

Untold Stories in Geosciences:

Social and Historical Contexts of the Development of Geosciences as a Discipline

These slides were made by Jeemin H. Rhim for a First-Year Seminar (EARS07) that was offered at Dartmouth College during Winter 2022. Some of these slides may be used to give a short introductory lecture before a reading discussion for papers listed in the accompanying document ([UntoldStoriesGeosci_ReadingList.pdf](#)).

Table of contents

UNIT 1: Extraction and Oppression During the Early Development of Geosciences

- Week 1 – Introduction: Social and historical contexts of the development of geoscience disciplines ([p. 3–13](#))
- Week 1 or 2 – Example Community Guidelines ([p. 14–16](#))
- Week 2 – Exploitation of Land, Resources and People: Social and political impacts of early geological expeditions ([p. 17–31](#))
- Week 3 – Scientific Racism and Colonialism: Origins of Scientific Racism in the U.S. ([p. 32–36](#))
- Week 4 – Sexism and Ableism in Geosciences: Past and present: underrepresentation of women in (geo)sciences ([p. 37–40](#))
- Week 4 – Sexism and Ableism in Geosciences (cont.): Ableism and exclusion of people with disabilities in geosciences ([p. 41–82](#))

UNIT 2: Modern-day Manifestations of Racism and Colonialism in Geosciences

- Week 5 – Continued Impacts on Indigenous People: U.S. settler colonialism and environmental injustice ([p. 83–90](#))
- Week 6 – Where the Geoscience Community Stands Today: History of racism and its impact on the geoscience community today ([p. 91–100](#))
- Week 6 – Where the Geoscience Community Stands Today (cont.): Challenges faced by BIPOC and LGBTQIA+ geoscientists in the field ([p. 101–109](#))

Social and historical contexts of the development of geoscience disciplines

UNIT 1: Extraction and Oppression During the Early Development of Geosciences

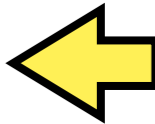
Week 1 – Introduction: these slides may be useful for giving an overview of the course.

What comes to your mind when you see this image?

[\[Insert PolEV link here\]](#)



Course Structure

- **UNIT 1:** Extraction and Oppression During the Early Development of Geosciences 
- **UNIT 2:** Modern-day Manifestations of Racism and Colonialism in Geosciences
- **UNIT 3:** Building Anti-Racist Culture and Practices in Geosciences

Inspirations: feminist philosophy of science and critical race theory

- Feminist standpoint theory posits that knowledge is socially situated (Haraway 1988)
- “Strong objectivity” requires us to understand the practice of science in a social context where the political, economic, and social values of the scientific community control the entire scientific process (Harding 1992)

Why tell untold stories?

A step toward “strong objectivities”

Why tell untold stories?

A step toward “strong objectivities”

19th century landscape research

- Historical backdrop: westward expansion and imperialist projects
- Many of these scientists hired for these imperialist projects were involved in research in scientific racism
- Example: John Wesley Powell



Powell poses with Tau-Ruv, a Ute woman, with a mirror case. Clothing worn by both sewn by Powell's sister for Smithsonian Museum. Photograph by Hillers, 1874.

“... next to teaching them to work, the most important thing is to teach them the English language. Into their own language there is woven so much mythology and sorcery that ... the ideas and thoughts of civilized life cannot be communicated to them in their own tongues.”

— Powell, Report on the condition of the Ute Indians of Utah, 1873

William Morris Davis and Race

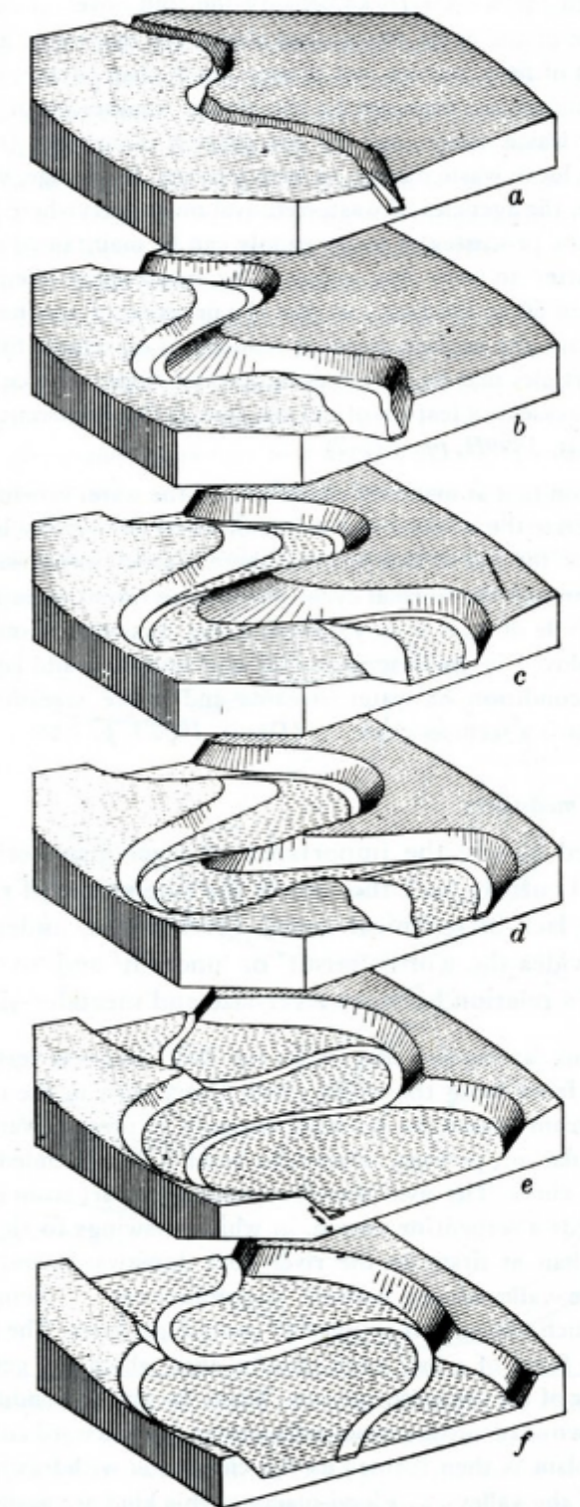
- Proposed concept of a river's "life cycle" from young to mature describing stages of river evolution through time
- Wrote geography textbooks connecting topography and climate to superiority/inferiority of human races

*"The study of physical geography...gives a knowledge ...so that we may better understand the relation of man and nature. This relationship is of great importance because the **progress of man from the savage toward the civilized state has been made by taking advantage of favorable geographical conditions.**"*

"Few nations among [black, brown, red] races have made important advances towards civilization."

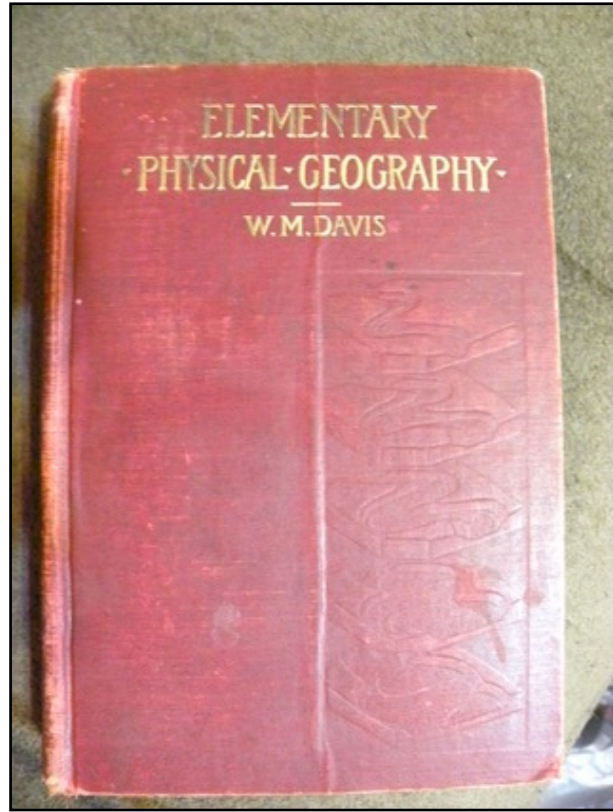
"Inhabitants of [North America] were savages who did not know how to develop its riches..."

Elementary Physical Geography, 1902



William Morris Davis, *Physical Geography*, 1898 (Fig 152)

What stories are told in classrooms/media?

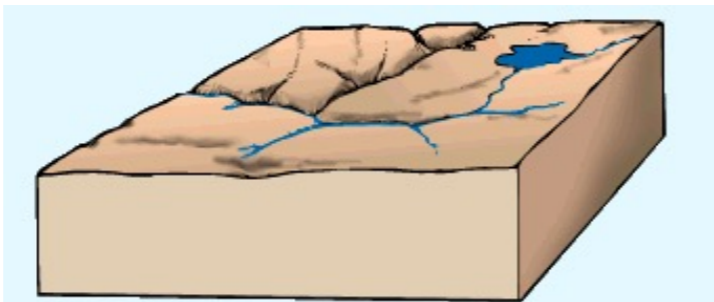
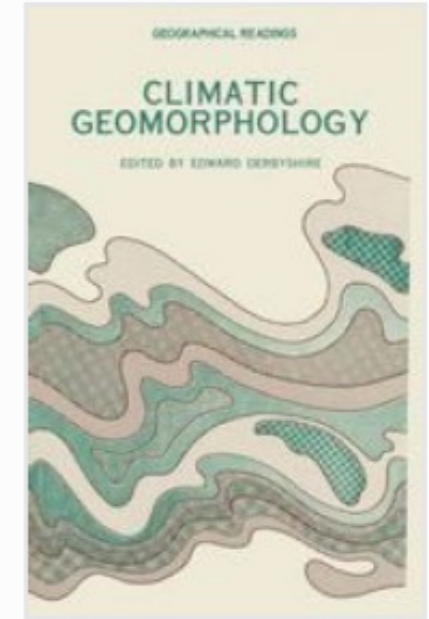


The geographical cycle

WM Davis - Climatic Geomorphology, 1973 - Springer

All the varied forms of the lands are dependent on—or, as the mathematician would say, are functions of—three variable quantities, which may be called structure, process, and time. In the beginning, when the forces of deformation and uplift determine the structure and attitude ...

☆ Save 📄 Cite Cited by 1581 Related articles All 7 versions ⇨



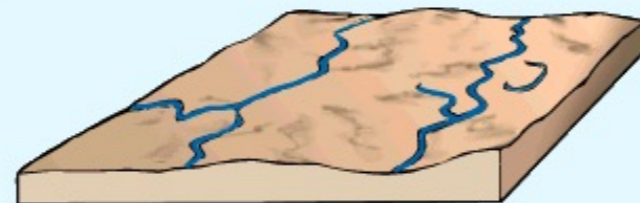
A Youth

V-shaped valleys, few or no floodplains, extensive interfluvies, many falls and rapids plus some lakes and swamps; incising watercourses



B Maturity

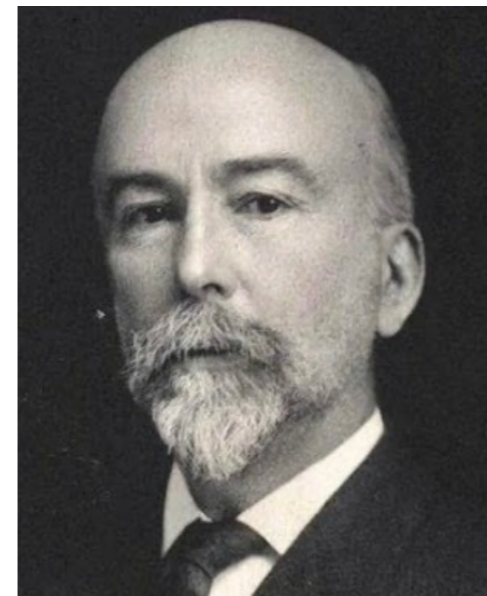
well-drained terrain, all in slopes except floodplains; trunk and some tributary streams meander; maximum relief



C Old Age

broad, open valleys with widely meandering streams, indistinct divides, erosion remnants of resistant lithologies, surface near erosional base level

©1994 Encyclopaedia Britannica, Inc.



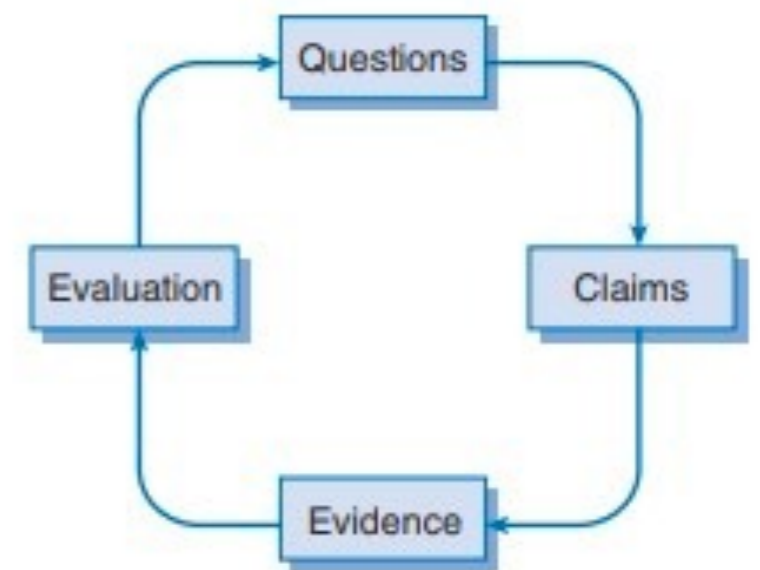
Davis' Model of Cycle of Erosion

William Morris Davis, the 'Father of American Geography'

December 13, 2013 by Kids Discover

Writing about untold stories in geosciences

- We are not writing about stories for storytelling's sake — the stories will serve the purpose of building your main argument
- General structure of social science writing:
 1. Introduction
 2. Thesis
 3. The argument
 4. Conclusion



methodspace.com

- We will explore some papers in scientific article format as well

Assignments

Read Monarrez et al. (2021) and respond to Canvas discussion

- Reading material: Canvas > 'Files' > 'Week 1'
- Discussion: Canvas > 'Discussions' > 'Extraction, Exclusion, Oppression and Erasure in Geosciences'

DUE morning of class by 8:00 a.m., Monday, January 10th

We will start off the first week with a recent article on the history of paleontology and geology in Western countries since the 1800s. Please read "[Our past creates our present: a brief overview of racism and colonialism in Western paleontology](#)" (Monarrez et al., 2021) and post your response to each of the following questions. PDF file of this paper can be found in the 'Files' tab as well.

- What are some new term(s) or concept(s) you learned from this reading?
- What are some facts or observations you found interesting, surprising and/or noteworthy, and why?
- What questions and/or reflections do you have after reading this article?

Note: if your peers have already posted responses before you, please make sure to read them and refer to them in your responses as needed. You will be graded on both completing the assignment on time and putting critical effort into your responses. If you are additionally commenting on your peers' posts (highly encouraged), please be respectful of each other's perspective.

Example Community Guidelines

UNIT 1: Extraction and Oppression During the Early Development of Geosciences

Week 1 or 2 – these slides are used to set student expectations and community guidelines for facilitating respectful discussions throughout the term. After introducing these on the first week, a quick reminder of these guidelines can be included at the beginning of the first few discussions.

All EARS07 members are to...

- Be treated with respect and consideration
- Be considerate, collegial, and collaborative
- Communicate openly, with civil attitudes, critiquing ideas rather than individuals
- Respect the privacy of fellow community members by not sharing details outside the group without explicit permission
- Avoid personal attacks
- Alert me (the instructor) if you notice disrespectful behaviors, someone in distress, etc.

Example behaviors that contribute to positive environment include:

- Using welcoming and inclusive language
- Speaking from one's own personal experiences and perspectives ("I" instead of "they," "we," "you," etc.)
- Being respectful of differing viewpoints and experiences
- Gracefully accepting constructive criticism
- Focusing on what is best for the community
- Showing empathy towards other community members

Social and political impacts of early geological expeditions

UNIT 1: Extraction and Oppression During the Early Development of Geosciences

Week 2 – Exploitation of Land, Resources and People: these slides may be used to start off the reading discussion for the following references.

- [*The Darker Side of John Wesley Powell*](#) (Pico, 2019)
- [*Minik and the Meteor*](#) (Meier, 2013)

Additional readings:

- [*Caught in the Middle: the Tragic Life of Minik Wallace*](#) (Perry-MacMillan Arctic Museum, Bowdoin College, 2020)
- [*Robert E. Peary and the Cape York Meteorites*](#) (Huntington, 2002)

Example behaviors that contribute to positive environment include:

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Backdrop to 19th c. research & teaching on landscapes

Imperialist projects, including government-sponsored expeditions, which sought to describe topography/landscapes in territories to justify who should live on and use the land

→ **many** of these scientists were involved in research in **scientific racism**, for example using physical geography to designate the inferiority or superiority of human races that evolved on different landscapes

- [John Wesley Powell](#) (U.S. Geologic Survey Director)
- [Mary Somerville](#) (first physical geography textbook 1848)
- [Louis Agassiz](#) and [Nathaniel Shaler](#) (professors at Harvard, trained many scientists)
- [Arnold Guyot](#) (founding professor of geoscience at Princeton)
- Grove Karl Gilbert (president of Geologic Society of America)
- [William Morris Davis](#) (president of Geological Society of America)

John Wesley Powell

- Led the 1869 Powell Expedition, the first U.S. government-sponsored expedition through the Colorado River into the Grand Canyon
- Contributions of the local native people downplayed in Powell's accounts, including knowledge of the land
- Studies on language of the Ute people inhabiting canyonlands sought to prove the inferior "barbaric" status of Native American culture
- Government reports recommended Native American assimilation



John Wesley Powell on horseback near Flagstaff, Arizona ca. 1891.

Credit: National Park Service (NPS)



Powell poses with Tau-Ruv, a Ute woman, with a mirror case. Clothing worn by both sewn by Powell's sister for Smithsonian Museum. Photograph by Hillers, 1874.

What kinds of power do maps and languages have?

Collecting Geologic Samples: An Example with Meteorites

Reading: Minik and the Meteor (Meier, 2013)

Meteorites

- Fragments of asteroids, other planets, comets, and the Moon
- Provide information about the origin and evolution of Earth, other planets, and the Solar System:
 - origin of Earth's water;
 - differentiation of Earth's crust;
 - possible role of meteorites in delivering extraterrestrial sugars (precursors for life) to Earth
 - formation of the solar nebula



11.51 gram partial slice of Allende. ASU collection.
[Wikimedia Commons.](#)

Ahnighito meteorite, fragment of the Cape York meteorite

Hall of Meteorites, American Museum of Natural History



[Jonathan Blair, National Geographic](#)

The dark history behind the largest meteorite ever displayed, and a resource still used in science today.

“Discovered” in Greenland by 1894 Robert E. Peary

Language on AMNH.org only recognizes Peary, a problematic framing that does not acknowledge the humanity of the Inughuit.

150 YEARS | AMERICAN MUSEUM OF NATURAL HISTORY

a small asteroid

that broke apart.

When you touch the 4.5-billion-year-old Cape York Meteorite, you are touching an object that is nearly as old as the Sun. Discovered in 1894 in Greenland, this iron meteorite slammed into Earth some 10,000 years ago.

