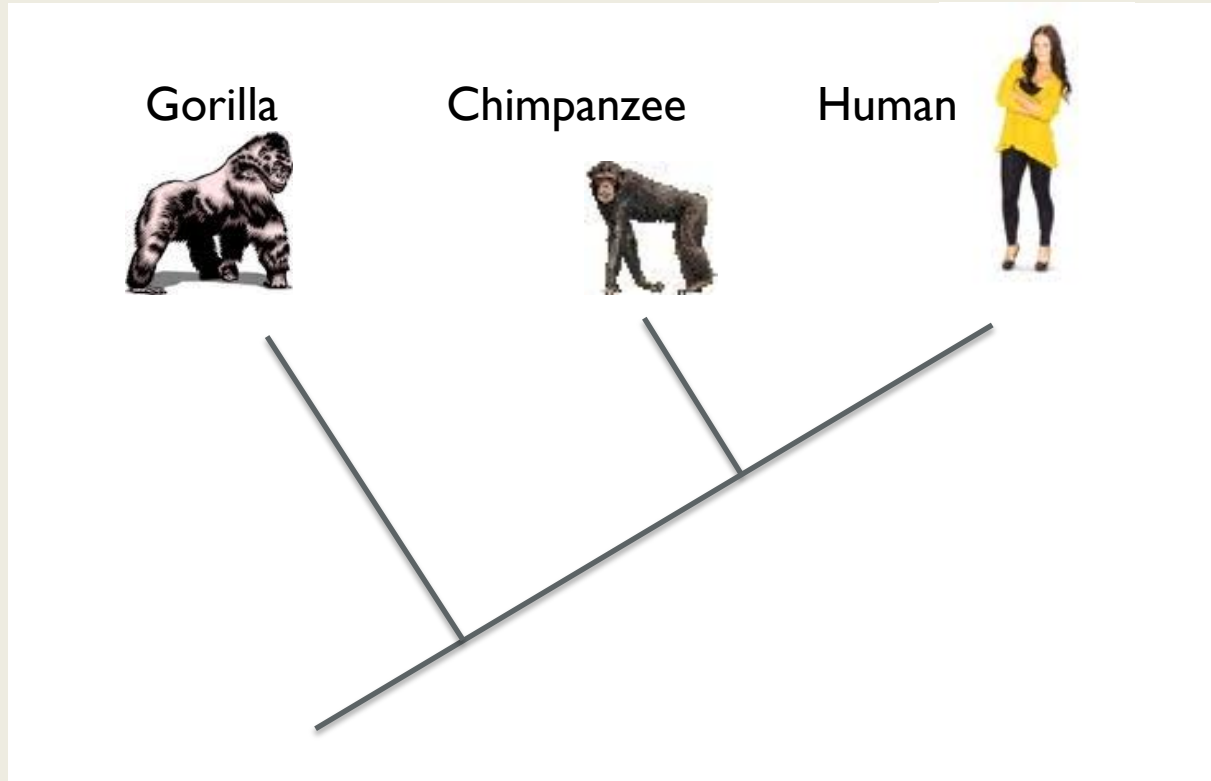


# Outline

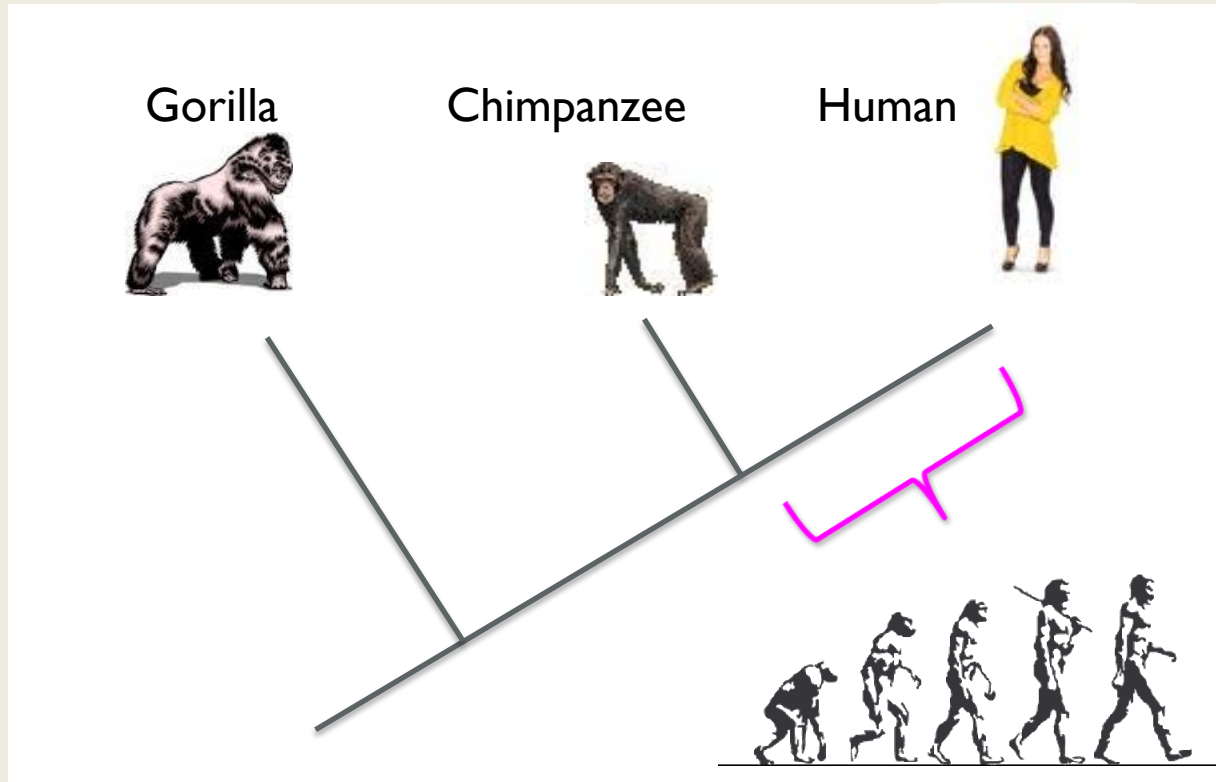
- Crash course in human evolution
- Conclusions regarding insects in the diet at hallmark stages of evolution
- Brief discussion of theory and methods that lead me to those conclusions

