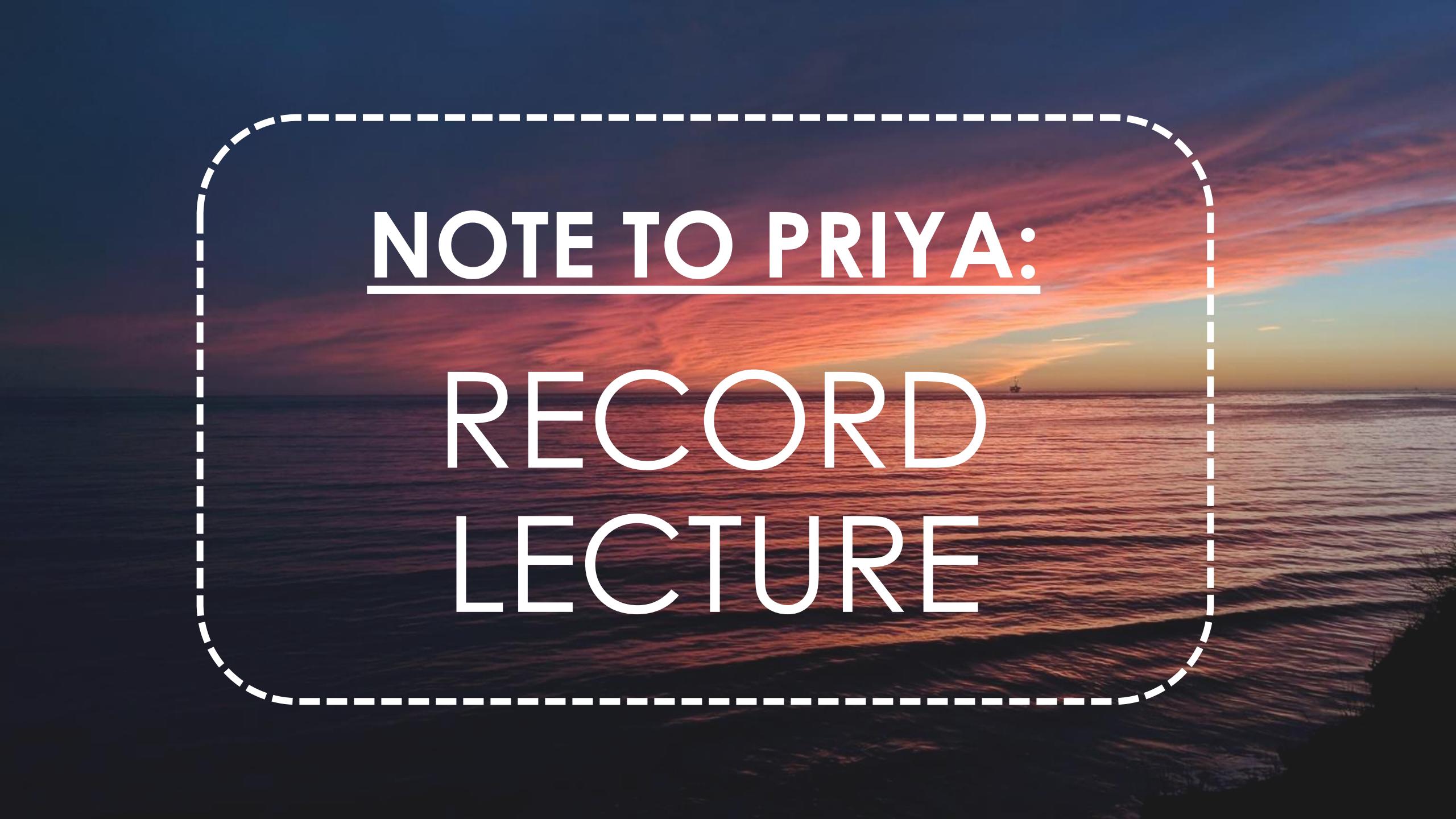


LECTURE 2

ACADEMIC SCIENCE

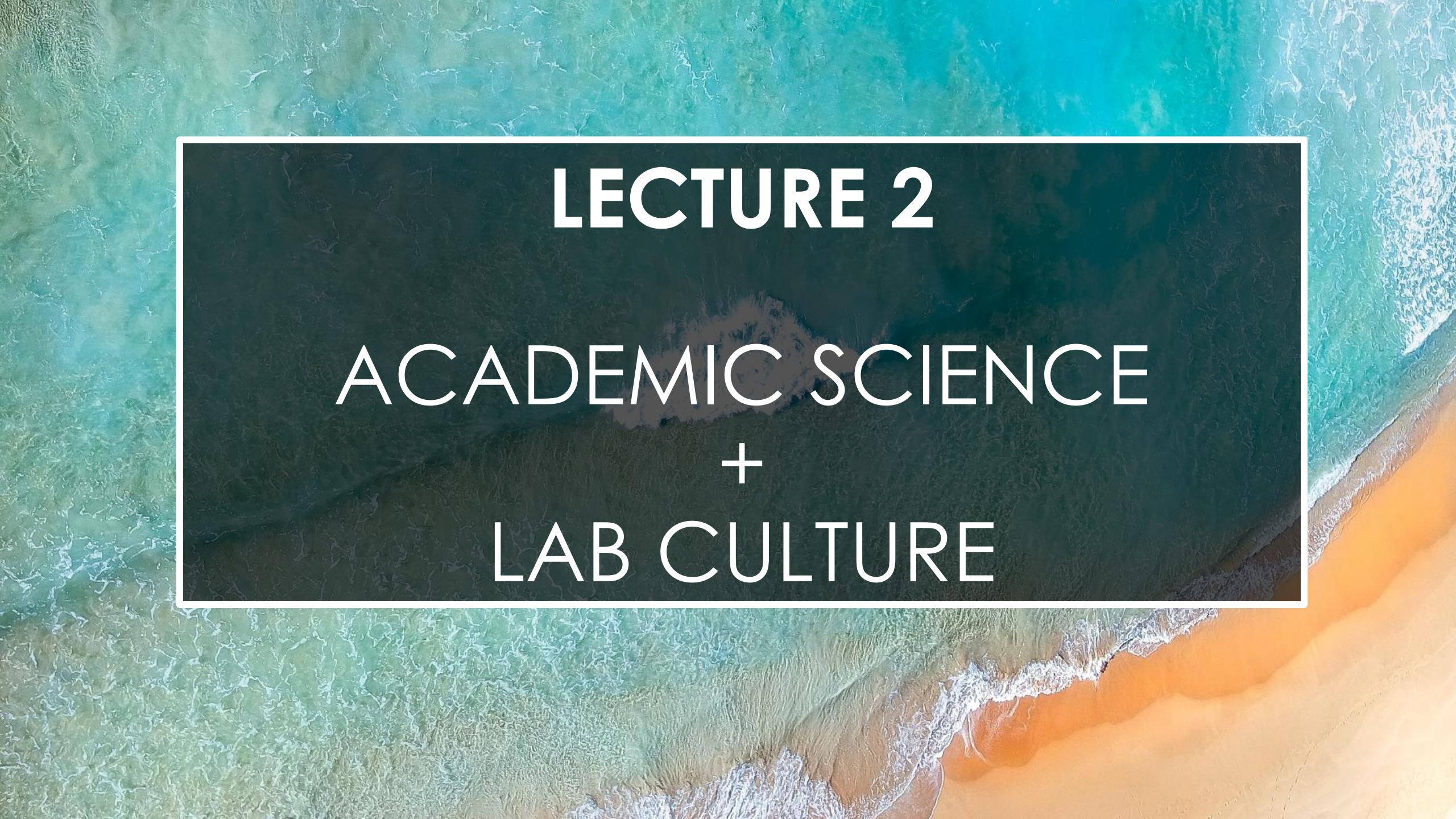
+

LAB CULTURE

A photograph of a sunset over a calm ocean. The sky is filled with warm, orange, and red hues, transitioning into a darker blue at the top. The horizon line is visible in the distance, where the ocean meets the sky. A small, dark object, possibly a boat or a distant landmass, is visible on the horizon. The overall atmosphere is peaceful and scenic.

NOTE TO PRIYA:

RECORD
LECTURE



LECTURE 2

ACADEMIC SCIENCE

+

LAB CULTURE

RULES OF ENGAGEMENT

Be Open & Encouraging

Communicate Effectively & Respectfully

Contribute / Participate In Group Conversations

Step Up / Step Back: Give people
time/space to answer



MAKE A PLAN
TO VOTE

<https://makeaplantovote.com/>

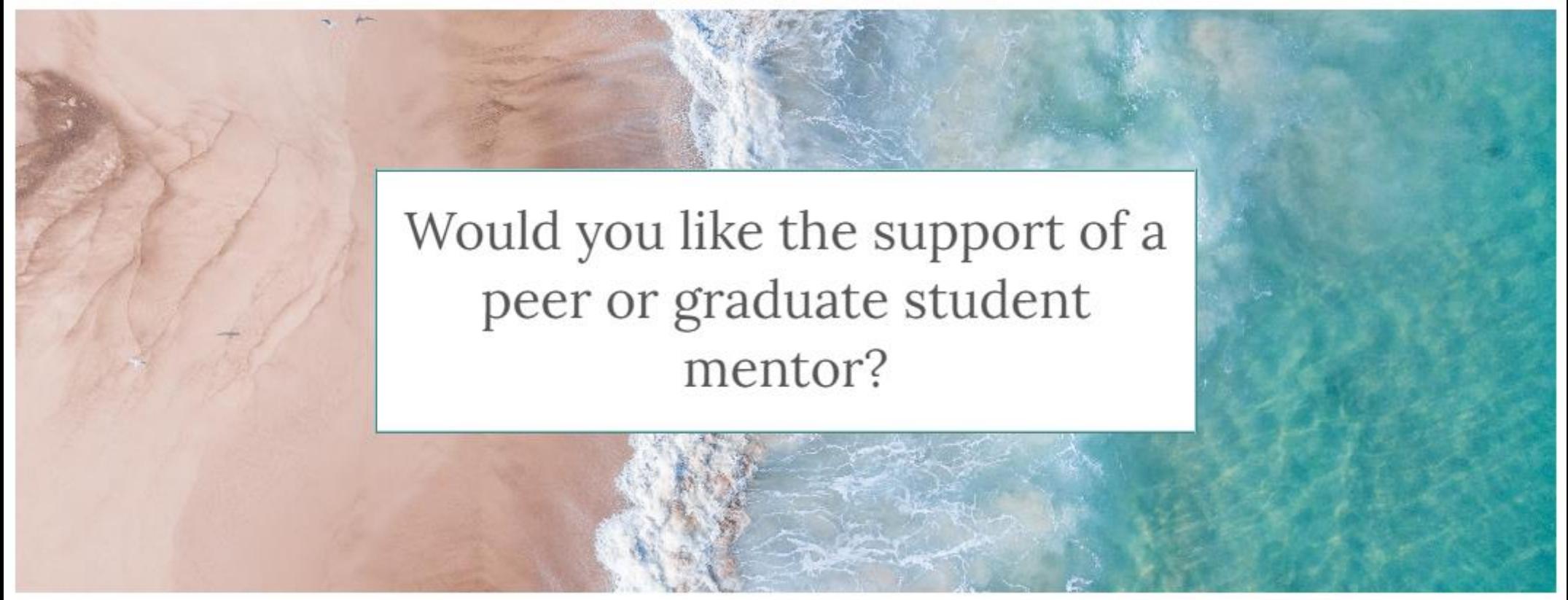
Undergraduate Research Week

Save the date:

**OCTOBER
12-16, 2020**



MENTORSHIP PROGRAM



<https://airtable.com/shrVKInxWoa0E8dwp>

Demystifying Undergraduate Research Experiences

[Home](#) > [Blog](#) > Demystifying Undergraduate Research Experiences



October 02, 2020

by MCS Lead Mentor Priya Shukla

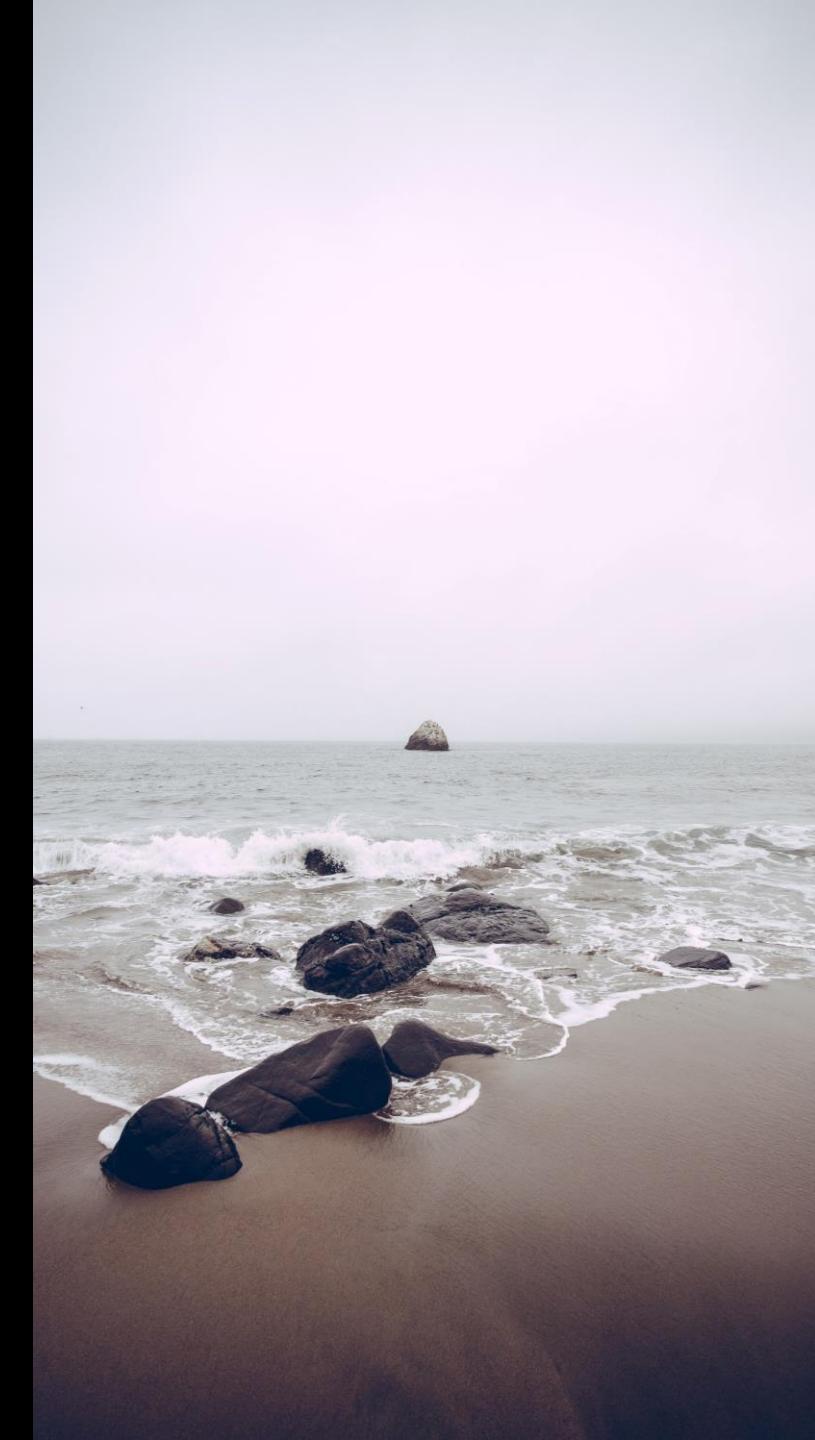
<https://marinescience.ucdavis.edu/blog/demystifying-undergraduate-research-experiences>

BM_L SEMINAR SERIES

Wednesdays, 1-2pm PT

Opportunity to learn about
cutting-edge research

<https://marinescience.ucdavis.edu/events>



ACTIVITY – ABOUT YOU!

In breakout sessions of 3 people each ...



Share a ~~fun~~ **boring** fact about
yourself

Share something you're hoping to
get out of this class

ACTIVITY – ABOUT YOU!

In breakout sessions of 3 people each ...



SHARE SOMEONE ELSE'S ~~FUN~~
BORING FACT

SHARE SOMETHING SOMEONE ELSE
IS HOPING TO GET OUT OF THIS
CLASS

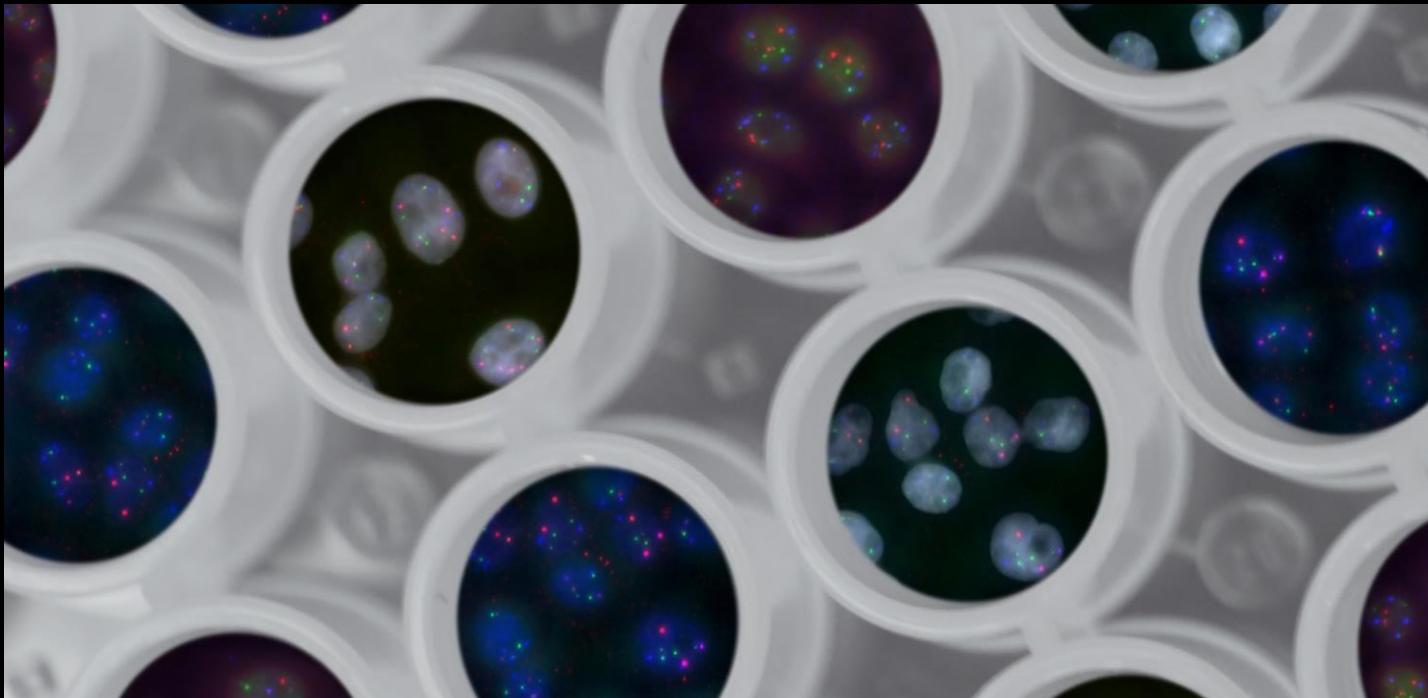
ACTIVITY – ABOUT YOU!

In breakout sessions of 3 people each ...



