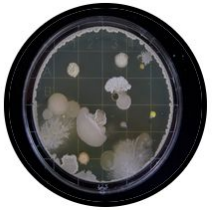


8AM

1PM in London (GMT), 10PM in Tokyo (GMT+9)

Bacteria & Viruses

Moderator: Stephen Uzzo, *President and Executive Director, Cape Cod Museum of Natural History*

Panelists:

- Mara G. Haseltine, **https://www.calamara.com**
- Rob Dunn, *North Carolina State University Curtin University, Raleigh, North Carolina*

ENVISIONING INTELLIGENCES

Aurora Mititelu

BLUEPRINTS TO HEAL THE PLANET

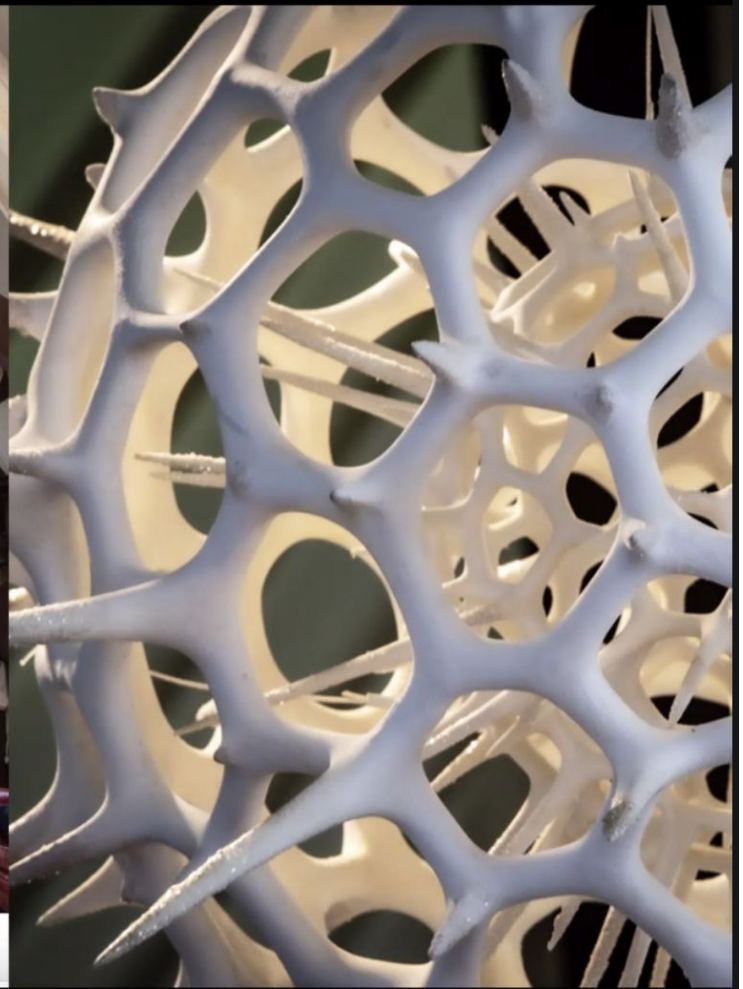
Bio: Mara G. Haseltine

Mara G. Haseltine is an international artist renowned in the field of SciArt, an environmental activist and educator. Haseltine collaborates with scientists and engineers to create work that addresses the link between our cultural and biological evolution. Her work takes place in the studio, lab, and field, infusing scientific inquiry with poetry. She was a pioneer in the translation of scientific data and bioinformatics into three-dimensional sculptures and became known for her outsized renditions of microscopic and sub-microscopic life. She created the first solar-powered oyster reef in NYC and has extensively studied sustainable reef restoration methods for the past 20 years, fusing art with sustainable solutions for 'SIDS,' Small Island Developing States at the United Nations. Haseltine has been a contributing member of the Explorers Club since 2008. She was awarded Return of the Flag with Honors for her work on the high seas with Tara Ocean Foundation studying atmospheric climate change and its relationship to planktonic ecosystems. Haseltine's work is refreshing in the world of environmental and biomedical art because of its surreal, often playful, and witty nature, as well as her intense devotion to ascetics and sensuality. She has recently become the Director of an NGO the Geotherapy Institute for Art and Field Science whose mission is to integrate art into the field sciences. Her first prototype project for the Geotherapy Institute for Art and Field Science is for coral restoration nurseries using 'nature-based" solutions in Laguna de Maya, Cuba.

http://geotherapyinstitute.org

Robert Dunn

Robert Dunn is a biologist, writer and professor in the Department of Applied Ecology at North Carolina State University. Dunn obtained a PhD in Ecology and Evolution from the University of Connecticut in 2003. At the University of Connecticut, Dunn studied the recovery of tropical forests in Costa Rica, Peru and Bolivia after clear-cutting and use for traditional agriculture. He sought to understand how long it takes for the biodiversity of animals to return to regenerating forests. He has written several books and his science essays have appeared at magazines such as BBC Wildlife Magazine, Scientific American, Smithsonian Magazine, National Geographic and others. He has become known for efforts to involve the public as citizen scientists in arthropod surveys and bacterial flora studies. His projects include studies of belly button biodiversity, mites that live on human faces, ants in backyards, and fungi and bacteria in houses.

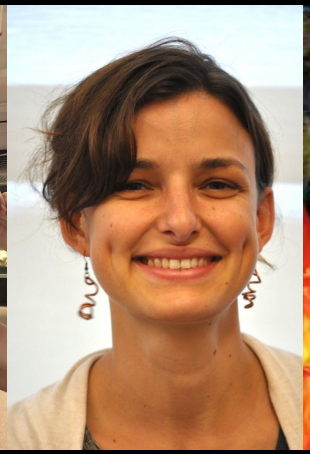


Radiolarian Skeleton hangs from rafters in historic "Gallery" room at Explorer's Club in NYC, photo credit Esteban Salazar (above) and detail (left)

With sourdough, I will lead you to two bigger stories about the Earth, one about the ways in which our unconscious bodies are negotiating vast terrains and the other about the quasi-conscious intelligences of human cultures.

>40 COLLABORATORS
1000s OF PUBLIC PARTICIPANTS

Ann Madden
Bookery apps.
History



Liz Landis
Food microbiology

Angela Oliveiro
Bioniformatics.