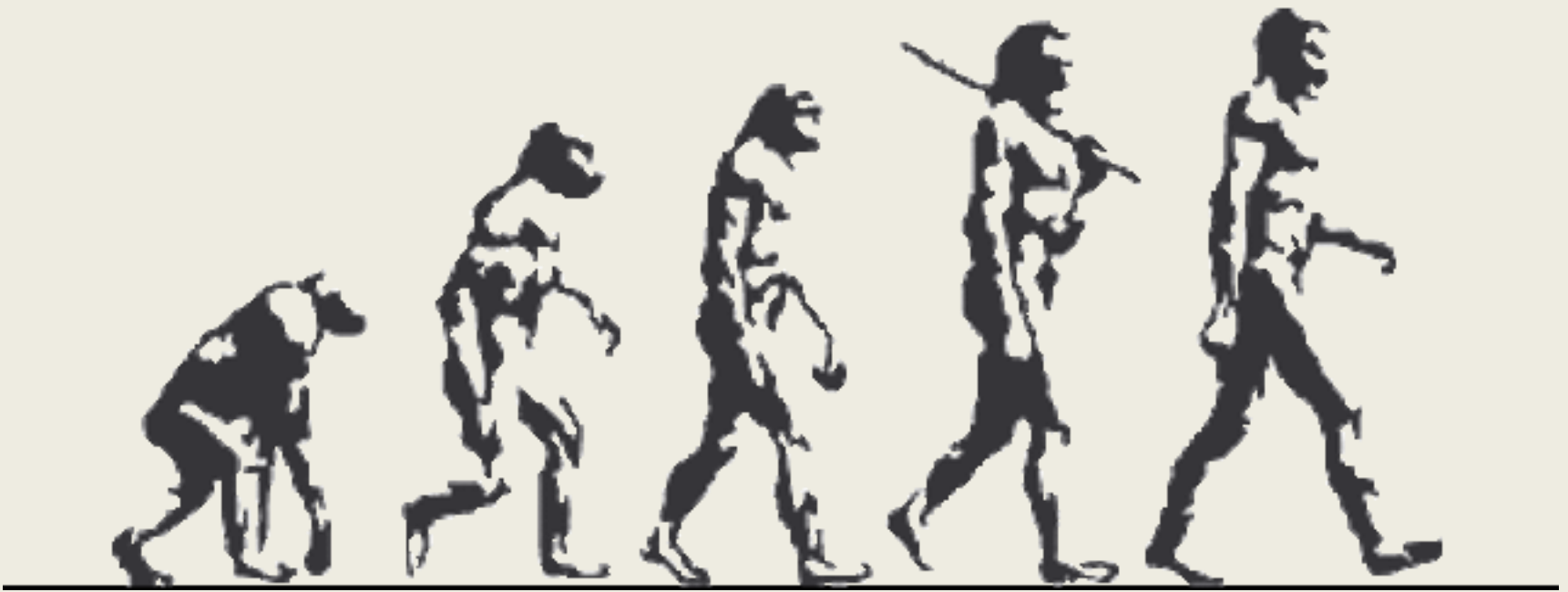


# Crash course in human evolution



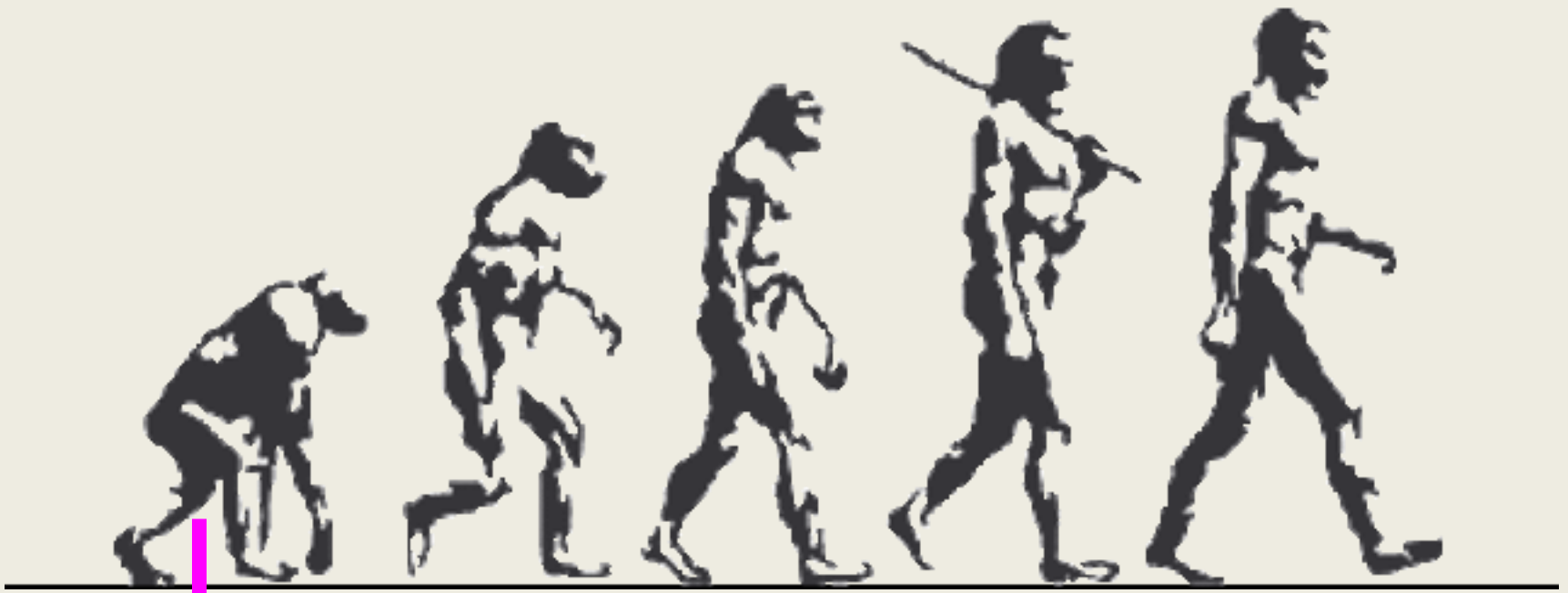
# Crash course in human evolution





“Hallmark stages” of human evolution

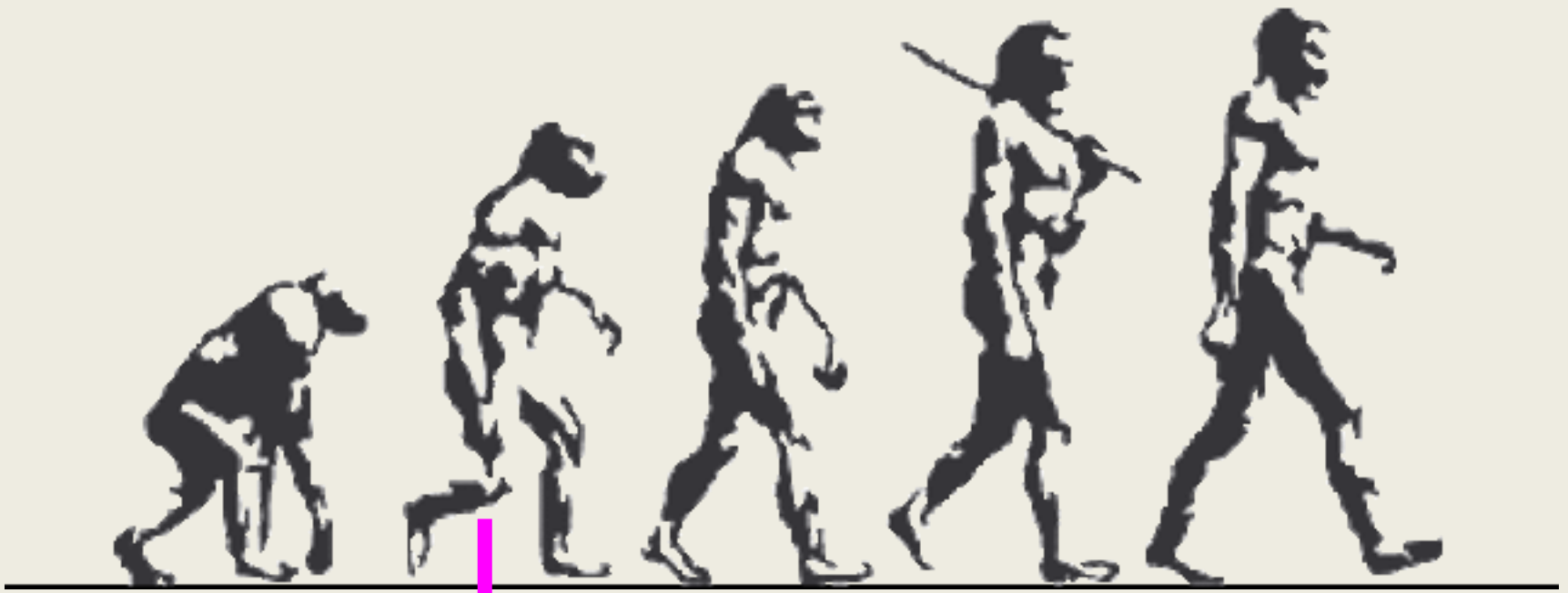




**“Last common ancestor”**

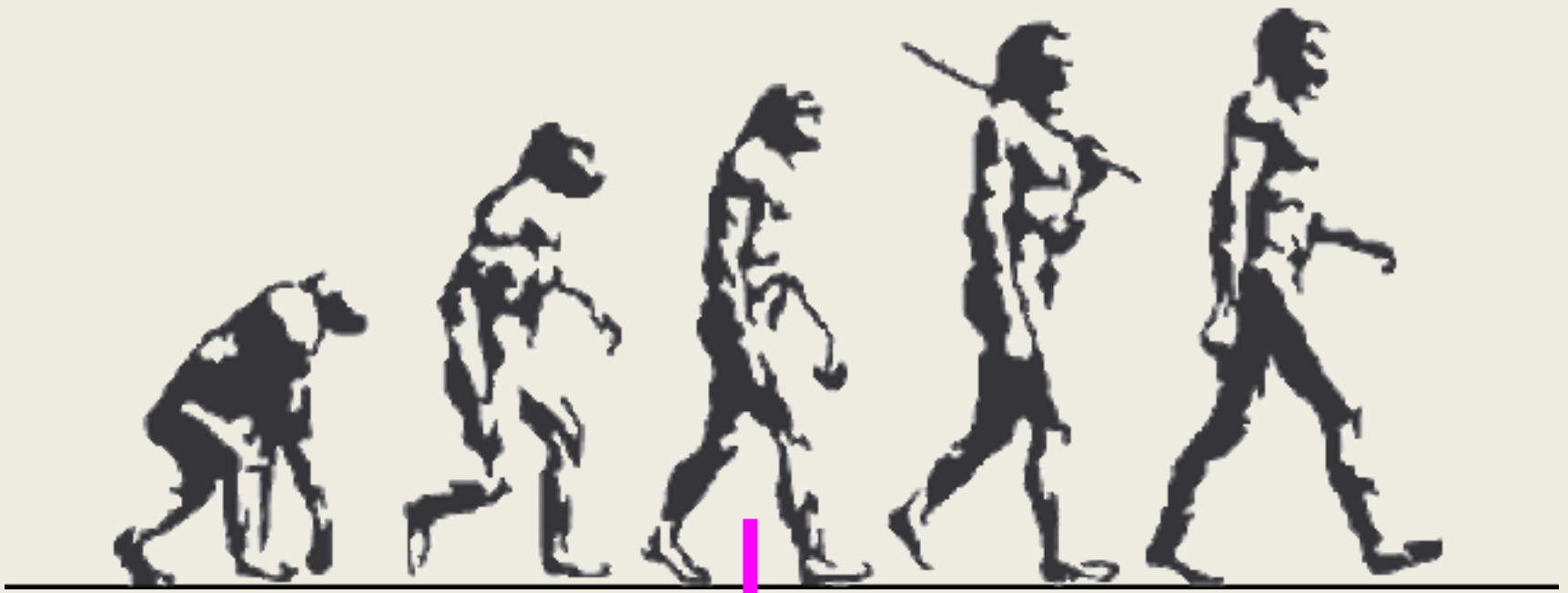
A great ape, likely ate insects similar to the great apes today  
