Summit 2023/2024: University of Alaska Southeast's Collection of Exceptional Academic Works

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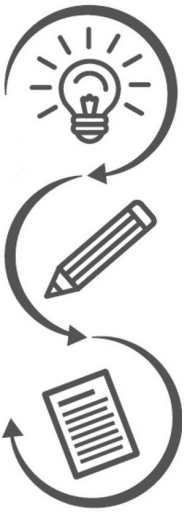
Academic works from
UAS undergraduate
students, presented by
the UAS Writing Center.

THE **WRITING** CENTER



The place
to plan,
organize,
and revise
your writing.

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Editors and Production: UAS Juneau Writing Center Student Tutors Adonis Scalia, Sophia Gimm, AJ Schultz, Madelynne Brehmer, and Ian Jensen and UAS Egan Library Dean Elise Tomlinson

Contributors: Past UAS Juneau Writing Center Student Tutors Autumn Daigle and Francesca Johnson

Faculty Judges: Forest Haven, Jonas Lamb, Julie Schram, and Jay Szczepanski

Staff Advisor: UAS Juneau Writing Specialist Jessy Goodman

5th Edition Cover Art: Daal At.ja Casey Lee Moats and Sophia Gimm
Cover Layout: Alison Krein

UNIVERSITY OF ALASKA SOUTHEAST WRITING CENTER

Dedication

We, the UAS Writing Center tutors, dedicate this journal to Rosemarie Alexander for her outstanding work at the University of Alaska Southeast over the past many years. Rosemarie's steadfast dedication to her craft has imbued generations of students with strong skills in writing, communications, and reporting. As Rosemarie retires from UAS, we would like to express our sincerest gratitude for all her work, and her support of the Writing Center. Though she will be missed as a bright light in our University community, we wish her the very best going forward and offer our sincerest congratulations on her retirement.

Contents

Forward

It is with great pleasure that I introduce the 5th edition of *Summit,* UAS's undergraduate research journal. Over the years, I have seen numerous exciting student-led initiatives slowly fade away after the initial student champions graduated from UAS; that has not been the case with *Summit*. The passionate and dedicated UAS Writing Center tutors, along with Writing Specialist Jessy Goodman, put in the energy and hard work needed to produce a publication that continues to grow, receiving more student submissions every year.

Within these pages, you will find a diverse array of research articles spanning various disciplines. From thought-provoking social analyses on blood quantum and gender identity, to scientific research on the evolutionary history and adaptations of pinnipeds, our contributors have delved into the depths of their chosen fields, seeking knowledge and understanding. I encourage you to engage with the articles, to question assumptions, and to appreciate the fresh perspectives that emerge from the minds of our undergraduate scholars.

To our student authors: thank you for sharing your insights, your data, and your passion. Your work enriches our scholarly community and inspires us all. Together let's celebrate the power of undergraduate research and its potential to reshape the world.

Sincerely
Elise Tomlinson, UAS Library Dean

Acknowledgments

Our campuses reside on the unceded territories of the Áakw Kwáan, Taant'á Kwáan, and Sheet'ká Kwáan on Lingít Aaní, also known as Juneau, Ketchikan, and Sitka, Alaska, adjacent to the ancestral home of the Xaadas and Ts'msyen peoples.

We would like to acknowledge all of the wonderful undergraduates who submitted to the fifth edition of *Summit*. This year, we received a record number of student submissions. To this year's published scholars, it is our honor to display and celebrate your academic achievements as a testament to your dedication, scholarship, creativity, and interdisciplinary activity.

A huge thank you to this year's judges: Dr. Forest Haven, Jonas Lamb, Dr. Julie Schram, and Jay Szczepanski II. Their insight and expertise has been indispensable in curating this journal.

Thank you to Student Government for their generosity in funding the UAS Ernestine Hayes Award for Excellence in Essay Writing. We are thrilled to present this year's award to Shamai Thacker for her outstanding essay, "Alaska Native and American Indian Perspectives on Blood Quantum and Tribal Status."

