World Within: Microbiomes and Anthropology

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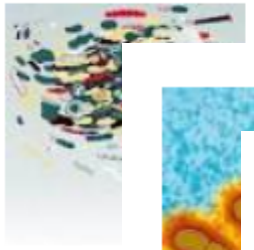
Photo: Kharlamova / Thinkstock via
https://www.motherjones.com/environment/2014/10/microbiome-health-gut-bacteria/

The microbiome: A cure for what ails you

Cervical '**Microbiome**' Could Help Predict Cancer Risk

Lupus strongly linked to imbalances in gut **microbiome**

PhillyVoic



Germs in Your Gut Are Talking to Your Brain. Scientists Want to Know ...

Alzheimer's bacterial link reiterates the importance of our **microbiome**

What you need to know about your skin's **microbiome**

Could gut bacteria microbes make you fat?

BBC News - Feb 12, 2019

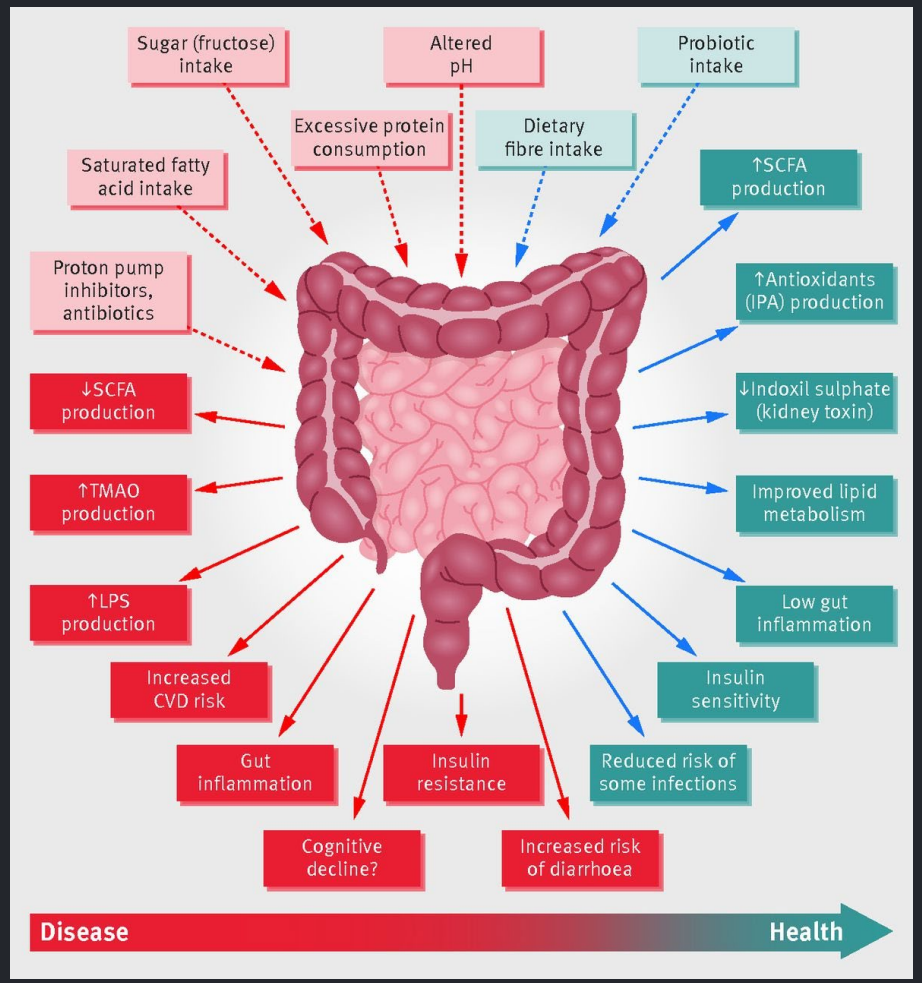
Studies involving twins have shown that **obesity** has a heritability rate – how ....
Researchers transplanted an **obese**-associated **microbiome**, ...

Morris Animal Foundation awards $1M for canine, feline studies

American Veterinary Medical Association - 2 hours ago

"Evaluation of the recovery of the gut **microbiome** and metabolome of dogs following an acute diarrhea episode," Dr. Rachel Pilla, Texas A&M ...