[Ahnighito, American Museum of Natural History](#)



Robert E. Peary on the *SS Roosevelt*, 1906, [Library of Congress](#)

Cape York meteorites: Source of iron for the Inughuit

- An iron meteorite ~4.5 billion years old, falling in NW Greenland ~10,000 yrs ago
- An essential source of iron for the Inughuit, the Inuit living in Greenland

"The Tent" fragment (Ahnighito) in situ



[Huntington \(2002\)](#), AMNH

"The Woman" in situ, surrounded by hammer stones carried >50 km to site



THE "WOMAN" IN SITU.

R.E. Peary (1898) Northward Over the "Great Ice"

Handtool by Inughuit



The Natural History Museum, London

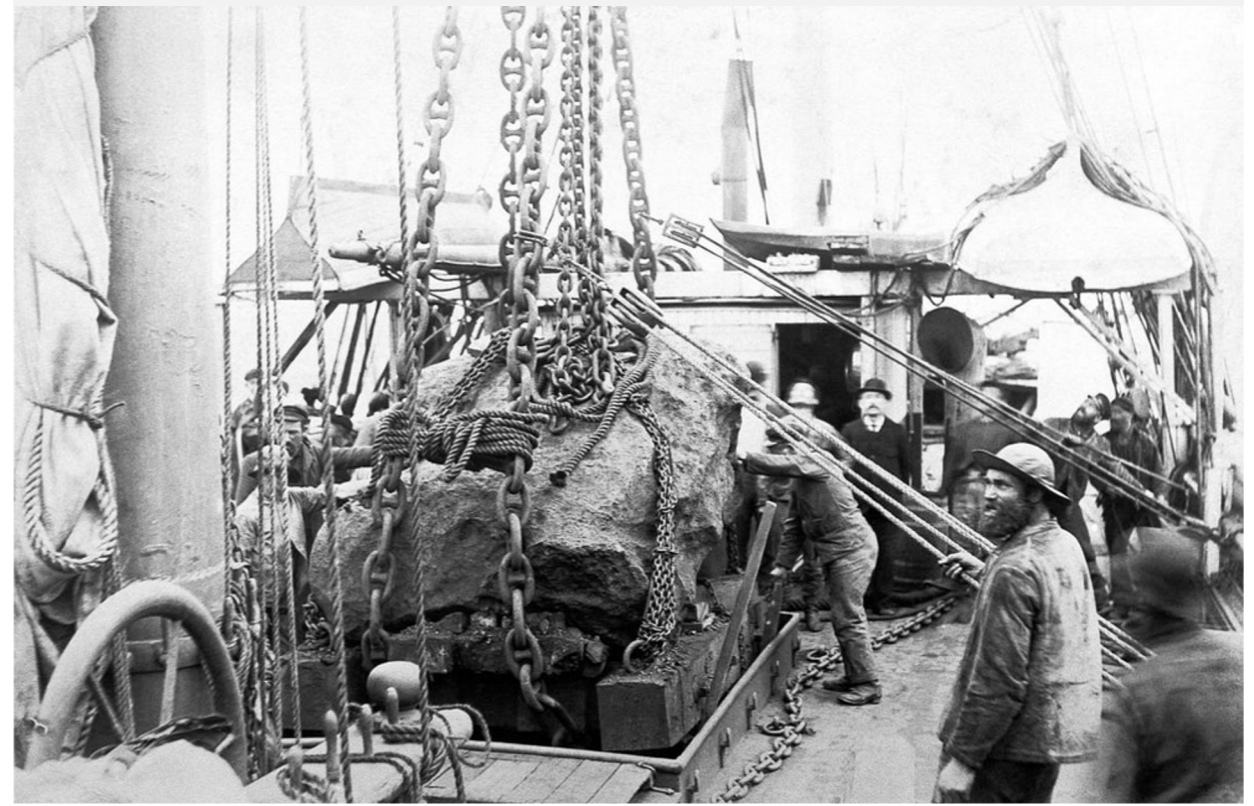
Cape York meteorite removal from Greenland

Local Inughuit hauling a jack for meteorite



[National Geographic](#)

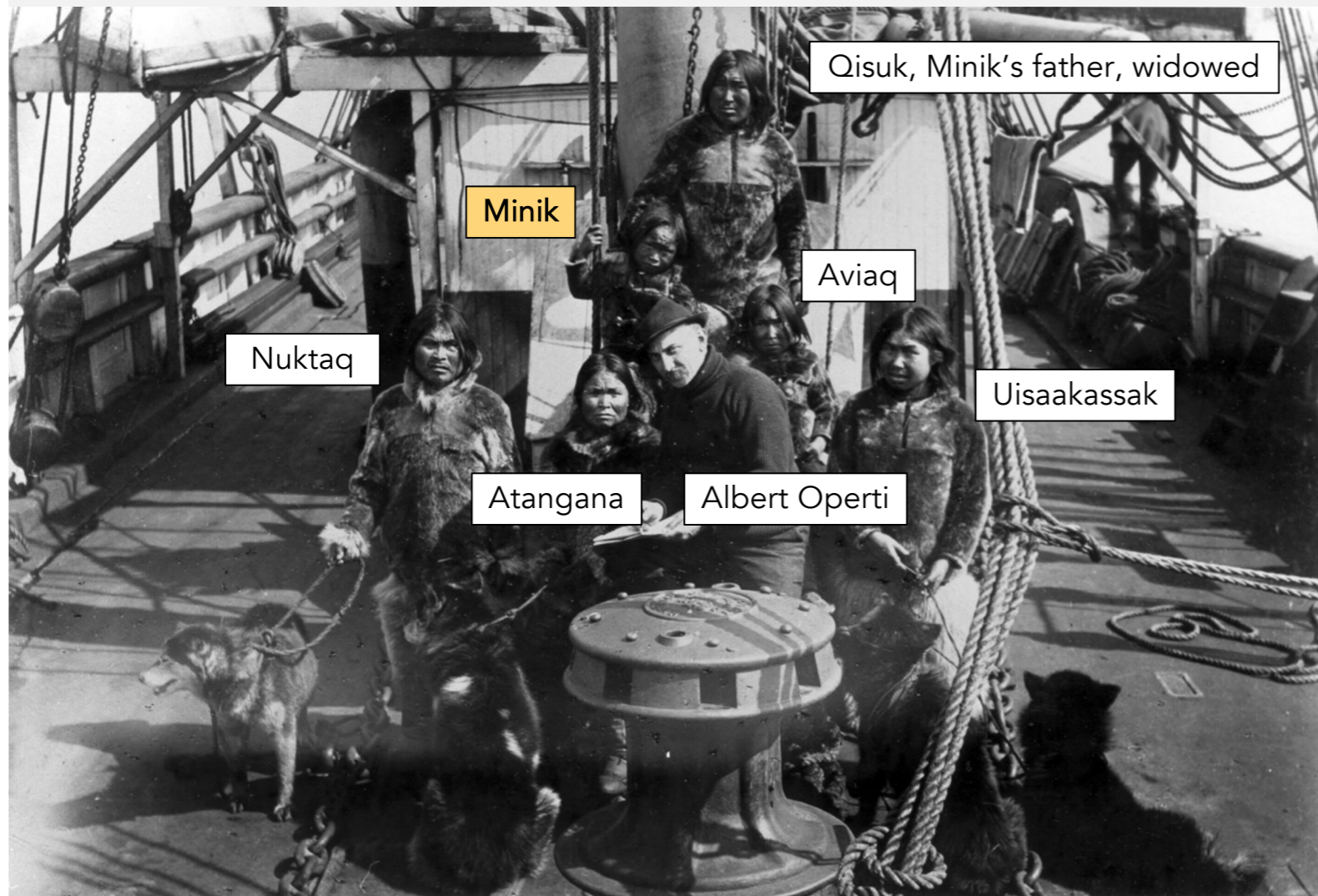
"The Tent" block secured on board *The Hope*



[National Geographic](#)

Peary also brought six Inughuit to New York

Six Inughuit aboard *The Hope* en-route to New York, 1897



1897: Anthropologist Franz Boas (AMNH) asks Peary to invite an Inughuit man to stay in New York for a year to record his culture with museum staff.

Peary brings six people instead. The group includes a 7-year-old boy named **Minik**.

[Caught in the Middle: the Tragic Life of Minik Wallace](#)

Minik (or Mene) Wallace

- **Age 8:** Within months of arriving in New York, Nuktak, Atangana, Aviaq, and Minik's father Qisuk all die of tuberculosis. Minik, now an orphan at age 8, is adopted by William Wallace, the AMNH superintendent.
- **Age 18:** Minik finds out that museum staff had faked his father's funeral, his bones preserved in the museum's collections. Minik tries for years to get his father's bones back but is unsuccessful.
- **Age 20:** Minik returns to Greenland, but finds that in his many years away, he has forgotten much of the language and other basic survival skills.



[Caught in the Middle: the Tragic Life of Minik Wallace](#)

Minik Wallace

- **Age 28:** Minik returns to the United States and takes a job at a lumber camp in New Hampshire.
- **Age 29:** Minik dies of Spanish flu during the 1918 pandemic.



Above: W. Elmer Ekblaw, *Mene in Kayak, Umanak, North Star Bay, Greenland, 1914.*
Gift of Margaret Tanquary Corwin.

Right: G. LeMoine, *View of the grave of Minik Wallace.* Indian Creek Cemetery, Pittsburg, New Hampshire, 2018. Arctic Museum Collection.

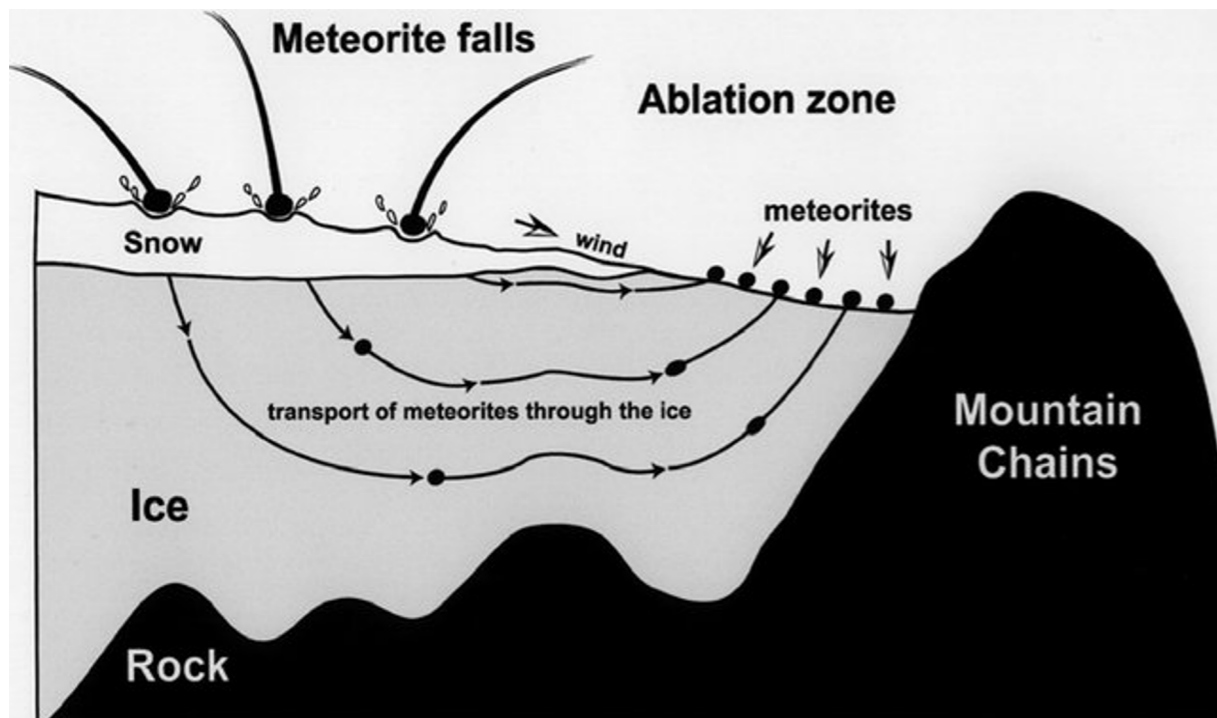


How meteorites are collected for science today

- Best places to find meteorites are barren, dry, and old landscapes where dark rocks are easy to spot (e.g., Mojave Desert, Antarctica)
- Science expeditions vs. acquisition by private collectors
- ANSMET: Antarctic Search for Meteorites, funded by the National Science Foundation



[ANSMET/Case Western University](#)



Meteorite accumulation in Antarctica. Figure redrawn after drawing of L. Schultz, Max-Planck-Institute für Chemie (Mainz).

[ResearchGate](#)

More readings and sources

References:

- Patricia A. M. Huntington (2002) Robert E. Peary and the Cape York Meteorites, *Polar Geography*, 26:1, 53-65, DOI: [10.1080/789609353](https://doi.org/10.1080/789609353)
- [Minik and the Meteor](#), Allison C. Meier, *Narratively: Hidden History*, 2013.
- [Caught in the Middle: the Tragic Life of Minik Wallace](#), Perry-MacMillan Arctic Museum, Bowdoin College, 2020.
- [The Cape York meteorite: Making an impact on Greenland](#), Emily Johnson, University of Washington, 2019.
- Martin Appelt et al. (2015) [The Cultural History of the Innaanganeq/Cape York Meteorite](#). Technical Report. Greenland National Museum and Archives.

Additional sources:

- Dr. Erin L. Thompson's [Twitter thread \(@artcrimeprof\)](#) about the meteorite
- "[The Mad Scramble to Claim the World's Most Coveted Meteorite.](#)" *Wired Magazine*.

Contents from GeoContext (doi.org/10.6084/m9.figshare.14158457)

Origins of Scientific racism in the U.S.

UNIT 1: Extraction and Oppression During the Early Development of Geosciences
Week 3 – Scientific Racism and Colonialism: these slides may be used to start off the reading discussion for the following references.

- [*The American School and Scientific Racism in Early American Anthropology*](#) (Dewbury, 2007)
- [*Morton, Agassiz, and the Origins of Scientific Racism in the United States*](#) (Menand, 2002)
- [*There's No Scientific Basis for Race—It's a Made-Up Label*](#) (Kolbert, 2018)

Additional readings:

- [*The fault in his seeds: Lost notes to the case of bias in Samuel George Morton's cranial race science*](#) (Mitchell, 2018)
- [*Nathaniel S. Shaler and racial ideology*](#) (Livingstone, 1982)
- [*Looking for Louis Agassiz: A Story of Rocks and Race in Maine*](#) (McInnes, 2019)
- [*Louis Agassiz, Under a Microscope*](#) (Iqbal, 2021)
- [*Race and Soil: Geography, Ethnology, and Nazism*](#) (Kophamel, 2021)

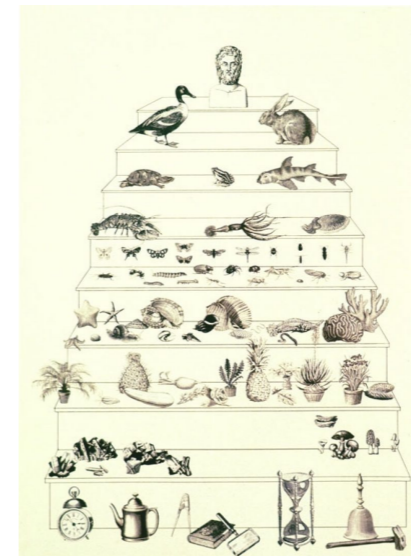
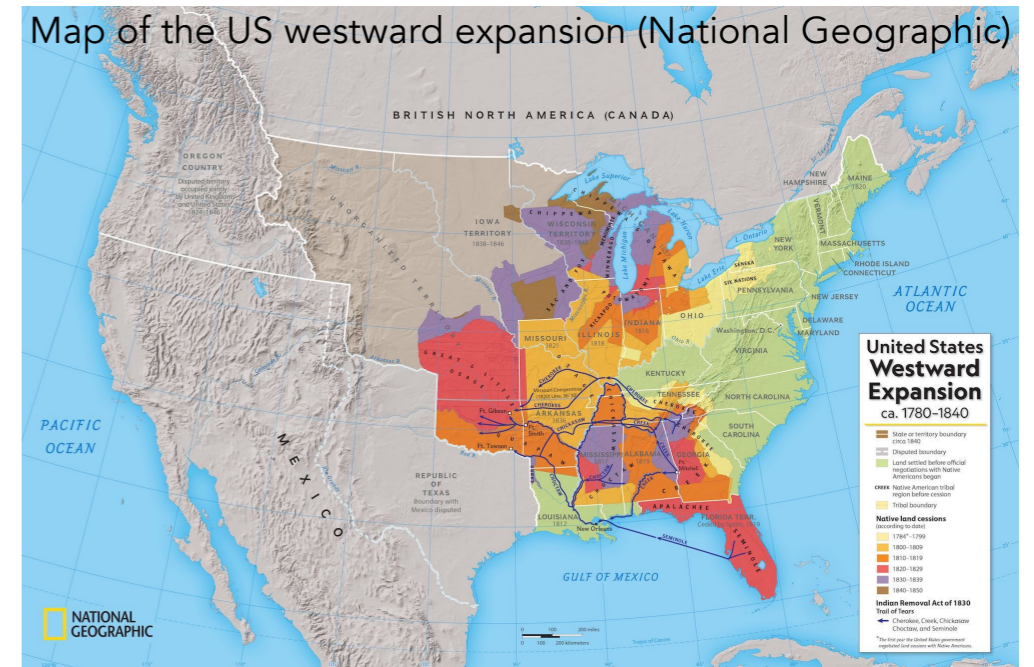
Social, political & intellectual backgrounds (19th c.)

Social/Political Backgrounds

- Post-American Revolutionary War (1775–1783) westward expansion
- Question about slavery in the new territories and growing abolitionist movement

Intellectual Backgrounds

- Conceptual frameworks for American science: creationism and essentialism
- Early anthropologists = scientific professionals in other fields (+ newfound interest in the natural sciences)
- Development of polygenist theory



[Left] *Scala Naturae* by Mark Dion (1993); [Right] *Allegory of the Cave* by MatiasEnElMundo (Getty Images)

Glaciology and Race: Louis Agassiz

Louis Agassiz was a scientific racist and a key figure in early glaciology

- 1837: Louis Agassiz presented the idea of oscillatory ice ages to Helvetic Natural History Society
- 1846-1847: moved to the US to give a lecture series ("The Plan of Creation as shown in the Animal Kingdom") and was hired as the head of Harvard's new Lawrence Scientific School (later SEAS) as its first attempt to provide a formal education in science and engineering
- 1859: Agassiz founded the Harvard Museum of Comparative Zoology, which he directed until his death in 1873



Different species of animals displayed with various human skulls, drawn by Louis Agassiz in Types of Mankind (1854)³

Glaciology and Race: Louis Agassiz

Agassiz was a proponent of **polygenism**, the idea that different races constitute different species:

“The production of half-breeds is as much a sin against nature, as incest in a civilized community is a sin against purity of character. . . . No efforts should be spared to check that which is abhorrent to our better nature, and to the progress of a higher civilization and a purer morality.” – Agassiz to his mother (1846)



Different species of animals displayed with various human skulls, drawn by Louis Agassiz in Types of Mankind (1854)³

Glaciology and Race: Louis Agassiz

Agassiz passed on his legacy of racism:

- **Nathaniel Shaler**, an outspoken white supremacist who was eventually hired by Harvard, was one of Agassiz's students
- Shaler mentored **William Morris**, who later justified racial classification based on perceived contributions to civilization.
- Morris mentored **Ellsworth Huntington**, a scientist who was an early supporter of the idea that Earth's climate undergoes major variations. He used this work to validate the role of a "stimulating climate" in the development of civilization.
- Agassiz's style of scientific racism was perpetuated and normalized at respected universities in the United States by his academic family tree.