While Thacker's essay was ultimately selected as best embodying the spirit of the Ernestine Hayes award, we would like to acknowledge the outstanding work of Keefer Brown for writing the closest runner-up essay in *Summit's* history, "Sea Bears to Ocean Badgers."

This journal would not have been a success without the support of our new Chancellor Aparna Palmer, Provost Maren Haavig, and Dean of Arts and Sciences Carin Silkaitis.

Thank you to Elise Tomlinson, the Egan Library Dean, and

Jessy Goodman, our Writing Specialist. Their support, expertise, and resources made the creation of *Summit* possible.

We are also grateful to Kerry Neely, Kaia Henrickson, the rest of the library staff and faculty, *Whalesong*, Alison Krein, and Shauna Sage for their social, technological, and overall support during the promotion and production of *Summit*.

In addition, thank you to the UAS Writing Center Support fund and its donors for enabling this publication and for funding its printing!

We hope you enjoy this edition of *Summit* and that the essays within inspire you as they inspire us.

Maddie Brehmer, Sophia Gimm, Ian Jenson, Adonis Scalia, and AJ Schultz

UAS Writing Center Tutors

Ernestine Hayes Award for Excellence in Academic Writing

In an effort to promote the academic excellence of students and to highlight their writing, the UAS Writing Center held its first student essay writing contest in 2019. The essay contest, now named after Professor Emerita Ernestine Hayes, strives to honor the commitments she made toward student achievement and the craft of writing. Our fiith edition of *Summit* once again features the Ernestine Hayes Award for Excellence in Academic Writing. As before, students were invited to submit exemplary essays they composed for courses in a bachelor's program at any campus in the UAS system. A board of student and faculty judges unnafiliated with the Writing Center rated the essays, given to them anonymously, to determine which would be published and which would be the recipient of the Ernestine Hayes Award.

This year, the UAS Writing Center congratulates a devoted professional with a passion for creativity and greater equity in Indigenous learning experiences, Shamai Thacker, an Alaska Native of Inupiaq, Tsimshian, and Scottish descent from Clam Gulch, Alaska. Shamai weaves personal experiences with a dedication to supporting others. She currently works as a Training & Development Specialist III at the Alaska Native Tribal Health Consortium. Residing in Anchorage with her family, Shamai continues to pursue education, recently completing the Alaska Native Language & Studies program, and aspires to pursue a Ph.D. in the future. This trajectory is geared towards advancing the empowerment of future generations through culturally responsive teaching and program development.

Alaska Native and American Indian Perspectives on Blood Quantum and Tribal Status

Shamai Thacker

University of Alaska Southeast

SP-23 ANS498-J01: Res: Blood Quantum Data/Reseach

Dr. Forest Haven

First, let us address the elephant in the so-called room. Blood quantum. To the Indigenous reader, it brings a bit of a shudder. A metallic tinge on your tongue out of nowhere. A ripple of static throughout your entire body. The decision to research blood quantum did not come lightly. This research came to fruition through my own experiences related to blood quantum and tribal status. Not in all cases does blood quantum dictate tribal status, and while my blood quantum does not dictate my own tribal status with a federally recognized entity, my tribal status was revoked for other reasons related to antiquated tribal laws that were created under the established blood quantum laws.

To experience such a thing causes one to pause; in those moments of reflection that come often since my disenrollment from Qutekcak Native Tribe in Seward, Alaska in 2018, I asked myself, "How many others have been through something similar, and what did they do?" But this isn't a topic that many discuss openly. Even I, when all of this happened, kept it to my very close circle for inquiry and steps forward. Learning that the steps forward meant uprooting and starting over, and I kept wondering why no one talked about these things happening. I was at a complete loss and dead ends in my efforts to seek options to reinstate my tribal status without completely ruining all my current opportunities. How was this okay to everyone that I spoke with?