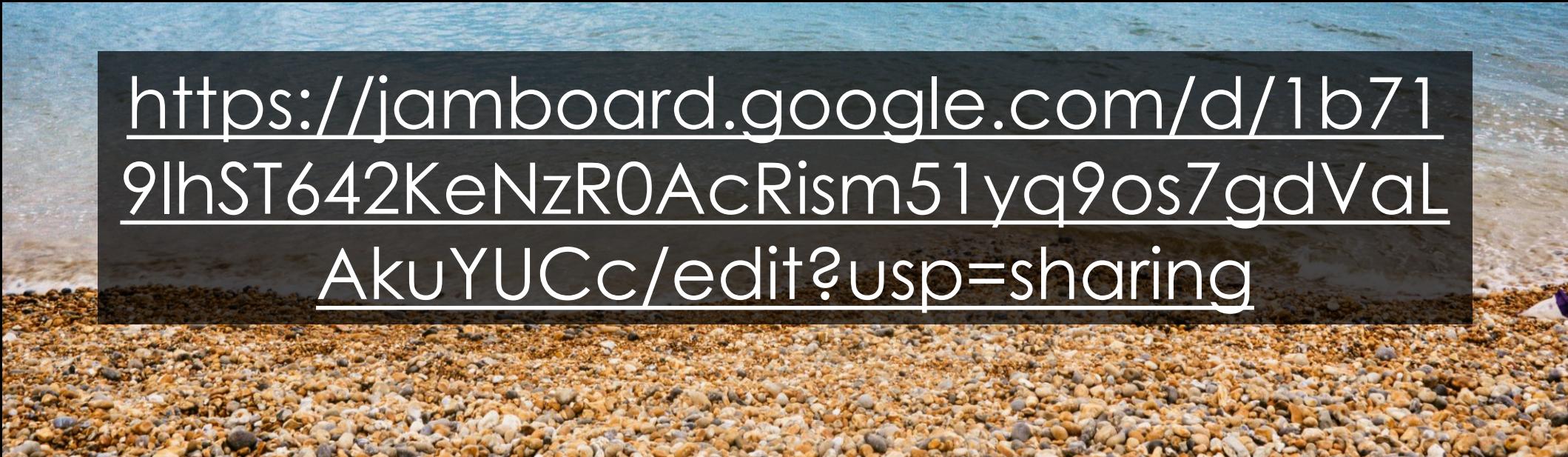
***In the future, these “ice breakers”
will be used to share the resource
you found to better your
understanding of that week’s topic!***

ACADEMIC SCIENCE & LAB CULTURE

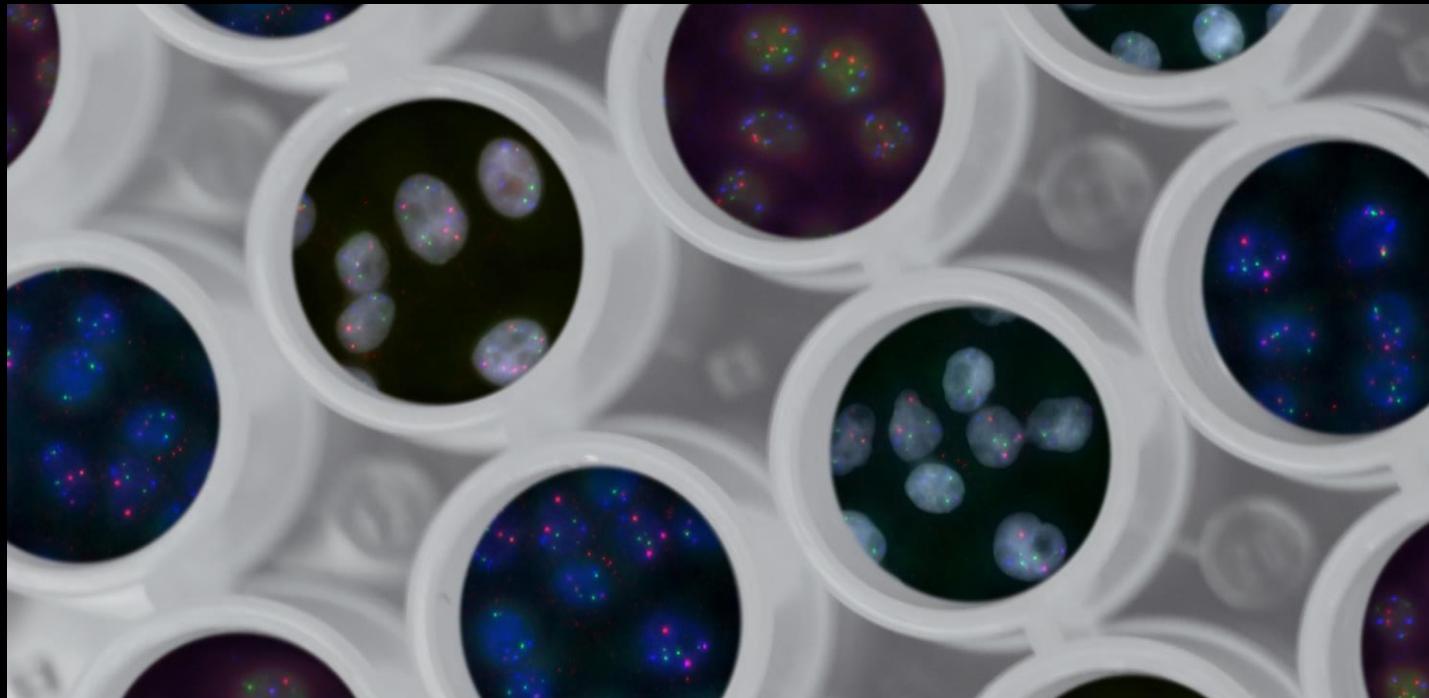


WARM-UP IN GOOGLE JAMBOARD!

<https://jamboard.google.com/d/1b719lhST642KeNzR0AcRism51yq9os7gdVaLAkuYUCc/edit?usp=sharing>



ACADEMIC SCIENCE & LAB CULTURE



ACADEMIC SCIENCE & LAB CULTURE



ABOUT PRIYA



Effects of an eelgrass bed (*Zostera marina*) on seawater pH and alkalinity

ABOUT PRIYA



Bodega Ocean Acidification
Research Technician



Bodega Ocean Acidification Research (BOAR)

ACADEMIC SCIENCE & LAB CULTURE



ABOUT PRIYA

Effects of an eelgrass bed (*Zostera marina*) on
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ABOUT PRIYA



Bodega Ocean Acidification
Research Technician



Bodega Ocean Acidification Research (BOAR)

HISTORY OF ACADEMIC SCIENCE

HISTORY OF ACADEMIC SCIENCE

JEDI MIND TRICKS



Justice

JEDI MIND TRICKS

Equity

Diversity



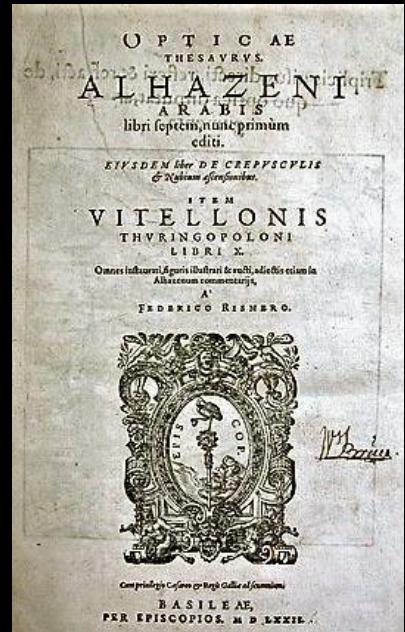
Inclusion



HISTORY OF ACADEMIC SCIENCE



Polynesian
Navigation



Middle Eastern
Experiments



Mesopotamian
Engineering



HISTORY OF ACADEMIC SCIENCE



Musaeum of Alexandria
367 – 283 BC



Nanjing University
258 - Present



Takshashila
Destroyed in the 400s

HISTORY OF ACADEMIC SCIENCE



Historic road to “Akademy”

The term **academy** originates from Plato's “Akademy”, a school of philosophy north of Athens, Greece founded in ~ 385 BC.

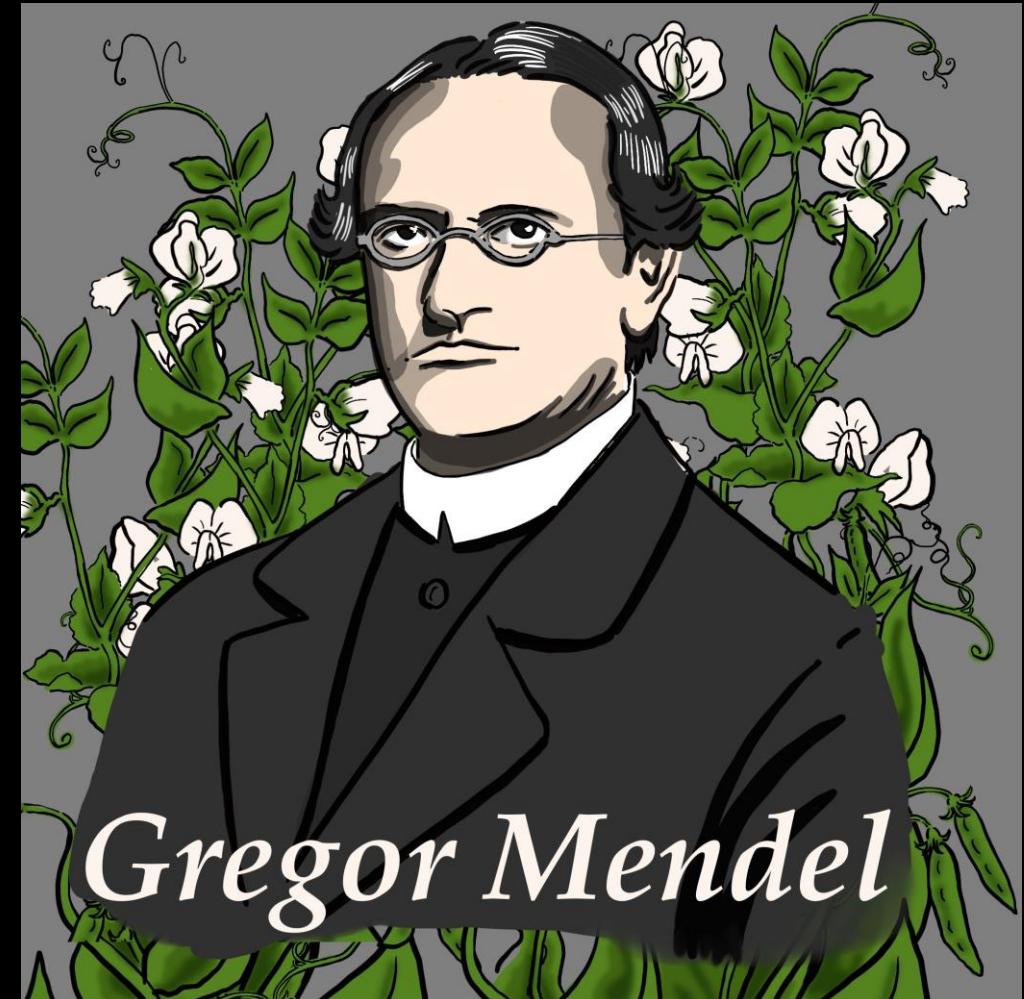
Academia today encompasses the idea of **accumulating and transmitting knowledge as well as practitioners of these activities**

HISTORY OF ACADEMIC SCIENCE

Many monks and priests established the very first schools of advanced study.