Different species of animals displayed with various human skulls, drawn by Louis Agassiz in Types of Mankind (1854)³

Past and present: underrepresentation of women in (geo)sciences

UNIT 1: Extraction and Oppression During the Early Development of Geosciences

Week 4 – Sexism and Ableism in Geosciences: these slides may be used to start off the reading discussion for the following references.

- [Women in glaciology, a historical perspective](#) (Hulbe, Wang and Ommanney, 2010)
- [Trends in the Representation of Women Among US Geoscience Faculty From 1999 to 2020: The Long Road Toward Gender Parity](#) (Ranganathan et al., 2021)

Additional readings:

- [Glaciers, gender, and science: A feminist glaciology framework for global environmental change research](#) (Carey et al., 2016)

"The Surgeon's Dilemma"

A father and his son are involved in a horrific car crash and the man died at the scene. But when the child arrived at the hospital and was rushed into the operating theatre, the surgeon pulled away and said:

"I can't operate on this boy, he's my son."

How can this be?

Picture A Scientist (2020)



Nancy Hopkins, Ph.D.

Nancy Hopkins is a molecular biologist and professor of biology at the Massachusetts Institute of Technology. She is known for her research identifying the role genes play in longevity and cancer predisposition in adult fish, as well as for her work promoting equality of opportunity for women scientists in academia. She is a member of the National Academy of Sciences, the Institute of Medicine of the National Academy, and the American Academy of Arts and Sciences.

Raychelle Burks, Ph.D.

Raychelle Burks is a professor of analytical chemistry at St. Edward's University in Austin, Texas. Her research focuses on developing low-cost colorimetric sensors for detecting chemicals of forensic interest, including explosives and regulated drugs. As a science communicator, Burks has appeared on the Science Channel's Outrageous Acts of Science, the American Chemical Society's Reactions videos, Royal Society of Chemistry podcasts, and at genre conventions such as DragonCon and GeekGirlCon. Burks was awarded the 2020 American Chemical Society Grady-Stack award for excellence in public engagement.



Jane Willenbring, Ph.D.

Jane Willenbring is a geomorphologist and professor of geology at the Scripps Institution of Oceanography, and director of the Scripps Cosmogenic Isotope Laboratory. Willenbring's research examines the evolution of the Earth's surface, especially how landscapes are affected by tectonics, climate change, and life on Earth. She is a 2018 Geological Society of America Fellow, and the recipient of the Antarctica Service Medal and the National Science Foundation CAREER Award.

Trailer: <https://vimeo.com/405966332>

More about the movie:

<https://www.pictureascientist.com/>

Trends in the Representation of Women Among US Geoscience Faculty From 1999 to 2020

(Ranganathan et al., 2021)



Left to right: Ellen Lalk, Julia Wilcots, Mara Amelia Freilich, Meghana Ranganathan, and Rohini Shivamoggi

Image: Gretchen Ertl

Ableism and exclusion of people with disabilities in geosciences

UNIT 1: Extraction and Oppression During the Early Development of Geosciences

Week 4 – Sexism and Ableism in Geosciences (cont.): these slides may be used to start off the reading discussion for the following references.

- [Creating Spaces for Geoscientists with Disabilities to Thrive](#) (Marshall & Thatcher, 2019)
- [Professionally held perceptions about the accessibility of the geosciences](#) (Atchison & Libarkin, 2016)
- ['Nothing about us without us:' The perspectives of autistic geoscientists on inclusive instructional practices in geoscience education](#) (Kingsbury et al., 2020)

Additional readings:

- [Between a rock and a workplace](#) (Lawrence, 2021)

Creating inclusive classroom environments

Example resources for supporting instructors of Blind and low-vision students in geoscience classrooms

The Geological Tactile Image Repository: A Digital Resource Collection to Support Instructors of Blind and Low-Vision Geoscience Students

Kent Ratajeski, University of Kentucky

P. Jack Reed, Stanford University

Sydney L. Clark, Kentucky Department of Public Health

Donna Lee, University of Kentucky

Christopher Atchison, University of Cincinnati-Main Campus

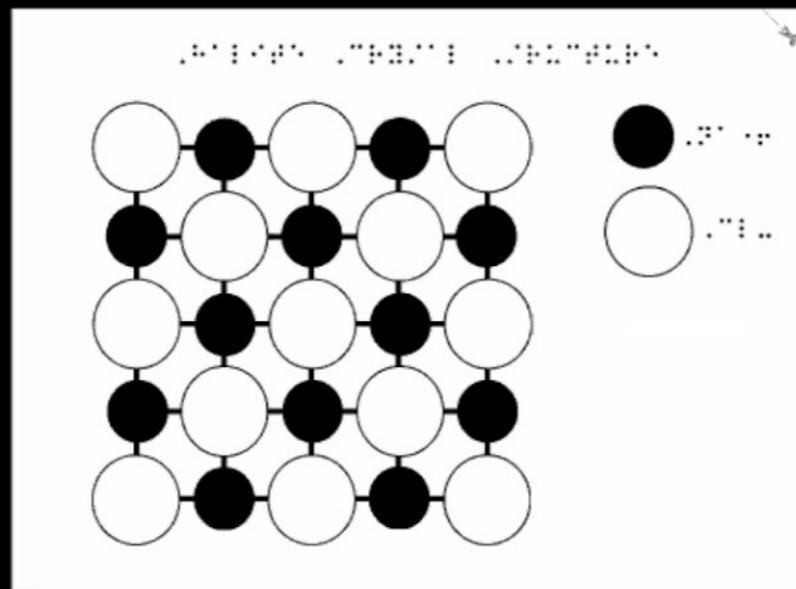
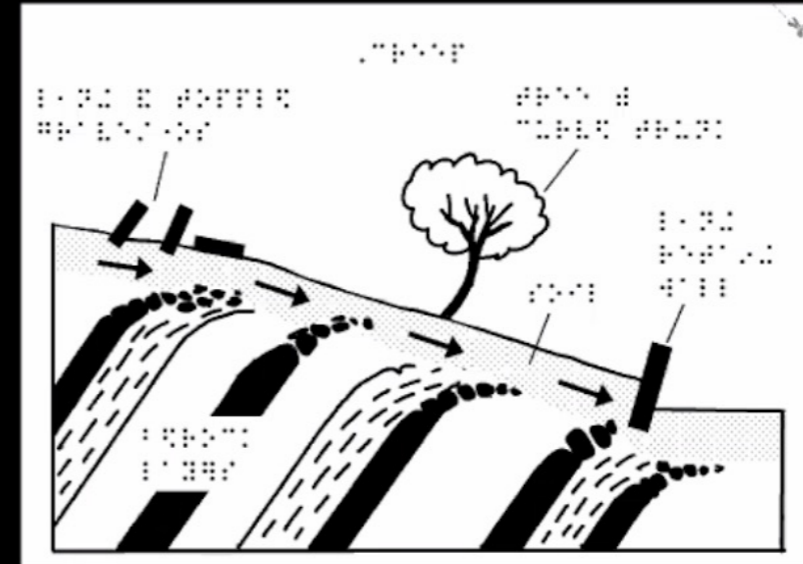
Tactile Graphics for Geoscience Education

<https://tactileimages.theiagd.org/>

Tactile Graphics for Geoscience Education

Tips for tactile graphic design

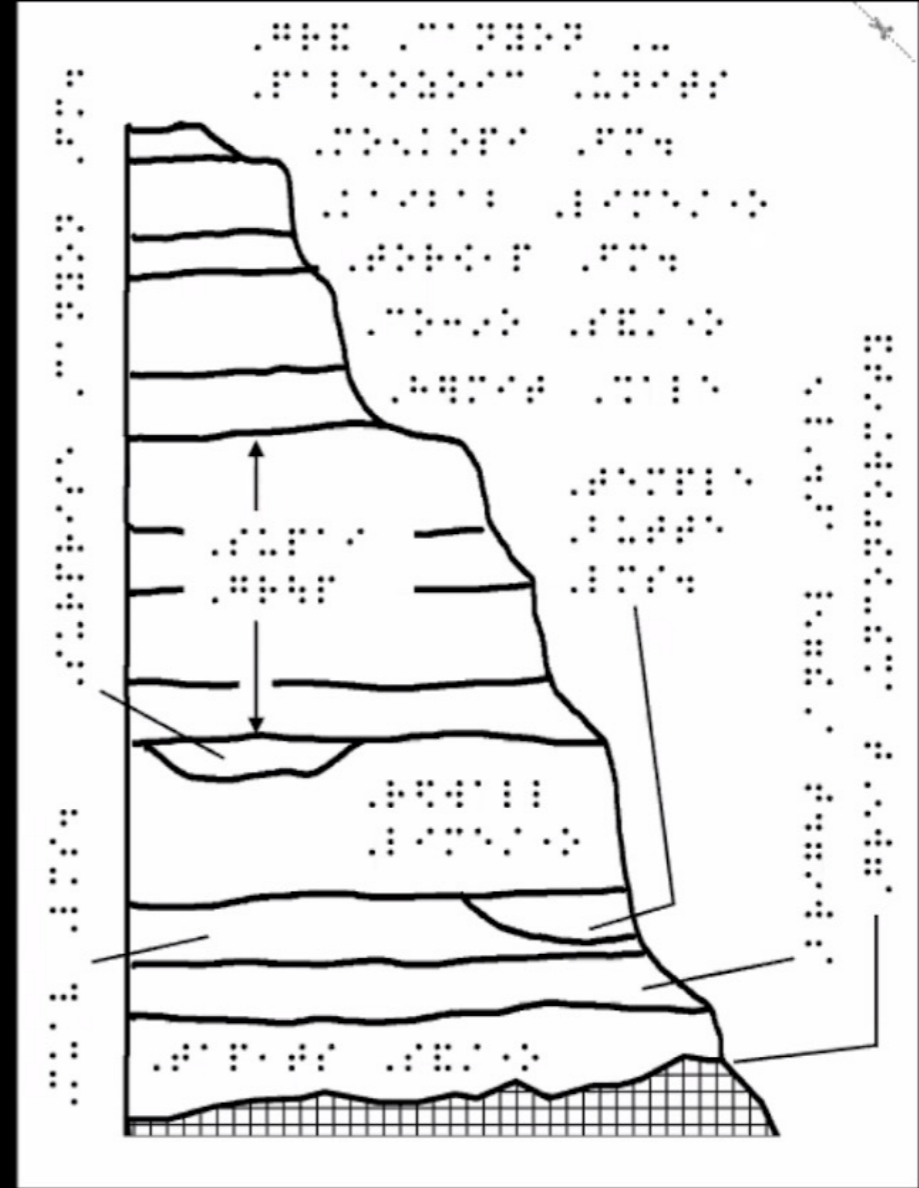
- simplify when possible
- limit of resolution = 0.25 in.
- add textures (< 5) when possible
- use black for lines and solid fill patterns; gray may not work well



Tactile Graphics for Geoscience Education

Tips for adding Braille annotations

- use a translation program (e.g., *Braille Translator* or *Braille Blaster*) and cut/paste into your graphic
- Grade 2 (contracted Braille)
- 24 point, Swell Braille font (download for free from TSBVI)
- all Braille must be horizontal
- if possible, have your graphic reviewed by a Braille reader



The following contents in p. 46–82 are *selected* slides from a presentation put together by Dr. Gabi Serrato Marks on the topic of “Building Equity Through Science Communication.”

Direct link to the FULL Google slides:

https://docs.google.com/presentation/d/1nEAKNp33PEADqkFwA5nfZpI9xbCV6v4eVU0a_TEUv44/edit?usp=sharing

Building Equity Through Science Communication

Gabi Serrato Marks, PhD
Partner, Stellate Communications



Wednesday, April 13, 2022
RWU Marine & Natural Sciences Seminar

Disability 101

Anything that impacts your ability to work, learn, and/or take care of yourself.



Disabled people are highly underrepresented in STEM: 2% of STEM PhDs

Social media can serve as a source of two-directional connections...

... if you can access it.

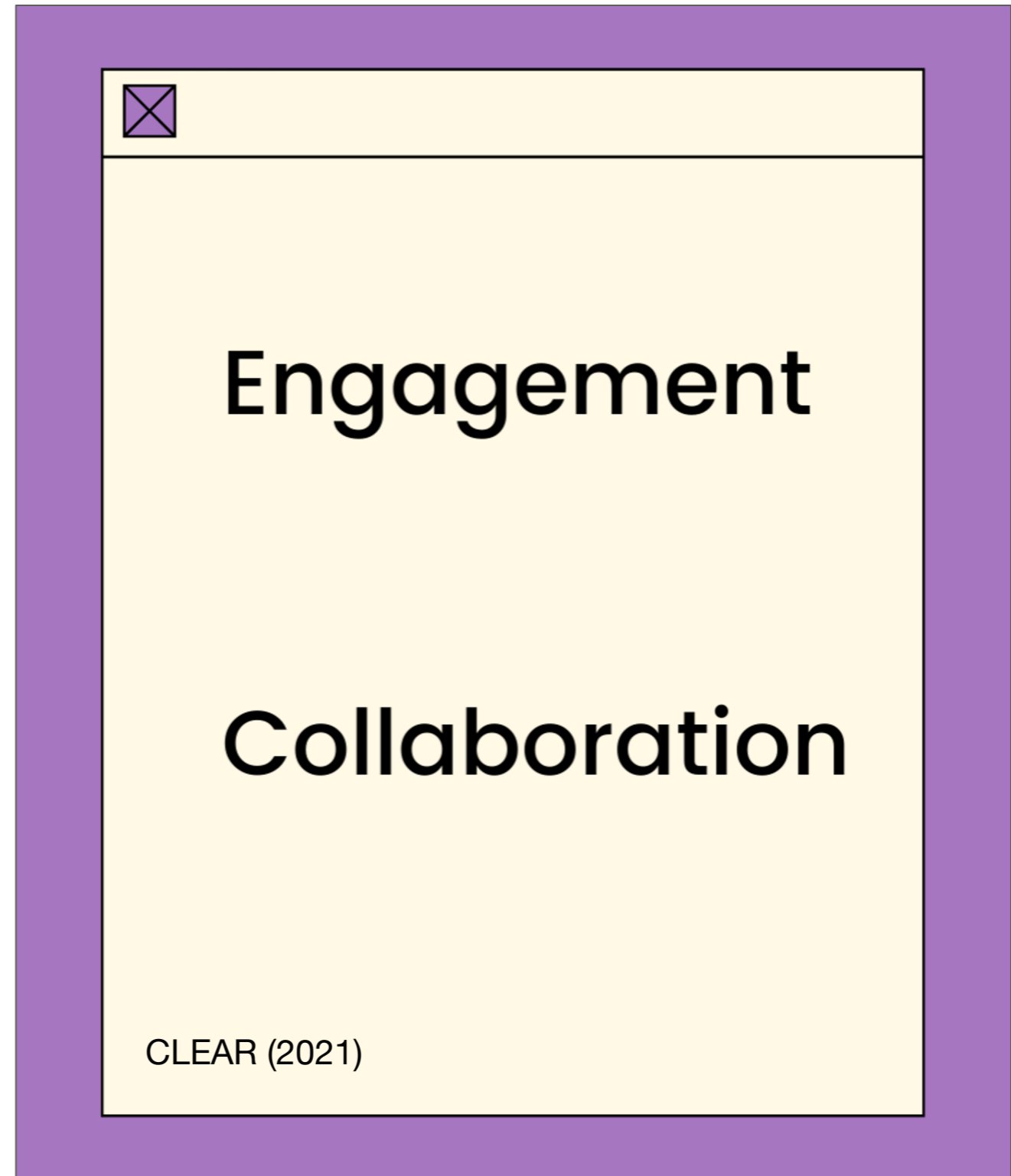
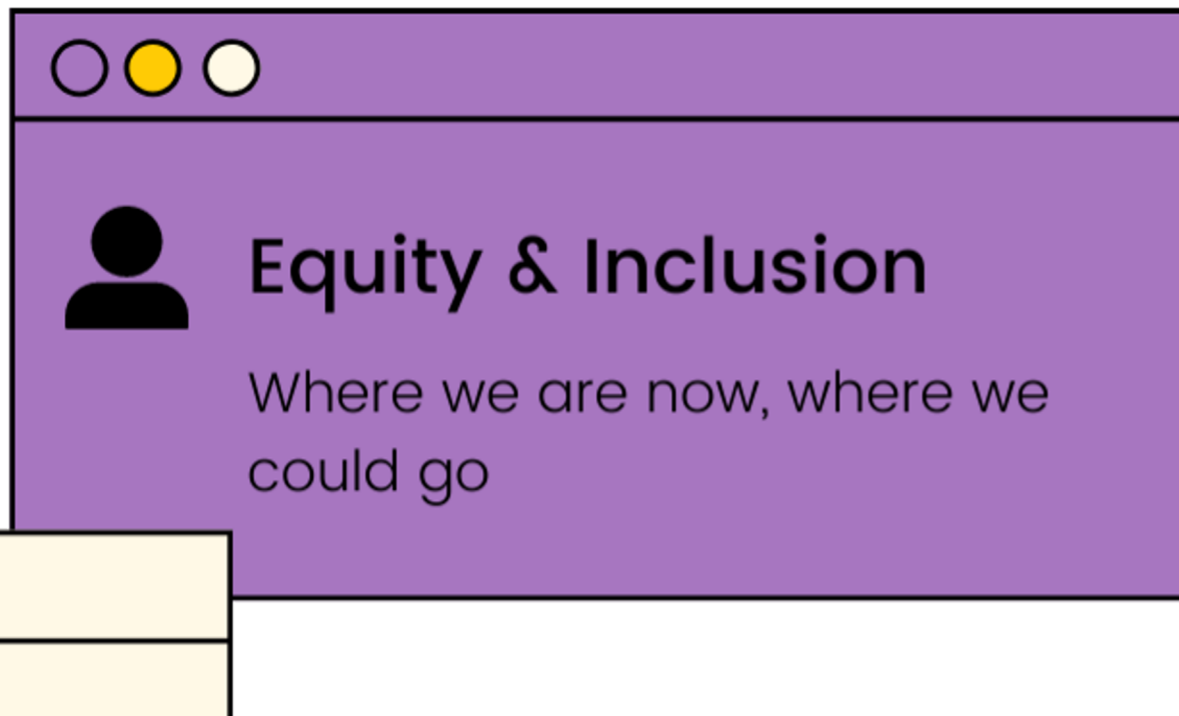


Connor Scott-Gardner  @CatchTheseWords · Nov 12

I live in a world where there is so much information available, and yet sometimes I feel like I live in an information desert. Because so much of it isn't accessible to me, and this only increases as people share it across social media. 11/

Scott-
Gardner,
2021

Science communication should be accessible to everyone



Digital science communication: best practices

Provide information in multiple formats:

Image alternative text

Video captions

Transcripts

Audio recordings





Autog

yeah uh yeah we can and that when
mo that one does have the olympics on it




that one does have the limpets on it.



