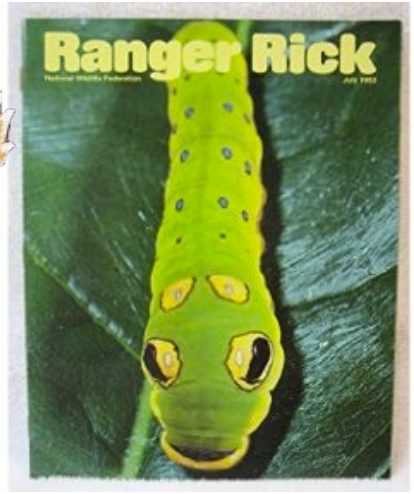
From Belly Buttons to Basements:

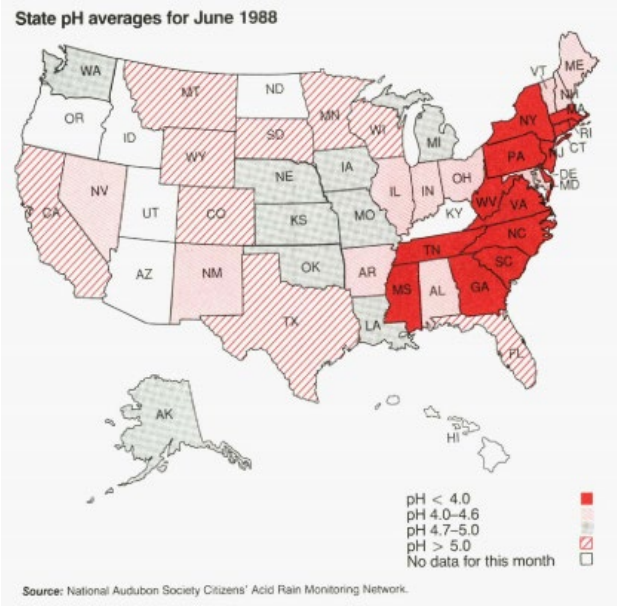
Lessons Learned from Engaging the Public in the Study of the Biodiversity in Their Daily Lives

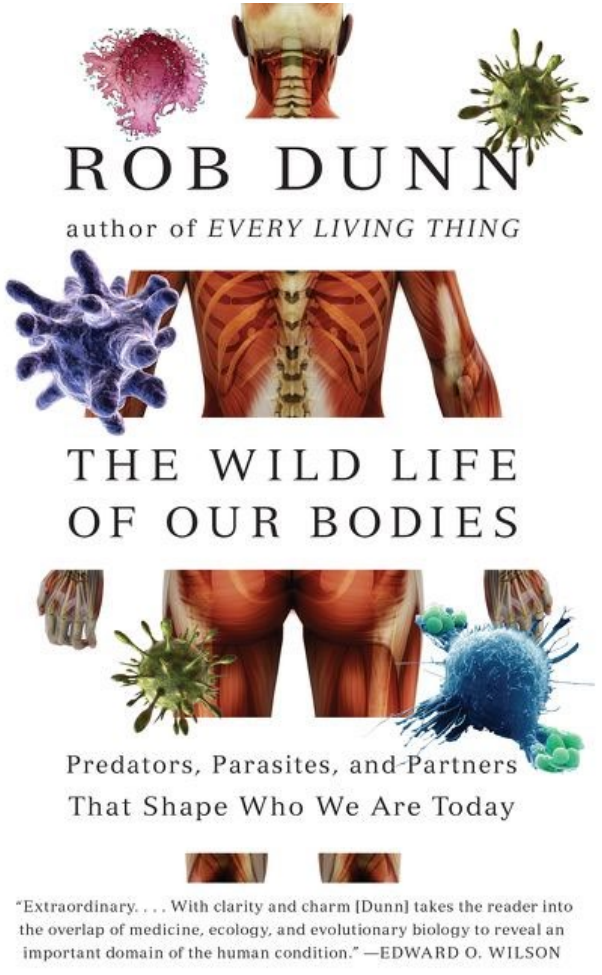
Holly L. Menninger, Ph.D.
Director of Public Engagement & Science Learning
@DrHolly | hmenning@umn.edu

bell museum

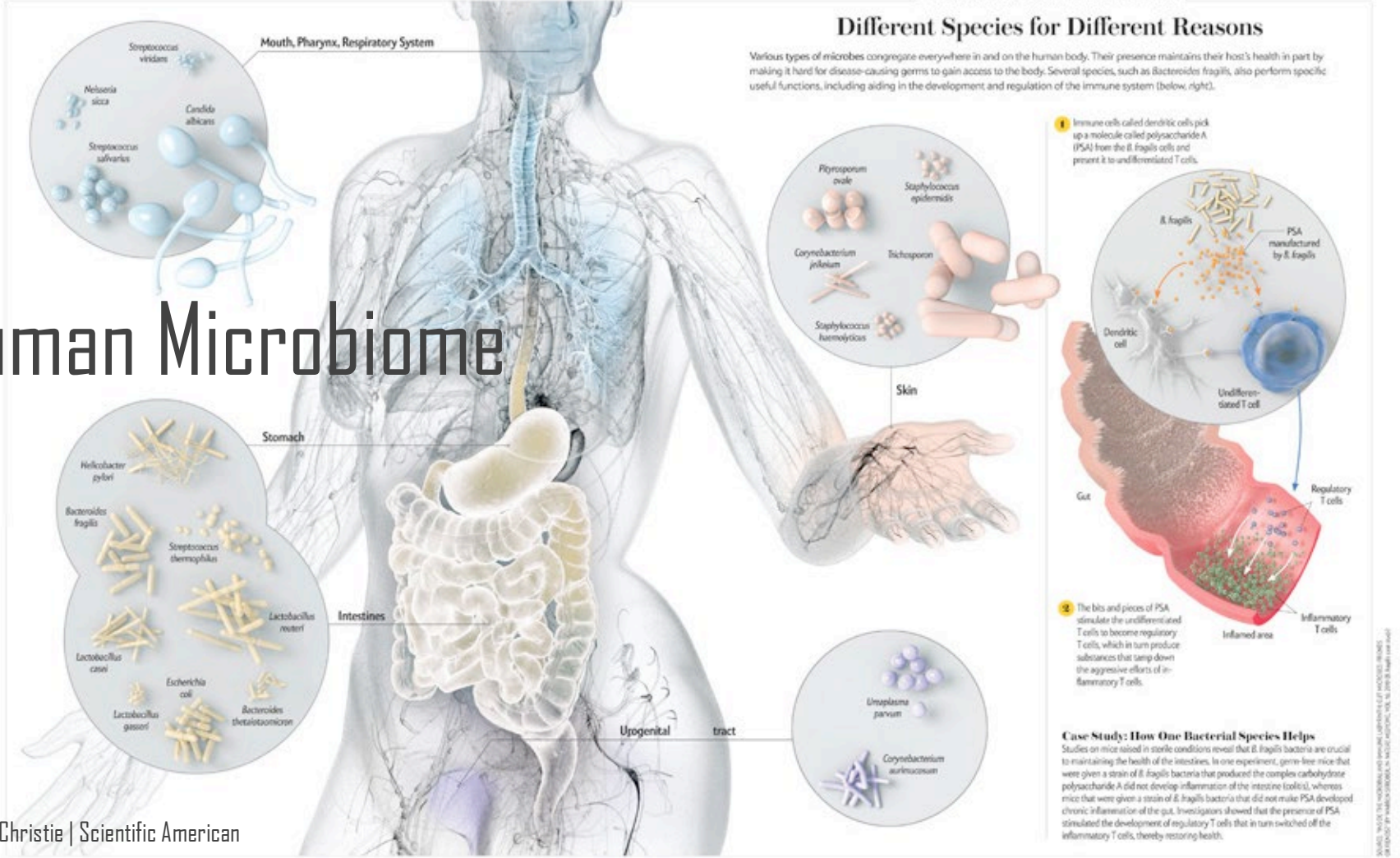

Ranger Rick


pHydrion
Vivid 1 to 11
pH1
pH7
8
9
10
11


State pH averages for June 1988
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
KY
TN
AL
OH
WV
GA
FL
SC
NC
VA
PA
NY
VT
ME
NH
MA
RI
CT
DE
MD
AK
HI
pH < 4.0
pH 4.0–4.6
pH 4.7–5.0
pH > 5.0
No data for this month
Source: National Audubon Society Citizens' Acid Rain Monitoring Network.