Attendees could receive an education without paying for it!

It's why Gregor (Johann) Mendel joined an Augustinian monastery & entered the Dept of Natural History & Agriculture.



Father of modern genetics

HISTORY OF ACADEMIC SCIENCE

Military academies were also important institutions of higher learning, where advancements in engineering and exercise physiology were made.



École militaire, Paris, France
Founded by King Louis XV in 1750

HISTORY OF ACADEMIC SCIENCE



Accademia dei Lincei
Rome, Italy

The first European Academy of Science was the Italian “Accademia dei Lincei”, established in 1603.

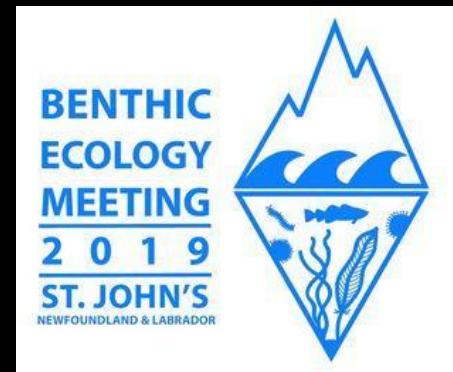
Other academies – funded by the aristocracy – were established across Europe until ~1800.

HISTORY OF ACADEMIC SCIENCE

“Academies” were/are different than **Academic Societies**, which were members-only groups of researchers who studied the same subjects and would present their work to one another.

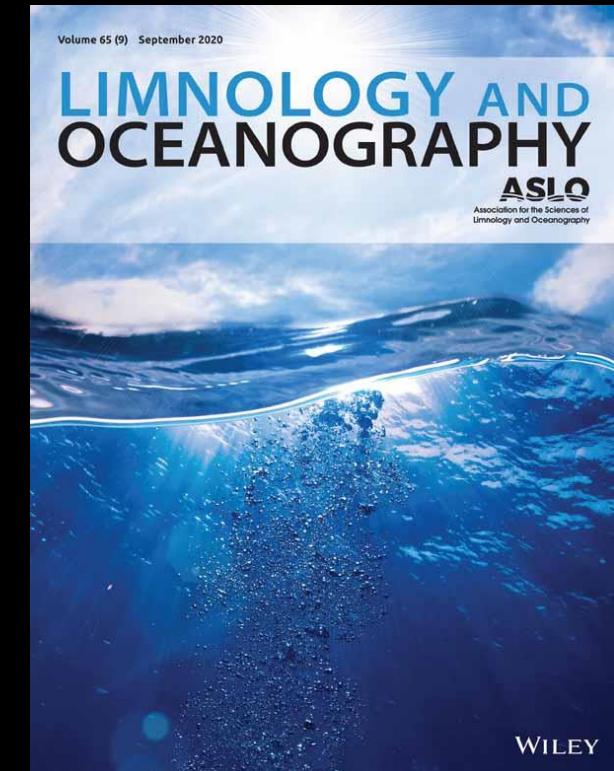


Royal Society, London



HISTORY OF ACADEMIC SCIENCE

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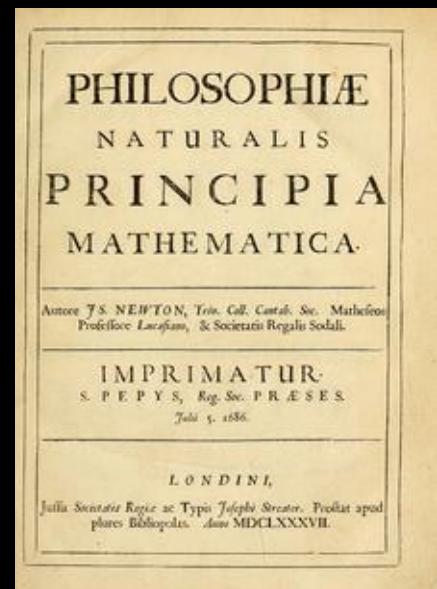
Many societies also publish (niche) journals with novel, peer-reviewed research.

HISTORY OF ACADEMIC SCIENCE

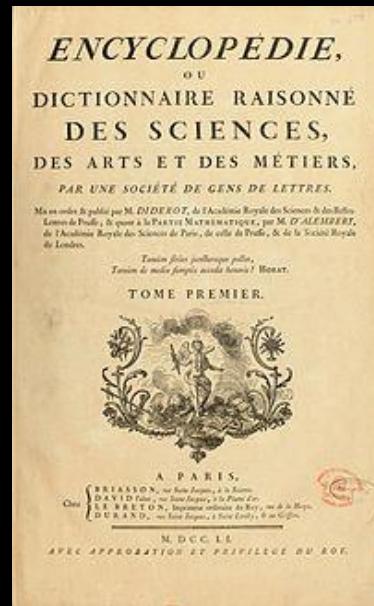
Publication has been and continues to be the main way that scientists disseminate information.



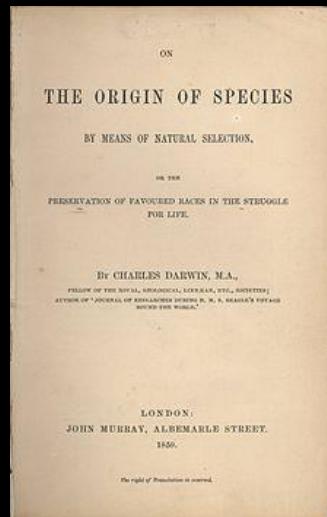
Copernicus' *On the Revolutions of the Heavenly Spheres* (1543)



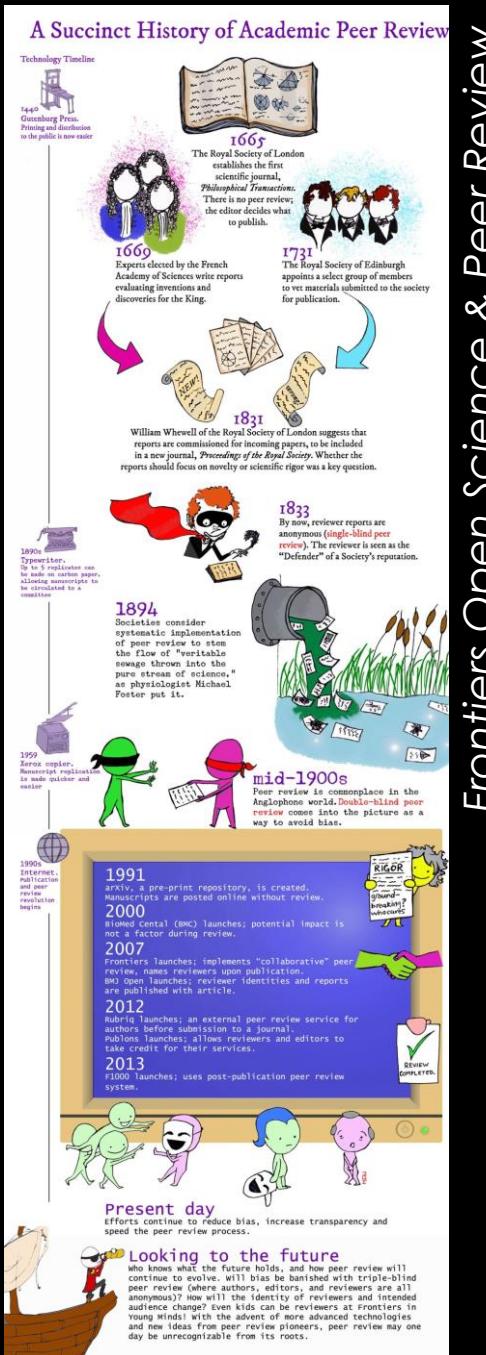
Newton's *Principia* (1687)



Diderot's *Encyclopédie* (1751)



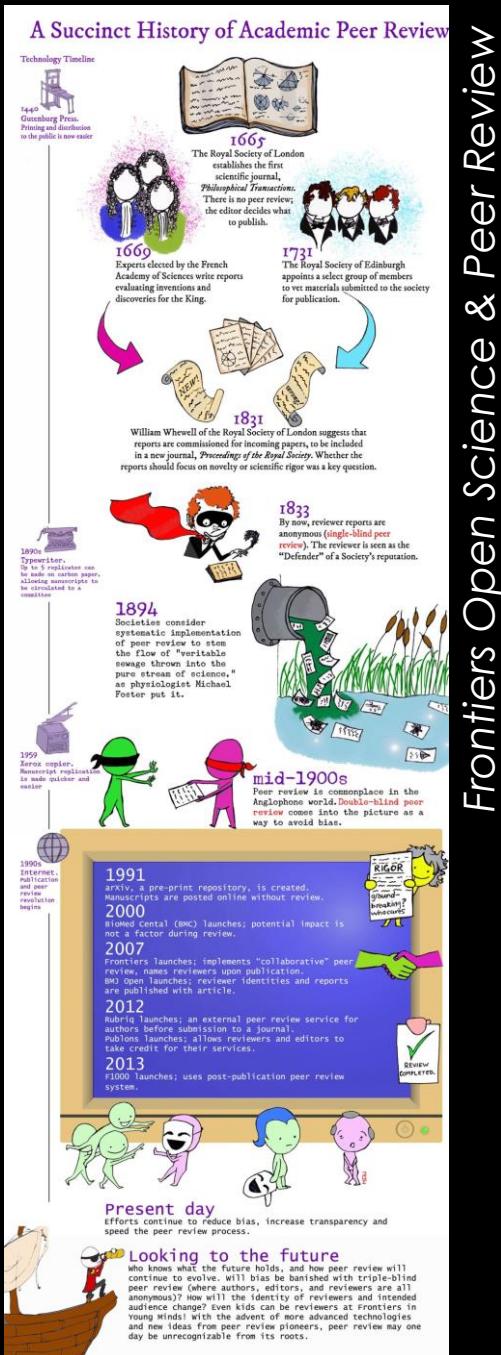
Darwin's *On the Origin of Species* (1859)



HISTORY OF ACADEMIC SCIENCE — Peer Review

1665: The editor of the Royal Society of London's scientific journal chooses what to publish.