Autog

right ahead of you that's it
score



- [Pilot] That's it, score!

Good captions capture more than just the content.

I love this channel so much. The scientists in each video make you feel part of the journey and bring the wonderful world of exploration right into our homes with amazing footage to boot. I always laugh when something cool happens on screen and I end up saying "woah!" at the same time as the team. There's only good vibes to be found here - Thank you for sharing your world with us! :)

The clear enthusiasm in the scientists' voices is absolutely fantastic - so much passion for their work.

👍 220 💬 REPLY

- [Pilot] That's it, score!

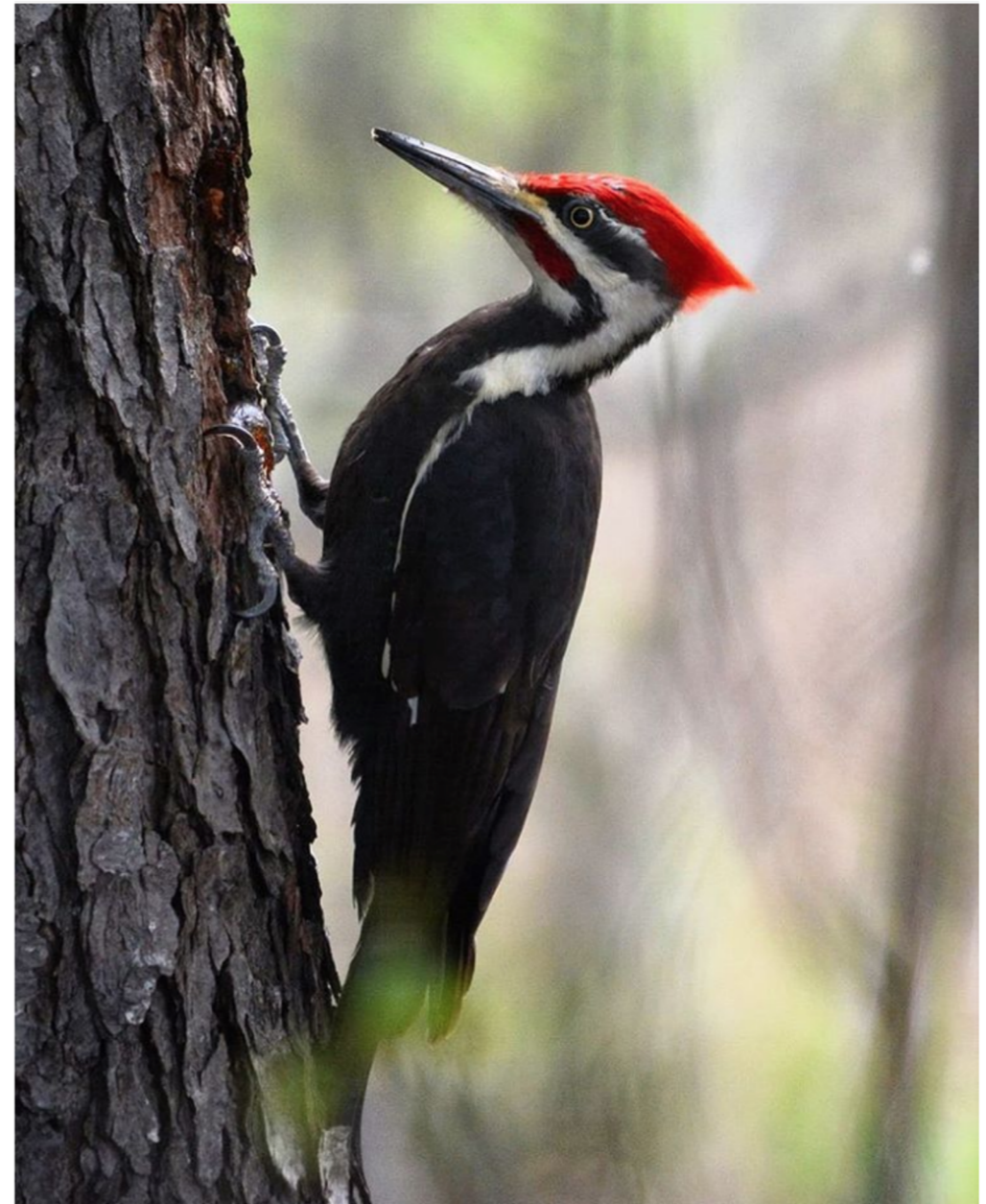
Image description:

A Pileated Woodpecker clinging to the side of a tree. It has a red crest above its head, black plumage on its body and face with white streaks on the sides of its face, and a long narrow beak.

bird



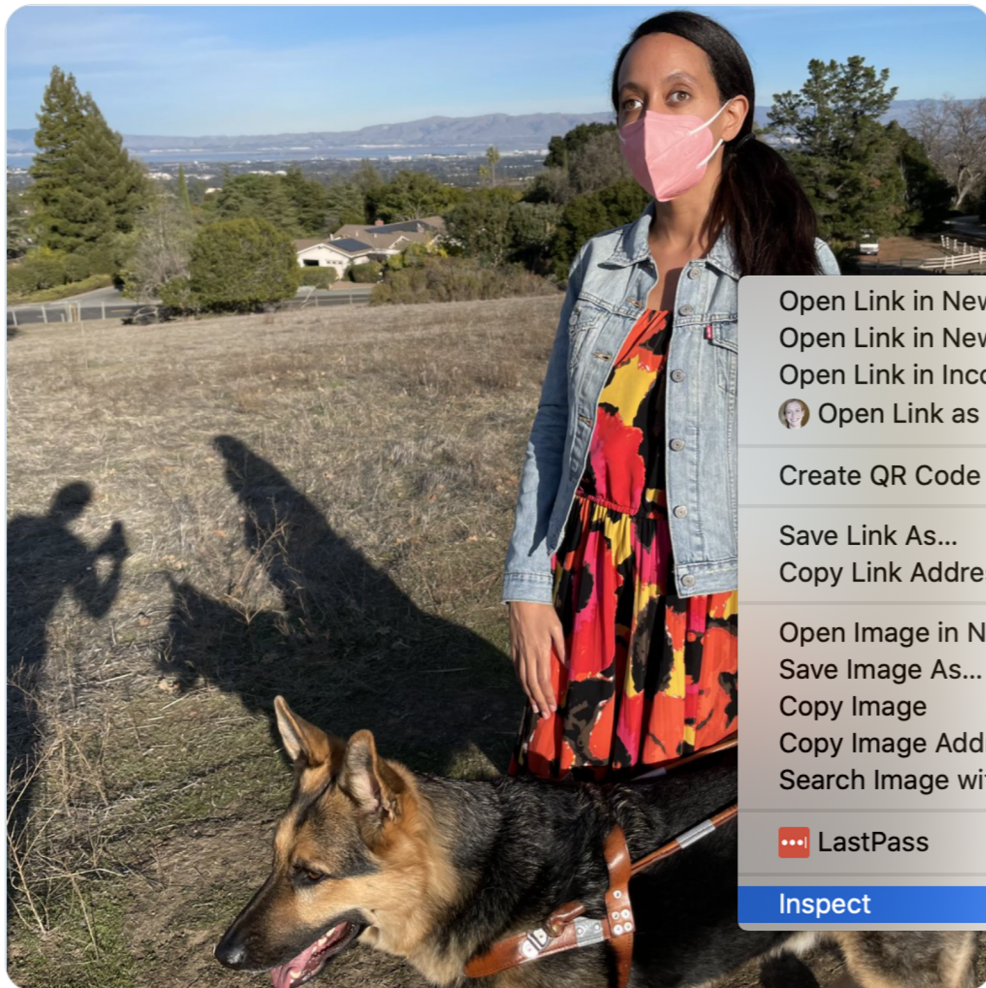
amnh  • Following





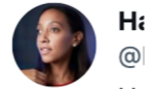
Haben Girma
@HabenGirma

Most images on Twitter lack descriptions, excluding #blind people like myself from conversations & critical information. Start 2021 with a commitment to include image descriptions with your photos & help increase #accessibility. Here's a guide help.twitter.com/en/using-tweet... #a11y



2:08 PM · Jan 3, 2021 · Twitter for iPhone

Relevant



Haben Girma
@HabenGirma

What's new

Ukraine conflict

Russian de... of 'high-pri... Kyiv

Trending with

- Open Link in New Tab
- Open Link in New Window
- Open Link in Incognito Window
- Open Link as Gabi
- Create QR Code for this Image
- Save Link As...
- Copy Link Address
- Open Image in New Tab
- Save Image As...
- Copy Image
- Copy Image Address
- Search Image with Google Lens
- LastPass
- Inspect

Show more

The screenshot shows the Chrome DevTools interface. The Elements panel is open, showing a tree view of the page's DOM. A specific image element is selected, and its HTML code is visible in the right-hand pane. The alt text for the image is: "I'm a woman wearing a face mask, multi-colored dress, jean jacket, and holding the harness of a German Shepherd Seeing Eye dog. We're standing in the sun on top of a dry grassy hill with views of the many neighborhoods stretching down to the bay in the distance." The code also includes a src attribute pointing to a media file on a Twimg server.

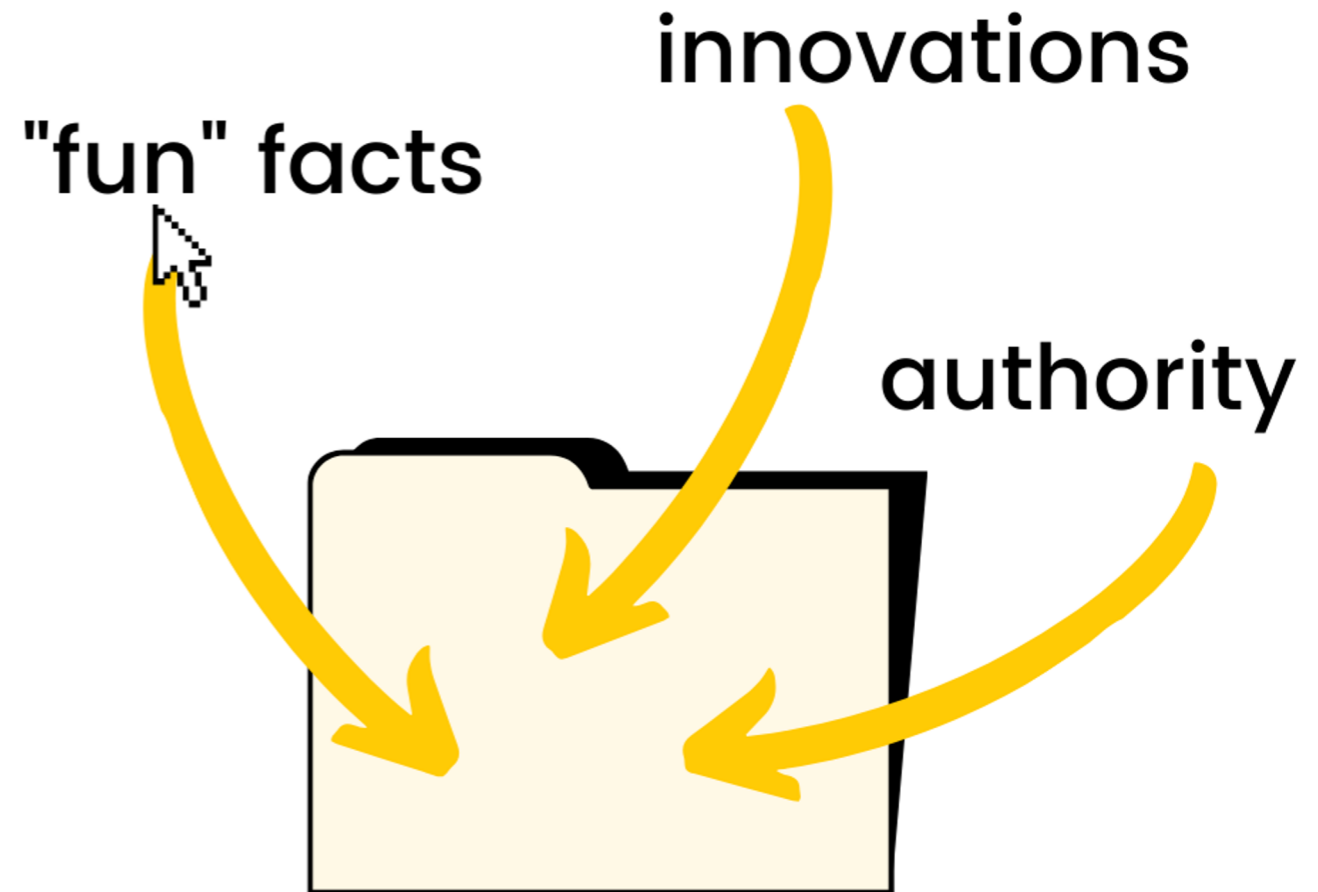
```



```

The Styles panel below shows the default styling for the image element, including its position (absolute) and dimensions (100% width and height).

Accessibility tools exist, but are scientists using them?



Quantifying the current state



Geoscience-related accounts



Science-related accounts
(without geoscientists)

Quantifying the current state



In the past 30 days...

@account



Geoscience-related accounts



Science-related accounts (without geoscientists)



How many images did @account post?

How often did @account include image descriptions?

Quantifying the current state



Geoscience-related accounts



Science-related accounts
(without geoscientists)



2019 analysis:

1,441 images
from 331
accounts

This analysis was quantitative, but has limitations



Sample size



Geoscience-related accounts



Science-related accounts (without geoscientists)



2019 analysis:

**1,441 images
from 331
accounts**

Most scientists were not using image descriptions or video captions.

Updated in 2021



Geoscience-related accounts



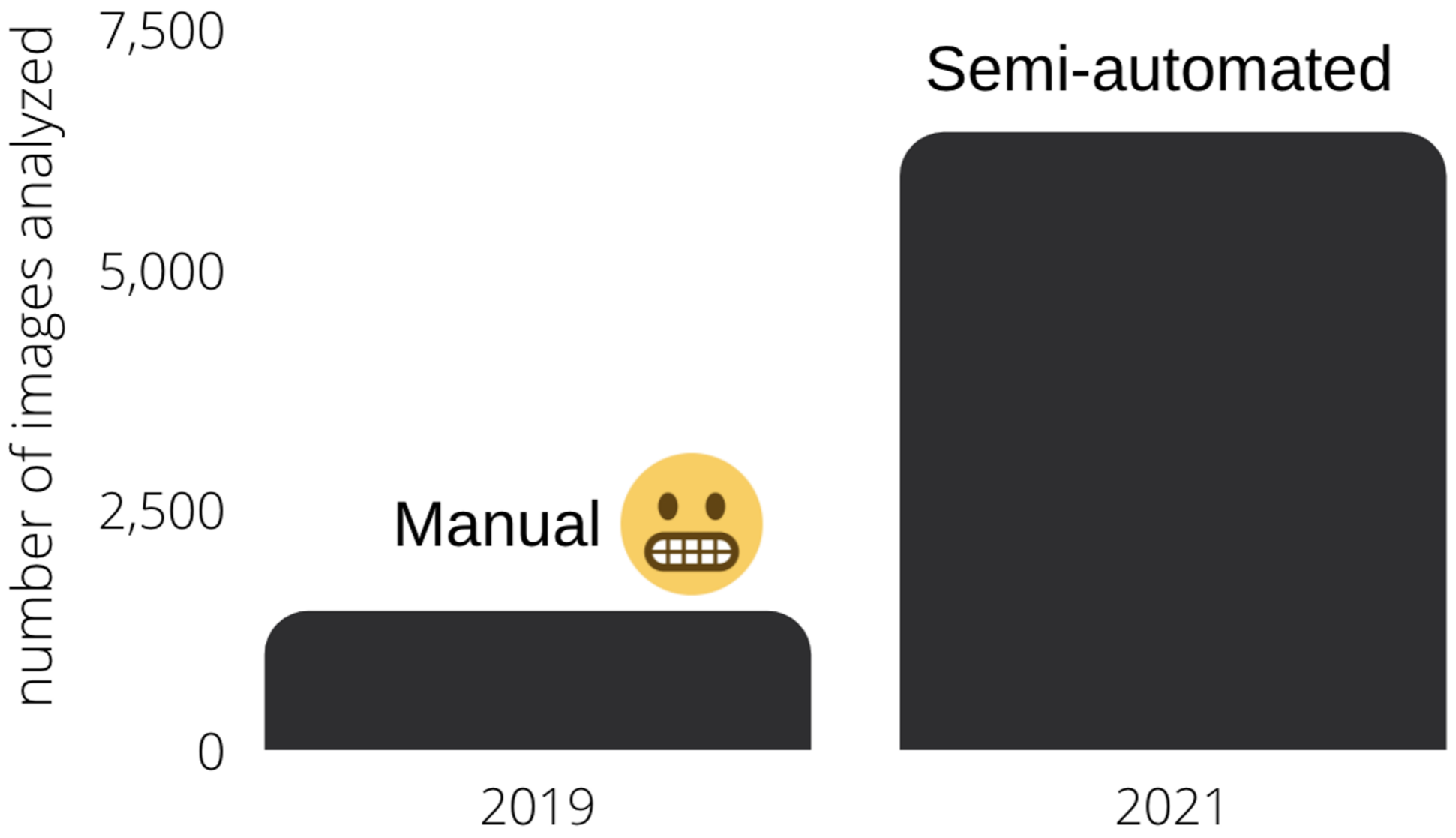
Science-related accounts
(without geoscientists)

2021 analysis:

6,428 images from 303 accounts

(+120 accounts without images posted in the past 30 days)

Increased sample size



Improvement since 2019: more images have alternative text.