ROB DUNN
author of EVERY LIVING THING
THE WILD LIFE OF OUR BODIES
Predators, Parasites, and Partners That Shape Who We Are Today
"Extraordinary. . . . With clarity and charm [Dunn] takes the reader into the overlap of medicine, ecology, and evolutionary biology to reveal an important domain of the human condition." —EDWARD O. WILSON

Human Microbiome



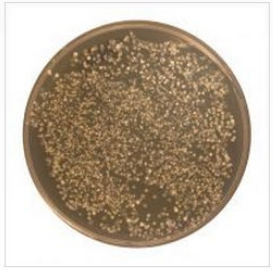
Bryan Christie | Scientific American

Julia Rice | Buzz Hood Roar

Sample 976

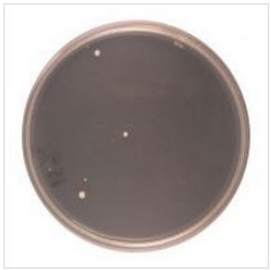
Sample 978

Sample 979



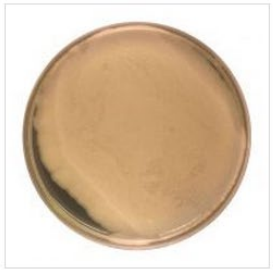
Sample 981

Sample 982

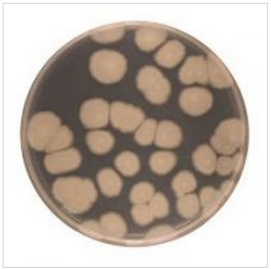


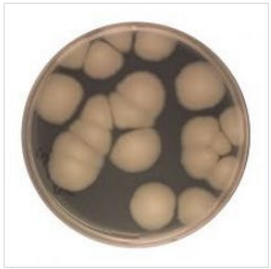
Sample 983

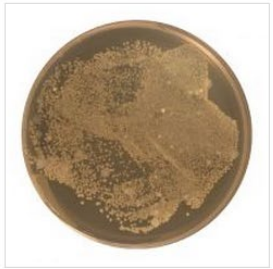
Sample 984

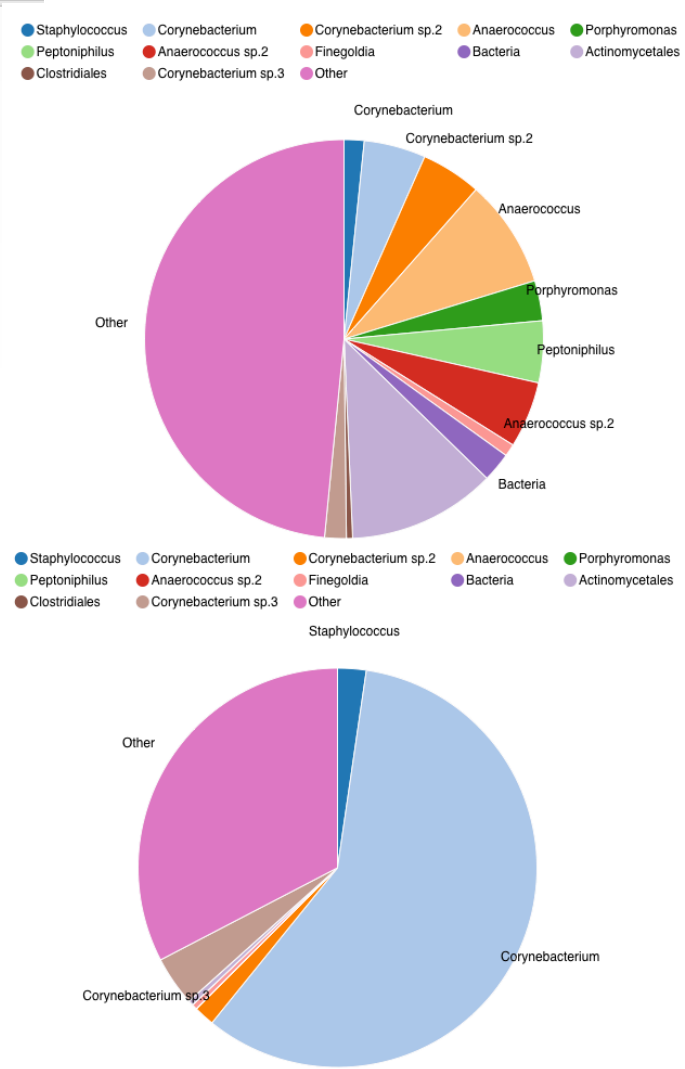


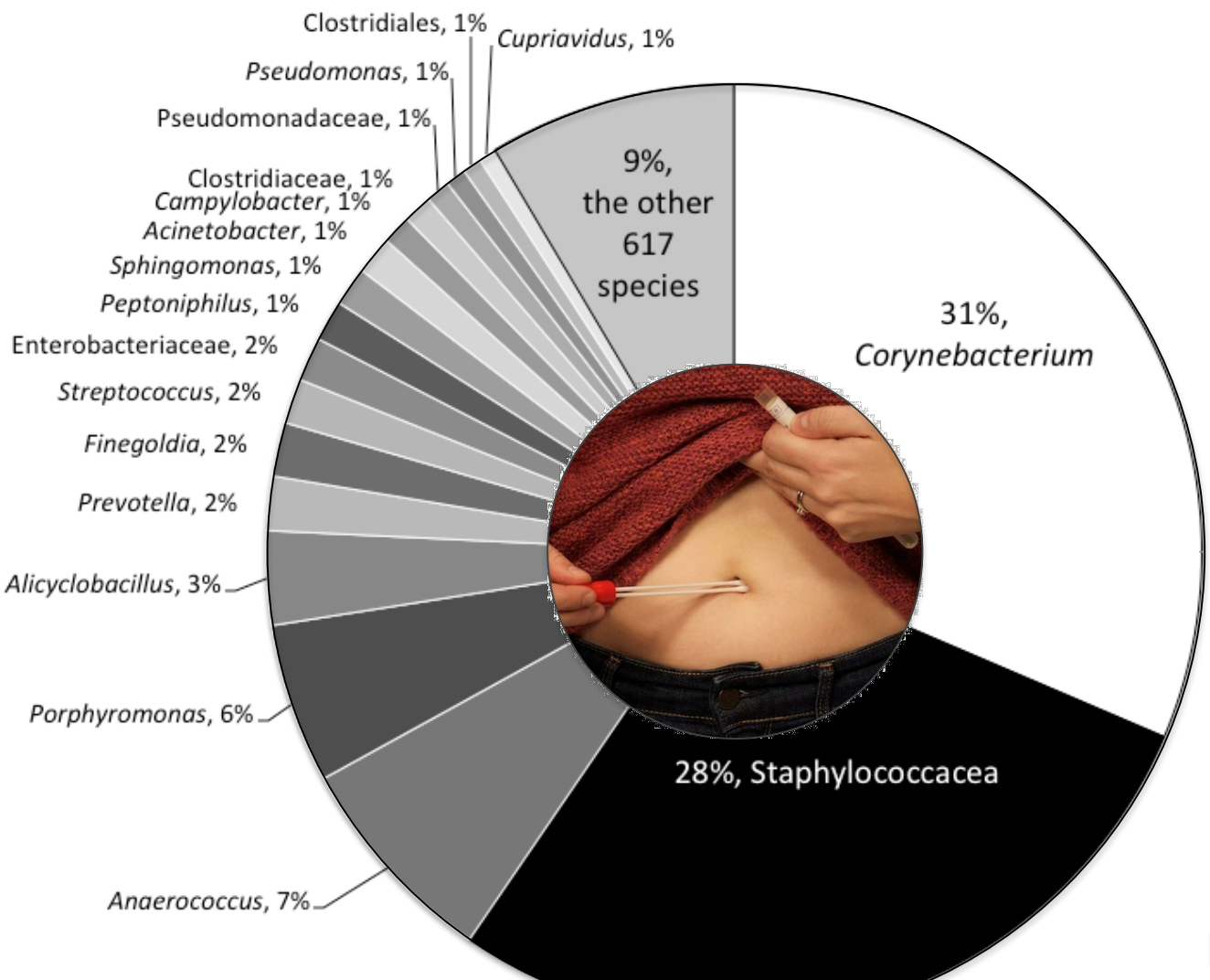