Frontiers Open Science & Peer Review

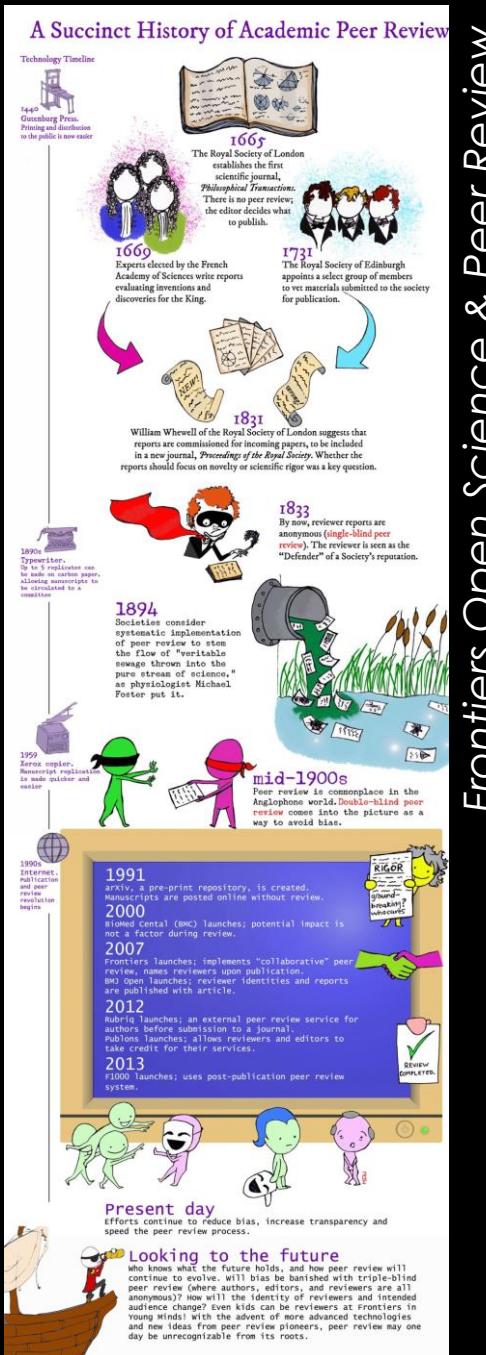


HISTORY OF ACADEMIC SCIENCE

— Peer Review

1665: The editor of the Royal Society of London's scientific journal chooses what to publish.

1833: Anonymous reviewers are seen as the "Defender" of a Society's reputation



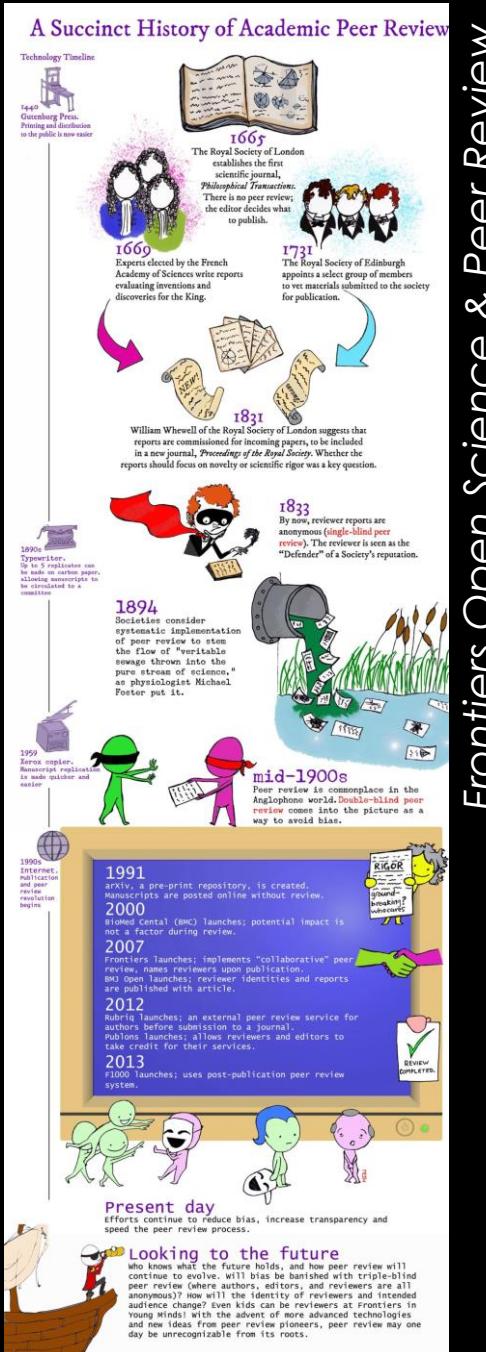
HISTORY OF ACADEMIC SCIENCE

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1894: Peer Review becomes a systemic part of the scientific process to reduce the “sewage thrown into ... science”



Frontiers Open Science & Peer Review

HISTORY OF ACADEMIC SCIENCE

— Peer Review

1665: The editor of the Royal Society of London's scientific journal chooses what to publish.

1833: Anonymous reviewers are seen as the "Defender" of a Society's reputation

1894: Peer Review becomes a systemic part of the scientific process to reduce the "sewage thrown into ... science"

Today: Still a work in progress – many efforts to reduce bias, improve transparency & speed up the process!

HISTORY OF ACADEMIC SCIENCE



Accademia dei Lincei
Rome, Italy

The first European Academy of Science was the Italian “Accademia dei Lincei”, established in 1603.

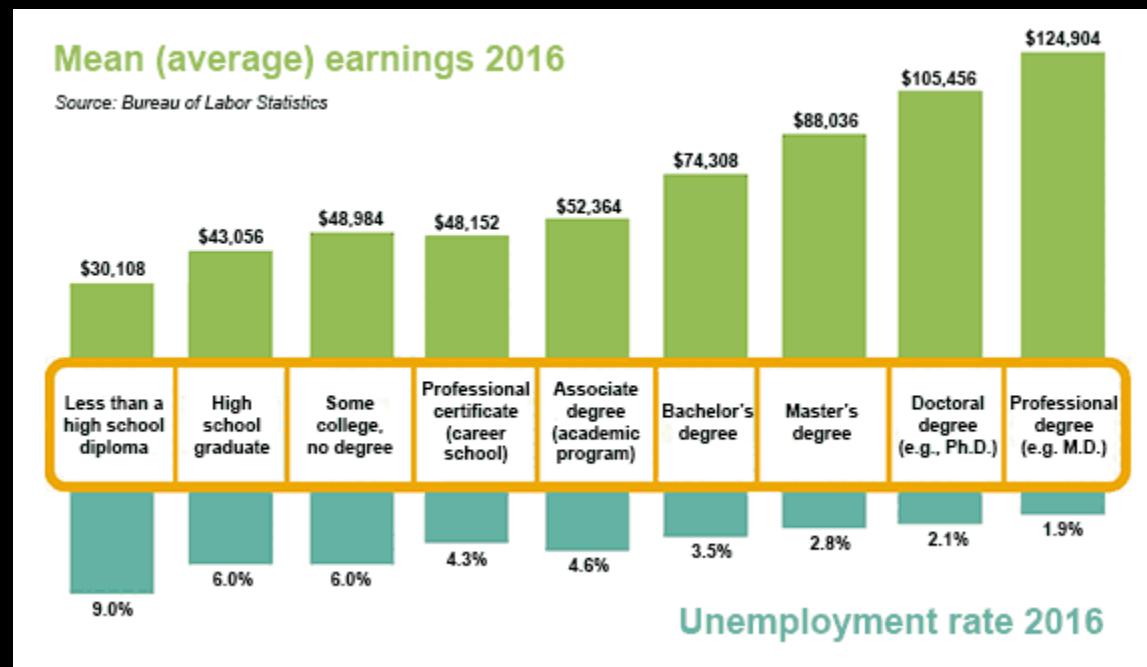
Other academies – funded by the aristocracy – were established across Europe until ~1800.

In the 1800s, universities were tasked with performing experimental research, shuttering many academies.

HISTORY OF ACADEMIC SCIENCE

The granting of Bachelor's, Master's, and Doctorate degrees dates back to medieval Europe.

“Doctor” became the highest possible degree awarded for those in Law & Medicine in the 1300s.



ACADEMIC SCIENCE TODAY

Universities roughly fall into two categories:

RESEARCH INSTITUTIONS



PRIMARILY TEACHING INSTITUTIONS



ACADEMIC SCIENCE TODAY

Universities roughly fall into two categories:

RESEARCH INSTITUTIONS

Institutions that grant PhDs



Tiers of research* :



* established by the Carnegie Classification of
Institutions of Higher Education

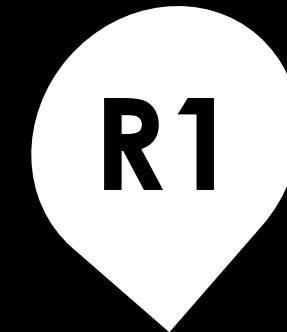
WHAT TIER DO YOU
THINK UC DAVIS IS?