Geoscience accounts



2019



9%

2021



24%

Science accounts



2019



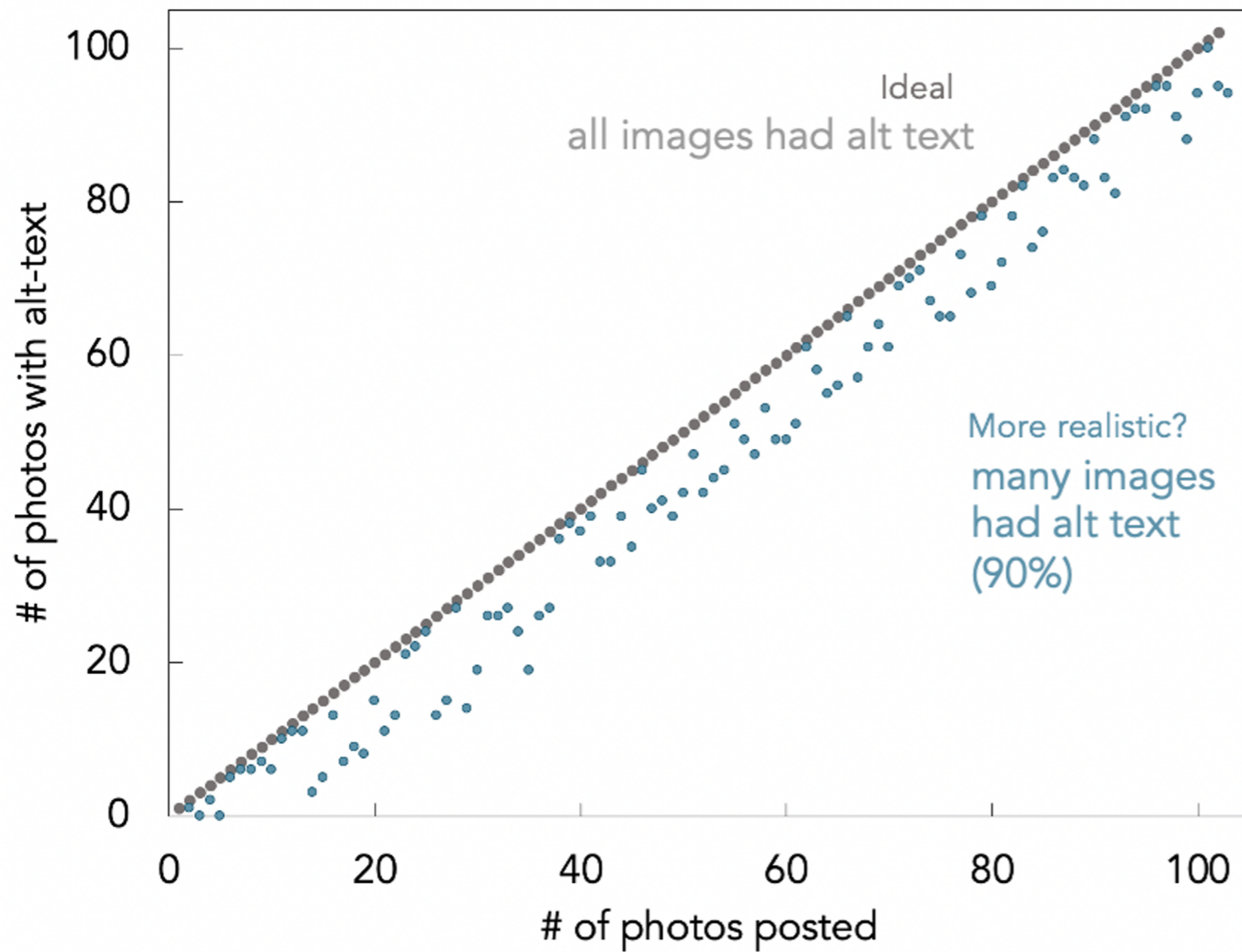
7%

2021

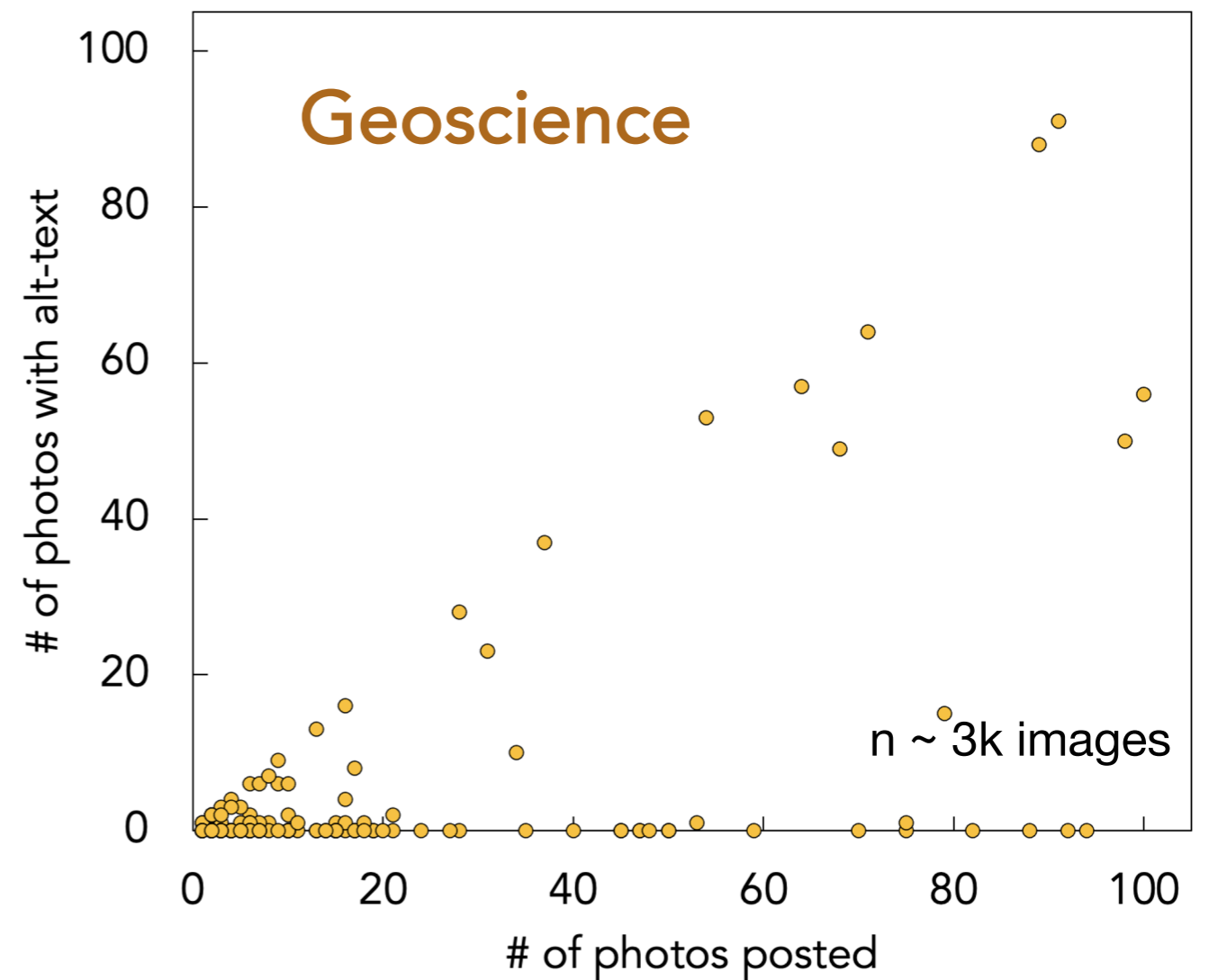
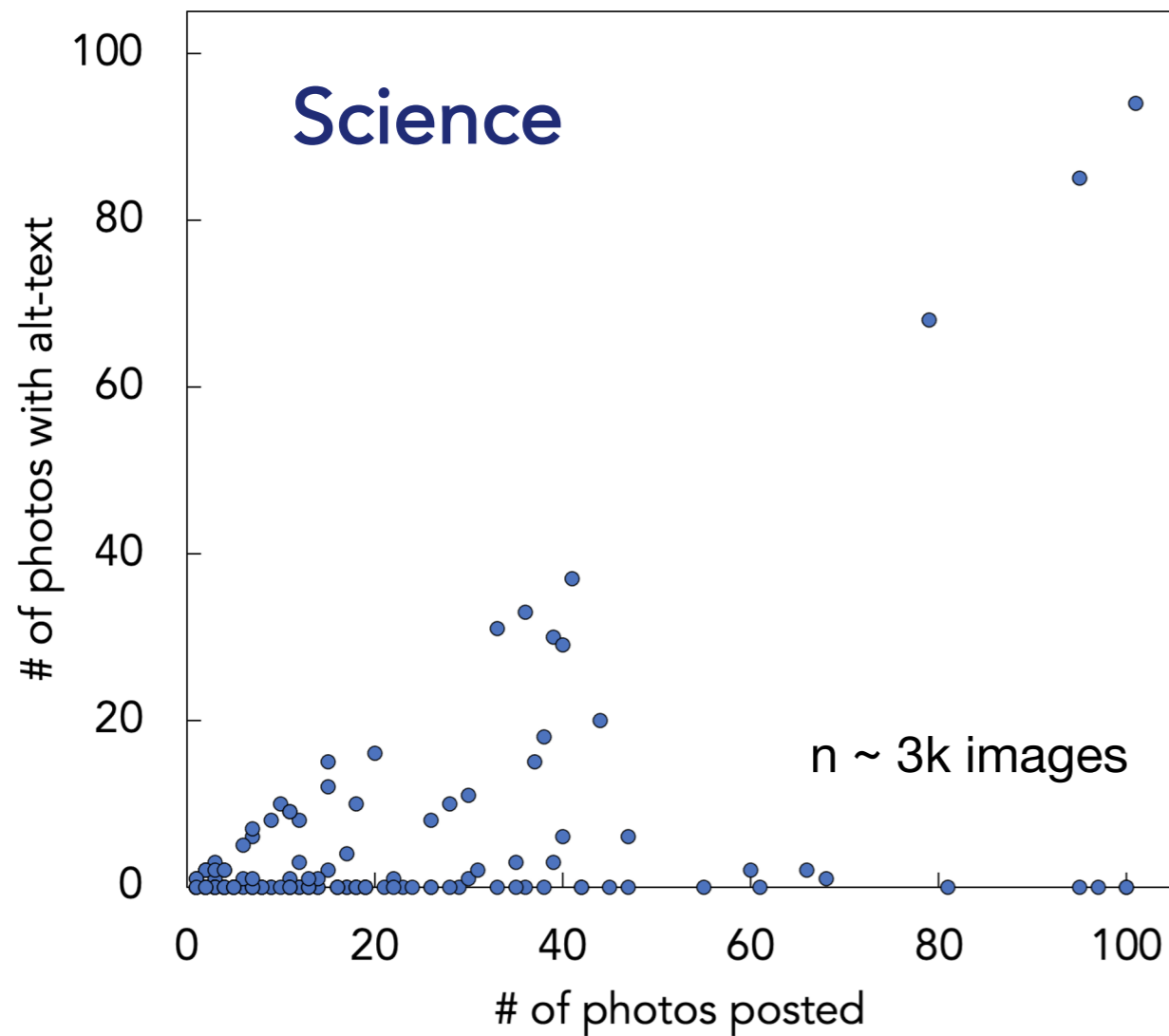


22%

What I was hoping for in 2021



Geoscience content is... equally



But we can
all do better



US Federal



56%

Non-profits, university
departments, societies



Organizations



23%

Peer-reviewed journals,
popular science
magazines



Publishers



20%

Researchers like
you



People



15%

Impact: **Science is for everyone, but not you**



We value
inclusion!



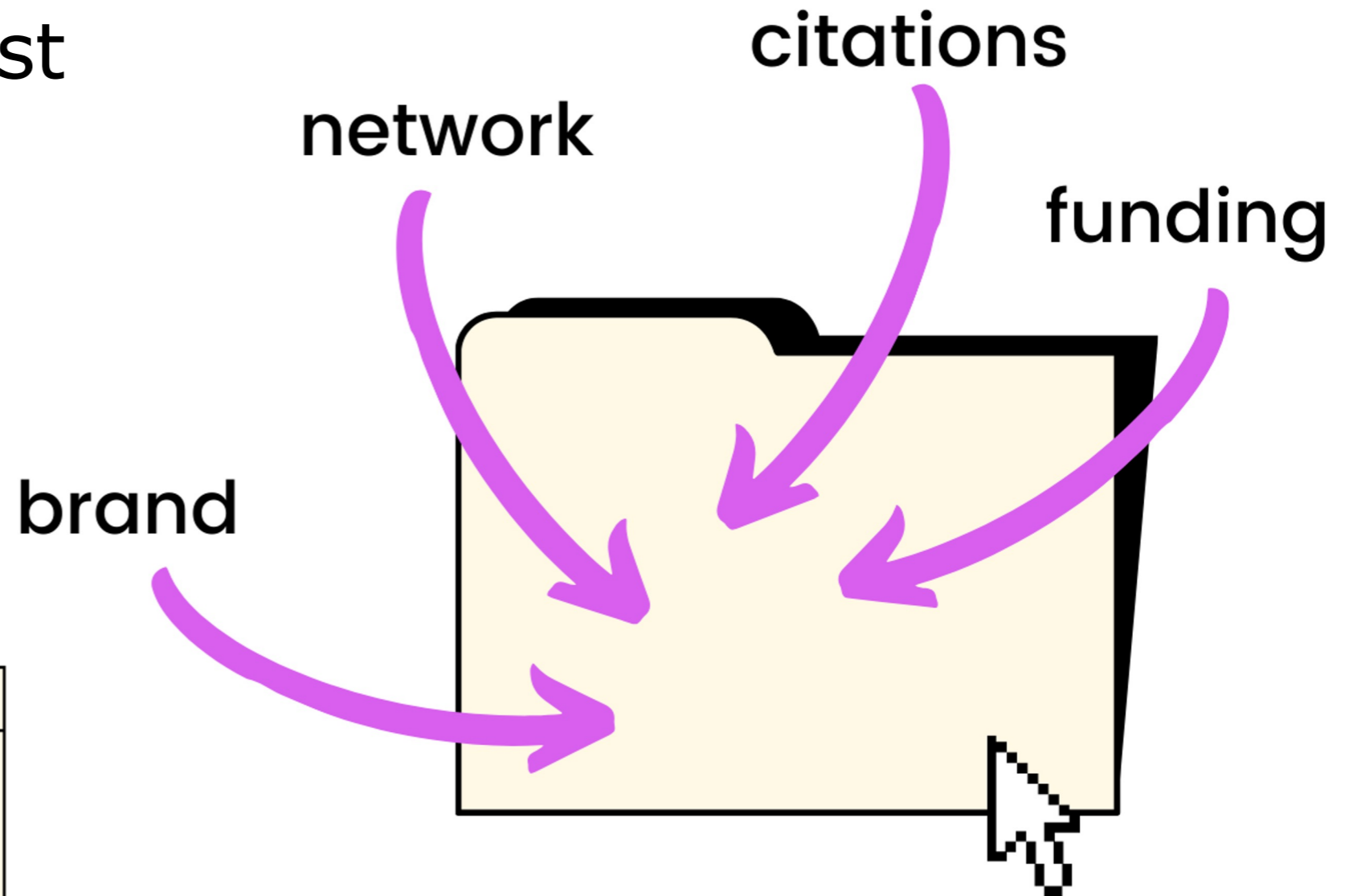


The PR Gap



Success as a scientist
requires specific
elements

Traditional science
media coverage can
help increase...

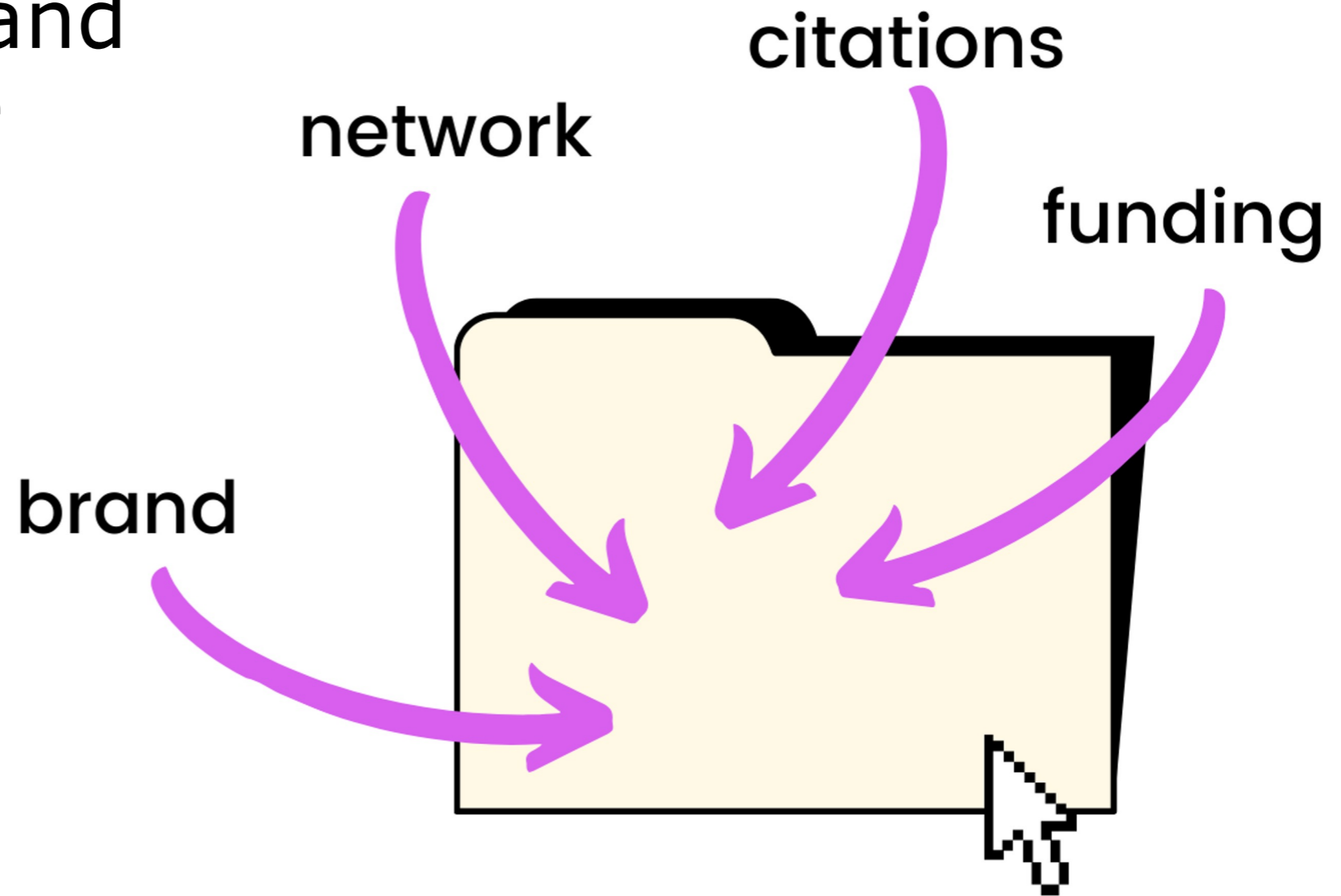


Who are the experts?

We don't contact the usual suspects because we've made some objective assessment of their worth, but because they were the *easiest people to contact*. We knew their names. They topped a Google search. Other journalists had contacted them. They had reputations, but they accrued those reputations in a world where women are systematically disadvantaged compared to men.

– Ed Yong, *The Atlantic*, 2018

Caveat: diversity and representation are improving.



If no one will give you a microphone, make your own.
(or help others make their own)

Key Points

Listen

Expertise

Citation Practices



When you communicate formally or informally, develop 2 - 3 clear and concise key points and stick to them.

RESEARCH ARTICLE

10.1029/2021PA004313

Key Points:

- Higher bulk carbonate $\delta^{18}\text{O}$ between ca. 5 and 7 Ma suggests cooler SSTs at Site U1335 compared to other off-Equator sites further east
- During the BB the equatorial upwelling band was less parallel to the Equator compared to present day
- During the BB the equatorial upwelling was more intense compared to present day

Key Points



Consume media, take interest in what your colleagues are working on, keep track of work you love (and why!)

Listen



Understand what you are qualified to speak about and pass the “mic” as needed.