Erin McKenney
Pedagogy

Caiti Heil
Genomics

Tate Paulette
Archaeology

Matthew

photo credit: Lauren Nichols

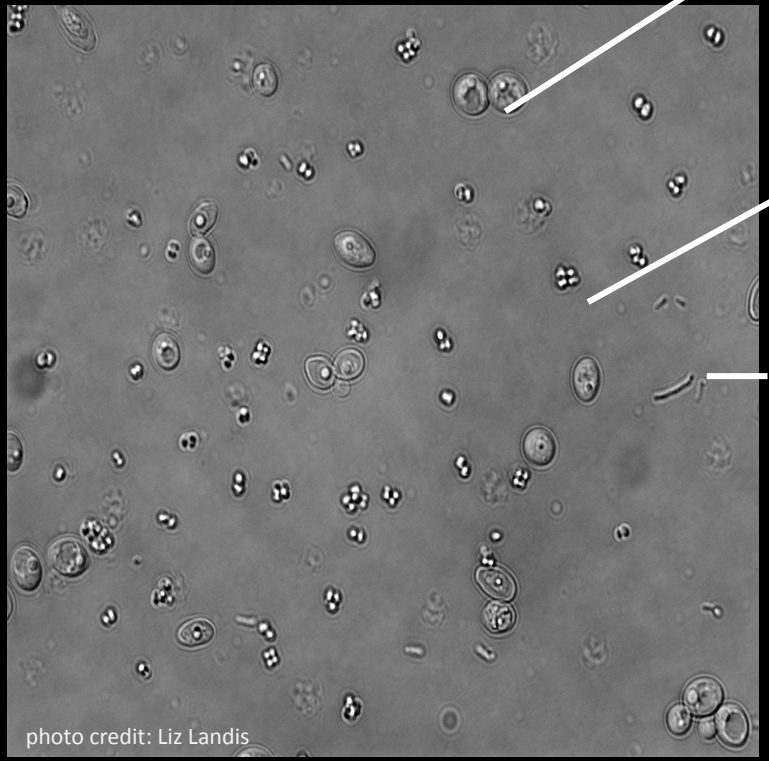
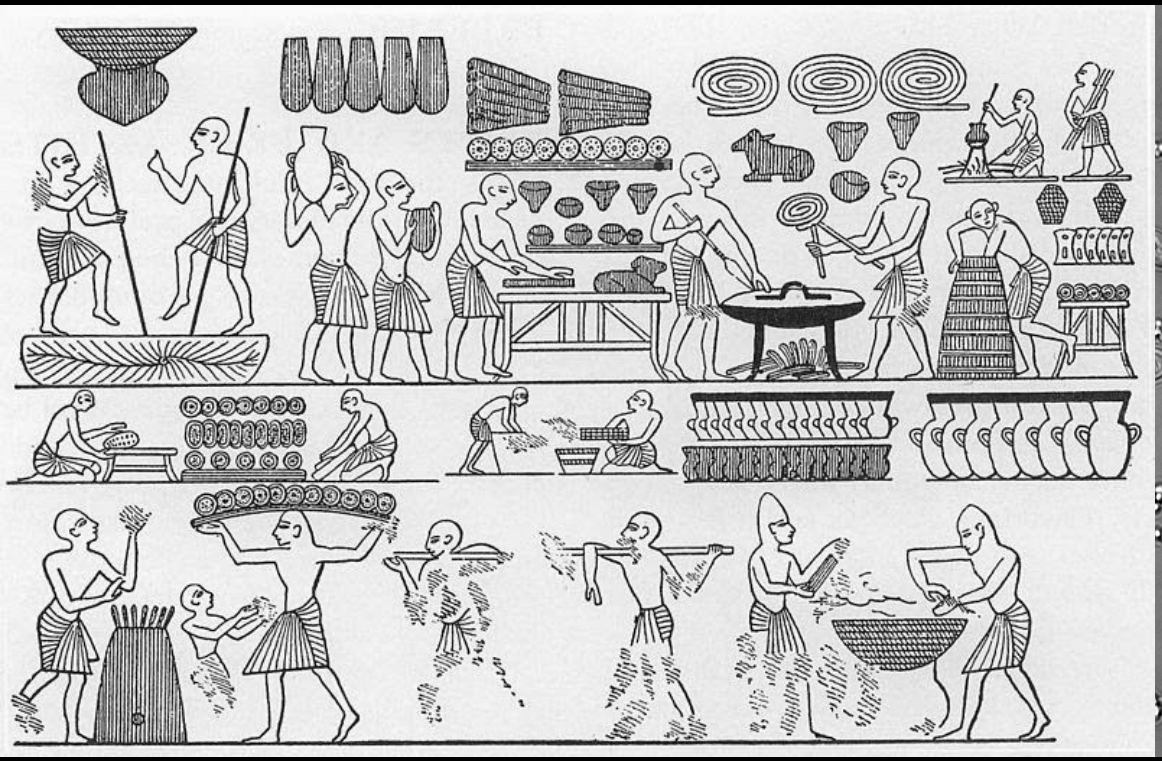
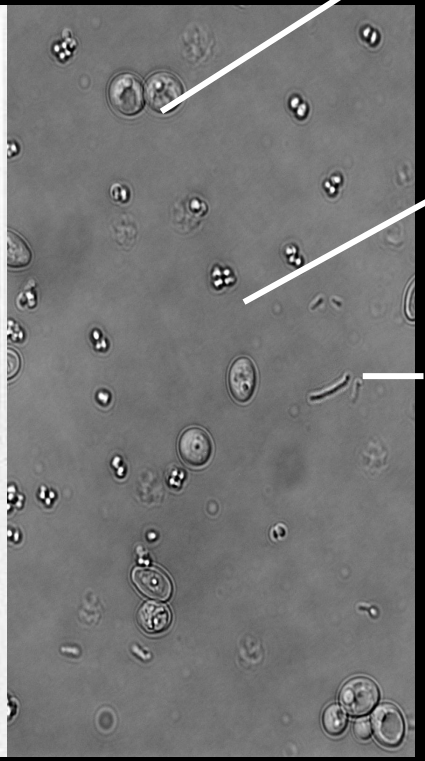