WHAT TIER DO YOU THINK UC DAVIS IS?



**THIS SLIDE
INTENTIONALLY LEFT
BLANK**

WHAT TIER DO YOU THINK UC DAVIS IS?



“Highest
Research
Activity”

ACADEMIC SCIENCE & LAB CULTURE



ABOUT PRIYA



Effects of an eelgrass bed (*Zostera marina*) on
seawater pH and alkalinity

ABOUT PRIYA



Bodega Ocean Acidification
Research Technician



Bodega Ocean Acidification Research (BOAR)

7-MINUTE BREAK

ACADEMIC SCIENCE & LAB CULTURE



ABOUT PRIYA



Effects of an eelgrass bed (*Zostera marina*) on
seawater pH and alkalinity

ABOUT PRIYA

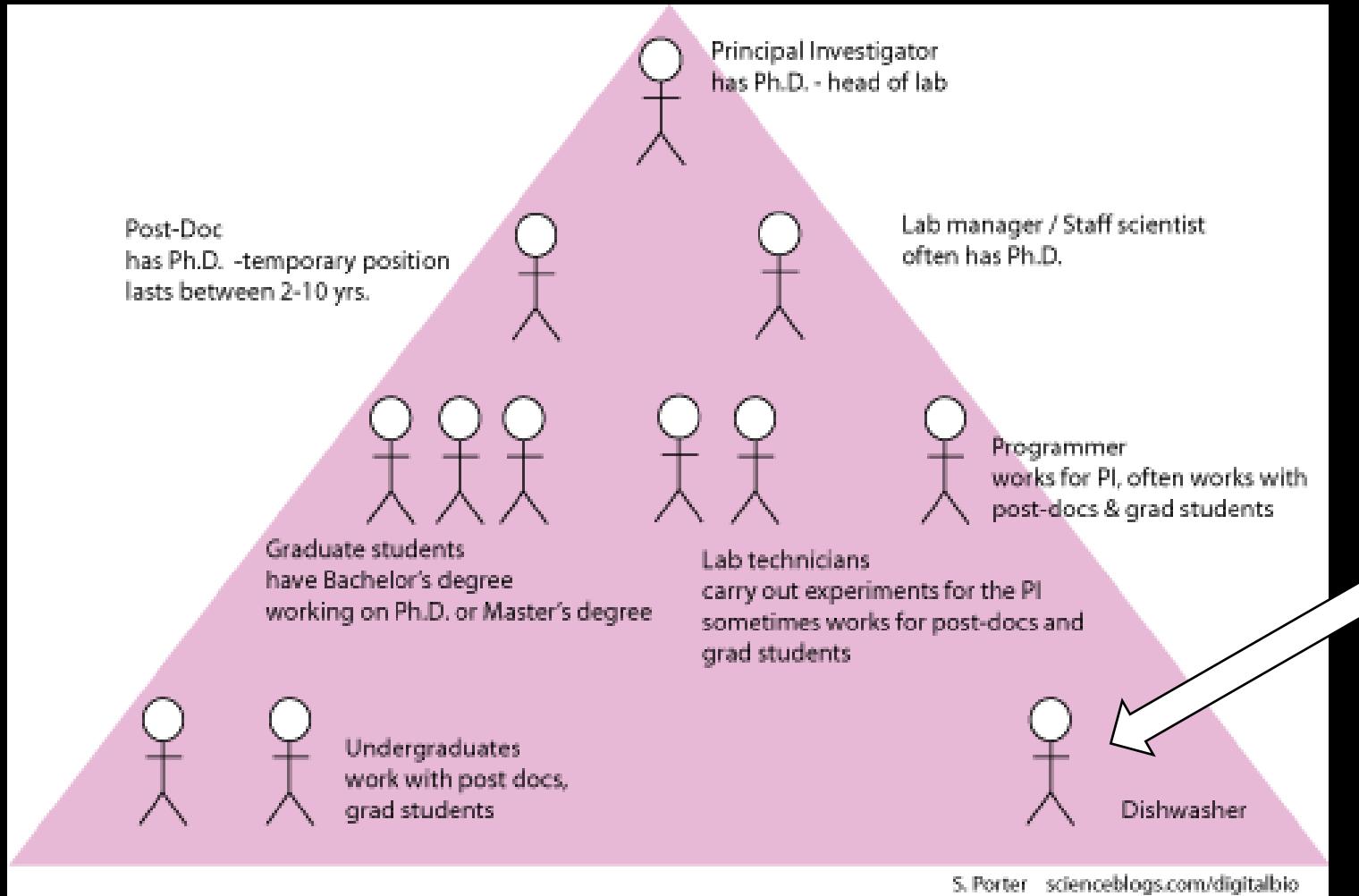


Bodega Ocean Acidification
Research Technician



Bodega Ocean Acidification Research (BOAR)

KEY PLAYERS IN A LAB



WHAT DRIVES THE RESEARCH IN A LAB?

WHAT DRIVES THE RESEARCH IN A LAB?

PI'S EXPERTISE / INTERESTS



Brian
Gaylord



WHAT DRIVES THE RESEARCH IN A LAB?

PI'S EXPERTISE / INTERESTS



Brian
Gaylord



Evolutionary change during experimental ocean acidification MH Pespeni, E Sanford, B Gaylord, TM Hill, JD Hosfelt, HK Jaris, ... Proceedings of the National Academy of Sciences 110 (17), 6937-6942	284	2013
OCEAN ACIDIFICATION	1994	
Functional impacts of ocean acidification in an ecologically critical foundation species B Gaylord, TM Hill, E Sanford, EA Lenz, LA Jacobs, KN Sato, AD Russell, ... Journal of Experimental Biology 214 (15), 2586-2594	230	2011
Ocean acidification through the lens of ecological theory B Gaylord, KJ Kroeker, JM Sunday, KM Anderson, JP Barry, NE Brown, ... Ecology 96 (1), 3-15	228	2015
Persistent carry-over effects of planktonic exposure to ocean acidification in the Olympia oyster A Hettinger, E Sanford, TM Hill, AD Russell, KNS Sato, J Hoey, M Forsch, ... Ecology 93 (12), 2758-2768	192	2012

WHAT DRIVES THE RESEARCH IN A LAB?

PI'S EXPERTISE / INTERESTS



Brian
Gaylord

Modulation of wave forces on kelp canopies by alongshore currents

Brian Gaylord¹

Marine Science Institute, University of California, Santa Barbara, California 93106

FUNDING

Kelp Recovery Research Program: Request for Proposals



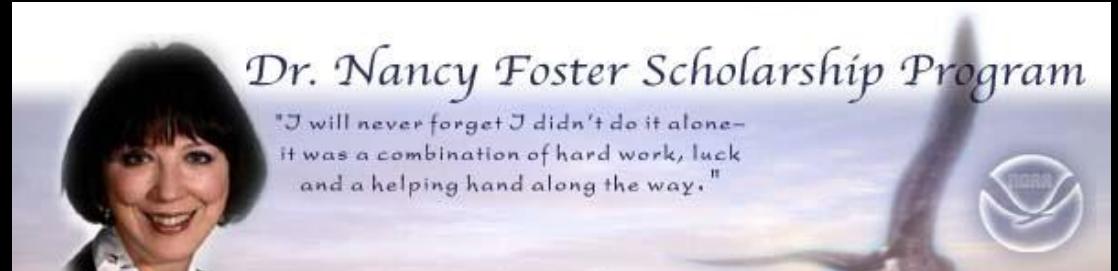
- [A multi-pronged approach to kelp recovery along California's north coast](#)
Brian Gaylord, Marissa Baskett, Aurora Ricart (UC Davis), Matt Edwards (San Diego State University), Mackenzie Zippay, Brent Hughes, Sean Place (Sonoma State University), Jason Hodin (University of Washington)

WHAT DRIVES THE RESEARCH IN A LAB?

STUDENT'S EXPERTISE / INTERESTS

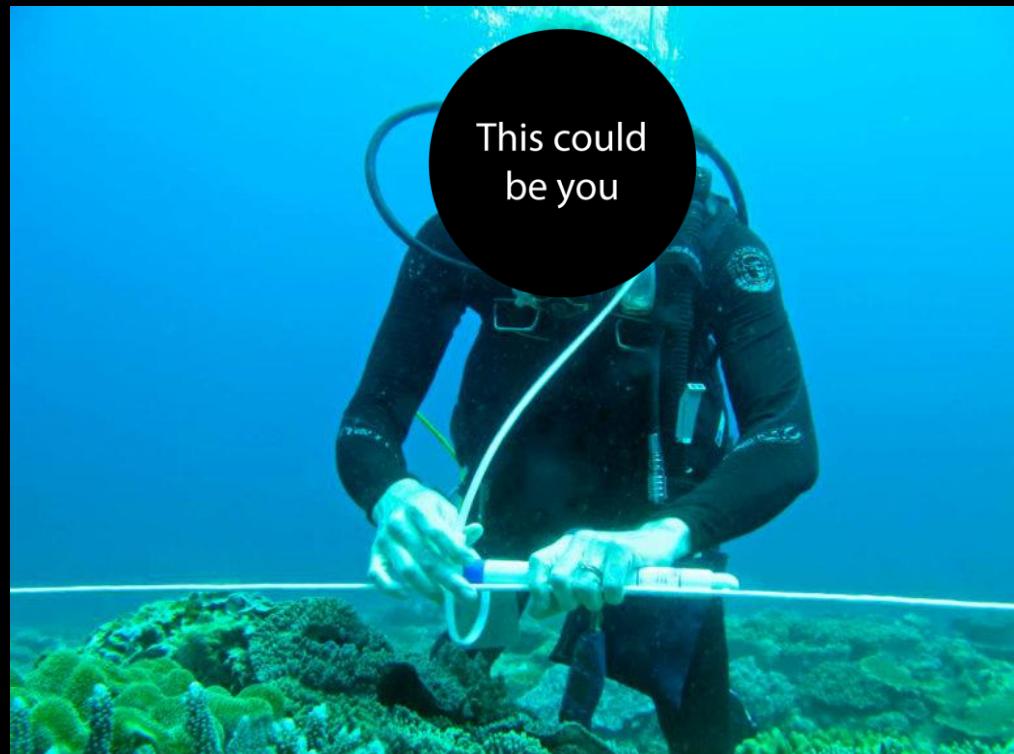


FUNDING



WHAT DRIVES THE RESEARCH IN A LAB?