Sample 985



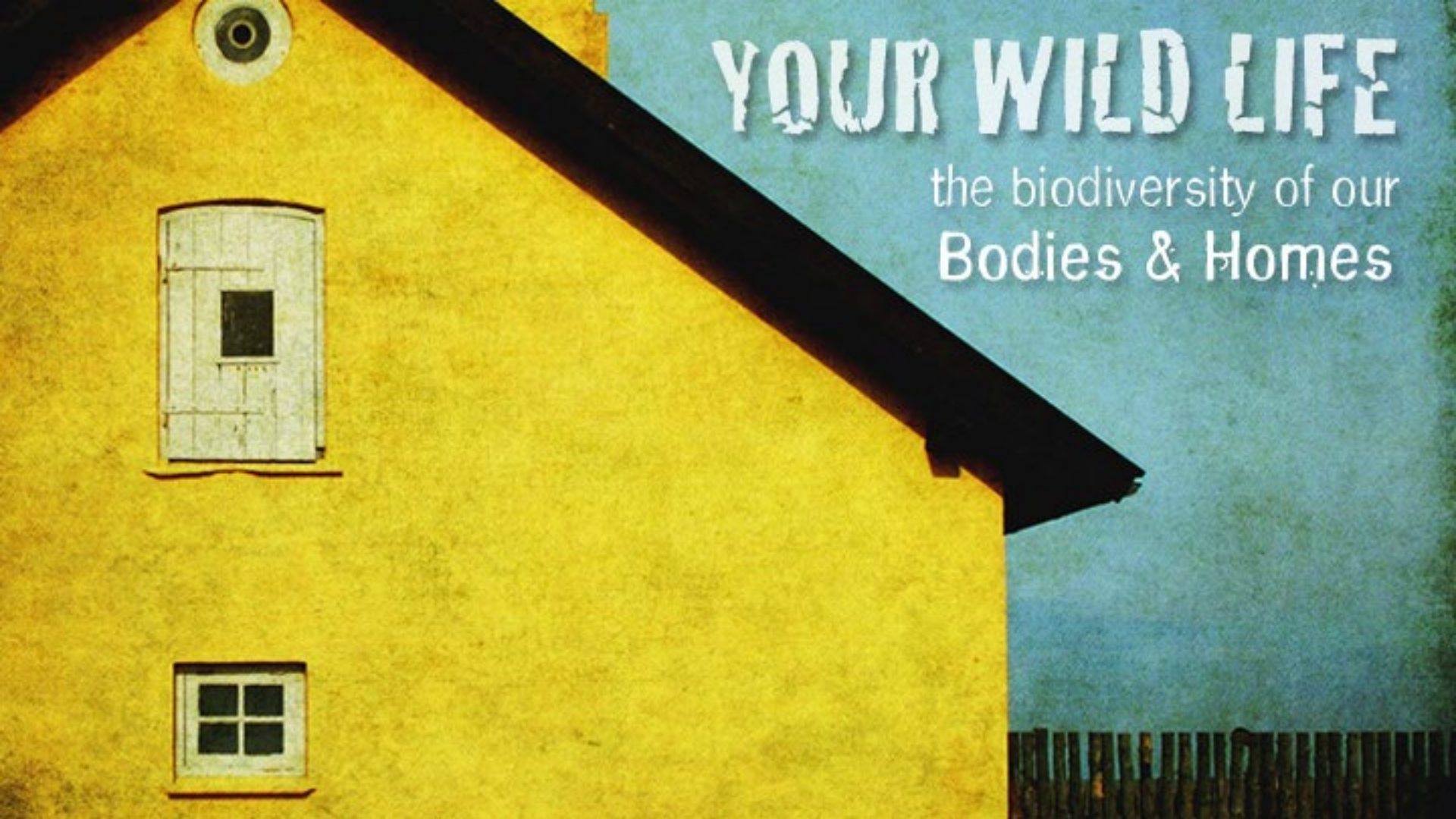








Hulcr et al. 2012, *PLOS ONE*

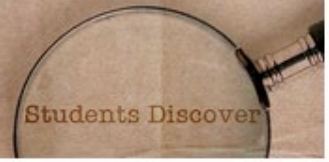

YOUR WILD LIFE
the biodiversity of our
Bodies & Homes

Cat Tracker

Camel Crickets

Home Census

Education



Students Discover

Dr. Eleanor's

Book of Common Ants

Forehead Mites

Meet Your Mites

Urban BUZZ

Arthropods

of Our Homes

Invisible Life

Microbe Stories

Wild Life

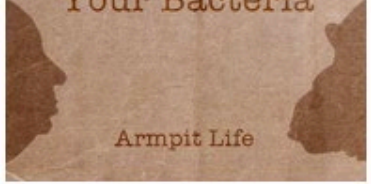
of Our Homes

School of Ants

Your Bacteria

Belly Button Biodiversity

Your Bacteria

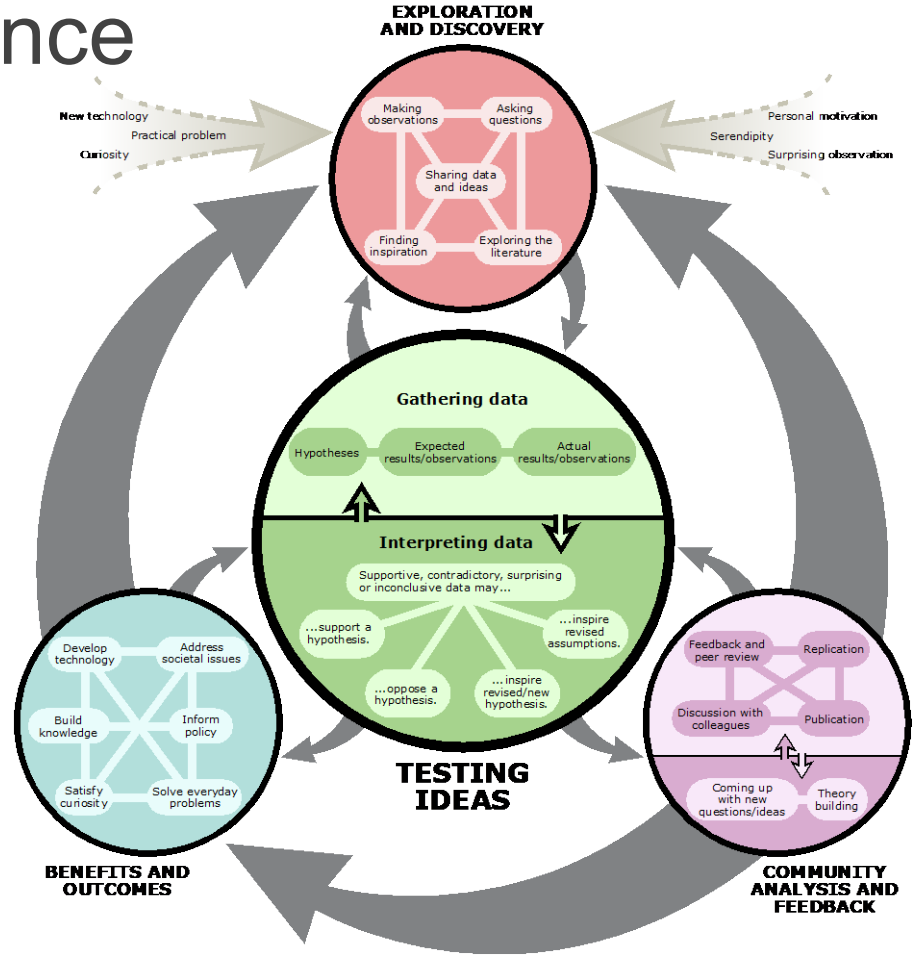


Armpit Life

Hyperlocal

Natural history meets modern tech

Process of science

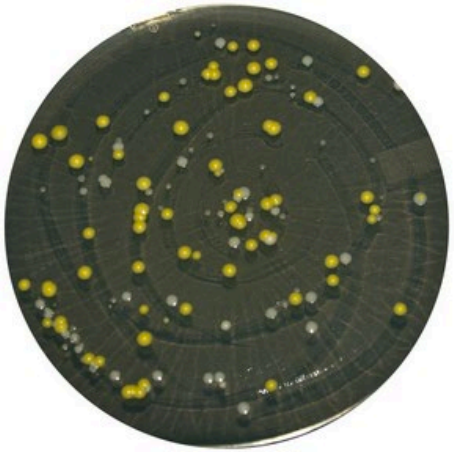


Understandingscience.org

Partnerships and collaborations

Science Communication

Kristina, North Carolina 2014 (NC 52)