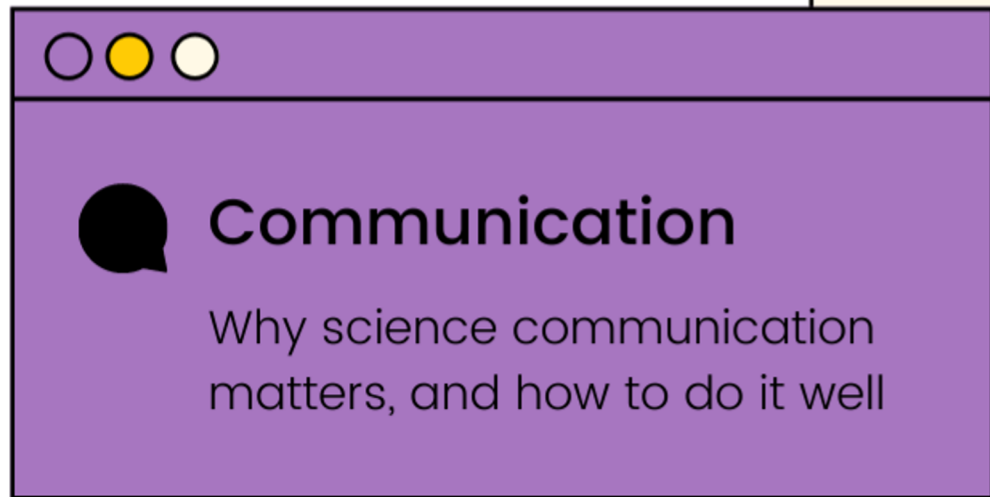


Expertise



Look at the diversity of your references section and give credit to everyone who deserves it.

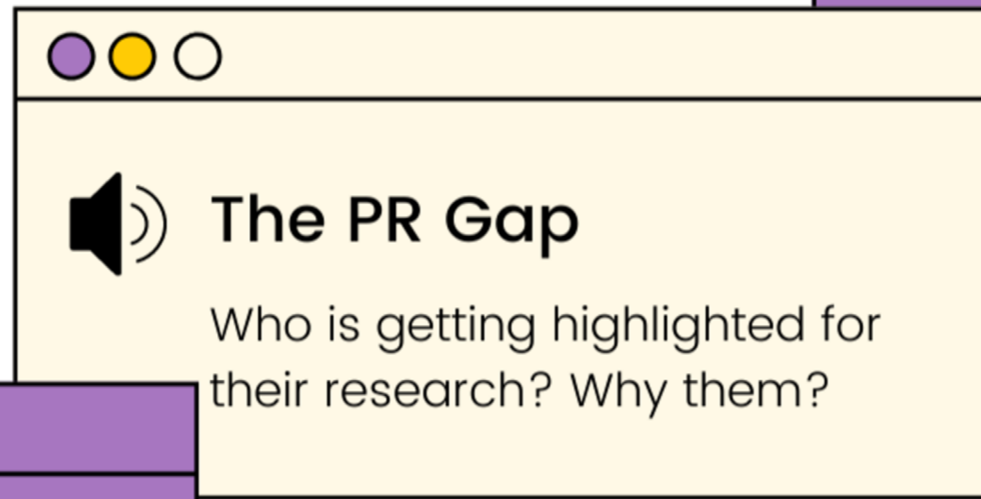
Citation Practices



○ ● ○

Communication

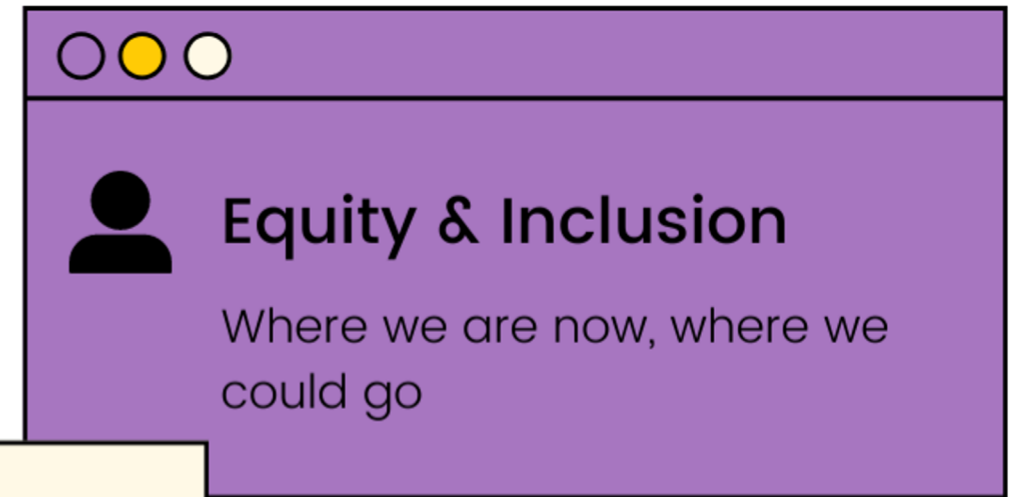
Why science communication matters, and how to do it well



● ● ○

The PR Gap

Who is getting highlighted for their research? Why them?



○ ● ○

Equity & Inclusion

Where we are now, where we could go

Resources

[How People with Disabilities Use the Web | Web Accessibility Initiative \(WAI\) | W3C](#)

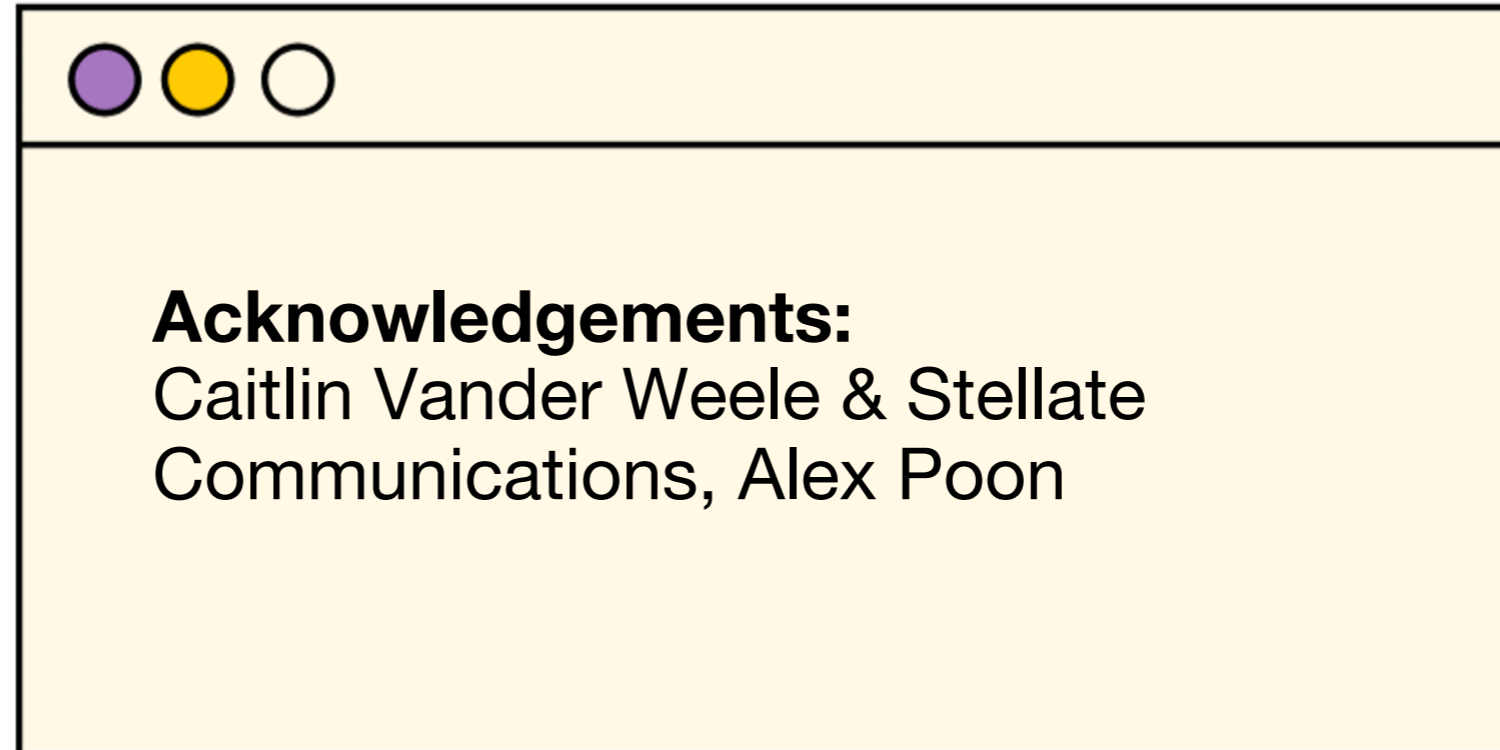
[Tools and Techniques | Web Accessibility Initiative \(WAI\) | W3C](#)

[Creating an Accessible Twitter Post | CSUSM](#)

[How to make images accessible for people](#)

[CLEAR Lab Book](#)

Questions?



Reach out to me:
gabi@stellatecomms.com

U.S. settler colonialism and environmental injustice

UNIT 2: Modern-day Manifestations of Racism and Colonialism in Geosciences

Week 5 – Continued Impacts on Indigenous People : these slides may be used to start off the reading discussion for the following references.

- [Theory and Practice: The Case of the Navajo-Hopi Land Dispute](#) (Cheyfitz, 2002)
- [The Dakota Access Pipeline, Environmental Injustice, and U.S. Colonialism](#) (Whyte, 2017)
- [From Ice Sheets to Main Streets: Intermediaries Connect Climate Scientists to Coastal Adaptation](#) (Ultee et al., 2018)
- [Climate Change, Environmental Justice, and Vulnerability: An Exploratory Spatial Analysis](#) (Wilson, 2010)
- [Climate Change, Vulnerability, and Responsibility](#) (Cuomo, 2011)
- [The impact of climate change on tribal communities in the US: displacement, relocation, and human rights](#) (Maldonado et al., 2013)

Traditional Homelands of the Navajo and the Hopi



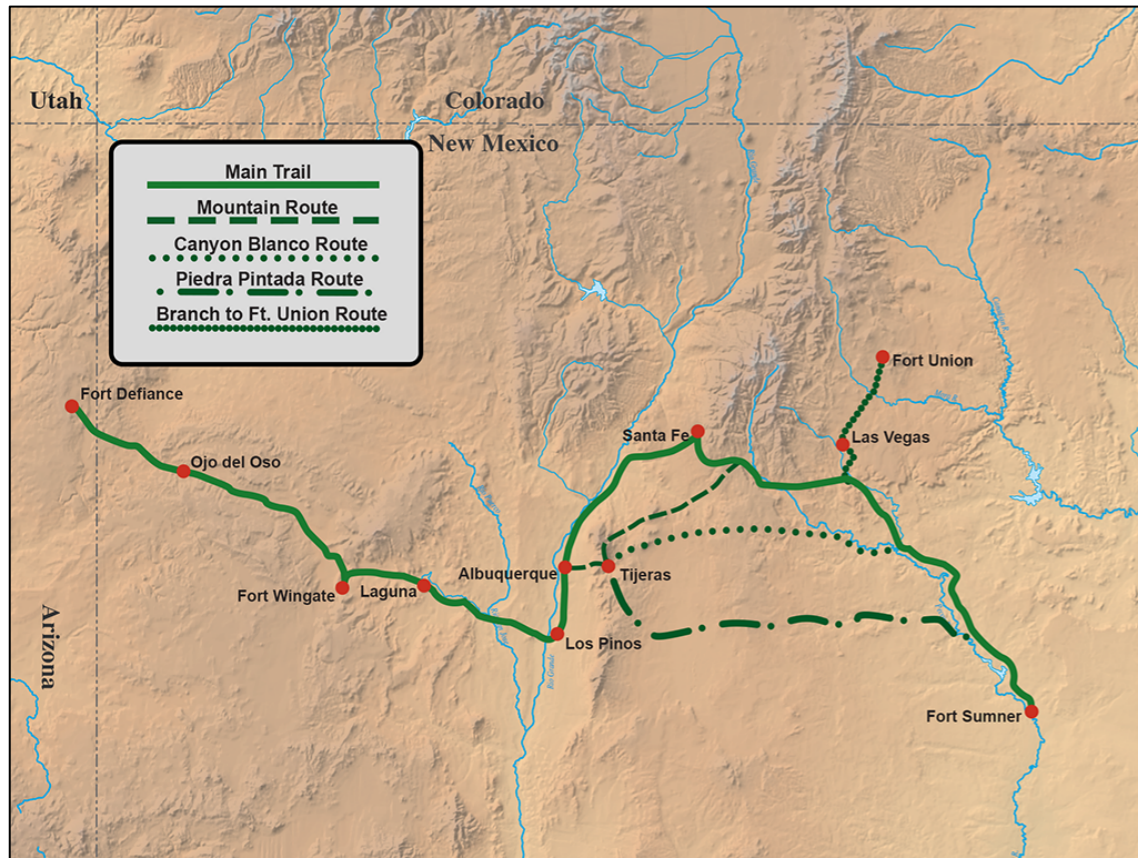
- The traditional homelands of the Navajo (Diné) are marked by four sacred mountains stretching across modern-day CO, NM, and AZ
- Similarly, Hopi Ancestral Lands were demarcated by shrines and important sites. The land ultimately granted to the Hopi fell well short of these sites

<https://americanindian.si.edu/nk360/navajo/long-walk/long-walk.cshtml>



<http://www.viewzone.com/day6.html>

The Long Walk (1863–1866)



<https://mytext.cnm.edu/lesson/the-navajo-long-walk/>

- Major General James H. Carleton ordered Christopher (Kit) Carson to defeat the Navajo (Diné) resistance
- In 1863 General Kit Carson began a campaign against the Navajo, killing upwards of 1,000 people and forcing roughly 8,500 to walk from Fort Sumner to Fort Defiance, a journey of over 400 miles (Lacerenza, 1988)

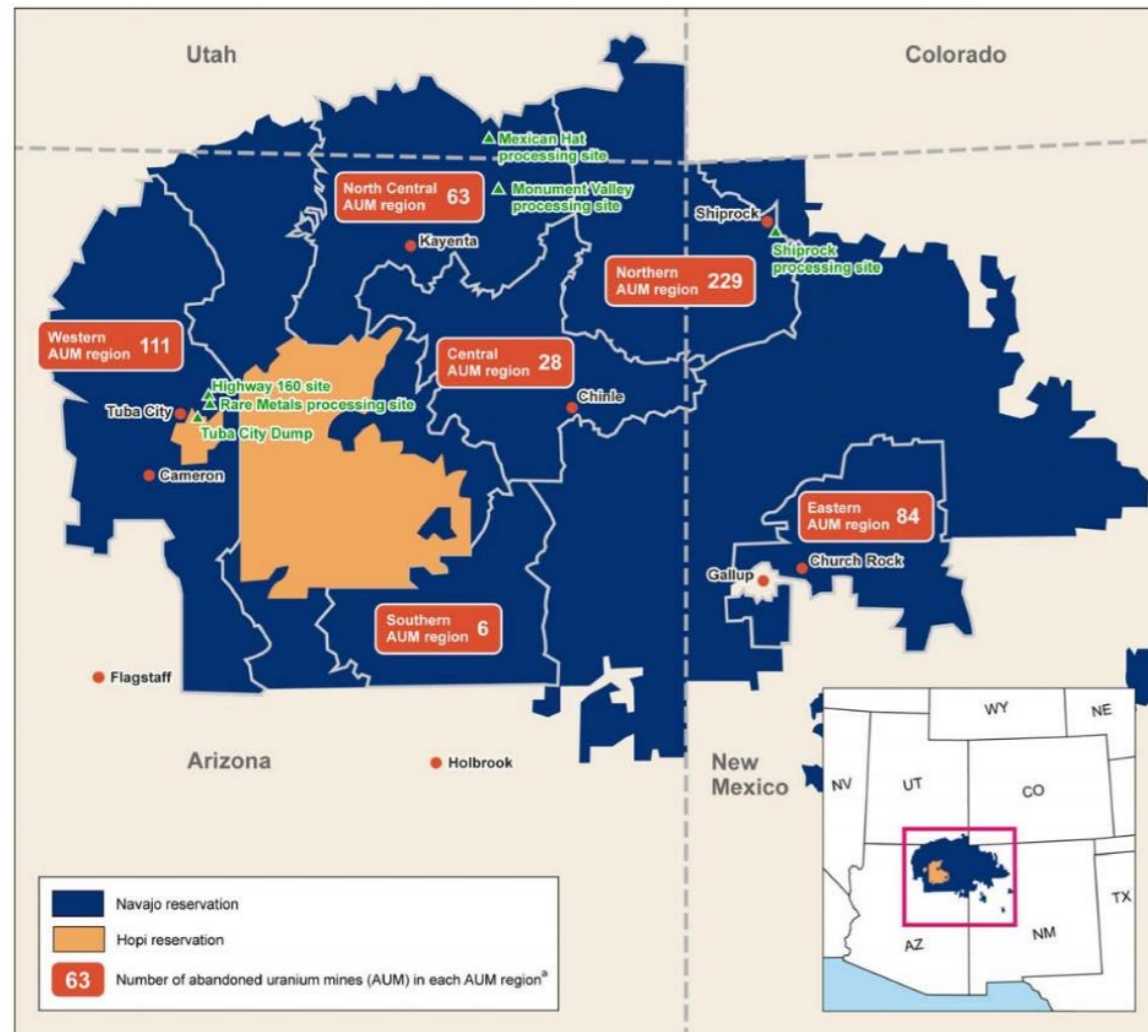
If the army placed the Navajo on a reservation far “from the haunts and hills and hiding places of their country” they would “acquire new habits, new ideas, new modes of life.” “Civilizing” the Navajo could be best achieved through their children: “The young ones will take their places without these longings: and thus, little by little, they will become a happy contented people.”