STUDENT'S EXPERTISE / INTERESTS



FUNDING



Research Experiences
For Undergraduates

WHO FUNDS RESEARCH?

FEDERAL



*Basic & applied
research depending
on agency*

STATE



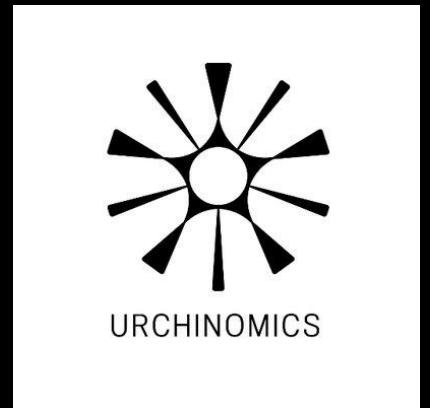
Applied research for regional management needs

PHILANTHROPIC



*Widely varying, but
topic-dependent*

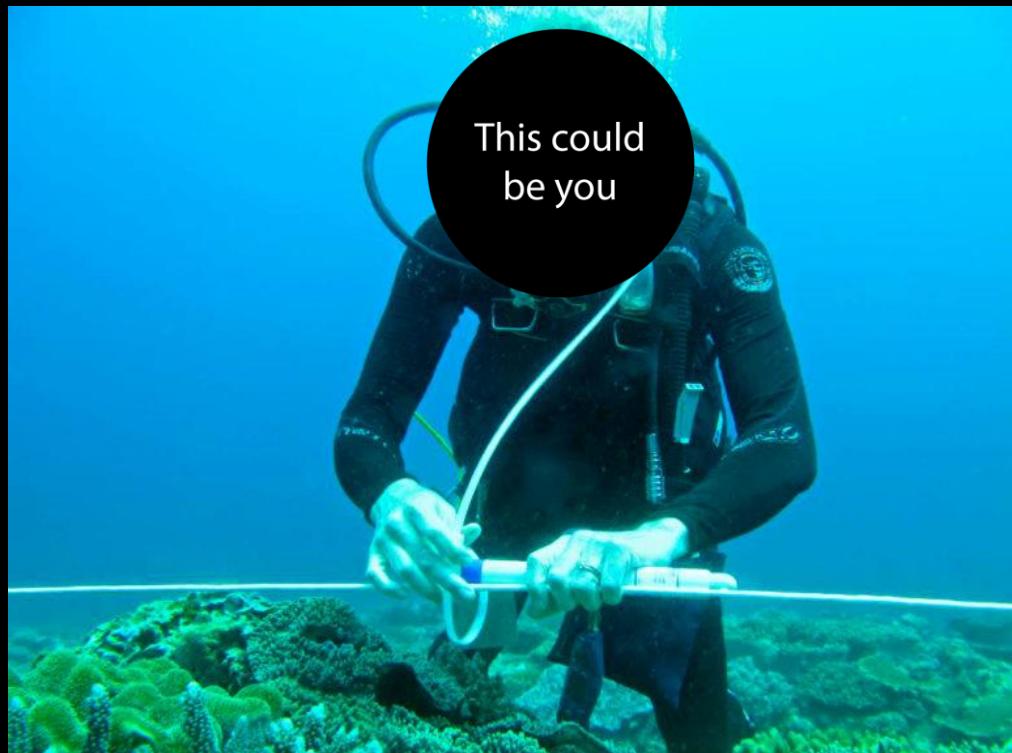
PRIVATE



Depends on organization's needs/goals

WHAT DRIVES THE RESEARCH IN A LAB?

STUDENT'S EXPERTISE / INTERESTS



FUNDING



Research Experiences
For Undergraduates

But you don't
generally start off with
an immersive
research experience

...

STARTING OUT IN A LAB



You might, in fact, start here (or doing some other mundane task).

Not because you & your skills are not valued, but because **it takes time to build trust.**

STARTING OUT IN A LAB

You may be intimidated, and that's okay!

No matter what you're doing, always try to remember how it connects to the research project.

Listen to the work happening around you so that you can figure out the lab dynamic.

Start keeping a lab notebook – even if it's just to record how you're spending your time at first.

Be a team player (offer to help when you reasonably can).

Ask questions!

Start reading relevant scientific papers (ask your mentor what these are).

STARTING OUT IN A LAB

Why am I working with grad students & post-docs if it's the Principal Investigator's lab?



DOING RESEARCH

... can be exciting & intimidating too!



DATA ENTRY /
DATA ANALYSIS



LAB WORK



FIELD WORK

DOING RESEARCH

... can be exciting & intimidating too!



DATA ENTRY /
DATA ANALYSIS



LAB WORK



FIELD WORK

DATA ENTRY / DATA ANALYSIS

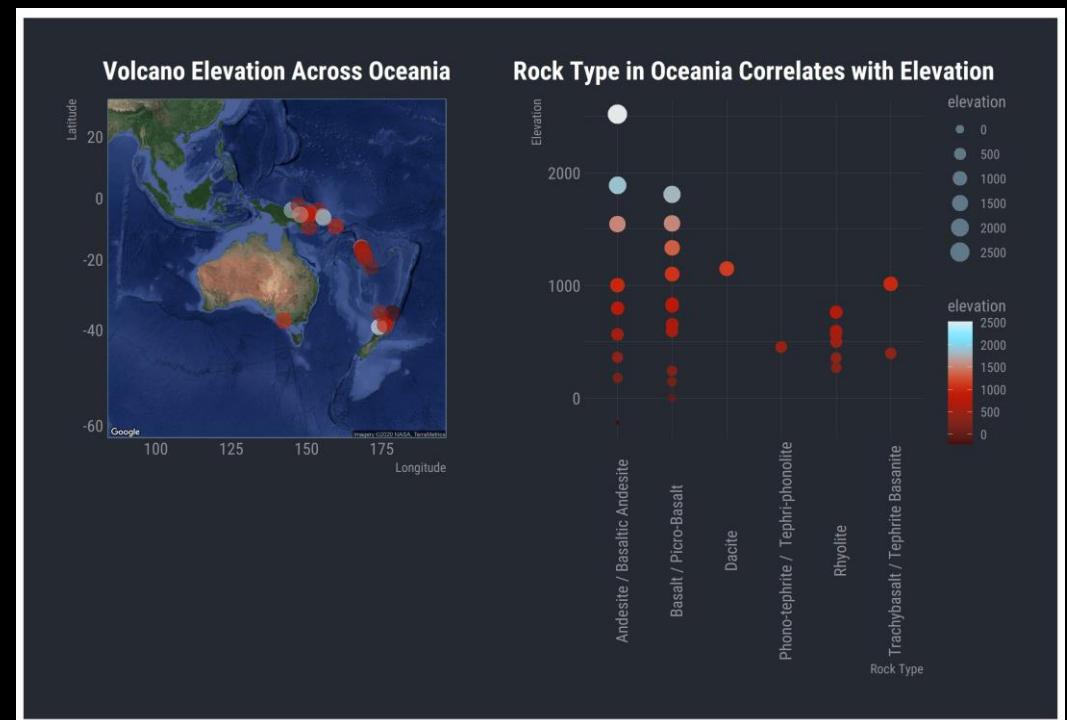
For some, this can seem like it's still pretty mundane ...

... but you are handling the raw materials of your research mentor's science!

This is a great opportunity to learn quantitative skills (coding, data visualization, statistics!)

So, be careful & double-check your work!

IT'S OKAY IF YOU MAKE MISTAKES!
Science is full of failure.



DOING RESEARCH

... can be exciting & intimidating too!



DATA ENTRY /
DATA ANALYSIS



LAB WORK



FIELD WORK

LAB WORK

This is the kind of work that takes patience and practice ...

... so be prepared to do several trial runs before you work with real samples!



These are marketable skills that can help you get a job / into grad school!

What's most important is YOUR SAFETY, then DATA QUALITY.

IT'S OKAY IF YOU MAKE MISTAKES!
Science is full of failure.

DOING RESEARCH

... can be exciting & intimidating too!



DATA ENTRY /
DATA ANALYSIS



LAB WORK



FIELD WORK

FIELD WORK

This is the kind of work that gets you out into the ocean (yay!) ...

... but it can seem scary and/or physically taxing!

Trust your gut – if you don't feel comfortable doing it, don't.

But also keep an open mind – fieldwork is very fun and builds skills in a different way.

Overall, **YOUR SAFETY IS MOST IMPORTANT.**



ONE LAST NOTE ON (DIS)COMFORT

You should feel comfortable going to the PI or grad student to let them know if something makes them feel uncomfortable!



Your mentor's goals is to help develop your passion.

Lab's are busy places with lots of backlog – there's always something else for you to help with!

DOING RESEARCH

... can be exciting & intimidating too!



DATA ENTRY /
DATA ANALYSIS



LAB WORK



FIELD WORK

DOING RESEARCH

If you end up being significantly involved in a project,
or even starting a project of your own ...

... ask about presenting that
research at a conference
as a talk or poster!

And, don't be afraid to ask
if the lab can help support
your attendance at the
conference!



RESEARCH IS COMMUNAL

Once you join a lab ...

... you will likely be invited to do more than just the tasks you have been assigned.