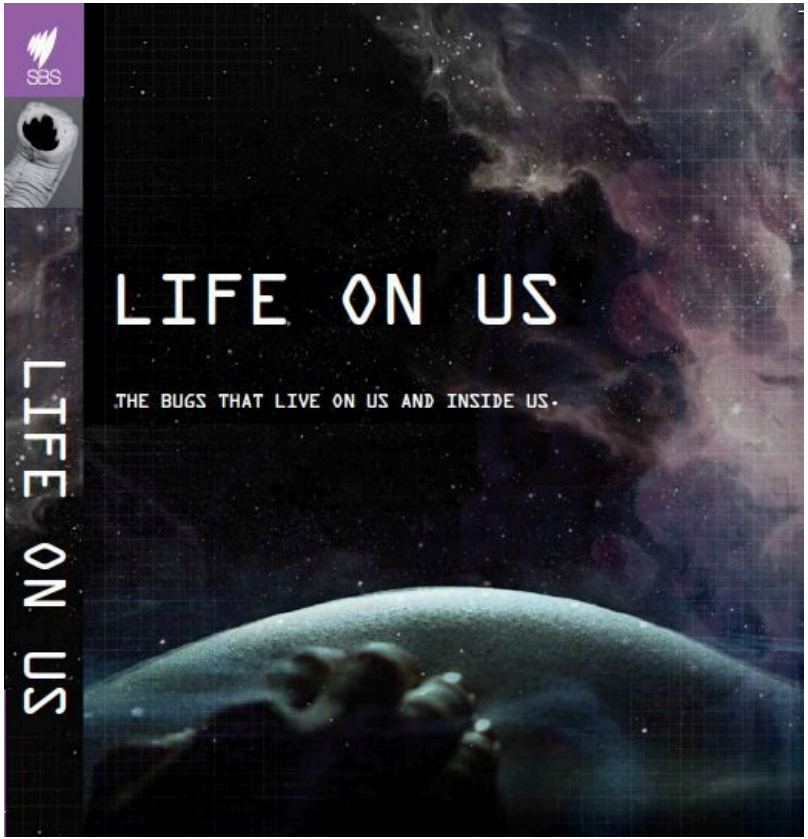
Demond, North Carolina 2014 (NC 51)

OTHER SELF PORTRAITS

2014-2015

INFO

Joana Ricou, microbialart.tumblr.com



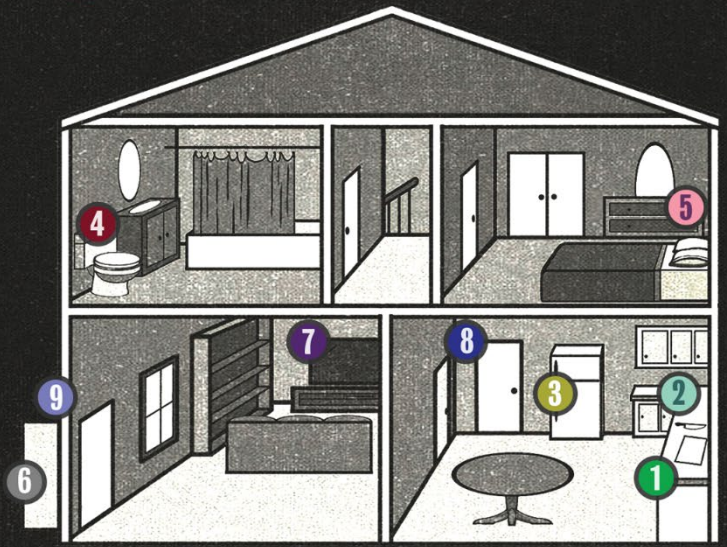

Lori Nix & Kathleen Gerber

Frank Moore, Release, 1999

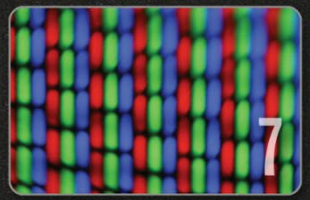
YOUR HOME: THE NEXT ECOLOGICAL FRONTIER

9 STANDARDIZED LOCATIONS SAMPLED PER HOME

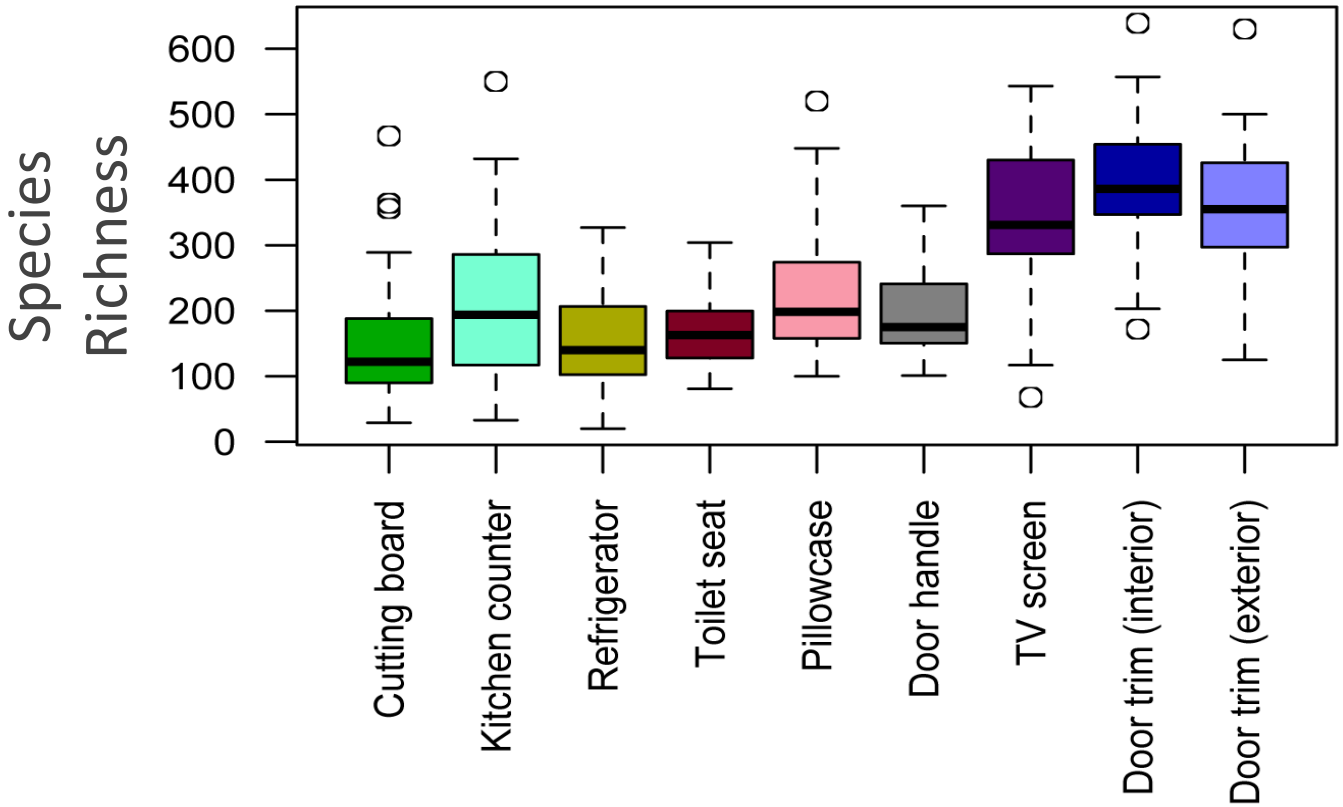
1. CUTTING BOARD
2. KITCHEN COUNTER
3. REFRIGERATOR
4. TOILET SEAT
5. PILLOWCASE
6. DOOR HANDLE
7. TV SCREEN
8. INTERIOR DOOR TRIM
9. EXTERIOR DOOR TRIM