(Social insects – ants, termites, honey)





## Genus *Australopithecus*

Upright walking apes. Likely also the same as extant apes, and we have some archaeological evidence that suggests this as well

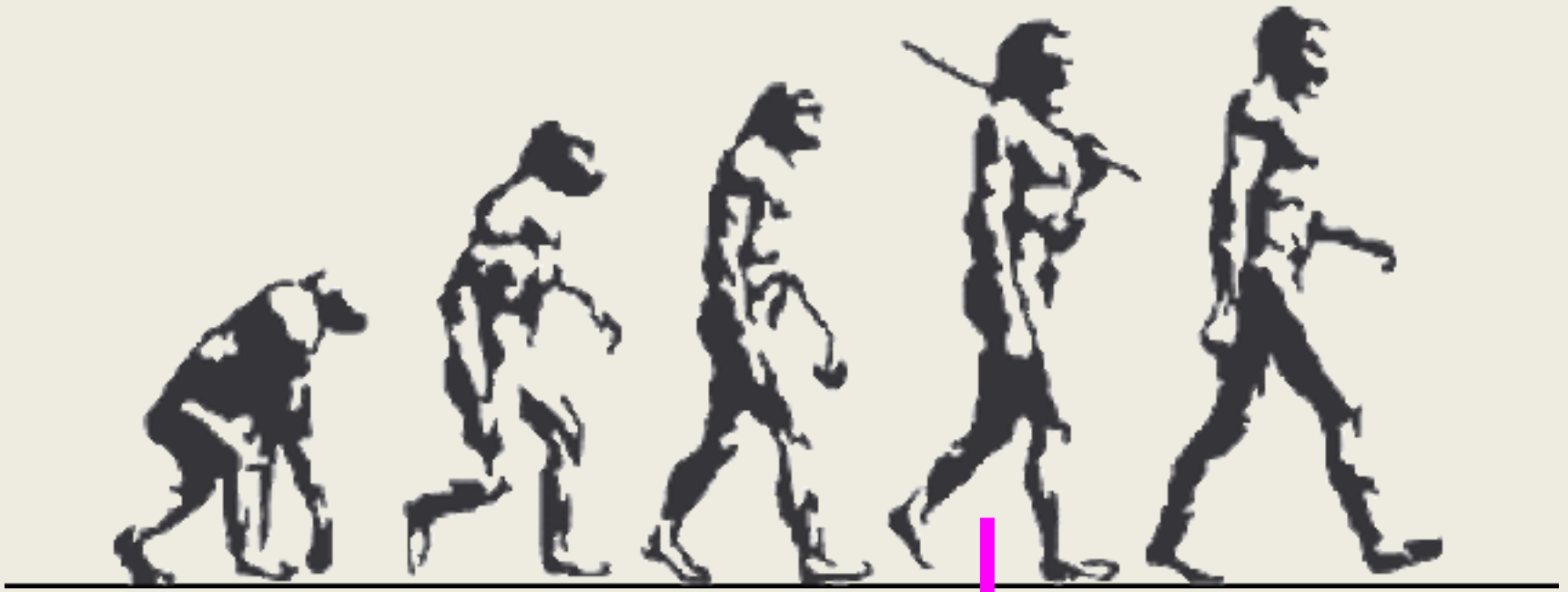


## *Homo erectus*

Origins of foraging/division of labor as we understand it today.  
Insects likely important to them as they are to foragers today.