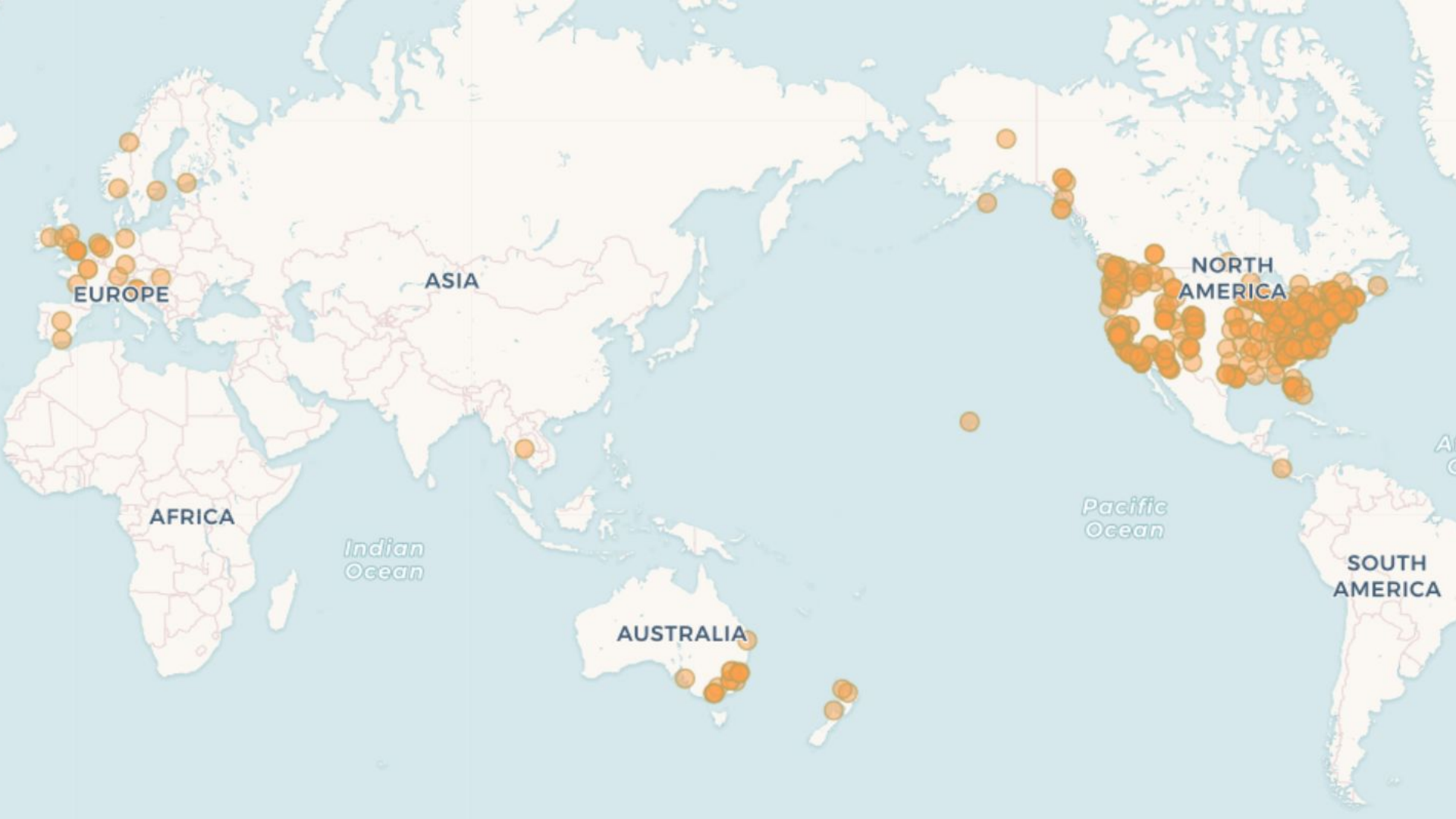
photo credit: Liz Landis



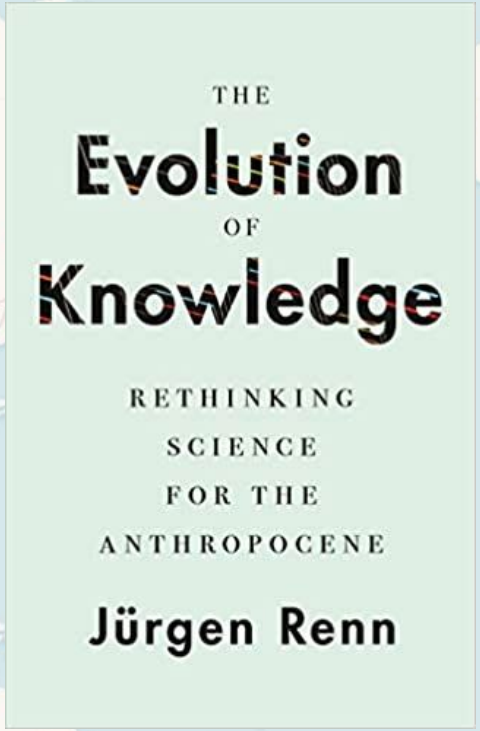


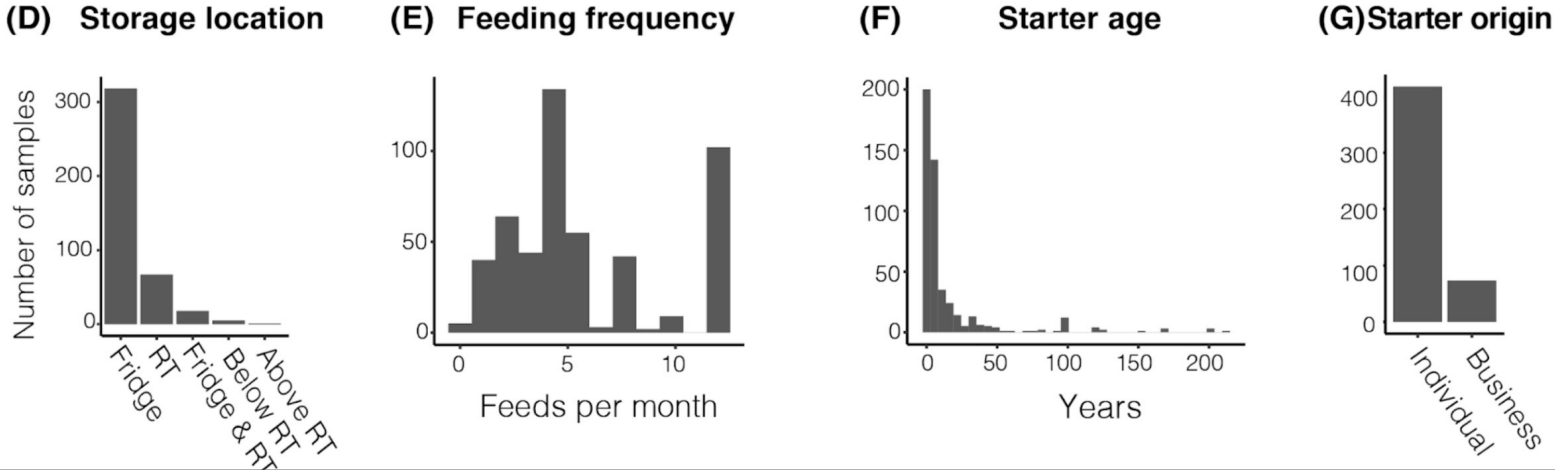
The technology that allows…. food storage, food transformation, food shipping and water purification.

photo credit: Lauren Nichols

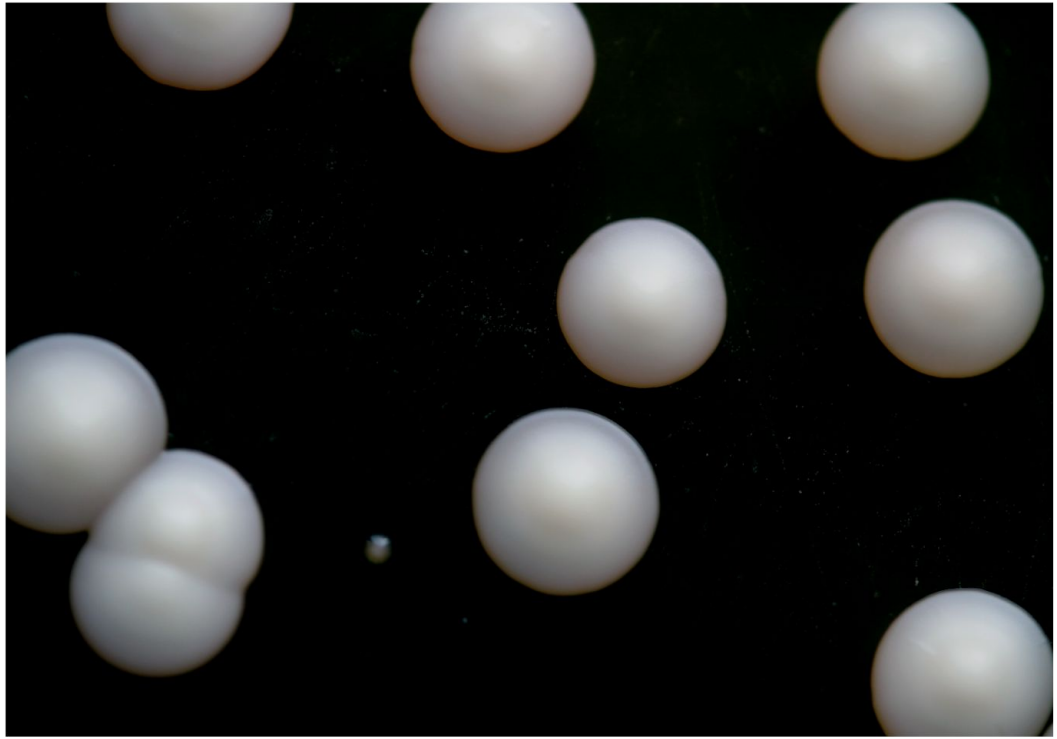

EUROPE
ASIA
NORTH AMERICA
AFRICA
Indian Ocean
Pacific Ocean
AUSTRALIA
SOUTH AMERICA

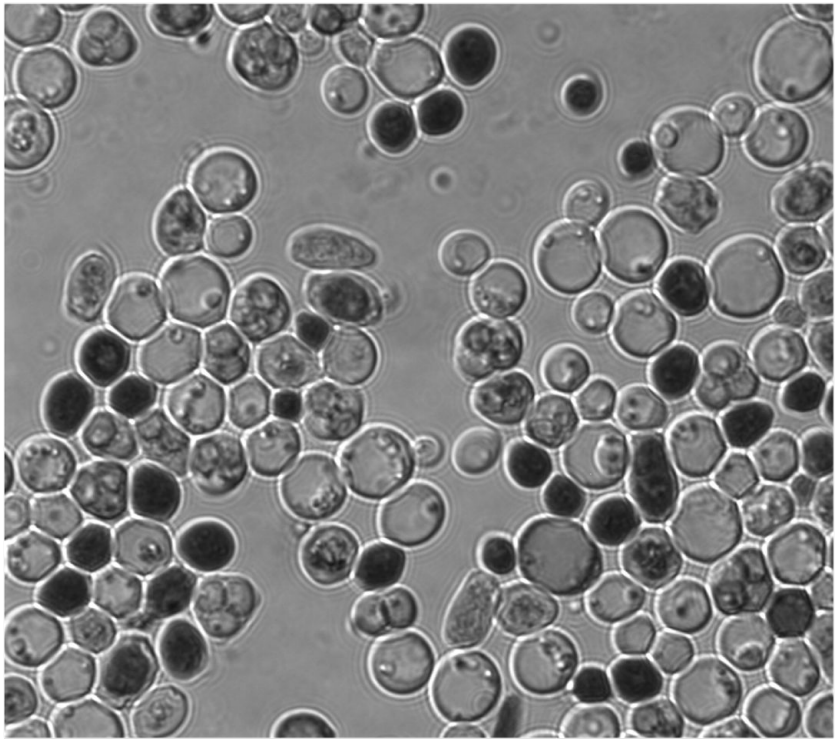
“transdisciplinary cooperation in science and education” where the education is bi-directional