9 SURFACE HABITATS

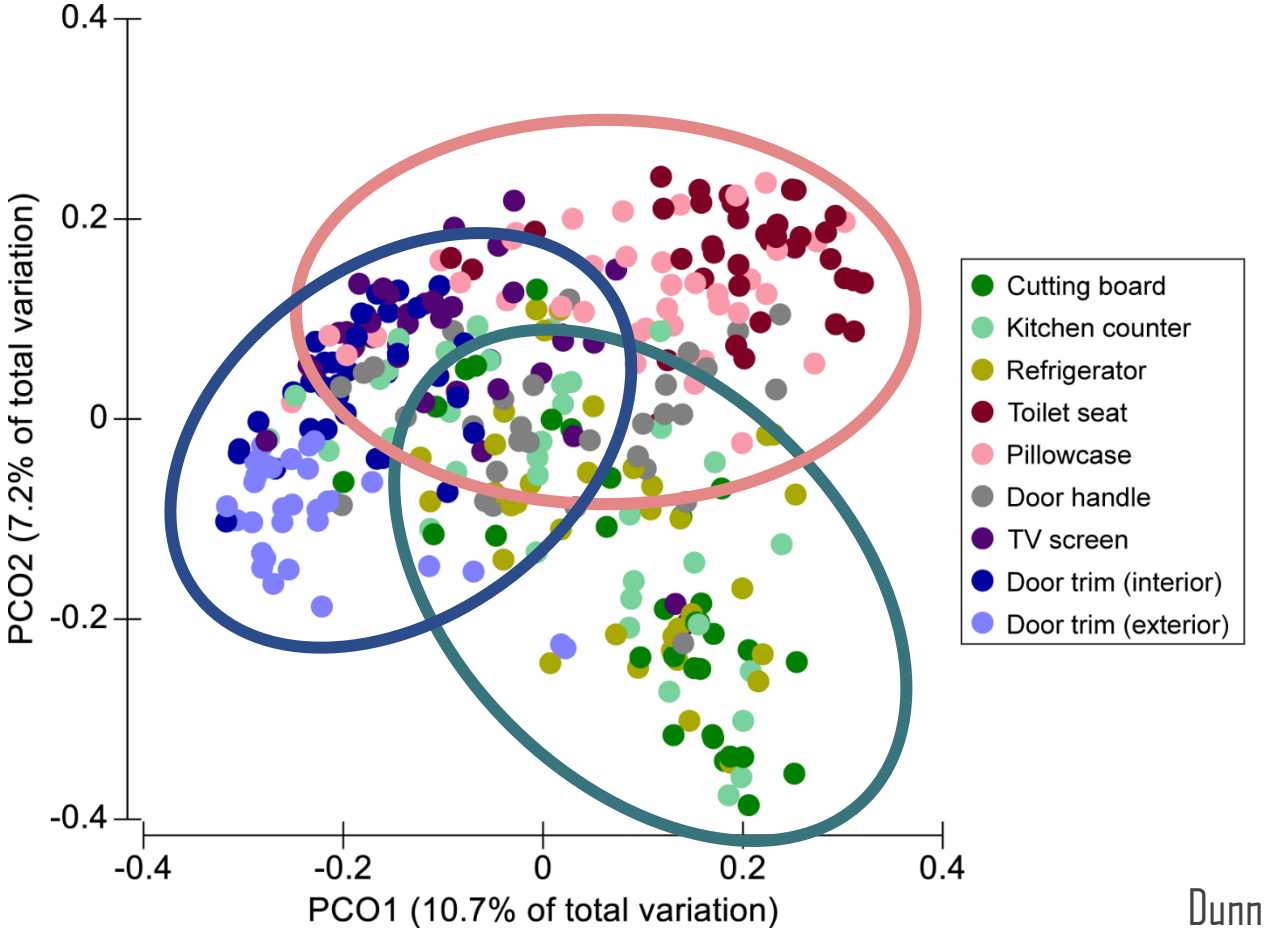


Bacterial diversity varies among habitats

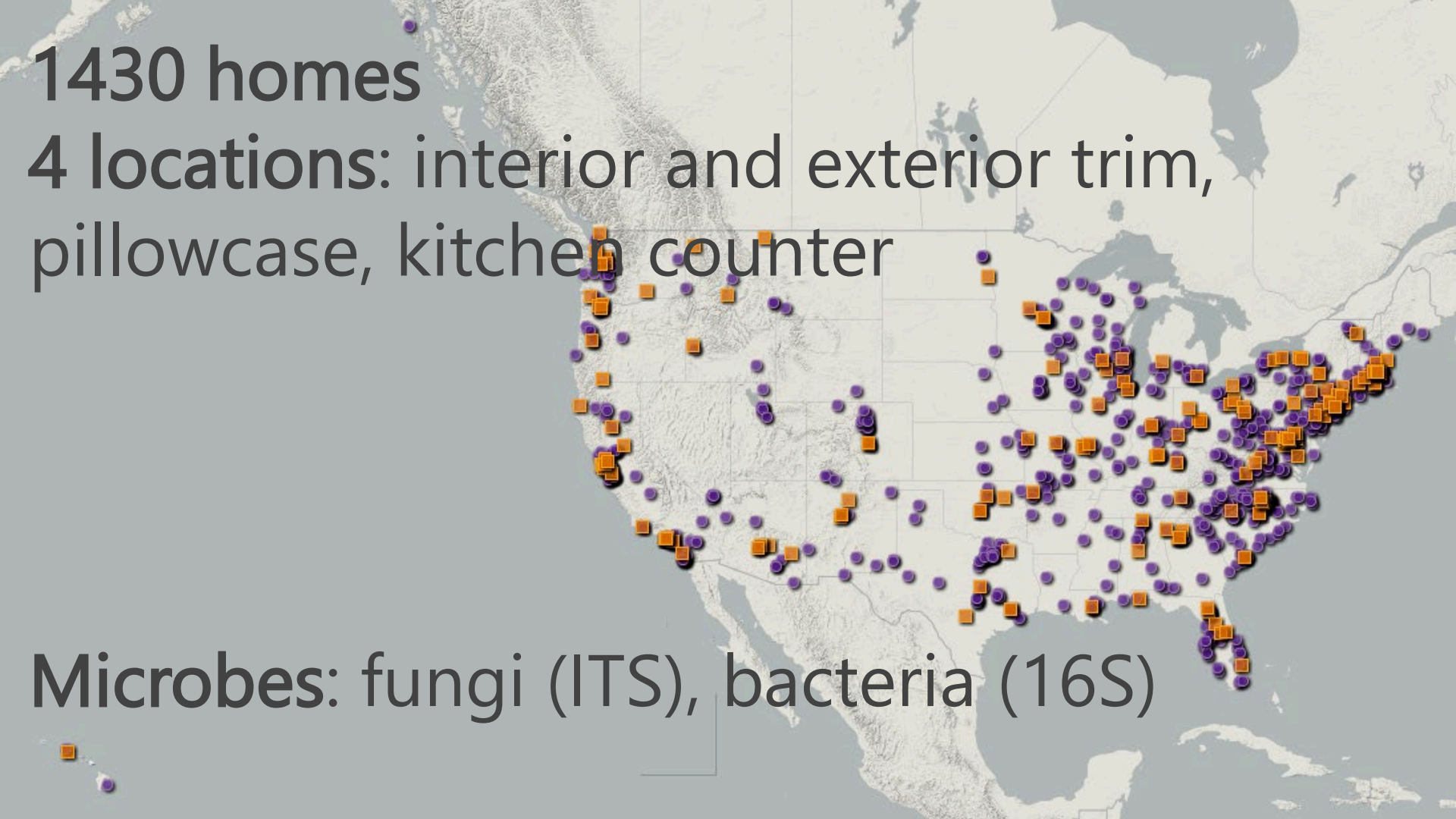


Dunn et al. 2013, *PLOS ONE*

Bacterial communities vary among habitats

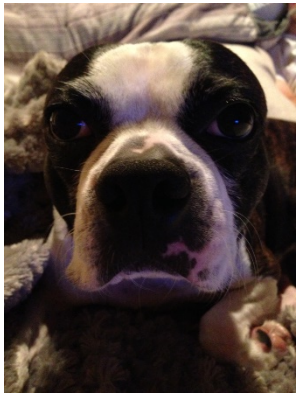


Dunn et al. 2013, *PLOS ONE*


1430 homes
4 locations: interior and exterior trim, pillowcase, kitchen counter
Microbes: fungi (ITS), bacteria (16S)

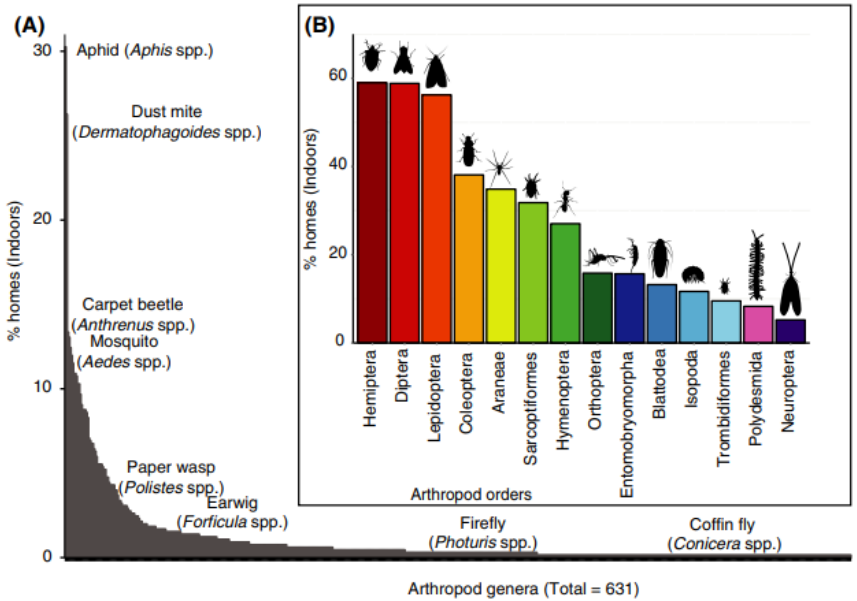
What have we learned about the home microbiome?