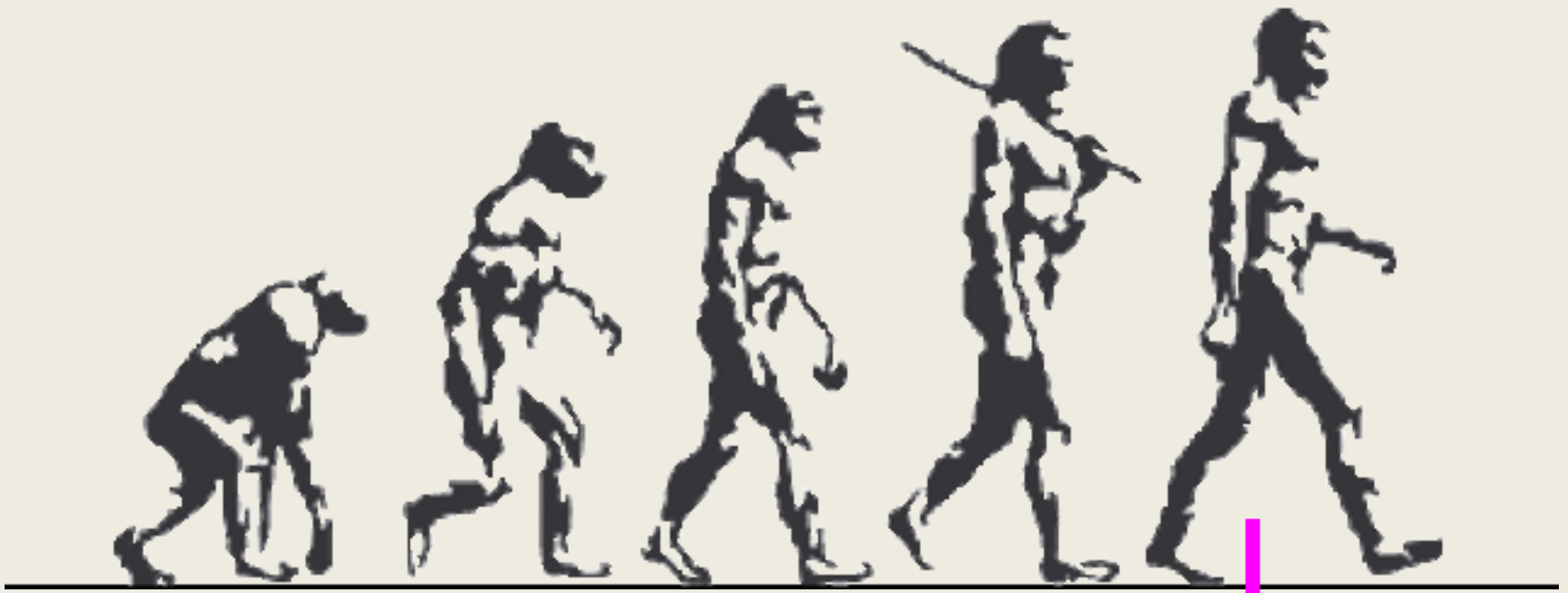




## Neanderthals

Occupying Europe during the last Ice Age.  
Biodiversity is low, insects likely not part of their diets.



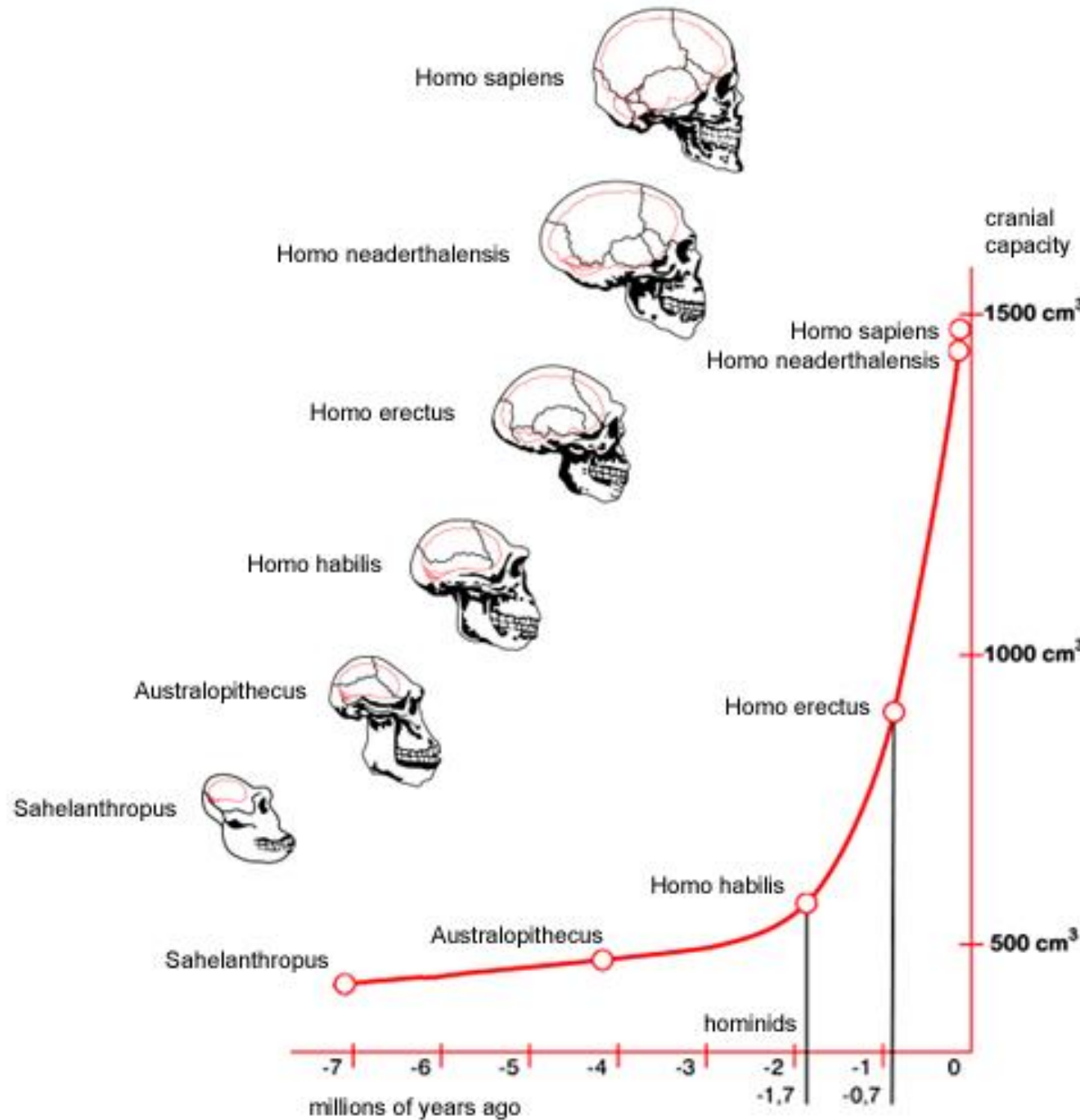


## “Modern Humans”

Intensive agriculture works against entomophagy.  
Rely on “fruits of labor” even to nutritional detriment.