(D) Storage location
Number of samples
300
200
100
0
Fridge
RT
Fridge & RT
Below RT
Above RT
(E) Feeding frequency
100
50
0
0
5
10
Feeds per month
(F) Starter age
200
150
100
50
0
0
50
100
150
200
Years
(G) Starter origin
400
300
200
100
0
Individual
Business

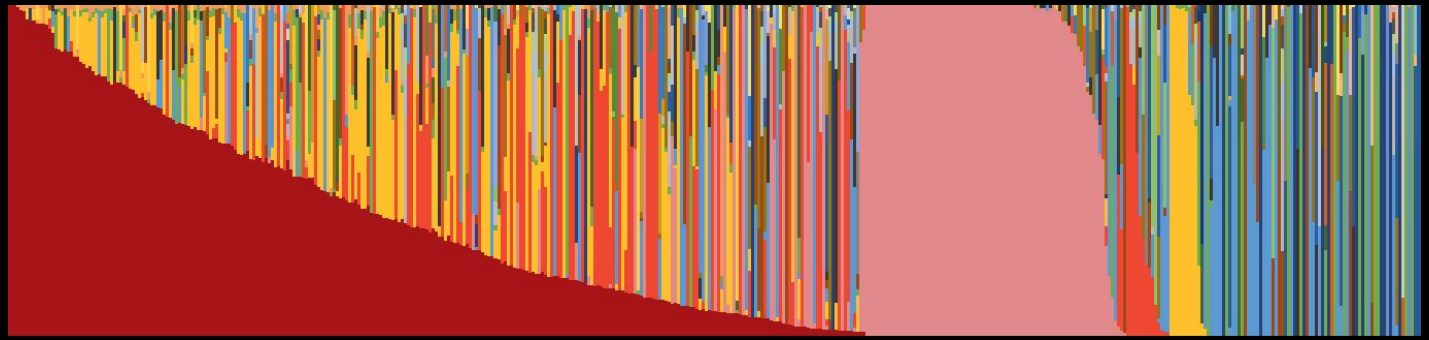
COMPOSITION: SPECIES. GENES. TRAITS. COLLECTIVE TRAITS.





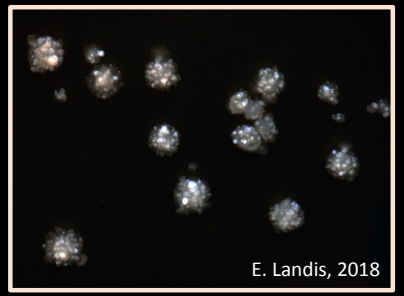
Yeasts are mostly *S. cerevisiae*

Over 70 types of lactic acid bacteria



L. brevis

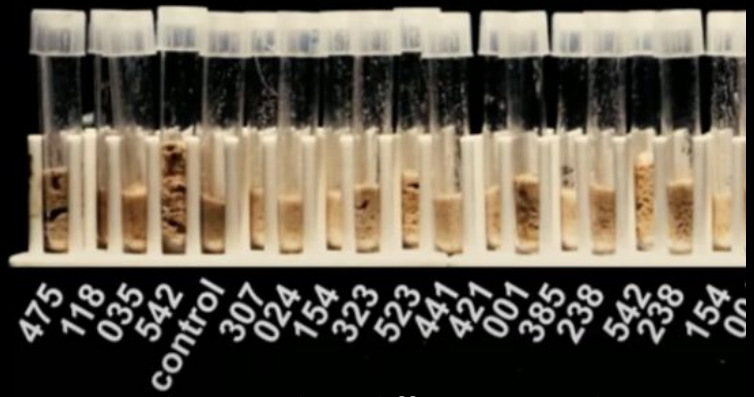
L. sanfranciscensis



The Starters Vary

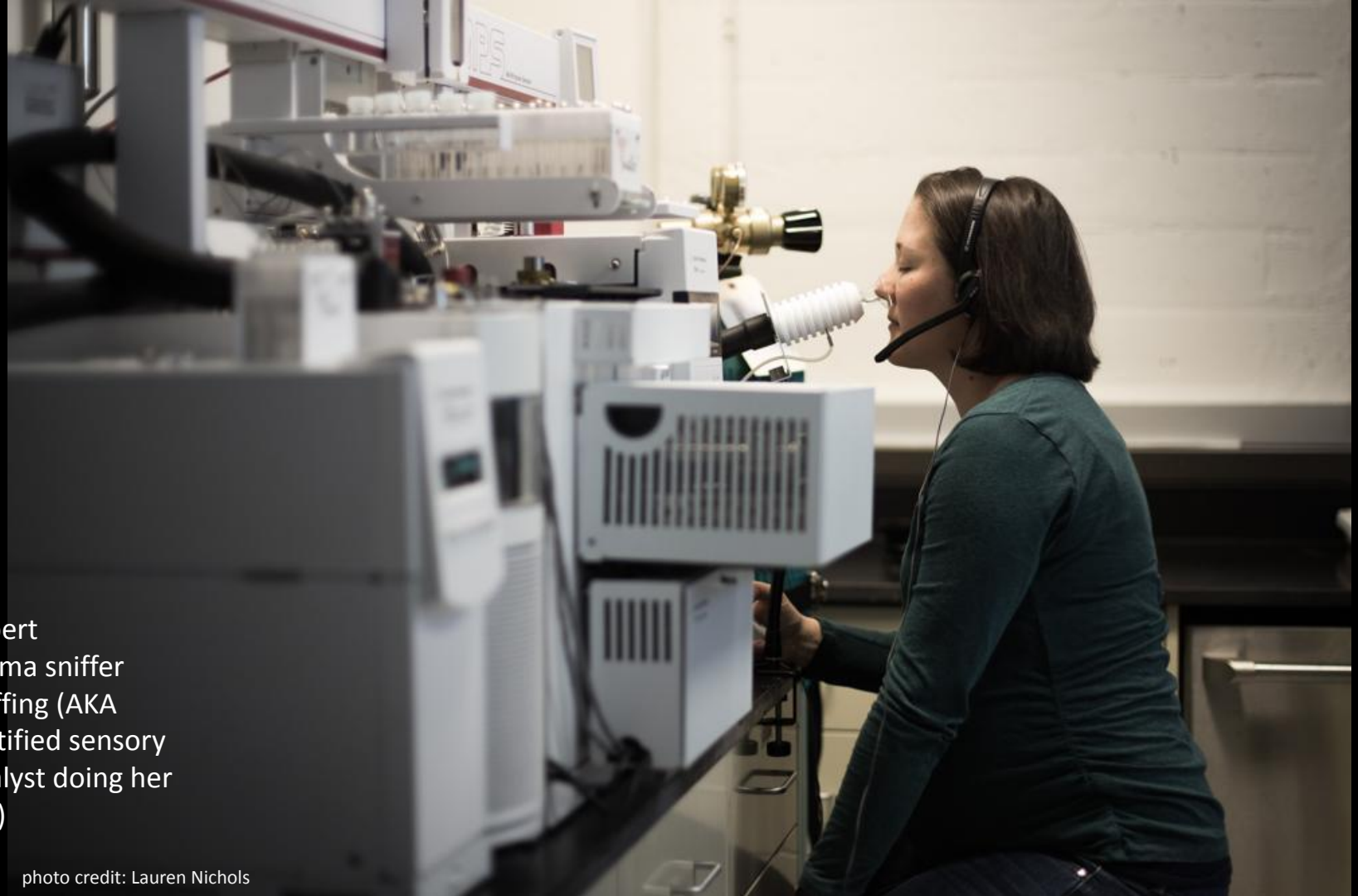
How do we explain this variation, make predictions about it and develop general models to account for it?