- Your house is teaming with life – much previously undescribed
- When it comes to fungi, what you see inside looks like what's outside
- Bacteria indoors are best predicted by home occupants



And the search continues…

Arthropods



Madden et al. 2016, *Molecular Ecology*

Pollen

Craine et al. 2017, *Aerobiologia*

The process of science is SLOW

The Biggest Microscope in the World– How do We See the Microbiota Around Us?

In this guest post, Dan Fergus, a researcher at the North Carolina Museum of Natural Sciences, picks up where Rob left off in the previous post, explaining how we use genetics and molecular biology to see the invisible life that covers our bodies and homes.

Many of you have participated in one of our microbiome projects, using sterile swabs to collect bacteria and archaea from your pillow, your doorframes, or even your belly button. You then close that swab back in its tube, seal it in an envelope and anxiously wait to learn the identity of the microbes that you kindly provide a nice comfortable home. But, you may wonder, what is the process that gets us from a dirty looking swab to the identification of your microbes? Hopefully we can shed some light on this question by providing this short primer to walk you through the lab work from beginning to end (in essence, through our metaphorical lens).

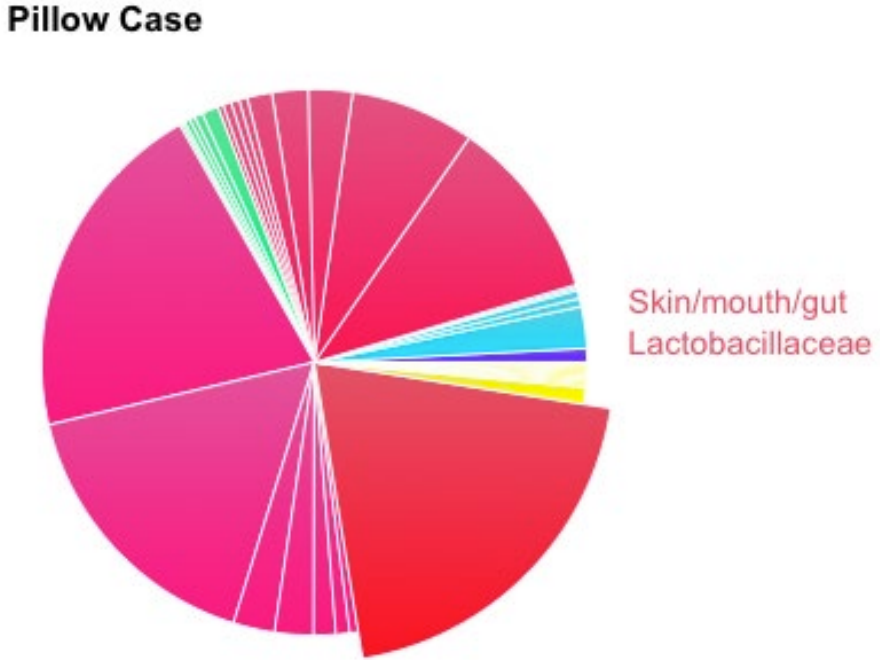
Invisible Life

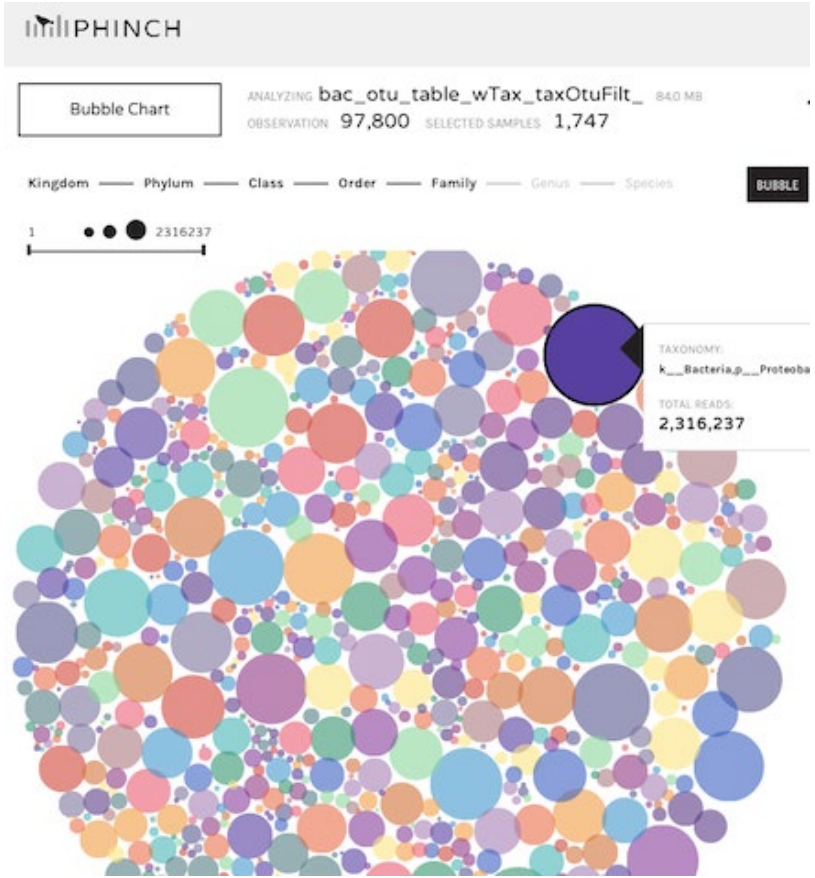
A Your Wild Life Project

Invisible Life | Table of Contents | About the Authors

Table of Contents

Visualization and data challenges





http://robdunnlab.com/projects/wild-life-of-our-homes/


Piotr Naskrecki


spiders
camel crickets
ants
crickets
mice
roaches
fruit flies
flies
fleas
cockroaches
silverfish
moths
dogs
stinkbugs
cats
mosquitoes
gnats
wood roach
palmetto bug
humans
meal moths
house centipedes
ladybugs
beetles
mold
ladybird beetles
centipedes
millipedes
cat
hornets
house flies
snake
squirrels
deer mice
wasps
bugs