# Brain size



# Diet Quality and Brain Size

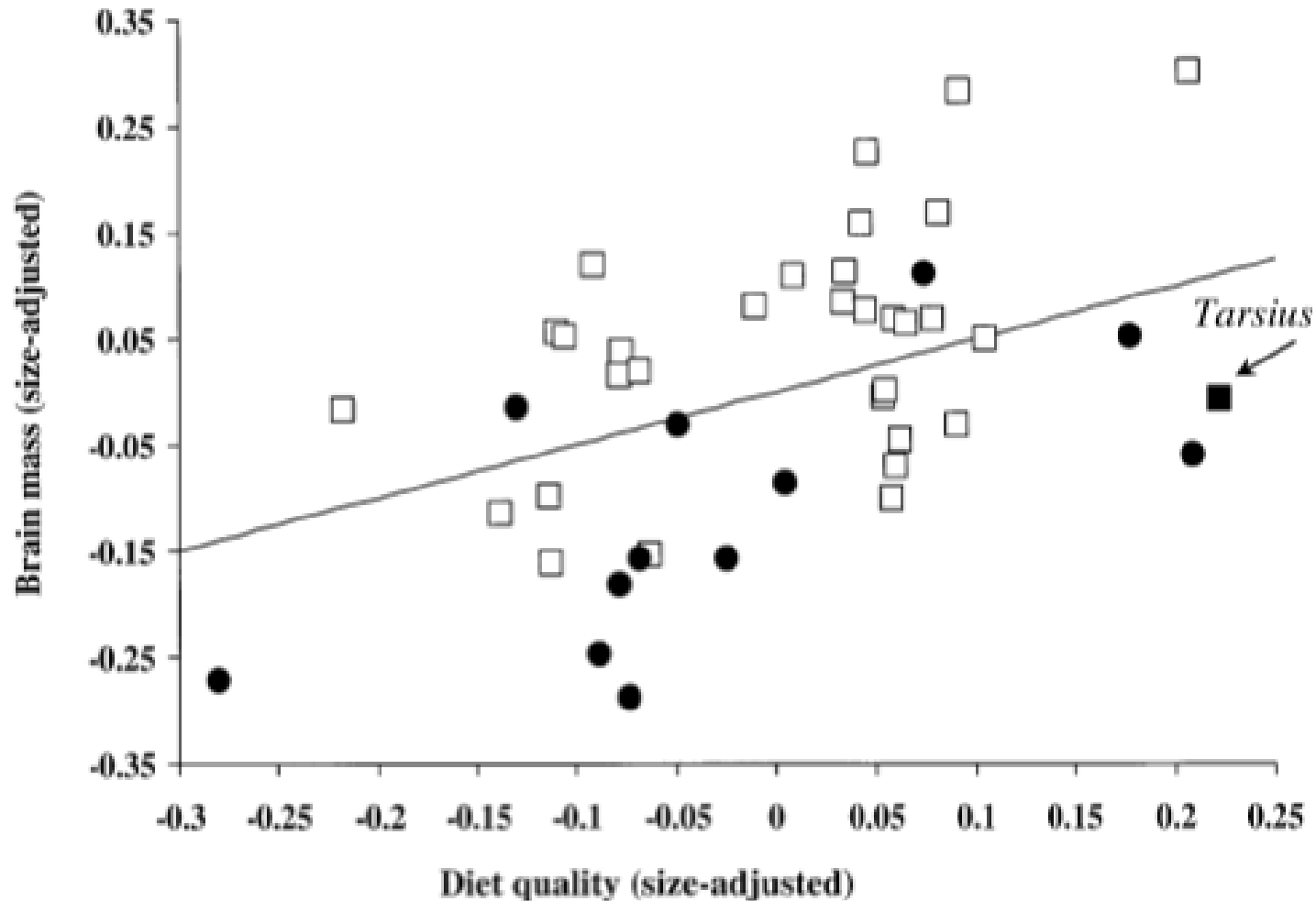


Fig. 1. All primates: brain mass residuals vs. diet quality residuals. Residuals were obtained through linear least-squares regression of each variable on body mass. The regression line has a significantly positive slope ( $y = 0.62x$ ). Squares, haplorhines; circles, strepsirhines.

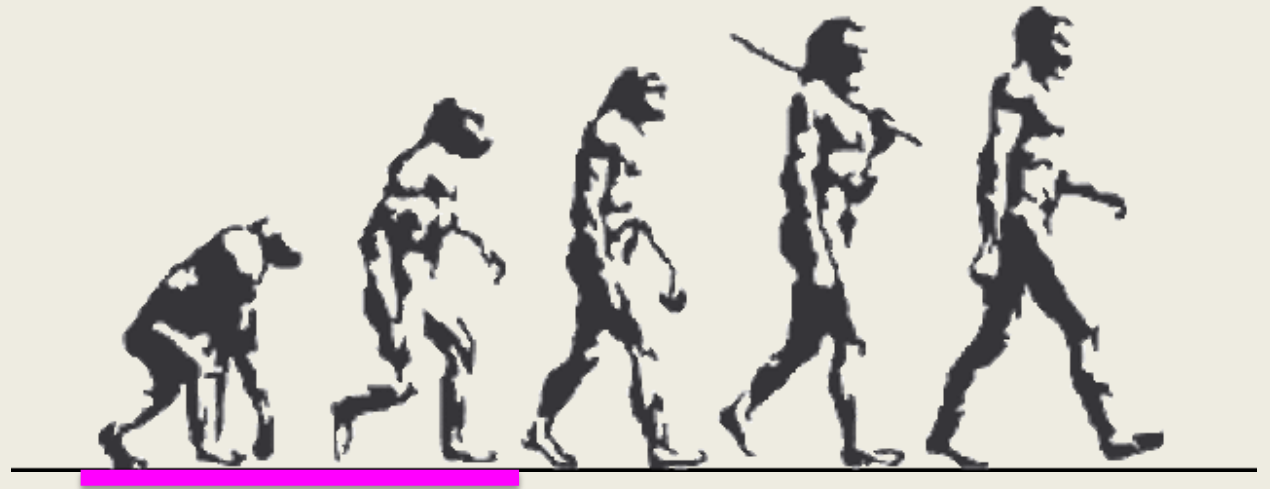
# Dietary Quality and Human Evolution

- We know brain size expands over the course of human evolution
- We know that there is a positive relationship between dietary quality and brain size
- Humans must have increased dietary quality over the course of their evolution






# Early hominids

- Ape-like early ancestors and australopithecines



# Termite Preferences and Nutrition

Species	Caste	Preferred By	Crude Protein (%)	Crude Fat(%)	Fe (mg/100g)
<i>M. muelleri</i> **	Soldiers	Chimps 	72	5	10
<i>C. heghi</i> **	Workers	Gorillas 	15	13	2962
<i>M. falciger</i> *	Alates	Humans 	21	22	—

\* Phelps *et al* 1975

\*\* Debalauwe and Janssens, 2008



# Great ape termite preferences reflect their diets



Frugivorous chimpanzees receive plenty of micronutrients, but protein requirements are more difficult to meet



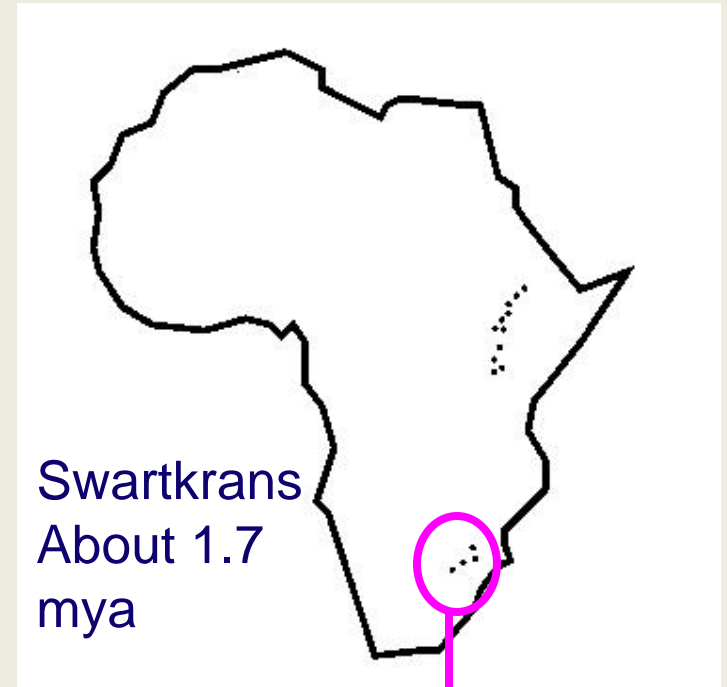
Folivorous gorillas receive plenty of protein from leaves, but micronutrient requirements are more difficult to meet