LAB MEETINGS: Where papers & ongoing research are discussed

Helping with experiments that have multiple components

Helping with a lab member's fieldwork

Attending research seminars

COLLABORATION IN SCIENCE



Brian Gaylord



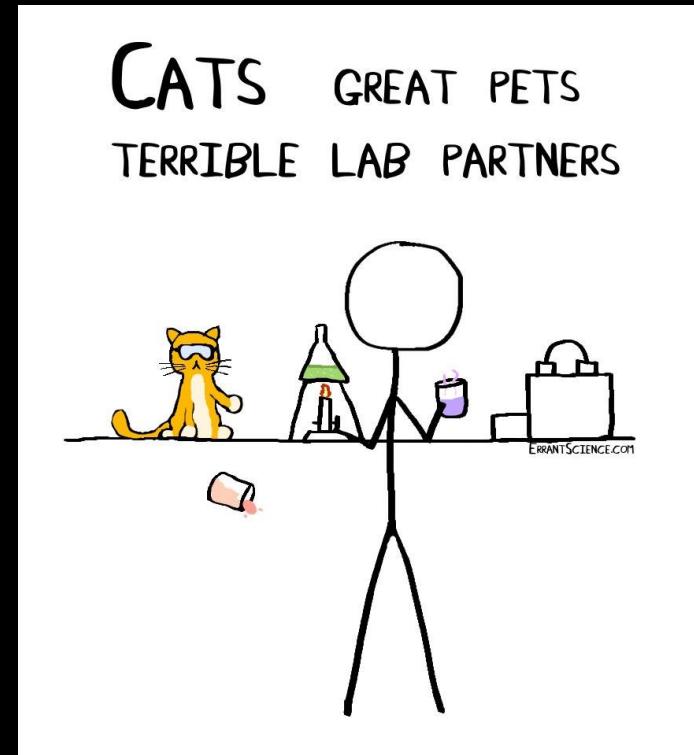
Eric Sanford



Tessa Hill

Bodega Ocean Acidification Research (BOAR)

COLLABORATION IN SCIENCE



Science is the name but
collaboration is the game



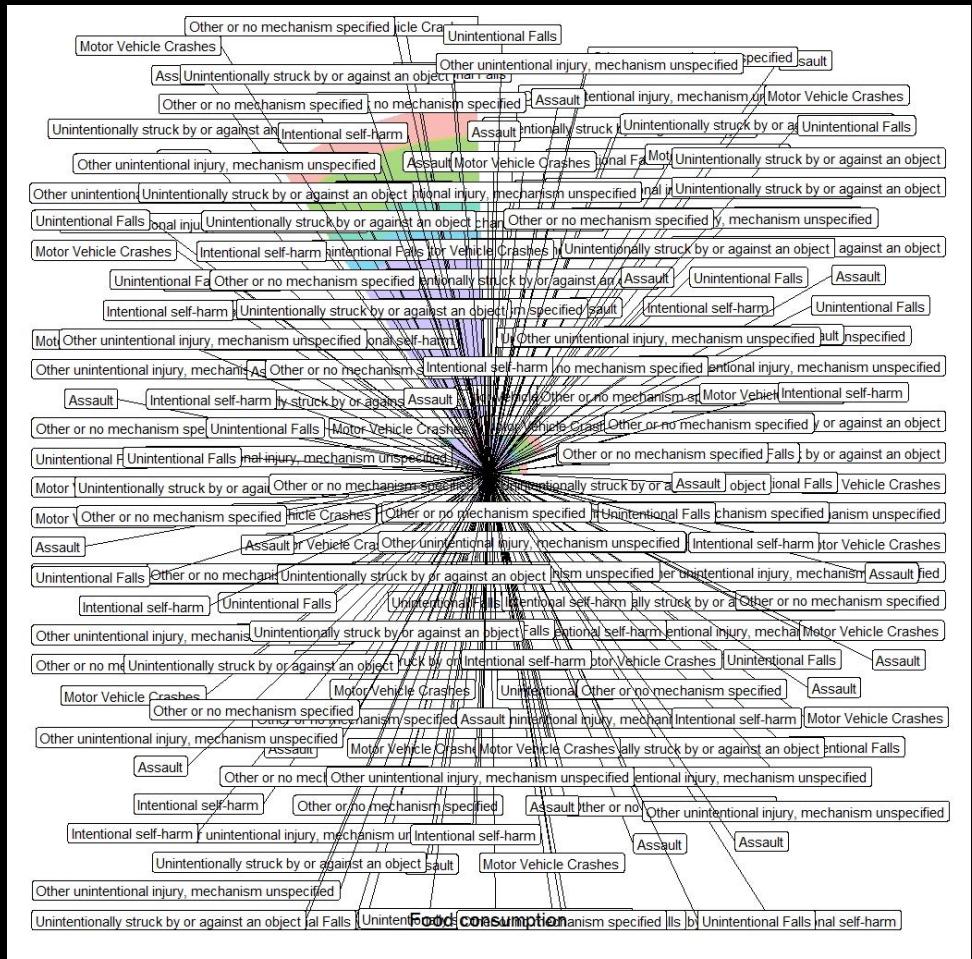
Partnership for Interdisciplinary Studies of Coastal Oceans



SCIENCE IS IMPERFECT

If an experiment doesn't work or your data don't make sense – that's okay & not tied to your self-worth!

SCIENCE IS INHERENTLY ITERATIVE – so you learn from one failure and improve the next time!



WHAT IF YOU DON'T LIKE WORKING IN A LAB?

**It's PERFECTLY NORMAL for you to decide that
research isn't for you!**

**I worked in 6 labs before figuring out what sort of
research I liked!**

**And, I enjoy my PhD research, but I don't want to
do it for a living!**

ACADEMIC SCIENCE & LAB CULTURE



ABOUT PRIYA



Effects of an eelgrass bed (*Zostera marina*) on
seawater pH and alkalinity

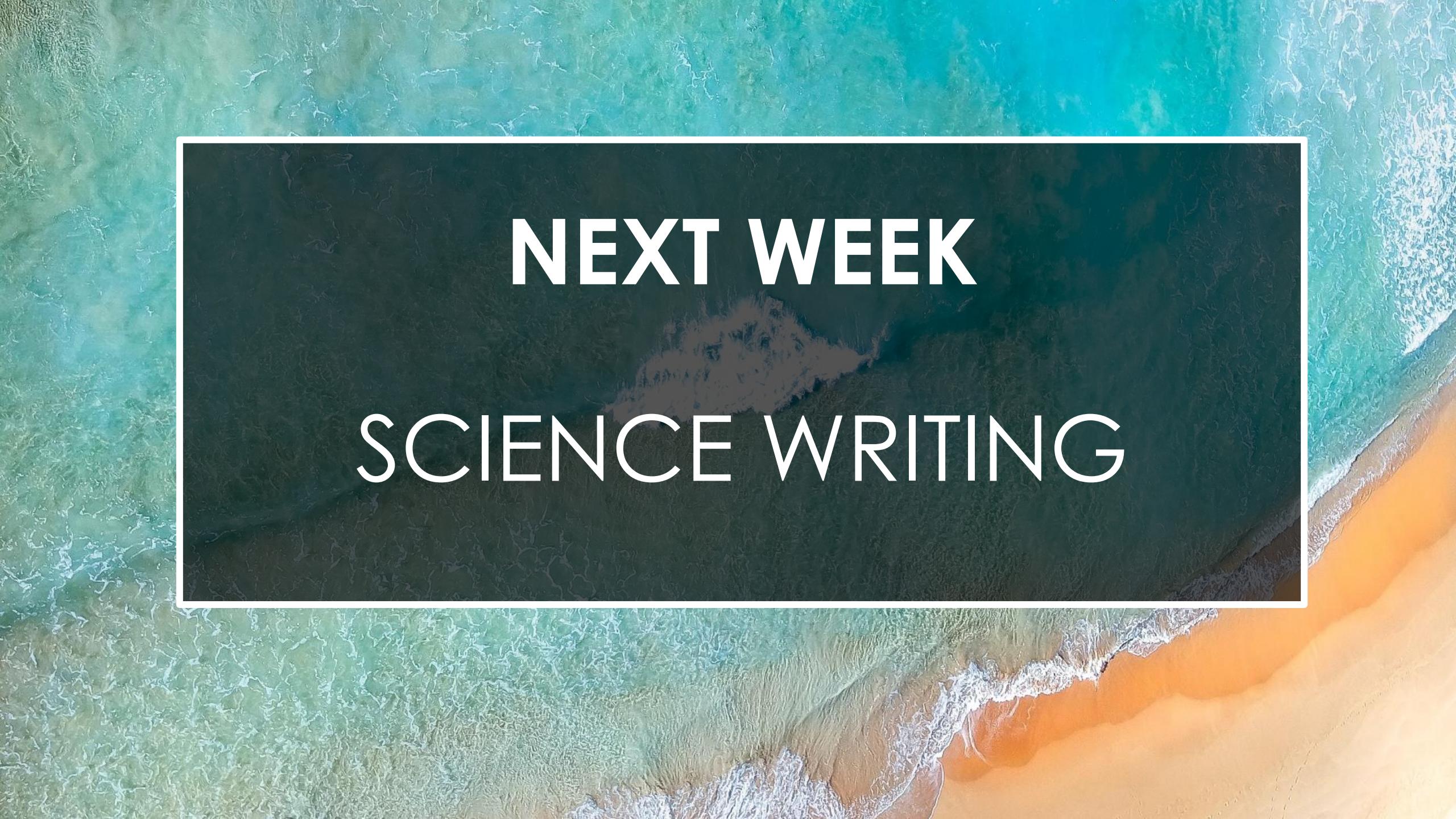
ABOUT PRIYA



Bodega Ocean Acidification
Research Technician



Bodega Ocean Acidification Research (BOAR)

The background of the image is a high-angle aerial photograph of a coastal area. The water is a vibrant turquoise color, with white foam where waves break on the shore. The beach itself is a bright orange or tan color. A dark, irregular shape, possibly a piece of debris or a shadow, is visible in the center of the water.

NEXT WEEK

SCIENCE WRITING

BEFORE CLASS NEXT WEEK

Complete
Assignment 2





QUESTIONS?