© Piotr Naskrecki

Camel Cricket Census

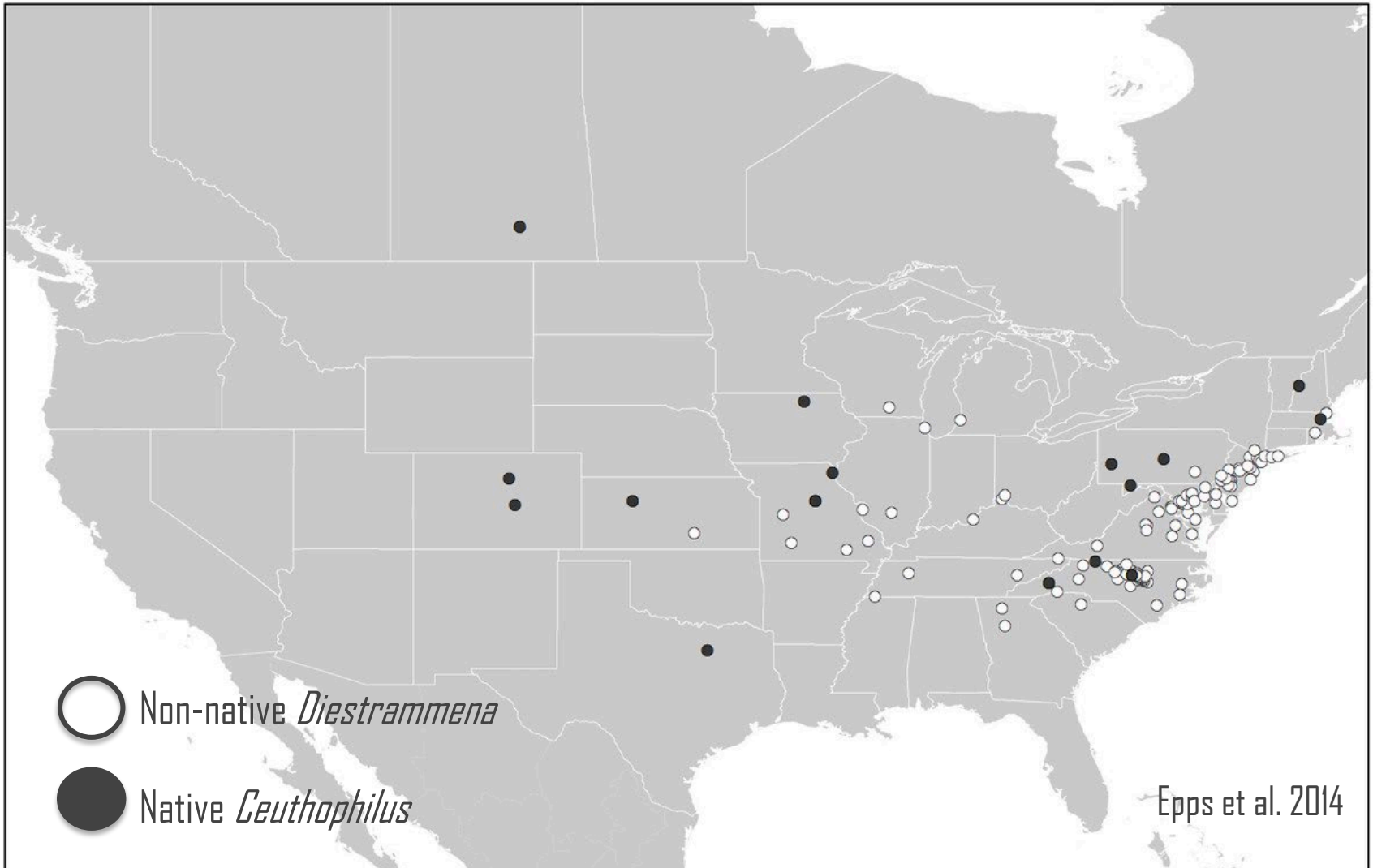
Diestrammena asynamora

- Smooth
- Stripey
- Slender

Ceuthophilus spp.

- Spiney
- Mottled
- Meaty

http://robdunnlab.com/projects/camel-cricket-census/


Non-native *Diestrammena*
Native *Ceuthophilus*
Epps et al. 2014

A lesson in inside baseball

Too big to be noticed: Cryptic invasion of a large Asian camel cricket in North America

Draft 3: Updated 28 January 2014 — Changes continue to be marked in text by ~~strikethrough~~. New text indicated in blue. New tables and figures as indicated, with links to older versions provided.

Draft 2: Updated 16 October 2013 — Changes marked in text by ~~strikethrough~~. New tables and figures as indicated, with links to older versions provided.

Draft 1: Published 26 September 2013

Mary Jane Epps, Holly Menninger, Piotr Naskrecki, Michelle Tratuwein, Robert Dunn, and the Public

Emotion expands audiences

52 Comments

AL September 2, 2014 at 10:26 pm – Edit – Reply

We bought a house in Cookeville, TN in 1998. During the moving in process I bunked in the finished walkout basement which was dry, carpeted.. Sleeping on the floor, turned in for the night, lights out, half asleep, got an eerie feeling, lights back on and my eyes played tricks but not really. The place was loaded with BIG camel crickets. Disgusting. Super hard to smash one, real jumpers. Sold the house less than a year later.

This year in Crossville, TN they're back, followed me from 50 miles away. I am sorry to say that this is not a new pest. Perhaps they hitched a ride from here to there. What is the "Origin of this Species?"

Don’t be afraid to close it up, move on

PeerJ

Too big to be noticed: cryptic invasion of Asian camel crickets in North American houses

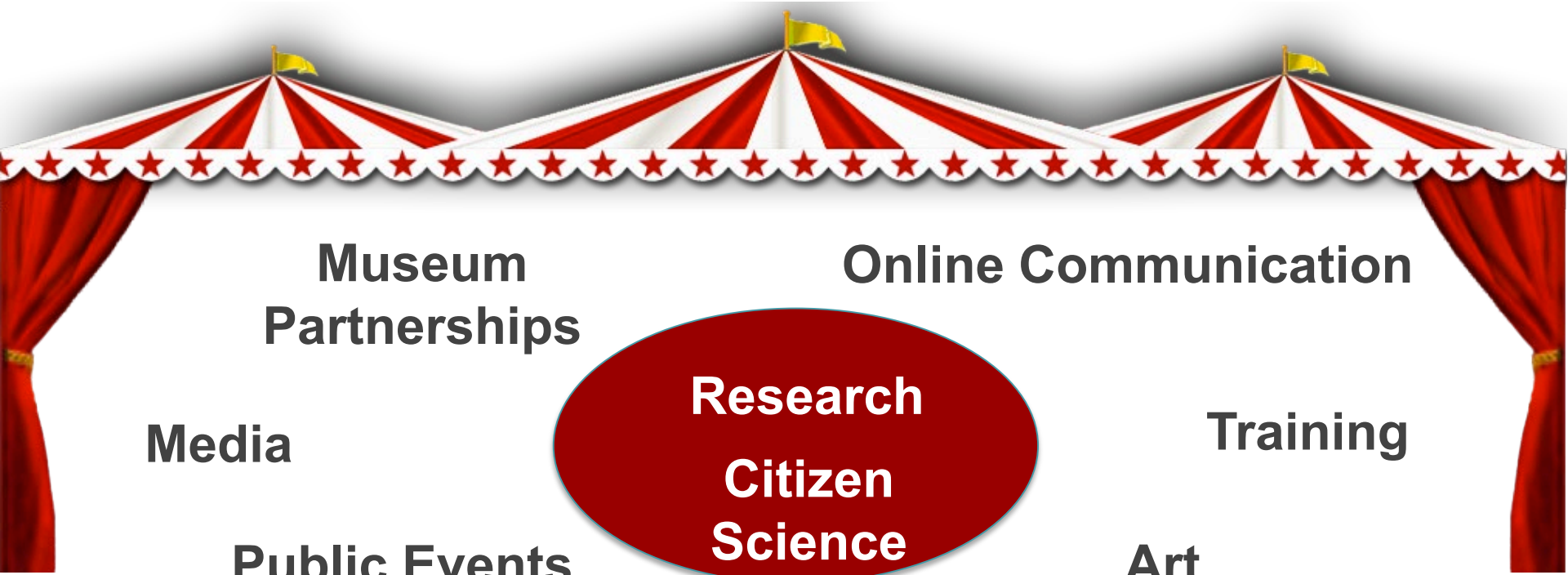
Mary Jane Epps[1], Holly L. Menninger[1], Nathan LaSala[2] and Robert R. Dunn[1]

[1] Department of Biological Sciences, North Carolina State University, Raleigh, NC, USA
[2] Enloe High School, Raleigh, NC, USA

ABSTRACT

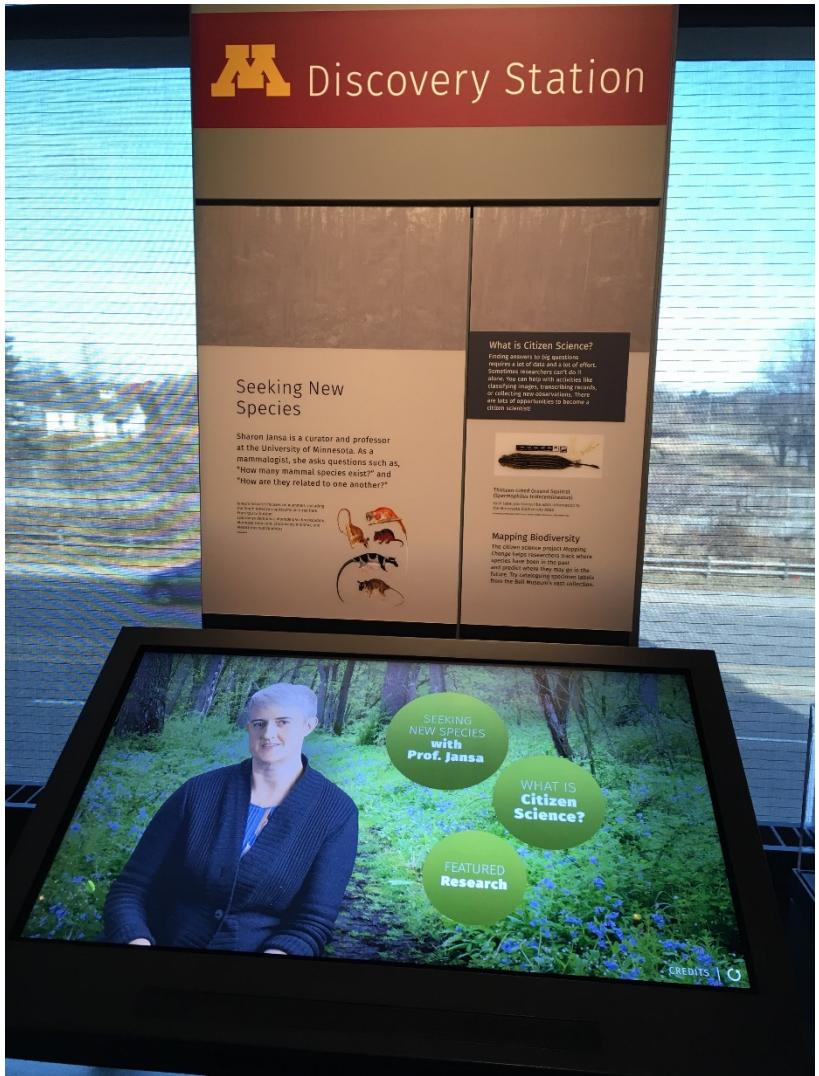
Despite the rapid expansion of the built environment, we know little about the biology of species living in human-constructed habitats. Camel crickets (*Rhaphidophoridae*) are commonly observed in North American houses and include a range of native taxa as well as the Asian *Diestrammena asynamora* (Adelung), a species occasionally reported from houses though considered to be established only in greenhouses. We launched a continental-scale citizen science campaign to better understand the relative distributions and frequency of native and nonnative camel crickets in human homes across North America. Participants contributed survey data about the presence or absence of camel crickets in homes, as well as photographs and specimens of camel crickets allowing us to identify the major genera and/or species in and around houses. Together, these data offer insight into the geographical distribution of camel