Current Trends in Microbiome Work



Valdes, A. M., Walter, J., Segal, E., & Spector, T. D. (2018). Role of the gut microbiota in nutrition and health. *BMJ*, *361*, k2179.

- Microbiome and health
- Characterizing global microbial diversity
- Microbiology/metagenomics of microbiomes

What is the place of anthropology in microbiome work?

Fossilized plaque may hold clues about ancient civilizations.

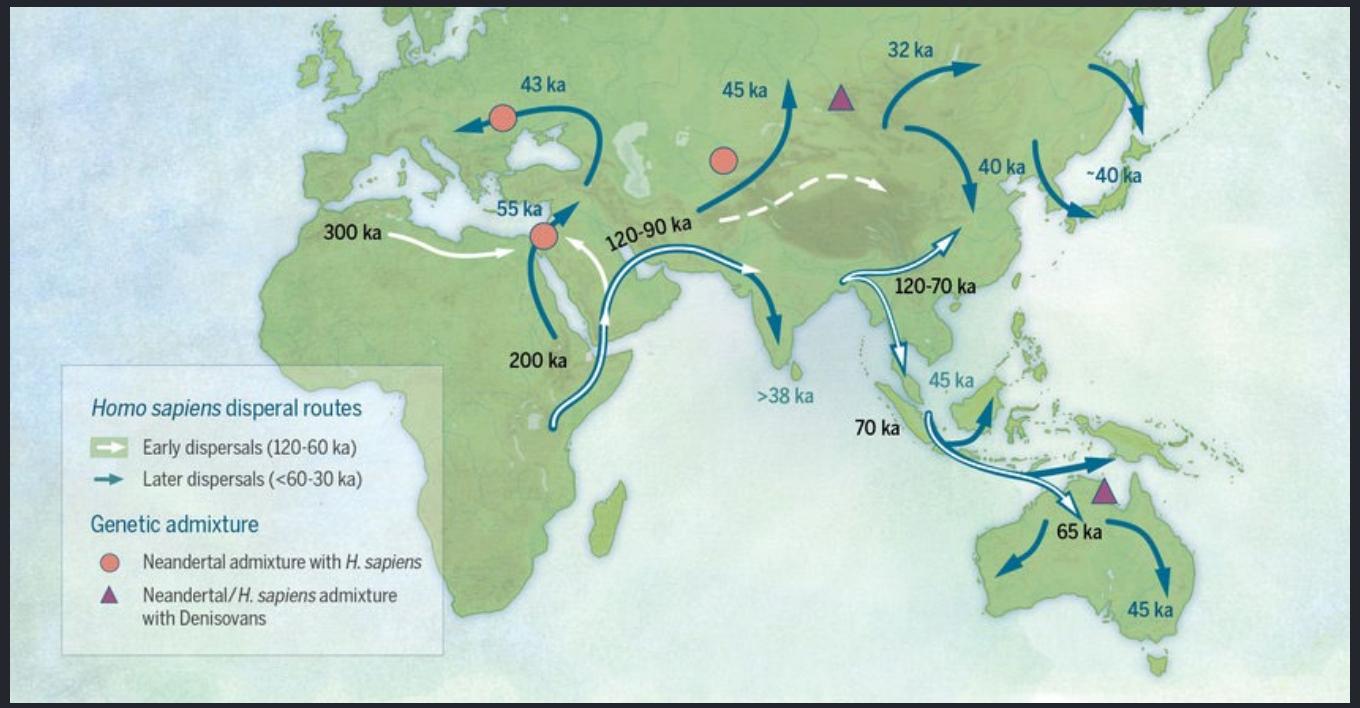
PHOTOGRAPH BY ANDREW OZGA

Tooth Plaque May Hold Clues About Ancient Life

- Global perspectives
- Past populations
- Theory, critical approaches, and meaning-making

Human Evolution

- Human evolution is a story of human migration
- Biological Anthropology: “Who we are and how we got here” –John Marks



Credit: C.J. Bae et al., Science (2017). Image by Katerina Douka and Michelle O'Reilly

Human Variation

- The study of humankind is fraught with misunderstandings of human biological variation, past and present

Ordo I.