1. Are the functions of the starters predicted by their composition? (Culinary lens)



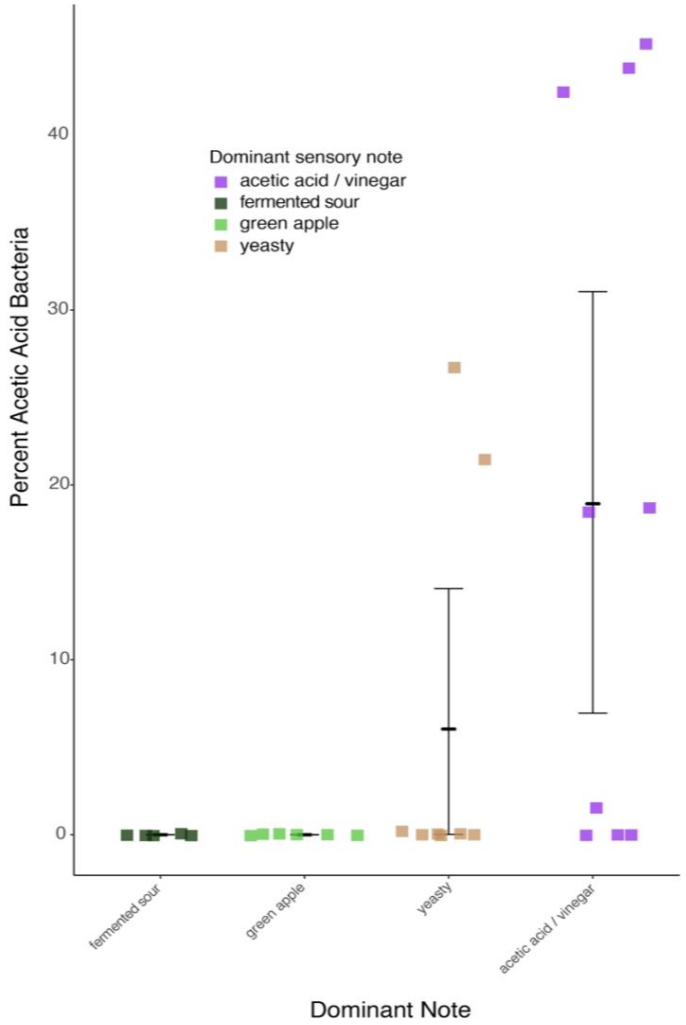
Starters showing their different growth rates since a common inoculation time.

photo credit: Lauren Nichols

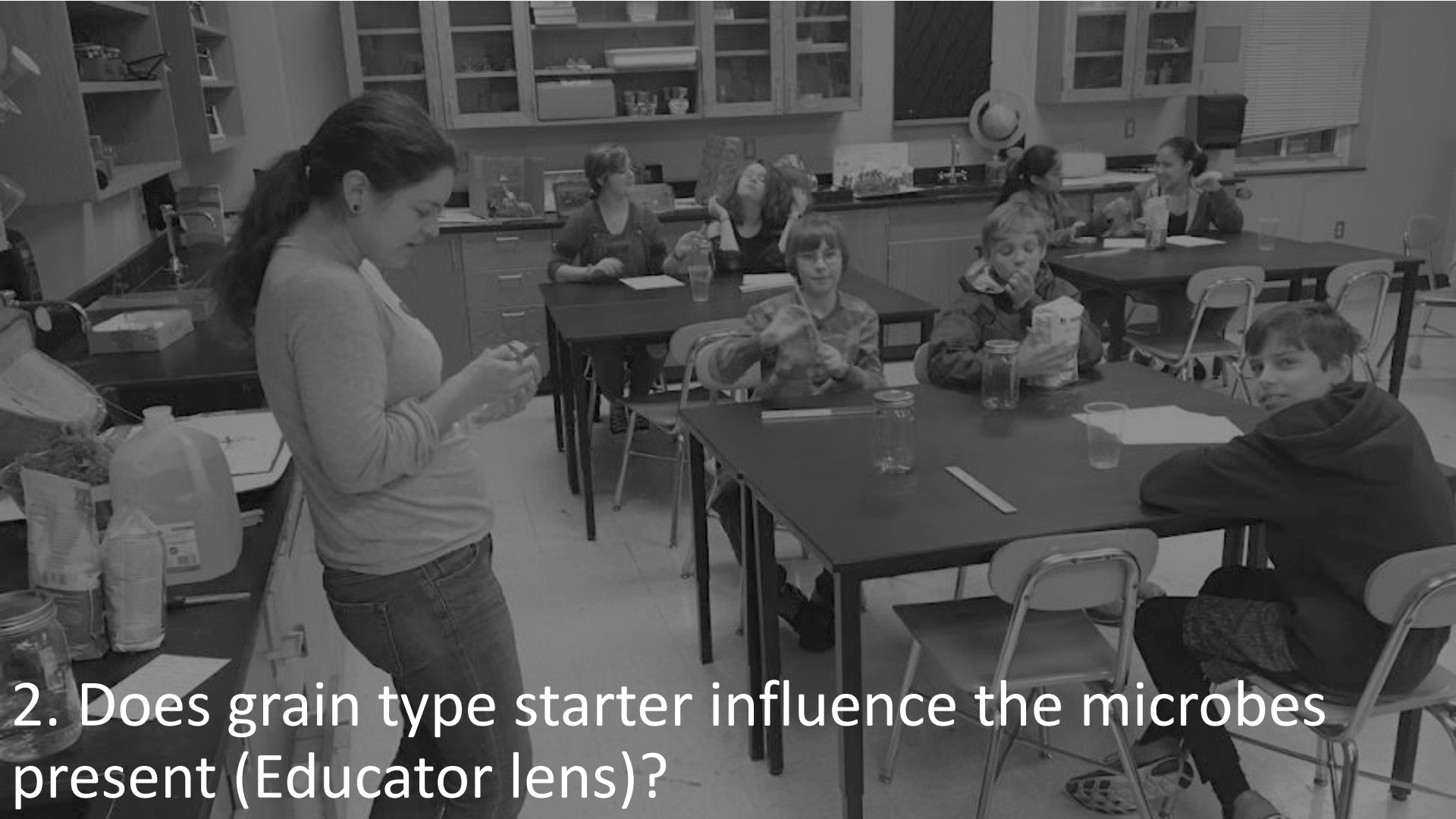


Expert aroma sniffer sniffing (AKA certified sensory analyst doing her job)