- *Au. robustus* has the largest brain size for the genus *Australopithecus*
- Utilization of resources beyond what is seen in chimpanzees would be necessary to support the large, expensive organ
- Eating more insects or insects with greater nutritional value (fatty reproductive termites, for instance) would aid in this brain size shift



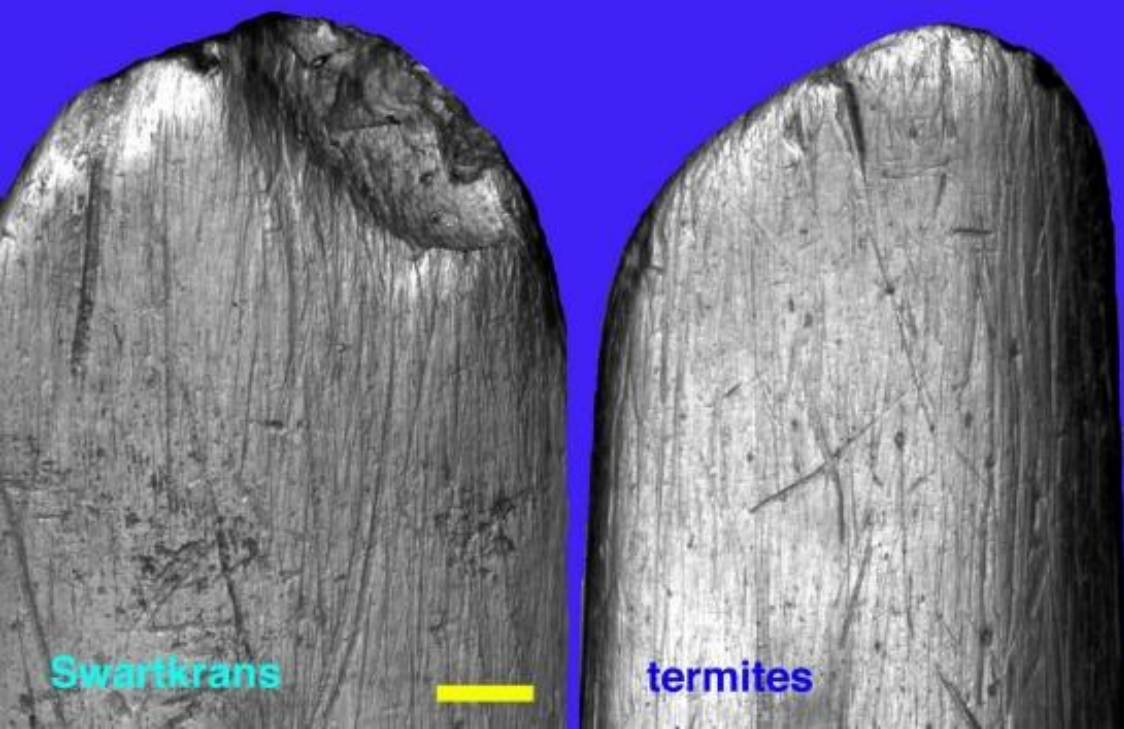
# *Australopithecus robustus*





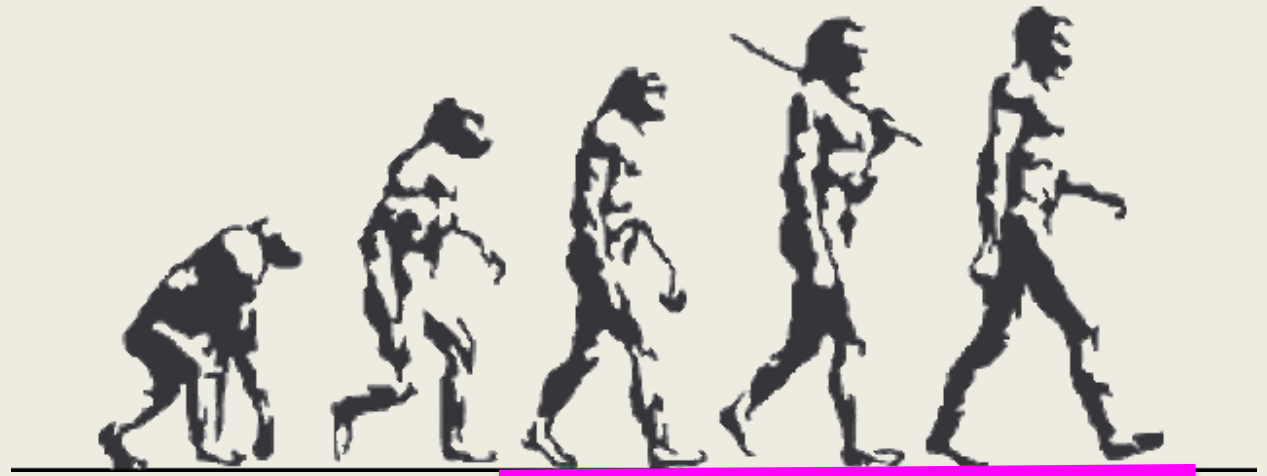
Pattern and width of the striations on the Swartkrans bone tools match that of tools used to experimentally excavate termite mounds

Photos: Backwell & d'Errico, 2001



# Genus *Homo*

- *Homo erectus* is when we start seeing brain and body size as well as behavior that are clearly “human”



# Ethnographic examples

- In attempting to reconstruct the evolutionary significance of insects as food, populations living at the subsistence level are of most interest



# The San



Photo:  
Photographers  
Direct

- When foraging, women may stop and eat termites all day (Nonaka, 1996)



# The Ache

- Women average 15 minutes a day in search of various insect larvae
- They will take them whenever encountered (Hawkes et al., 1982)



Photo:  
F1 Online Photos

# The Arrernte

- Women, accompanied by their children, carry digging sticks and go out in search of small fauna, including social insects that are available year-round (Bodenheimer, 1951)



Photo:  
Spencer and Gillan, 1899



# NW Amazonia Horticulturalists

- Insects provided up to 12% of the crude protein derived from animal foods in men's diets and 26% in women's diets during one season of the year (Dufour, 1987)