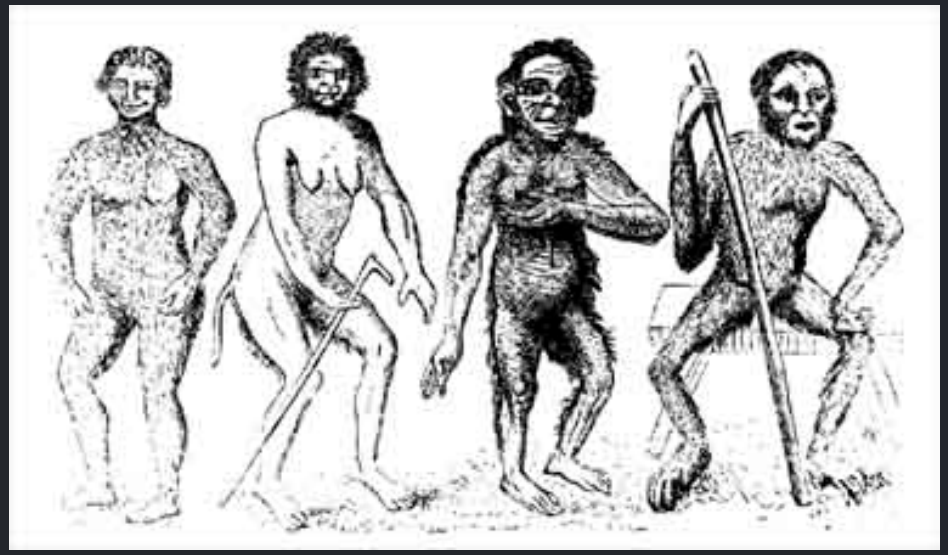
PRIMATES.

Dentes primores ſuperiores IV *paralleli.*
Mammæ *pectorales*, *binæ.*

1. HOMO noſce Te ipſum.

1. H. diurnus. (*) *vagans cultura, loco.*
   - *α.* H. ruſus, cholericus, rectus. — Americanus.
   - *β.* H. albus, ſanguineus toroſus. — Europeus.
   - *γ.* H. luridus, melancholicus rigidus. — Aſiaticus.
   - *δ.* H. niger, phlegmaticus, laxus. — Afer.
   - *ε.* H. monſtroſus ſolo (a), vel arte (b. c.)
     - a. *Alpini* parvi, agiles, timidi: *Patagonici* magni, segnes.
     - b. *Monorchides* ut minus ferriles: Hottentotti.
       Junceæ puellæ abdomine attenuato: Europeæ.
     - c. *Macrocephali* capite conico. Chinenſes.
       Plagiocephali capite antice compreſſo. Canadenſes.
2. Homo nocturnus. Ourang Outang *Bont. jav.* 84. *t.* 84.

Genus Troglodytæ *ſeu* Ourang Outang *ab* Homine vero *diſſi-ctum, adhibita quamvis omni attentione, obtinere non potui, niſi aſſu-merem notam lubricam, in aliis generibus non conſtantem. Nec* Den-tes laniarii *minime a reliquis remoti; nec* Nymphae caffræ, *quibus carent* Simiæ, *hunc ad* Simias *reducere admittebant. Inquirant au-ctoptæ in vivo, qua ratione, modo notæ aliquæ exiſtant, ab* Hominis *genere ſeparari queat*, nam inter Simias verſantem oportet eſſe Si-miam. *Apollodor.*