photo credit: Lauren Nichols

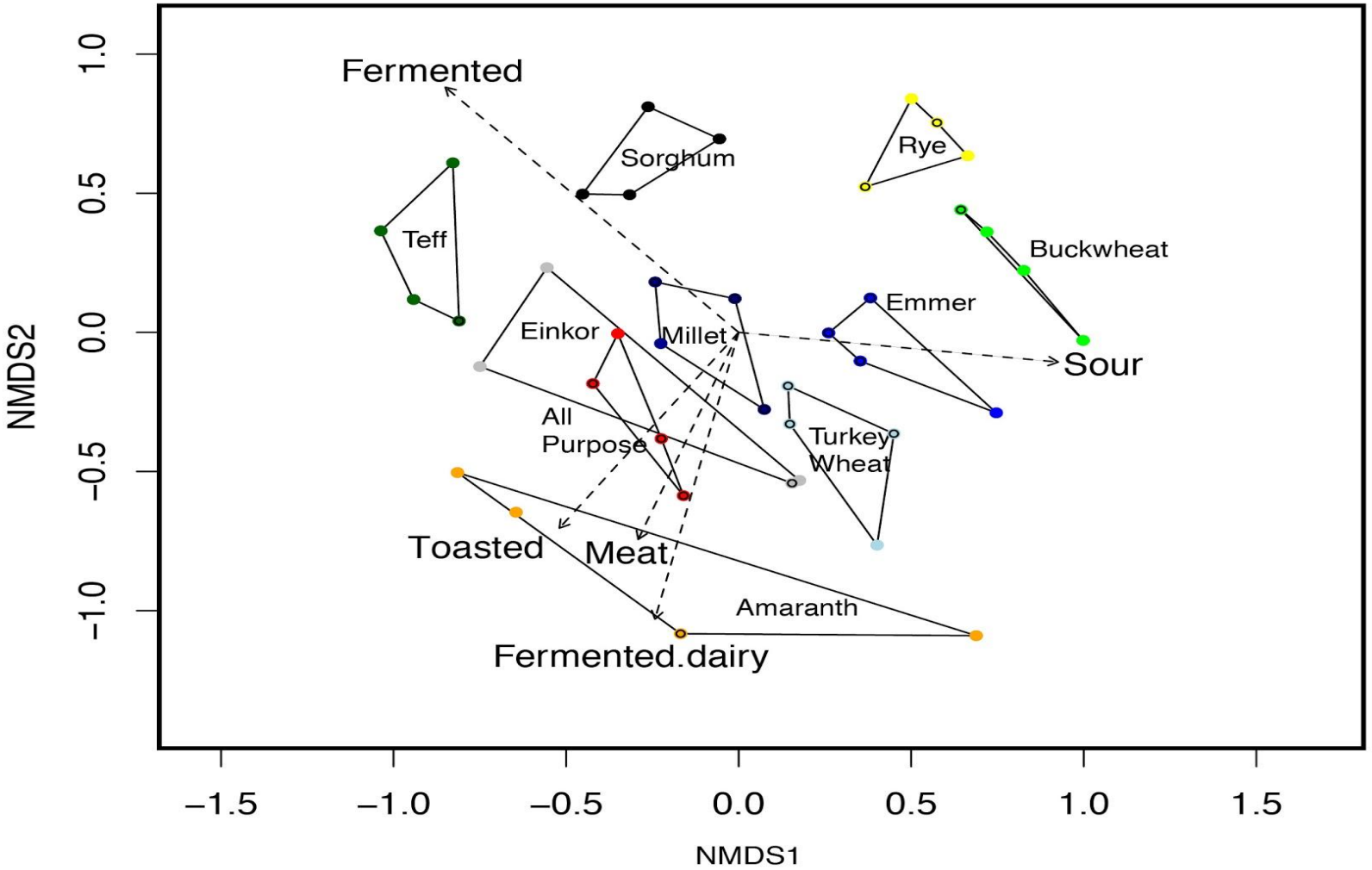


Can even be linked to individual acetic acid bacteria genes



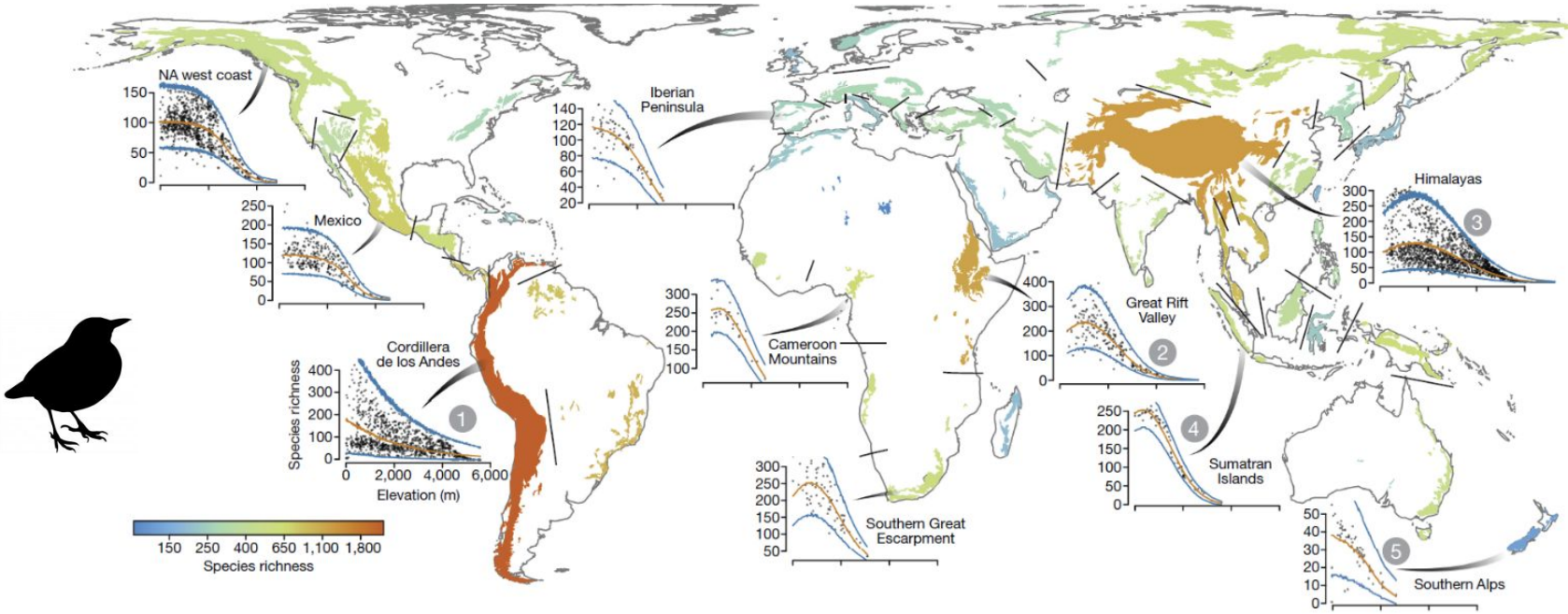
2. Does grain type starter influence the microbes present (Educator lens)?

2. Does grain type starter influence the microbes present (Educator lens)?


Fermented
Sorghum
Rye
Teff
Buckwheat
Emmer
Einkor
Millet
Sour
All
Purpose
Turkey
Wheat
Toasted
Meat
Amaranth
Fermented.dairy
NMDS2
NMDS1
1.0
0.5
0.0
−0.5
−1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5