Photo:  
SuperStock



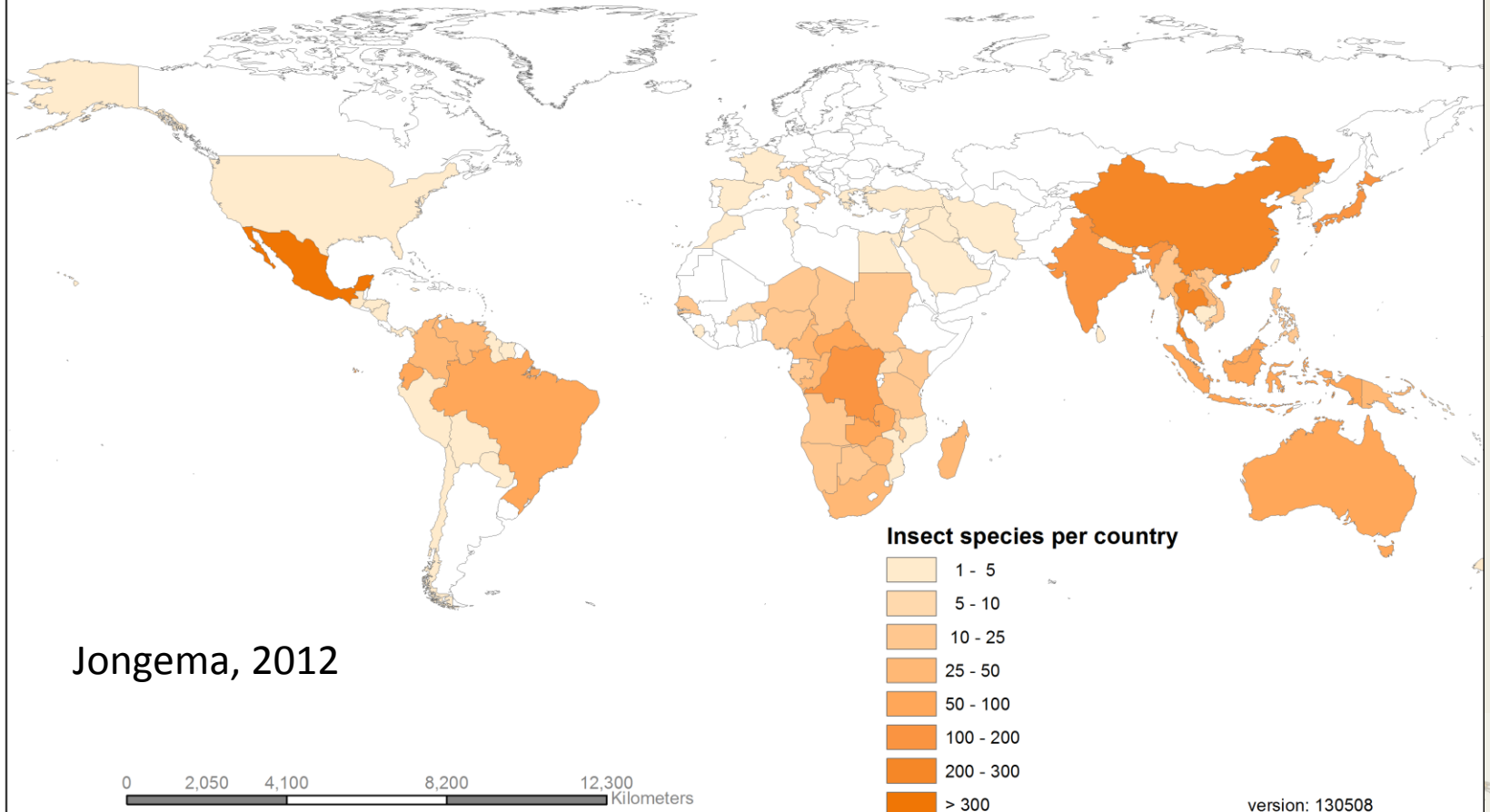
# Sexual division of labor

- Women's protein requirements increase by 50% when pregnant and lactating
- Insects may provide a reliable source of this nutrient they can obtain even when accompanied by small children
- This pattern of behavior could be expected for our early ancestors as well