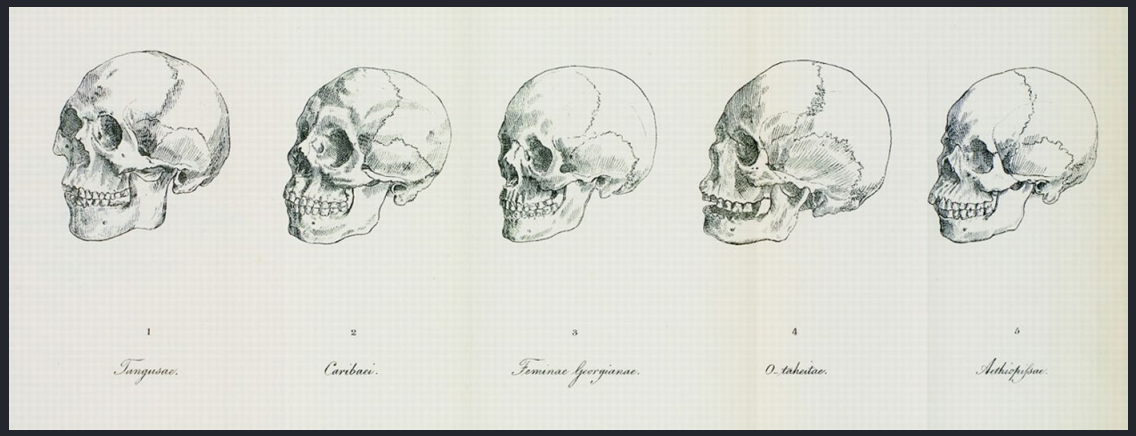


Linnaeus, *Systema Naturae*

Scientific desire to classify

Linnaeus	Cuvier (1790)	Coon (1962)
African	Caucasoid	Australoid
American	Mongoloid	Capoid
Asian	Negroid	Caucasoid
European		Congoid
		Mongoloid

And many more….



Blumenbach's cranial classification

Categories assumed a static, unchanging world

Race concept emerges

- Desire to categorize swept science from 1700s – 1950s

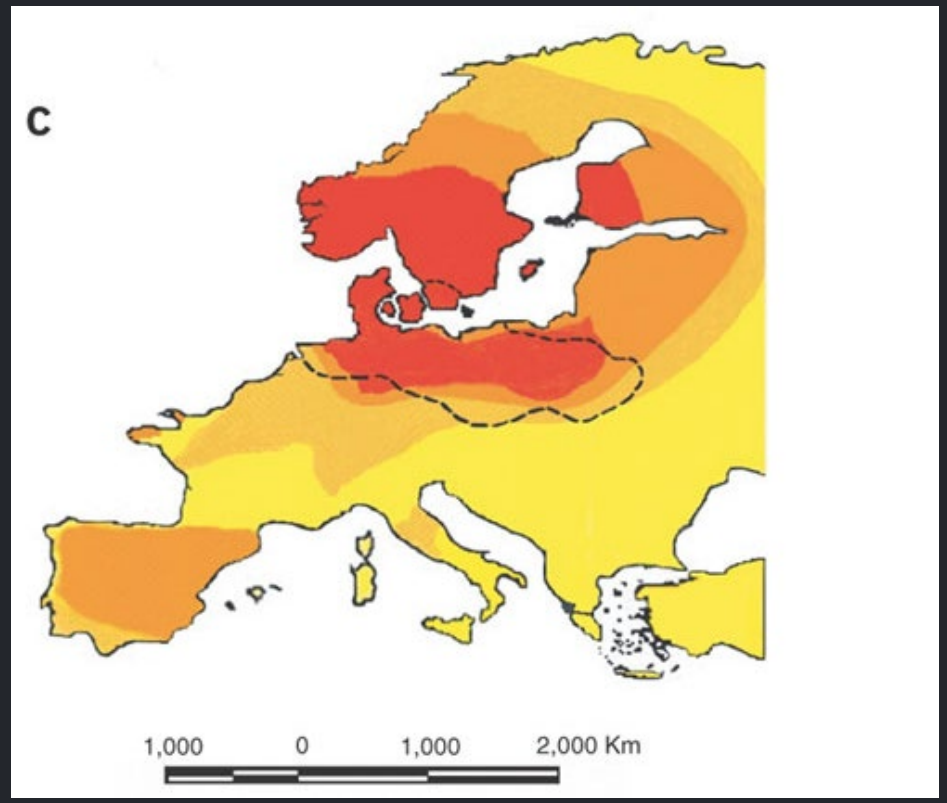
- Assumptions of race categories:
  - Humans can be divided into types
  - Types reflect a group's moral and mental capabilities
  - Race predicts an individual's ability

Clines

- Cline: pattern of gene frequencies over geography
- Lactase persistence in Europe