James Carleton to Thompson, September 19, 1863
(Navajo Roundup: Selected Correspondence of Kit Carson's Expedition against the Navajo, 1863–1865)

The Navajo–Hopi Land Dispute

- 1824: Creation of the Bureau of Indian Affairs (BIA)
- 1846–1848: Mexican War
 - U.S. took the Southwest from Mexico
- 1882: Beginning of the Navajo–Hopi Land Dispute
 - U.S. Secretary of the Interior ordered the creation of a reservation encompassing the entire Hopi population
- 1958: Congress authorized the Hopi and Navajo tribal councils to participate in lawsuit to determine the rights and interests of the 1882 EO area
 - Designation of the Joint Use Area (“JUA”)
- 1974: Navajo and Hopi Indian Land Settlement Act
 - Congress mandated the two tribes to negotiate for the partition of JUA, and the court eventually ordered the partition
- 1977: Creation of the Hopi Partitioned Lands (“HPL”) & the Navajo Partitioned Lands (“NPL”)
- 1996: Navajo–Hopi Land Settlement Act of 1996
 - HPL Navajos could remain on the HPL with a lease agreement;
 - Hopis had the right to eventually evict all Navajos from the HPL

Uranium Mining and the Navajo People

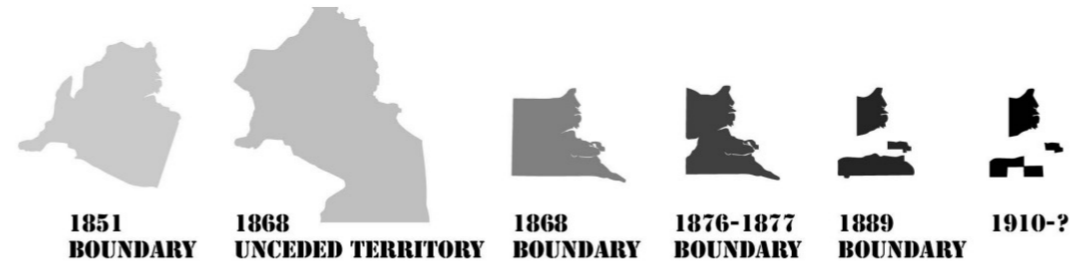


Sources: GAO analysis of EPA and DOE data; Map Resources (map).

https://en.wikipedia.org/wiki/Uranium_mining_and_the_Navajo_people#/

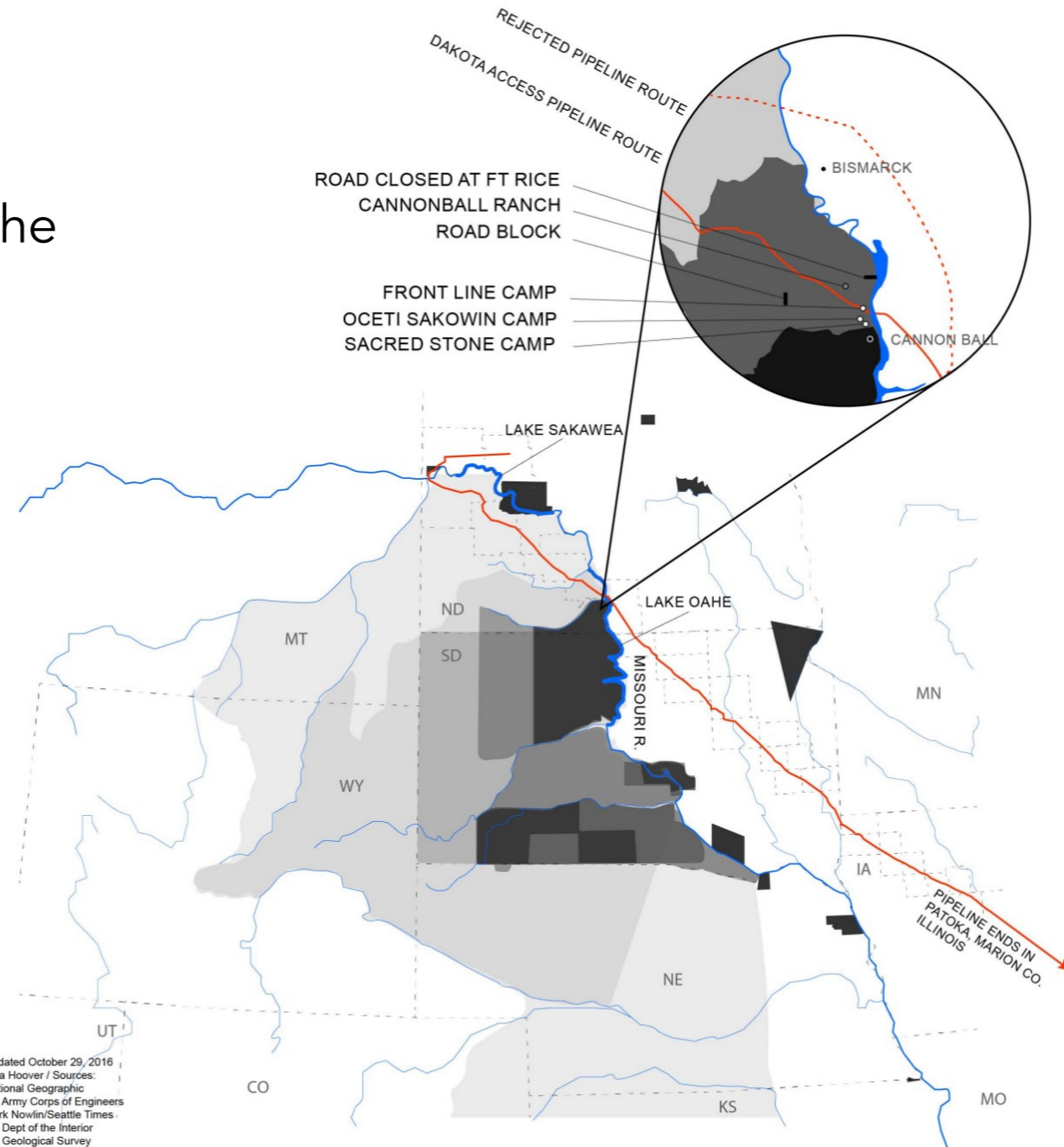
- 1944: Uranium mining under the U.S. military's Manhattan Project began on Navajo Nation lands and on Lakota Nation lands
- 1951: the U.S. Public Health Service began a human testing experiment on Navajo miners, without their informed consent, during the federal government's study of the long-term health effects from radiation poisoning
- Since 1988, the Navajo Nation's Abandoned Mine Lands program reclaims mines and cleans mining sites, but significant problems from the legacy of uranium mining and milling persist today on the Navajo Nation (e.g., health risks including lung cancer)

Oceti Sakowin Oyate Territory and Treaty Boundaries



Oceti Sakowin: The People of the Seven Council Fires

Oyate: The People

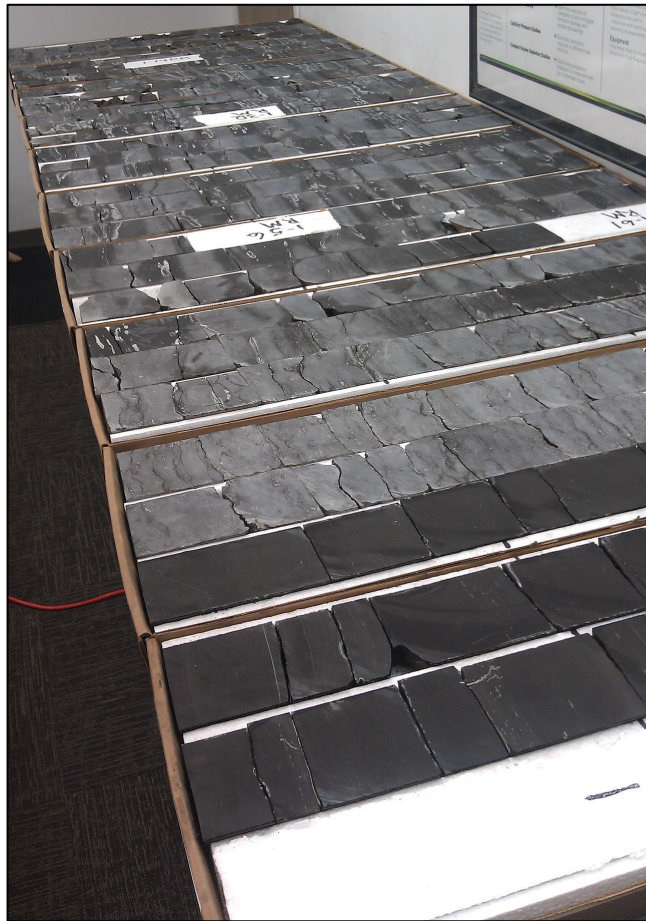


Updated October 29, 2016
Elsa Hoover / Sources:
National Geographic
US Army Corps of Engineers
Mark Nowlin/Seattle Times
US Dept of the Interior
US Geological Survey

Source: #StandingRockSyllabus

Dakota Access Pipeline

The **Dakota Access Pipeline (DAPL)** or **Bakken pipeline** is a 1,172-mile-long (1,886 km) underground oil pipeline in the U.S. It begins in the shale oil fields of the Bakken Formation in northwest North Dakota and continues through South Dakota and Iowa to an oil terminal near Patoka, Illinois.

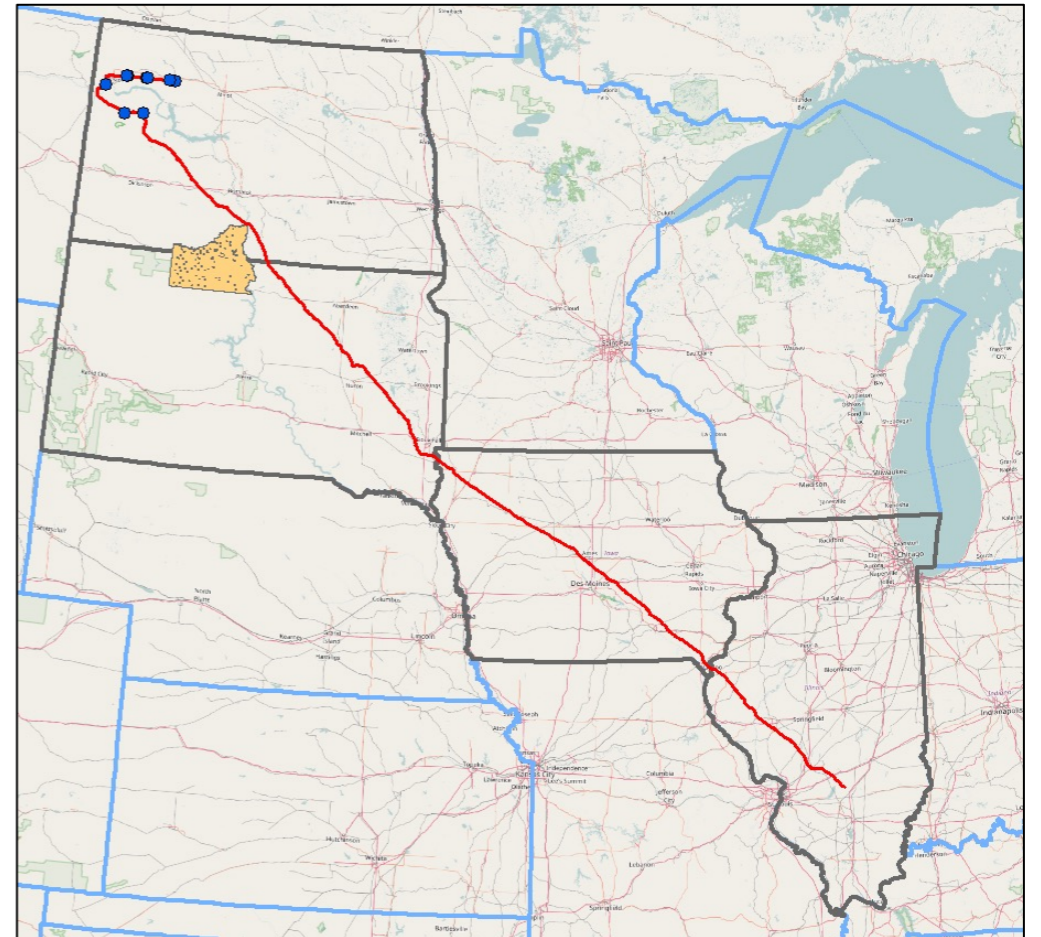


(Left) Cut Bakken core samples

- Bakken Formation: a rock unit from the Late Devonian to Early Mississippian (~380–340 Ma)
- Prolific source rock for oil

(Right) DAPL route

- Standing Rock Indian Reservation is shown in orange, affected states are outlined in black



Source: Wikipedia

Moving America's Energy The Dakota Access Pipeline

The Dakota Access Pipeline is a 1,172-mile underground 30" pipeline transporting light sweet crude oil from the Bakken/Three Forks production area in North Dakota to Patoka, Illinois.

Safely operating since June of 2017, the Dakota Access Pipeline now transports 570,000 barrels of oil per day. The pipeline is the safest and most efficient means to transport crude oil from the geographically constrained region, providing better access to Gulf Coast and Midwest refineries and other downstream markets.

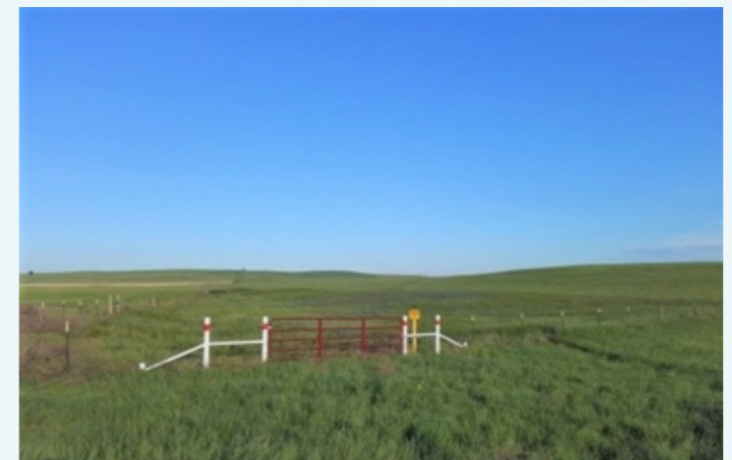
By transporting oil on the Dakota Access Pipeline, the equivalent of **3,000 tanker trucks** are removed from the roads every day. Similarly, the pipeline removes the equivalent of **815 rail cars** that would cross through neighborhoods and over waterways every day.

Benefitting America

The Dakota Access Pipeline has helped bolster production in the Bakken, **currently moving approximately 40% of the Bakken's oil output per day**. It has also helped to improve the region's drilling economics by lowering transportation costs for operators, and is providing a safer means of transportation over truck or rail.

Quick Facts

- ✔ The entire Dakota Access Pipeline is buried underground.
- ✔ The pipeline is made of heavy-walled steel pipe.
- ✔ Pipelines like Dakota Access are proven to be safer than rail or truck transportation of crude.
- ✔ The pipeline is monitored 24/7, 365 days a year by a computer network control system.



<https://www.dapipelinefacts.com/>

History of racism and its impact on the geoscience community today

UNIT 2: Modern-day Manifestations of Racism and Colonialism in Geosciences

Week 6 – Where the Geoscience Community Stands Today: these slides may be used to start off the reading discussion for the following references.

- [Minorities in the geosciences](#) (Bromery et al., 1972)
- [Minorities in the Geosciences: Beyond the Open Door](#) (Gillette, 1972)
- [No progress on diversity in 40 years](#) (Bernard and Cooperdock, 2018)
- [Hostile climates are barriers to diversifying the geosciences](#) (Marín-Spiotta et al., 2020)

Additional readings:

- [An investigation of accessible and inclusive instructional field practices in US geoscience departments](#) (Carabajal & Atchison, 2020)

“minority” vs. “minoritized”

A note on the language

PERSPECTIVE ON DIVERSITY AND INCLUSION

Time to Reconsider the Word Minority in Academic Medicine

Sylk Sotto-Santiago, EdD, MBA, MPS¹

Author Affiliations: ¹School of Medicine, Indiana University, Indiana

Corresponding Author: Sylk Sotto-Santiago, Department of Medicine, Indiana University
School of Medicine, Indianapolis, IN 46202 (ssotto@iu.edu)

Minoritization recognizes that systemic inequalities, oppression, and marginalization place individuals into “minority” status rather than their own characteristics. [...] The use of the term by scholars in higher education as “minoritized” students and “minoritized” faculty acknowledges the understanding that minority is socially constructed (Benitez, 2010; Stewart, 2013).

“minority” vs. “minoritized”

Not all official language has been updated (e.g., NSF)

The screenshot shows the National Science Foundation (NSF) website. The header includes the NSF logo and the tagline "WHERE DISCOVERIES BEGIN". A search bar is located in the top right corner. Below the header is a navigation menu with links for Research Areas, Funding, Awards, Document Library, News, and About NSF. The main content area features a breadcrumb trail: Home > Research Areas > Mathematical and Physical Sciences > Materials Research. The article title is "Division of Materials Research (DMR): Broadening Participation for Greater Diversity". The article text states: "NSF has a strong commitment to broadening participation (<https://www.nsf.gov/od/broadeningparticipation/bp.jsp>). Groups underrepresented in materials research include women, underrepresented minorities (African Americans, American Indians including Native Alaskans, Hispanics and Native Pacific Islanders), and persons with disabilities."

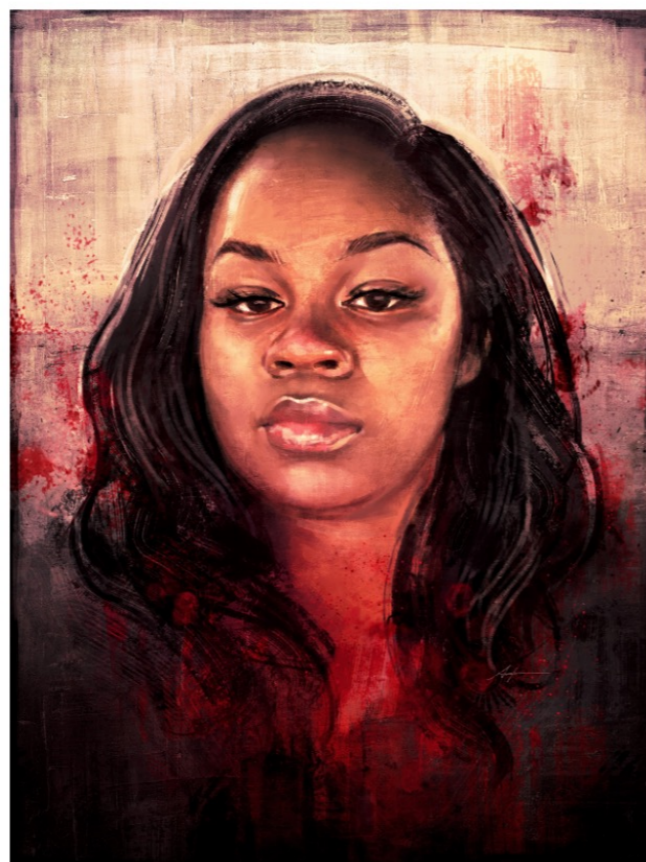
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What do you remember from Summer of 2020?

The Year **2020**:
Resurgence of the **Black Lives Matter** movement and **COVID-related health disparities**

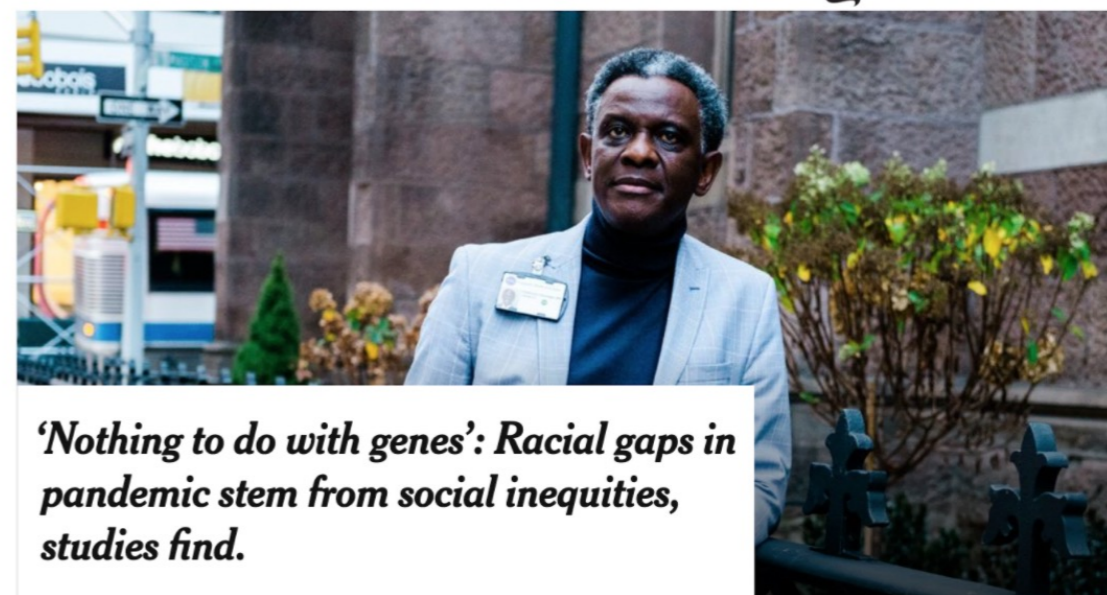


George Floyd,
artist [Nikkolas Smith](#)



Breonna Taylor,
artist [Alice X. Zhang](#)

The New York Times



'Nothing to do with genes': Racial gaps in pandemic stem from social inequities, studies find.