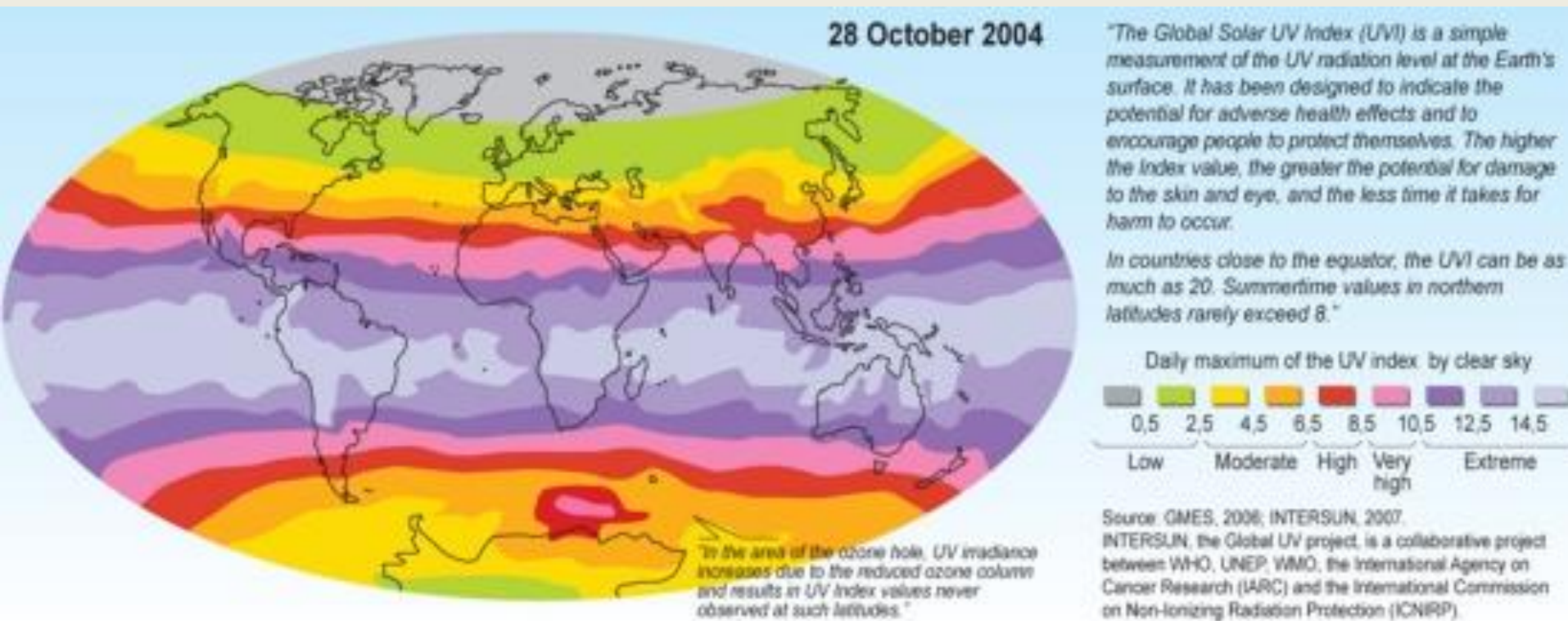


# Globally

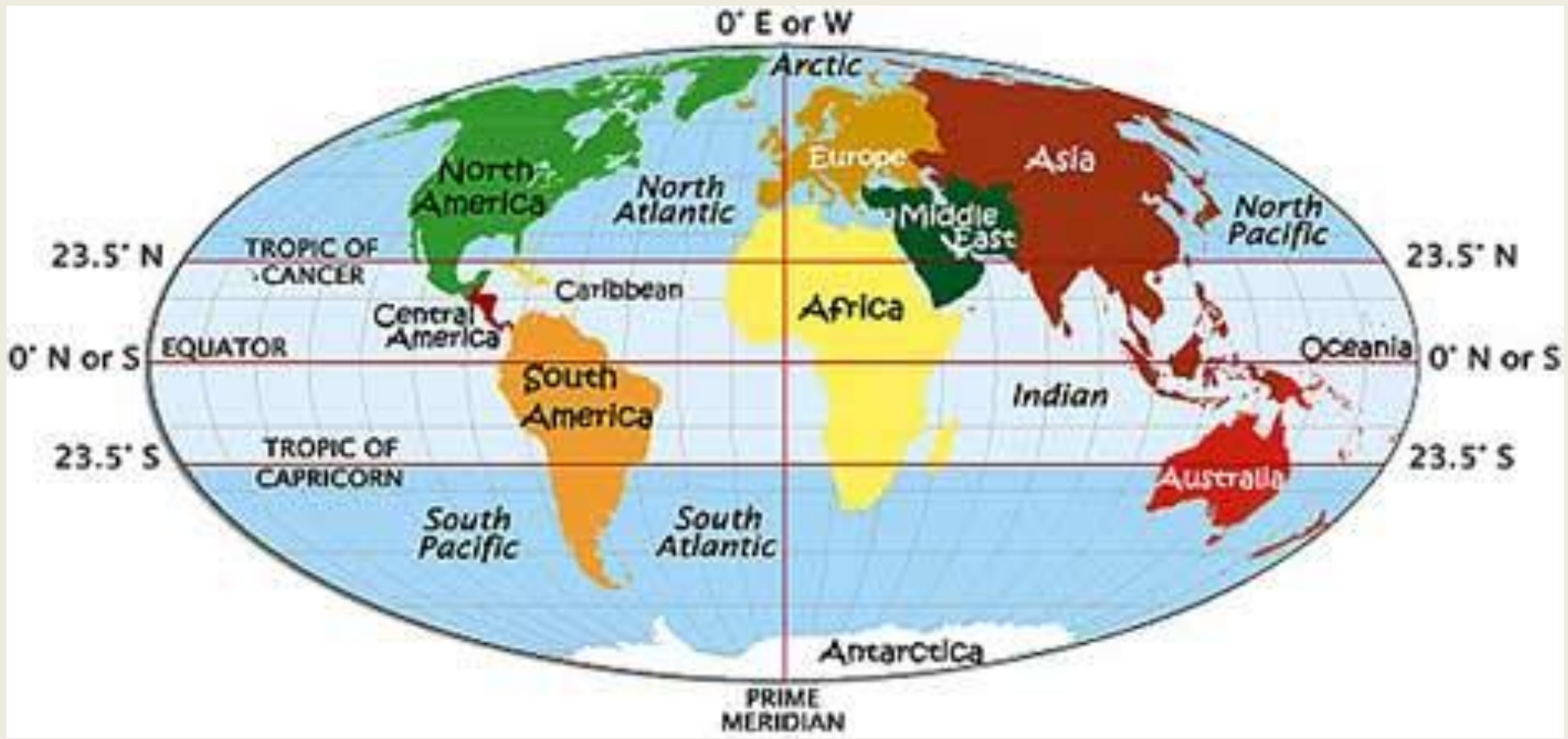
## Recorded edible insect species in the world



# Climatic variation: Variation over geographic space



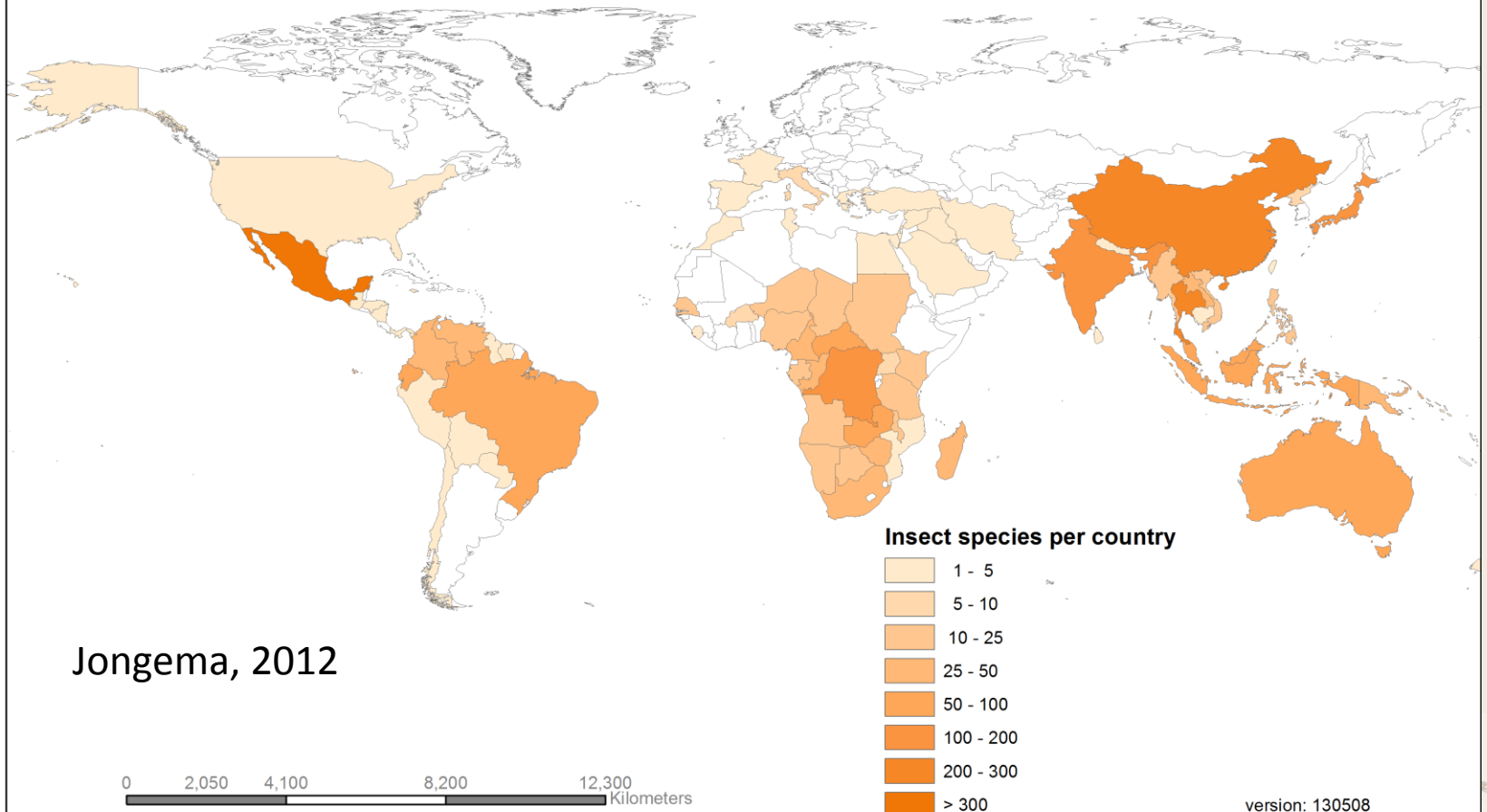
# Clinal variation: Variation over geographic space





# Globally

Recorded edible insect species in the world



# Global patterns of entomophagy

- I believe that the lack of entomophagy in the northern latitudes is related to long term occupation in these climates where biodiversity is significantly less than in the tropics
- Forest resources are not as available and efforts go to more intensive cultivation



# Conclusions

- Insects were very important in the diet of our early ancestors
- *Homo erectus* females were also likely to forage for this resource to support their families
- As humans started to occupy more northern latitudes, securing food required more ingenuity and some foraged resources were lost culturally, including insects







entomophagy anthropology



[www.entomoanthro.org](http://www.entomoanthro.org)

Thank you for having me and thank you for your attention. I look forward to talking to you more.

And special thanks to:

- The Departments of Anthropology at the University of Michigan and Wayne State University
- Aruna Antonella Handa and everyone working to put this conference together.
- David Gracer for finding me and bringing me into this network.