3. Is the diversity of starters predicted by elevation or climate (macroecologist question)?

3. Is the diversity of starters predicted by elevation or climate (macroecologist lens)?



Elevational richness gradients

Quintero & Jetz, Nature 2018

3. Is the diversity of starters predicted by climate (macroecologist lens)?

NO

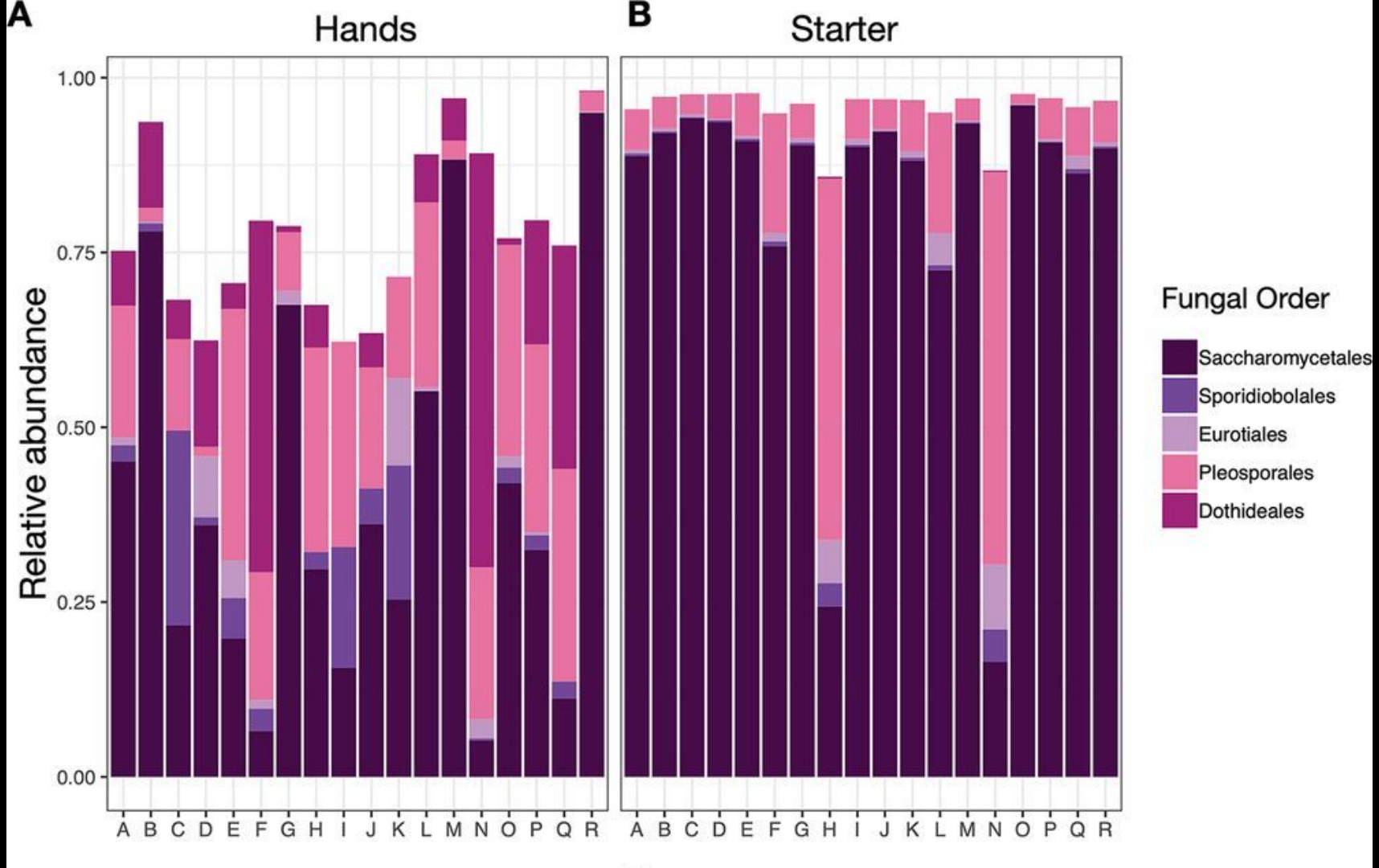
Although there is a caveat.

4. Is the composition of starters predicted by geography (biogeographer lens)?

4. Is the composition of starters predicted by geography (biogeographer lens)?

YES

5. Where do the bacteria and yeast in starters come from? (participant lens). Tson mat.


A
Hands
B
Starter
Relative abundance
1.00
0.75
0.50
0.25
0.00
A B C D E F G H I J K L M N O P Q R
Fungal Order
Saccharomycetales
Sporidiobolales
Eurotiales
Pleosporales
Dothideales

6. Where do the bacteria and yeast in starters come from? (evolutionary lens)

The ecology of insect–yeast relationships and its relevance to human industry

Anne A. Madden, Mary Jane Epps, Tadashi Fukami, Rebecca E. Irwin, John Sheppard, D. Magdalena Sorger and Robert R. Dunn

Published: 21 March 2018 | https://doi.org/10.1098/rspb.2017.2733

Abstract

Many species of yeast are integral to human society. They produce many of our foods, beverages and industrial chemicals, challenge us as pathogens, and provide models for the study of our own biology. However, few species are regularly studied and much of their ecology remains unclear, hindering the development of knowledge that is needed to improve the relationships between humans and yeasts. There is increasing evidence that insects are an essential component of ascomycetous yeast ecology. We propose a 'dispersal–encounter hypothesis' whereby yeasts are dispersed by insects between ephemeral, spatially disparate sugar resources, and insects, in turn, obtain the benefits

Building on amazing work by Irene Stefanini

Story of the bacteria is even more interesting. Ask me later if there is time.

7) What makes some starters resilient (historian lens)?

Prof. Matthew Booker, Assistant Director, National Humanities Center and Visiting Fellow, Rachel Carson Center, Munich

Charles E. Bunnel (1900)

The progenitor of Matthew's family starter.

SOCIAL RESCUE

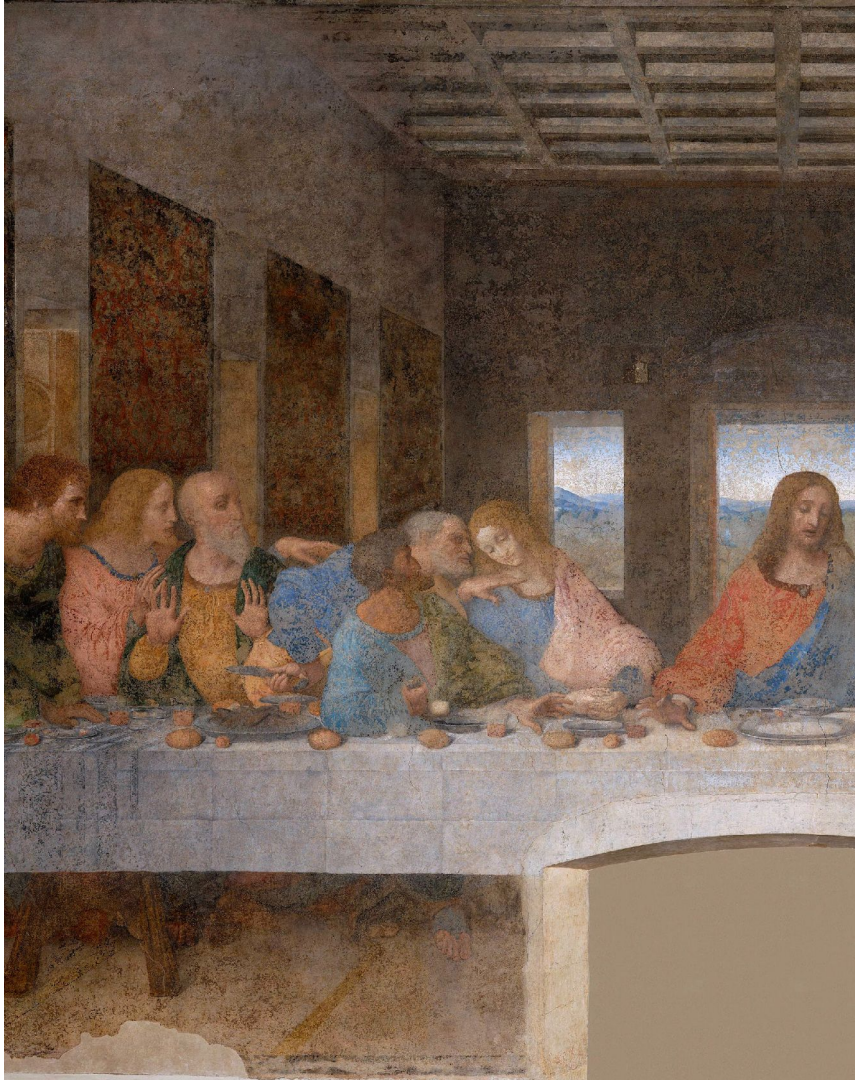
1) Starters are members of the family. They are talked about using kin terms as living beings that are born, live, die and are loved.

2) They are rescued because they are kept alive by multiple members of the family. They are rescued by their status and the social networks of which they are apart.