Your Wild Life | Public Science



What is the role of natural history and science museums when it comes to citizen science?


Discovery Station
"There is not a moral to every story in animal behavior."
Marlene Zuk
Studying Animal Behavior
Marlene Zuk is a professor at the University of Minnesota. She is interested in animal behavior and evolution. Her studies of crickets show how animals attract mates while avoiding enemies, shedding light on the sexual diversity of life.
What is Citizen Science?
Monitoring Monarchs
STUDYING
ANIMAL BEHAVIOR
with Prof. Marlene Zuk
TOUCH TO BEGIN
WHAT IS
Citizen Science?


Discovery Station
Seeking New Species
Sharon Jansa is a curator and professor at the University of Minnesota. As a mammalogist, she asks questions such as, "How many mammal species exist?" and "How are they related to one another?"
What is Citizen Science?
Mapping Biodiversity
SEEKING NEW SPECIES with Prof. Jansa
WHAT IS Citizen Science?
FEATURED Research
CREDITS

The Secret World Inside You

AMERICAN MUSEUM OF NATURAL HISTORY

Photo: NY Times

Mapping Change

Help us use over a century's worth of specimens to map the distribution of animals, plants, and fungi. Your data will let us know where species have been and predict where they may end up in the future!

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Get started


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LIBRARY


BEYOND OUR PLANET


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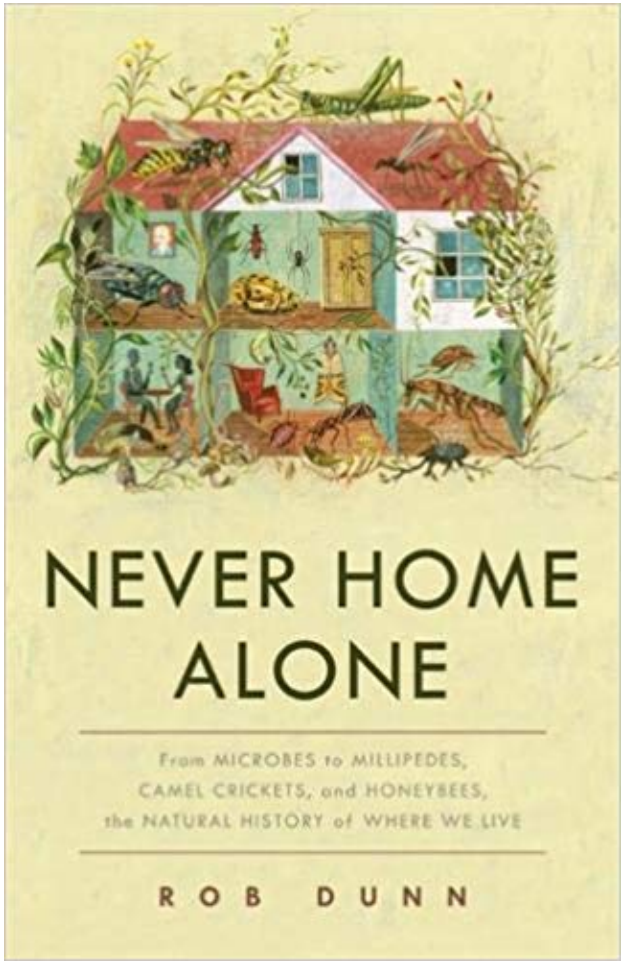
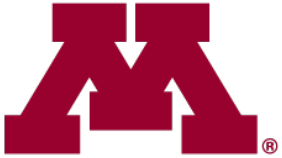
Tyler Imfeld

Dr. Nicole Garneau | Genetics of Taste Lab, DMNS



robdunnlab.com

www.inaturalist.org/projects/never-home-alone-the-wild-life-of-homes



bell museum

Dr. Holly Menninger

Director of Public Engagement & Science Learning

hmenning@umn.edu | 612-625-6889 | @DrHolly

bellmuseum.umn.edu

UNIVERSITY OF MINNESOTA

Driven to Discover℠

What does this mean for Museums? For Public Engagment?

21st Century Natural History

Let science drive

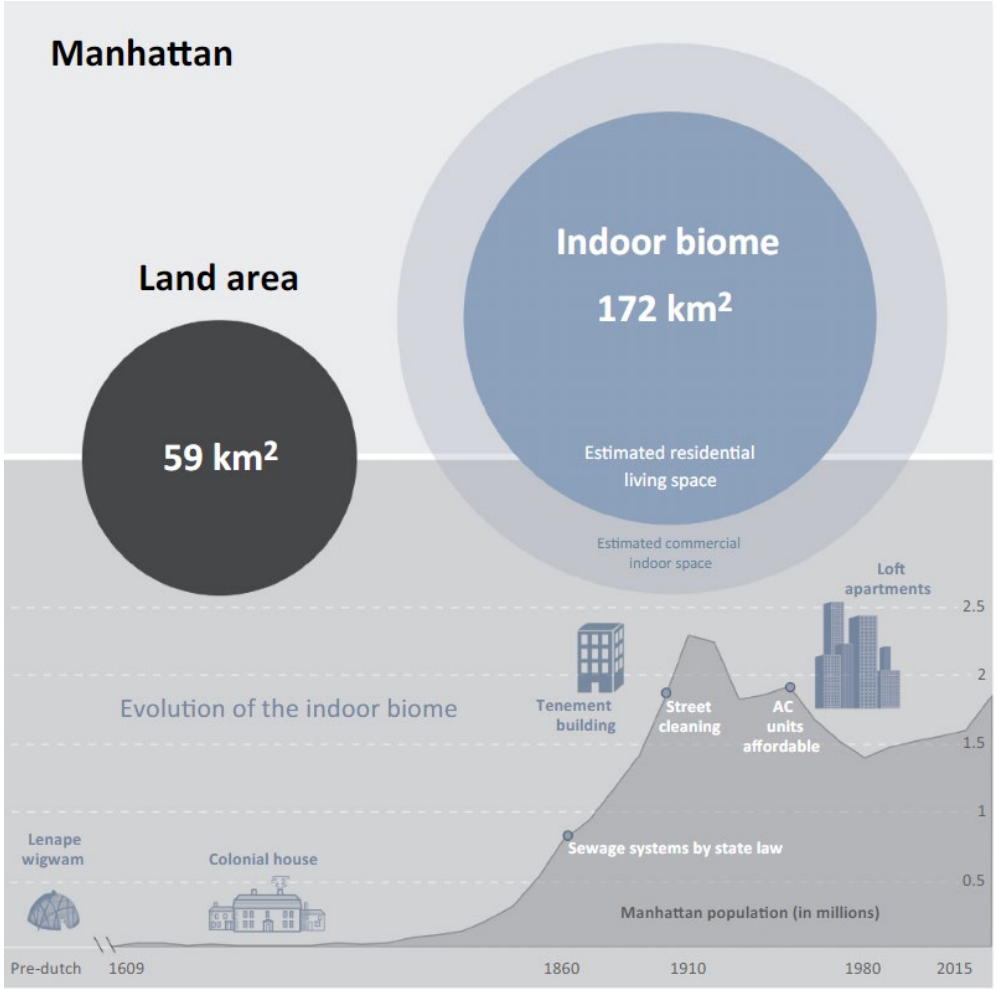
Hyper-local, personal

Process of science (museum examples)

Partnerships, collaborators

Expand outcomes beyond participants

Video still from Christmas Bird Count told by Chan Robbins | Audubon



Martin et al. 2015