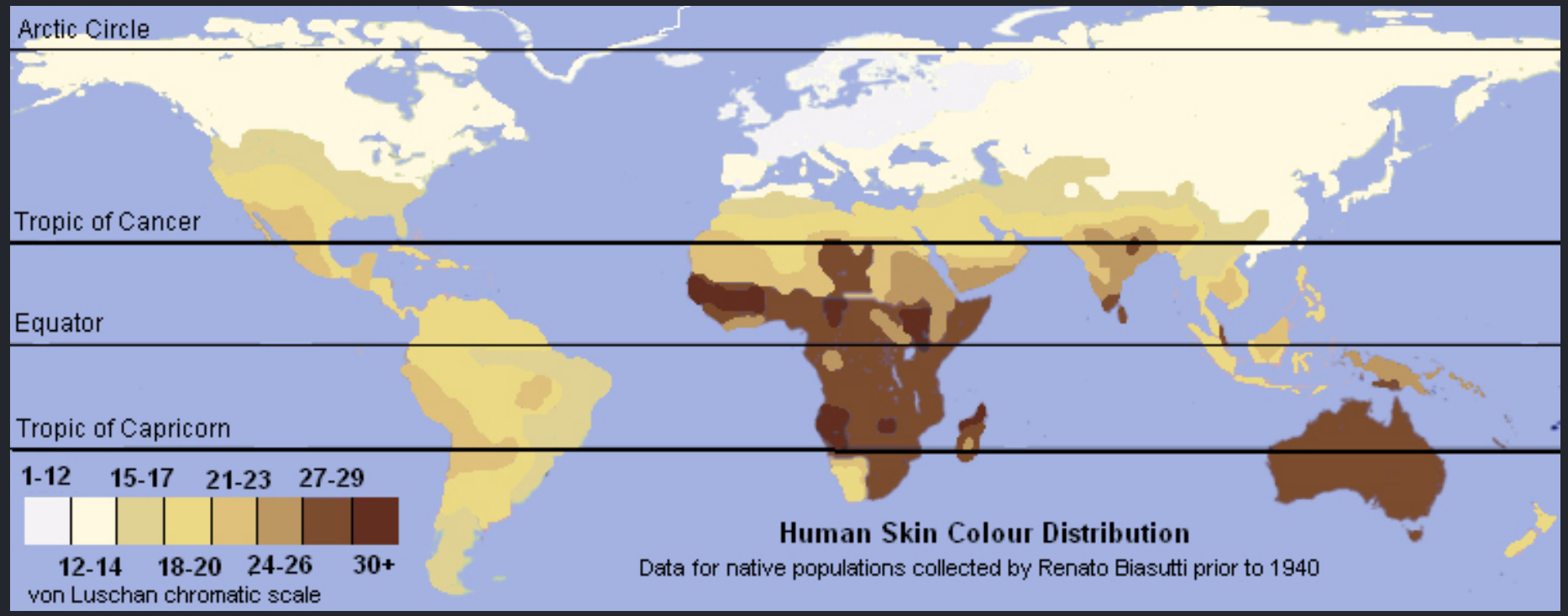
"There are no races, there are only clines"
–Frank Livingstone

The color denotes the frequency of the lactase persistence allele



Clines

- Skin color



- Distributed continuously, not categorically

Lewontin 1972

Table 4. Proportion of Genetic Diversity Accounted for Within and Between Populations and Races

Gene	Total $H_{species}$	Proportion		
		Within Populations	Within Races Between Populations	Between Races
Hp	.994	.893	.051	.056
Ag	.994	.834	–	–
Lp	.639	.939	–	–
Xm	.869	.997	–	–
Ap	.989	.927	.062	.011
6PGD	.327	.875	.058	.067
PGM	.758	.942	.033	.025
Ak	.184	.848	.021	.131
Kidd	.977	.741	.211	.048
Duffy	.938	.636	.105	.259
Lewis	.994	.966	.032	.002
Kell	.189	.901	.073	.026
Lutheran	.153	.694	.214	.092
P	1.000	.949	.029	.022
MNS	1.746	.911	.041	.048
Rh	1.900	.674	.073	.253
ABO	1.241	.907	.063	.030
Mean		.854	.083	.063