Dr. Gbenga Ogedegbe, [The NYTimes](#)

#ShutDownAcademia #ShutDownSTEM

About Who Can Act Take Action Your Plan Join Us! Resources Amplify Black Voices
Healing from Anti-Black Racism

#ShutDownAcademia

#ShutDownSTEM

10 June 2020



On June 10, 2020, we will #ShutDownAcademia, #ShutDownSTEM, and #Strike4BlackLives.

On June 10, 2020, we will #ShutDownAcademia, #ShutDownSTEM, and #Strike4BlackLives.

In the wake of the most recent murders of Black people in the US, it is clear that white and other non-Black people have to step up and do the work to eradicate anti-Black racism. As members of the global academic and STEM communities, we have an enormous ethical obligation to stop doing “business as usual.” No matter where we physically live, we impact and are impacted by this moment in history.

Our responsibility starts with our role in society. In academia, our thoughts and words turn into new ways of knowing. Our research papers turn into media releases, books and legislation that reinforce anti-Black narratives. In STEM, we create technologies that affect every part of our society and are routinely weaponized against Black people.

Black academic and Black STEM professionals are hurting because they exist in and are attacked by institutional and systemic racism. Black people have been tirelessly working for change, alongside their Indigenous and People of Color allies. For Black academics and STEM professionals, #ShutDownAcademia and #ShutDownSTEM is a time to prioritize their needs— whether that is to rest, reflect, or to act— without incurring additional cumulative disadvantage.

Those of us who are not Black, particularly those of us who are white, play a key role in perpetuating systemic racism. Direct actions are needed to stop this injustice. Unless you engage directly with eliminating racism, you are perpetuating it. This moment calls for profound and meaningful change. #ShutDownAcademia and #ShutDownSTEM is the time for white and non-Black People of Color (NBPOC) to not only educate themselves, but to define a detailed plan of action to carry forward. Wednesday June 10, 2020 will mark the day that we transition into a lifelong commitment of actions to eradicate anti-Black racism in academia and STEM. We join with members of Particles for Justice in calling for a #Strike4BlackLives.

Unlearning Racism in Geoscience (URGE)

URGE 
Unlearning Racism in Geoscience

TEAM PODS CURRICULUM RESOURCES RECORDINGS ZOOM LINKS DELIVERABLES FAQs BI

Read about our Refinement plans

Shop for URGE merchandise

AGU Resources

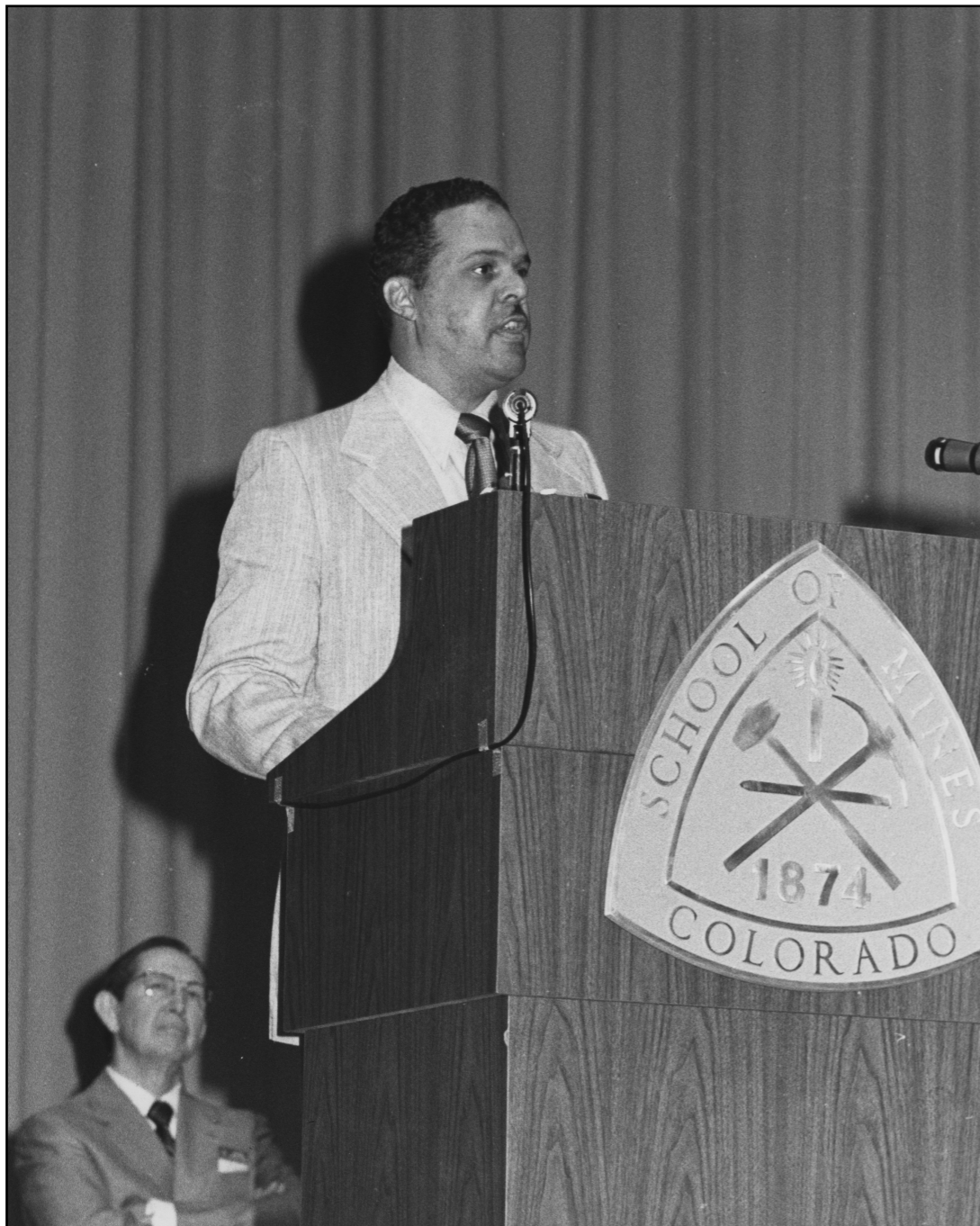
About URGE

Photo Credit Stephen Maturen

URGE 

equity, diversity, and inclusion
in our local communities,

First National Conference on Minority Participation in Earth Science & Mineral Engineering (1972)



- In the summer of 1972, Dr. Randolph Bromery and other geoscientists convened the First National Conference on Minority Participation in Earth Science and Mineral Engineering.
- Attended by 300+ representatives of academia, government, civil rights organizations, and industry, the FNC was a watershed event focused on barriers, opportunities and strategies for broadening participation of Black, Latinx and Native/Indigenous Americans in Earth sciences & related disciplines.

Second National Conference (Aug 2022)

In summer 2022, the Second National Conference will assemble experts and leaders across a range of disciplines who are seeking to form coalitions and generate transformative ideas for change. We will chart a collective course toward justice that is grounded in accountability, intentionality, innovation and the imaginary, and guided by the goals of broadening participation and advancing student success in geosciences and related disciplines.

(Washington, DC August 14–17, 2022) “We will celebrate fifty years of leadership, community-building, and resilience in geoscience as we convene at the Second National Conference to give shape to a justice-centered next 50 years, together.”

Challenges faced by BIPOC and LGBTQIA+ geoscientists in the field

UNIT 2: Modern-day Manifestations of Racism and Colonialism in Geosciences

Week 6 – Where the Geoscience Community Stands Today (cont.): these slides may be used to start off the reading discussion for the following references.

- [Safe fieldwork strategies for at-risk individuals, their supervisors and institutions](#) (Demery and Pipkin, 2020)
- [Ten Steps to Protect BIPOC Scholars in the Field](#) (Anadu, Ali and Jackson, 2020)
- [The Challenges of Fieldwork for LGBTQ+ Geoscientists](#) (Olcott and Downen, 2020)

Additional readings:

- [Six simple steps towards making GEES fieldwork more accessible and inclusive](#) (Lawrence & Dowey, 2021)

Field experiences can be defining moments in one's career

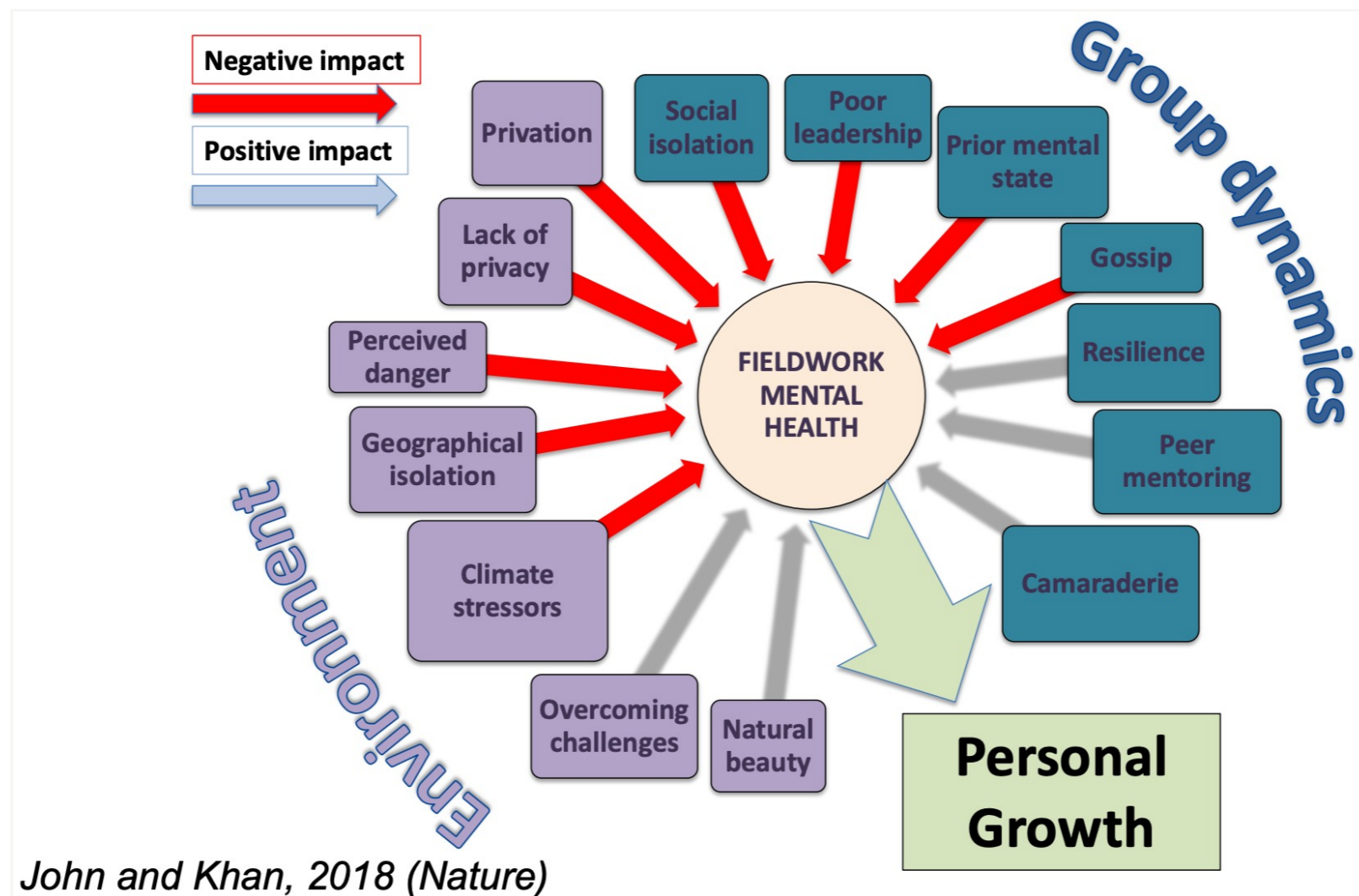
- Most geology undergraduate majors require field research experiences
e.g., the Stretch at Dartmouth (no longer required)
- Can inspire students to pursue a career in research
- A broad definition includes any work-related activities outside the home institution
(a wide range of timescales and spatial locations)

Unique challenges of field environments

- New, unfamiliar, unknown or nonexistent rules of conduct and reporting mechanisms
- Reduced independence for access to transportation, food, medical resources, etc.
- Distance from personal support networks at home
- Unfamiliar cultural norms or language
- Long days with physically strenuous work and exhaustion
- Exposure to harsh environmental conditions and potential greater risk of environmental hazards, or unfamiliar risks compared to the home base location

Unsafe field environments can have devastating consequences

The personal & professional impacts of harassment, bullying, racism, discrimination, etc., can be much worse in the field.



Feedback and reaction on John & Kahn (2018)

"Lack of private space for downtime really impacted me"

"I felt like a fraud: everyone around me seemed to enjoy the experience, yet I was miserable"

"For me, fieldwork was a torture, and for decades I thought I was the only one who felt that way"

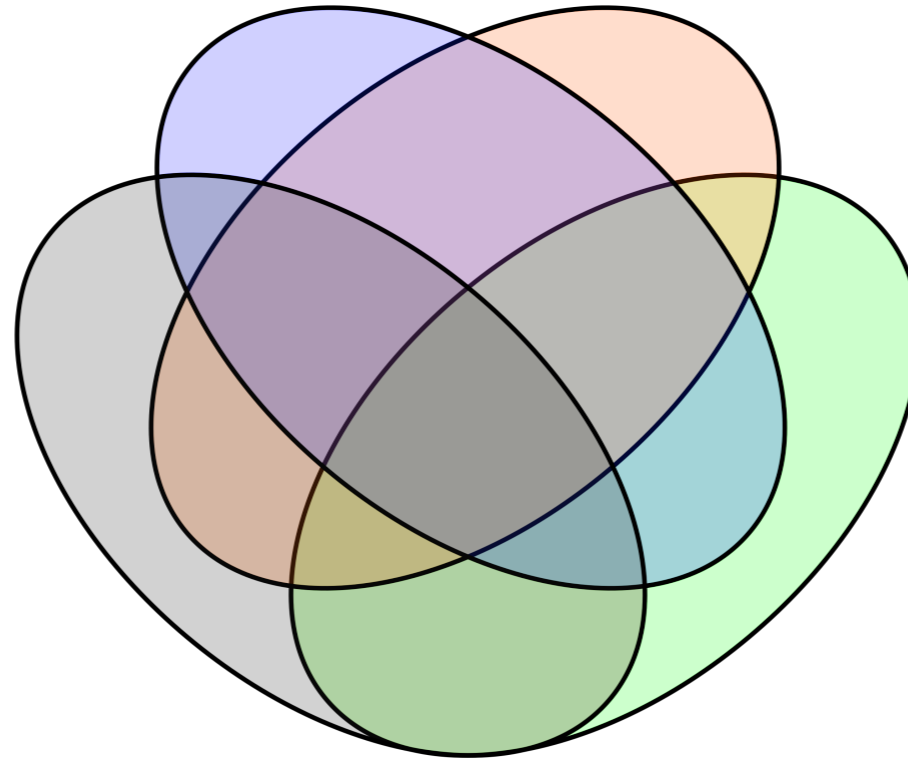
"No one seemed to want to take into account my serious mental condition and adapt their field course to make it possible for me to attend"

"The lack of planning for logistic for this [marked] field exercise put a huge strain on my mental state: so much so that at the beginning of the year I wanted to quit my degree"

"No one mentioned or prepared us for the reality of inter-personal conflicts when working within a small team for weeks on end"

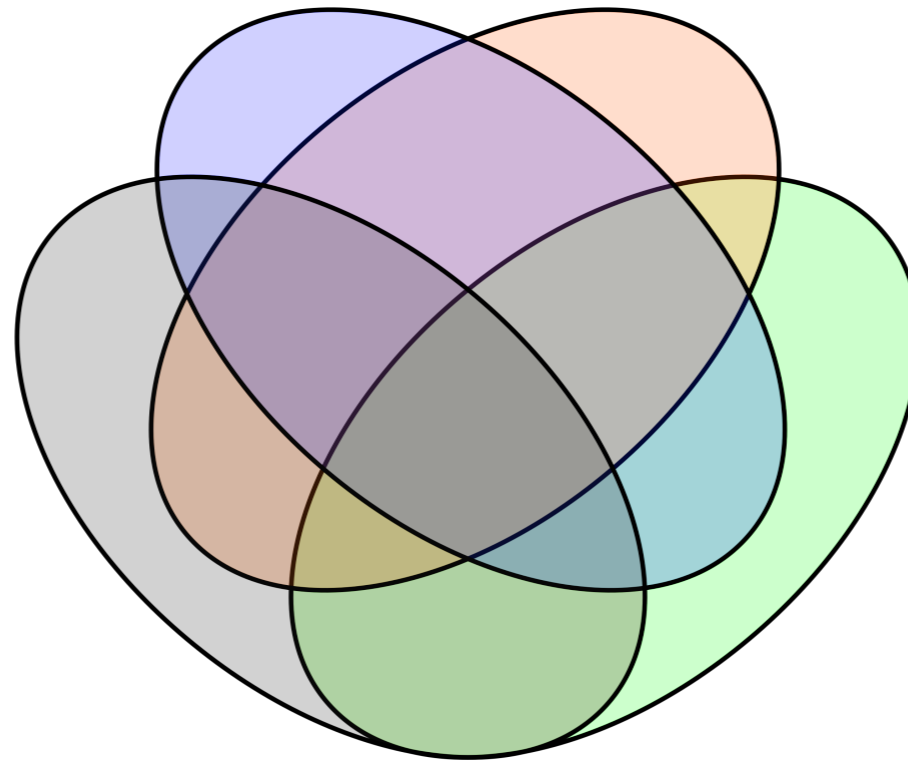
Mental Wellbeing During Fieldwork (C. John), January 15th 2019, Higher Education Network meeting

Intersectionality



- An analytical framework for understanding how aspects of a person's social and political identities combine to create different modes of discrimination and privilege
- First coined by Prof. Kimberlé Crenshaw in 1989 to help explain the oppression of African-American women

Intersectionality



“Because the intersectional experience is greater than the sum of racism and sexism, any analysis that does not take intersectionality into account cannot sufficiently address the particular manner in which Black women are subordinated.”

— Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics (Crenshaw, 1989)

At-risk individuals

“At-risk individuals include minority identities of the following: race/ethnicity, sexual orientation, disability, gender identity and/or religion.”

— Demery & Pipkin (2020)

At-risk individuals with intersectional identities

In a recent survey of field training, 64% of respondents stated that they had personally experienced sexual harassment and over 20% reported that they had personally experienced sexual assault. Over 90% of women and 70% of men were trainees or employees at the time of the incident (Clancy et al. 2014).

How do these experiences affect individuals with intersectional marginalized identities?

“As a woman, I'm often fearful about doing certain things alone and I take as many precautions as I can. However, as a *black* woman I have yet another set of circumstances to consider. I have to reconcile that as much as I love being in nature and seeing the world, there are those who whole heartedly believe someone like me has no right to be there — simply because I am black.”

- Lauren G., [Camping While Black](#)