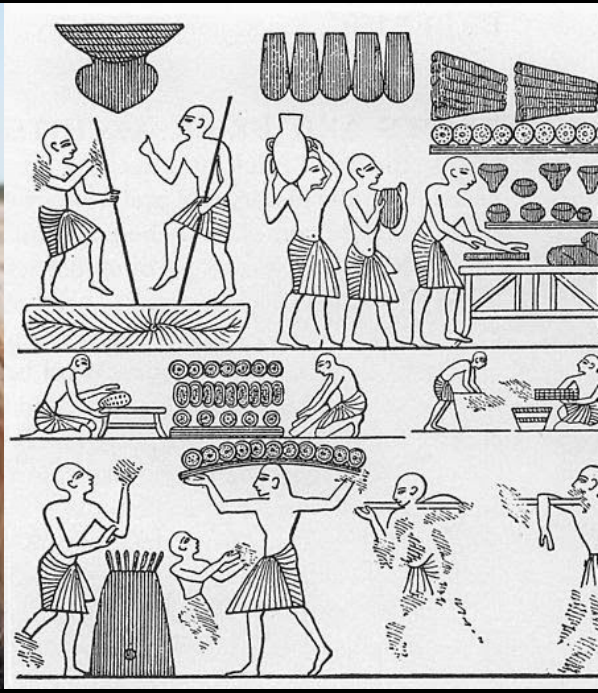
Margaret Simon
Bread in English
Literature
of the 1600s and 1700s

Aminah Al Attas Bradford
Sourdough (and other
microbiomes)
in Christian theology.

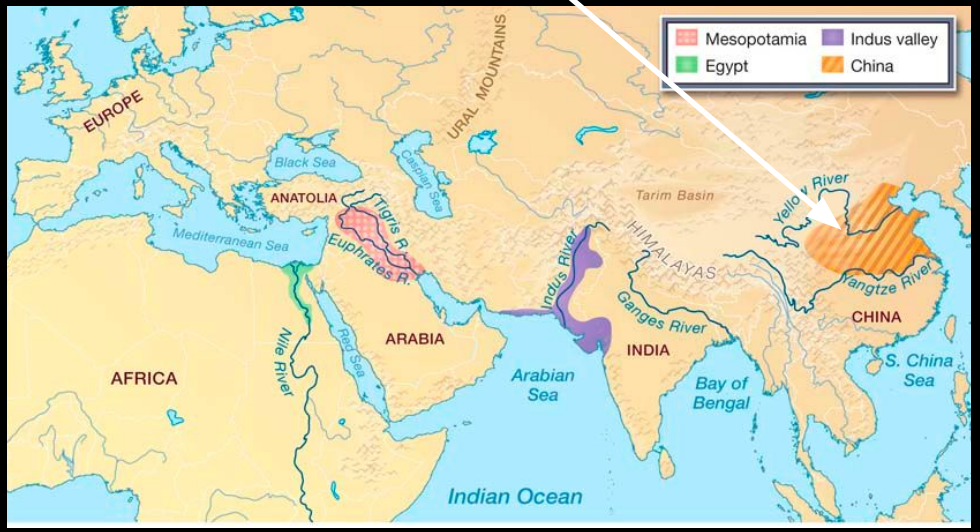
This work is slower because they need to write books
for promotion and tenure.



8. Can we predict the starters of ancient breads and beers (archaeologist question)?



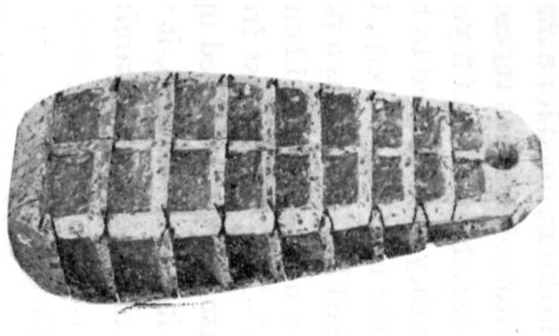
Likely origin



Tom Gilbert

Hannes Schroeder

Piece of ancient gum from which Hannes identified ancient human oral microbes



Diverse perspectives on the single universe of bread.

The whale sees a different sea from each of its enormous eyes–Jim Harrison paraphrasing Melville

We are part of the earth's "starter," or as Renn puts it, "We are not outside observers! We are all actors in a comprehensive drama in which humans and the nonhuman world take part equally."

Now, let’s talk about ants and yogurt

Rasmus Munk, chef, with eyeballs (at right)

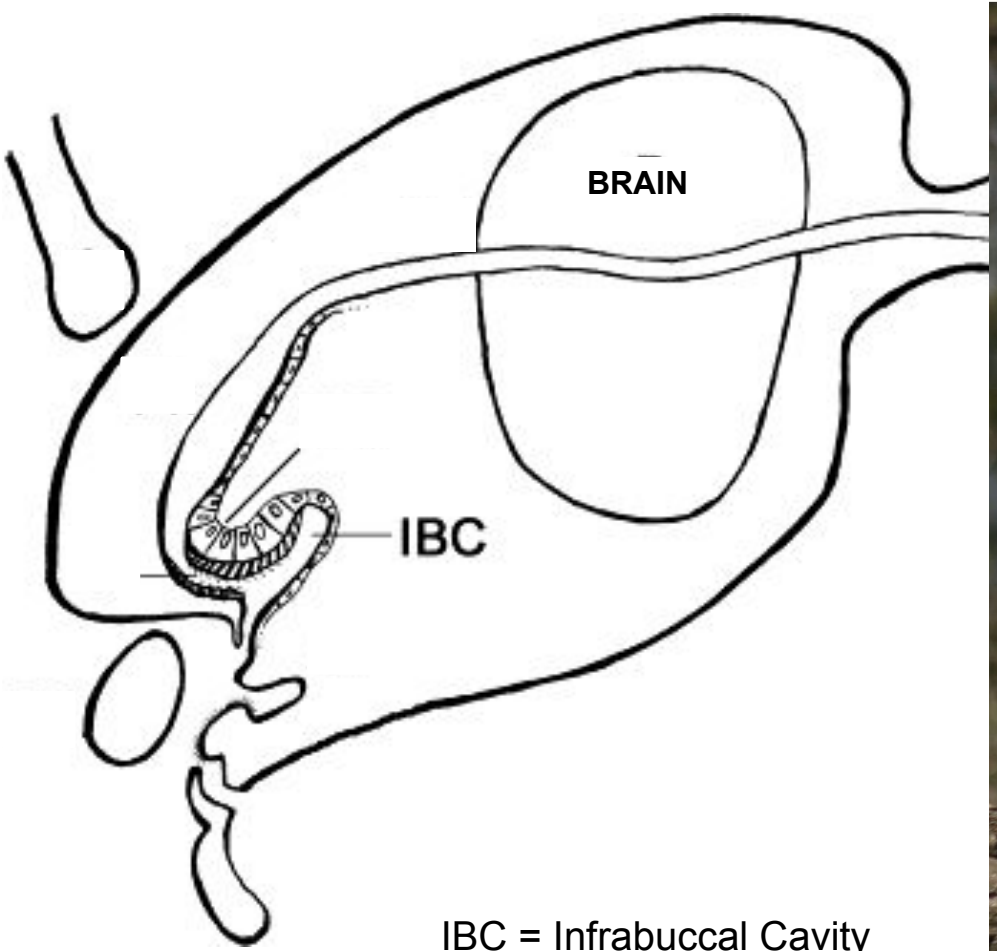
CULTURE CLUB

It once took ants, plants, and rainwater to make yogurt in Bulgaria. One group of researchers is working to bring the traditions back.

Written by
Veronica Sinotte,
Sevgi Mutlu Sirakova,
and David Zilber

Photography by
David Zilber


A



IBC = Infrabuccal Cavity
(AKA, mouthpouch)

9. Our bodies evolved in relation to paleo-fer mentation

Beaded art by Kathleen Ryan

Two strange conclusions

1) For hundreds of millions of years, the intelligences of our immune systems and olfactory systems have been negotiating intelligent decisions. 2) More recently (hundreds thousands of years) our cultures have been accreting complementary intelligence. Much of this has not been “conscious,” in the classical sense and yet, nonetheless, knowing.

Open Discussion

- In both of your presentations, you are talking about biological entities that are either invisible or largely inaccessible and putting them front and center for the public. What kind of responses do you get?
- In thinking about the future, are there living systems or relationships you would you like to explore next?
- As we know we are experiencing a crisis in science literacy and it is affecting human health and the environment. What do you want to tell attendees about how to counter this problem and the misinformation it foments?

24h Envisioning Intelligences
event slides and video recordings:

Call for exhibit submissions:
https://scimaps.org/call-for-submissions

ENVISIONING INTELLIGENCES

Aurora Mititelu