Clines can overlap…

…but trying to distinguish a race using clines is impossible

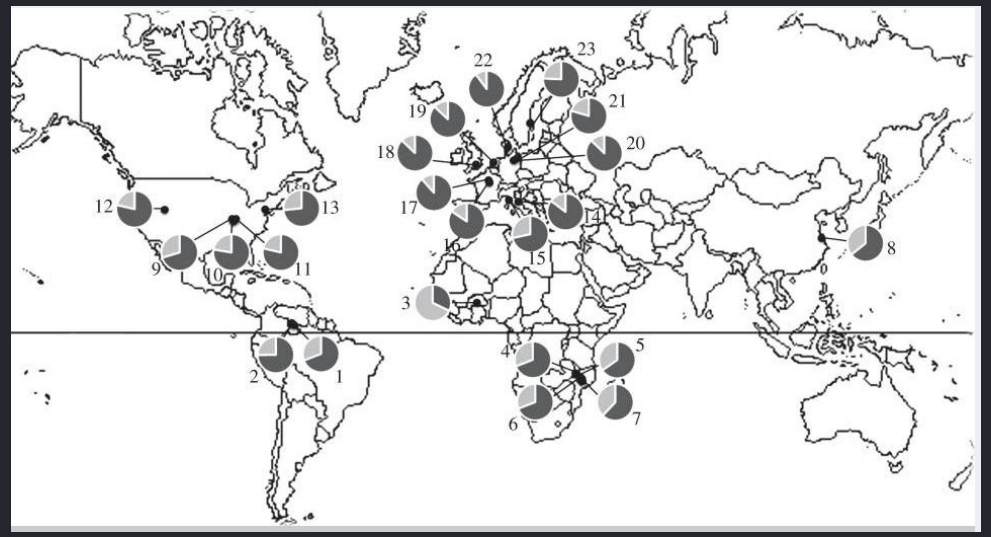
Discovering how human variation exists over geography is the stronger position, rather than categorization!

Human Variation

- “Global” human genomic populations are, in fact, terribly undersampled in many regions

- Map of the 26 populations sampled for the 1000 Genomes Project

Human Variation



Distribution map of human populations used in this study. Pie chart indicates the relative abundance of two bacterial phyla: Firmicutes (dark grey) and Bacteroidetes (light grey). The numbers indicate Map ID (see table 1).

Table 1.

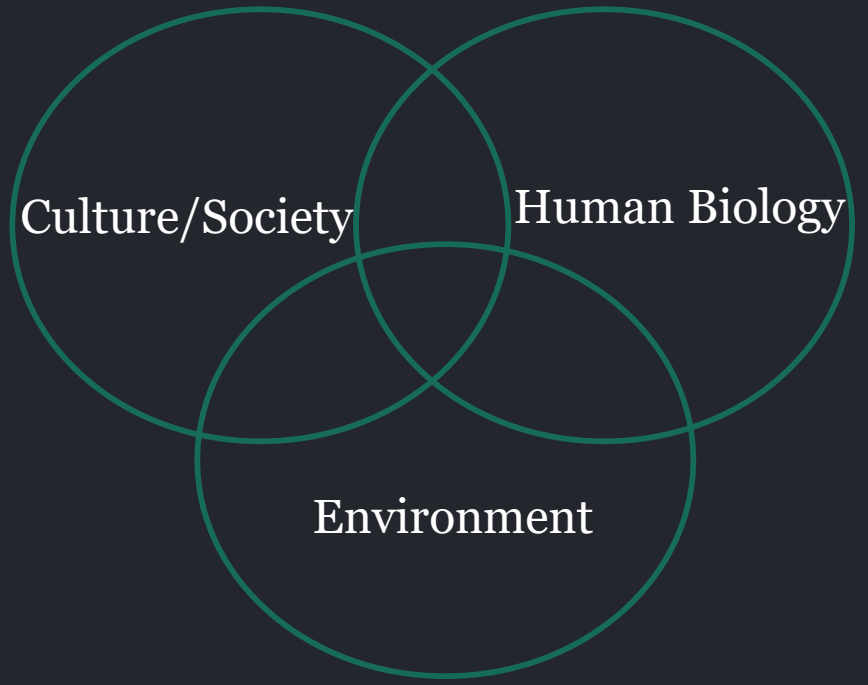
Six studies included in this study.

sample locations	latitude	sample size	no. of individuals per age class						female (%)	reference	map ID[a]
			Z (<1)	A (1–10)	B (11–20)	C (21–54)	D (>60)	no data			
Coromoto, Venezuela	5.4	53	6	19	6	16	4	2	57	[7]	1
Platanillal, Venezuela	5.4	45	1	24	7	8	5	–	58	[7]	2
Burkina Faso	12.3	14	—	14	—	—	—	—	36	[2]	3
Chamba, Malawi	15.3	21	5	6	—	3	—	7	56	[7]	4
Mayaka, Malawi	15.4	51	9	17	—	12	—	13	73	[7]	5
Mbiza, Malawi	16.0	31	11	5	—	6	—	9	83	[7]	6
Makwhira, Malawi	16.2	5	2	1	—	1	—	1	75	[7]	7
Shanghai, China	31.2	56	—	—	—	56	—	—	54	[6]	8
Missouri, USA	38.6	120	—	—	82	38	—	—	100	[5]	9
Missouri, USA	38.6	30	—	—	—	23	—	7	100	[7]	10
St Louis, USA	38.6	235	22	12	106	95	—	—	54	[7]	11
Boulder, USA	40.0	9	1	7	—	1	—	—	67	[7]	12
Philadelphia, USA	40.0	23	—	13	—	10	—	—	78	[7]	13
Camerino, Italy	43.1	58	—	—	—	20	38	—	53	[4]	14
Tuscany, Italy	43.4	13	—	13	—	—	—	—	31	[2]	15
Paris, France	48.9	48	—	—	—	22	26	—	58	[4]	16
France	48.9	21	—	—	—	21	—	—	52	[3]	17
UK	51.5	10	—	—	—	10	—	—	80	[3]	18
Netherlands	52.4	20	—	—	—	20	—	—	70	[3]	19
Potsdam, Germany	52.4	58	—	—	—	21	37	—	62	[4]	20
Germany	52.5	20	—	—	1	19	—	—	80	[3]	21
Denmark	55.7	20	—	3	1	16	—	—	55	[3]	22
Stockholm, Sweden	59.3	59	—	—	—	20	39	—	53	[4]	23

[a]Map ID corresponds to figure 1. See more details in the electronic supplementary material, table S8.

Suzuki, T. A., & Worobey, M. (2014). Geographical variation of human gut microbial composition. *Biology letters*, *10*(2), 20131037.

Biocultural Approaches



- Feedback systems that involve human biology, culture, society, political economy, activity, environment, etc.
- Many other models!

Embodiment

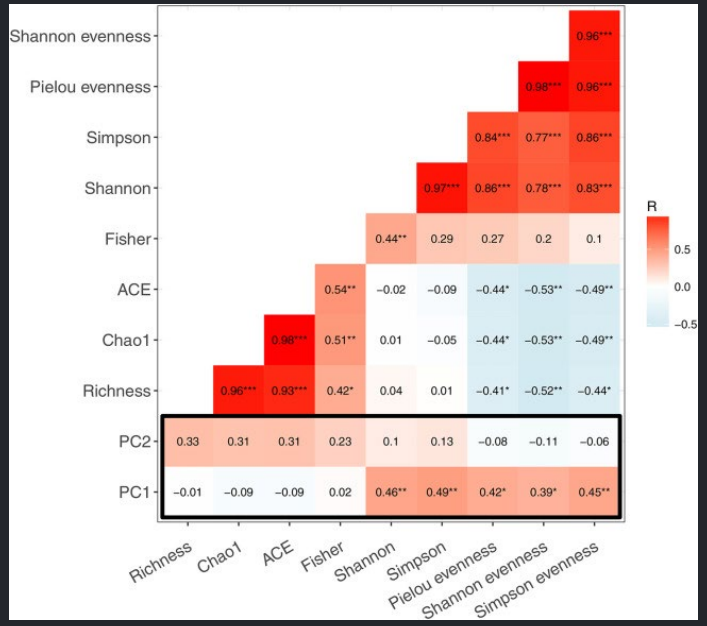
- The body's entanglements with the world
- What role does the microbiome play in embodying everyday experiences and social structure?
- Microbiome: a means to "get under the skin?"

AMERICAN JOURNAL OF HUMAN BIOLOGY

ORIGINAL RESEARCH ARTICLE | Full Access

Social networks, cooperative breeding, and the human milk microbiome

Courtney L. Meehan, Kimberly A. Lackey, Edward H. Hagen, Janet E. Williams, Jennifer Roulette, Courtney Helfrecht, Mark A. McGuire, Michelle K. McGuire



Spearman's correlation coefficient (r_s) of alpha diversity indices with social network and caregiving variables (PC1 and PC2). $^{**}P < .01$; $^{*}P < .05$