The depth of pain that came from being stripped of a part of my identity was lost on these people. 34 years of the only identity that I knew of my Alaska Native heritage were gone. How little I knew what that meant until just a few years later. How little I understood the impact of the topic and how it would lead to me

conducting a research study related to it a mere four years later.

This paper will highlight some of the key themes in the current research available related to blood quantum and tribal status laws, but, more importantly, will highlight the differences in the scholarly research compared to the perspectives that were captured in an online survey that was distributed to various communities for Alaska Native and American Indian identifying people to contribute to this research.

Background

In New Zealand, Indigenous identity is comprised of Whakapapa, genealogy, and self-identity. They don't have any other standard of what makes a person Indigenous—a stark difference when we look at how blood quantum and tribal status impacts the Alaska Native and American Indian people of North America (Hopkins, 2016). This research study focuses on how the history of blood quantum and tribal status impact a person's sense of self and belonging in Indigenous spaces.

Blood Quantum

The idea of blood quantum originated in the Allotment Era: a time in which the federal government devised minimum blood quantum requirements to set a definition of what terms meet tribal citizenship. Prior to the Allotment Era, though, the federal government never used a minimum blood quantum. In the 1900s, the "United States consistently recognized the inherent right of Tribal Nations to define their own citizenship requirements" (Fain & Nagel, 2017, pp. 805). The Allotment Era rose from a time in which the federal government was seeking tribal lands for the expansion of white settlers, which bore the federal blood quantum

requirements that are now managed by the Bureau of Indian Affairs (BIA) through the issuance of Certificate of Degree of Indian Blood (CDIB) to indicate the amount of Alaska Native or American Indian blood a person has. The CDIB is a direct result of the blood quantum regulations that so many tribes continue following the Allotment Era (Spruhan, 2018).

Tribal Status

Tribal status is impacted by blood quantum in that following the Allotment Era and into the Indian Reorganization Act, by "emphasiz[ing] tribal self-government, blood quantum was by then firmly entrenched, though existing alongside political definitions" (Spruhan, 2007, pp. 47), which then made a minimum 1/4 American Indian blood quantum a requirement for tribal enrollment in most Native American groups. The same minimum blood quantum was used during the passage of the Alaska Native Claims Settlement Act (ANCSA) in 1971. When the 12 Alaska Native regional corporation leaders came together to meet the vision of each ANCSA corporation, they mandated that Alaska Native people must meet a blood quantum of 1/4 or more and have been born before 11:59 p.m. on December 18, 1971 to be eligible for enrollment into an Alaska Native corporation (ANCSA Regional Association, 2021).

Cultural Identity

Indian Country Today (2021) did a newscast that covered a variety of topics related to the Indigenous world in the U.S. They mentioned that there is an issue with identity in our newer generations of Alaska Native peoples due to blood quantum, as well as the Anishinaabe people of Minnesota, who have recognized that blood quantum is an issue that if left unaddressed will lead to the extinc-

tion of the tribe(s). The Anishinaabe people have multiple bands that are a part of the Anishinaabe overall, but are still a different tribe. However, due to the current structure, there is a likelihood that any decisions related to tribal referendum for tribal status will be voted on, and a majority of another tribe could decide the fate of others.

When considering the extinction of a tribe related to blood quantum requirements, we must also consider the traditional cultural practices that are impacted by blood quantum requirements. In Alaska, Section 119 of the Marine Mammal Protection Act (Public Law 103-238) allows NOAA Fisheries or the U.S. Fish and Wildlife Service to establish agreements with Alaska Native Organizations (ANOs) in the regulation of marine mammals. The Marine Mammal Protection Act includes regulations for Alaska Natives to hunt marine mammals for subsistence, and part of the requirements include proof that one is, at minimum, 1/4 Alaska Native descent. This creates significant inequities because of blood quantum and the impact to Alaska Native descendants who are not 1/4 documented Alaska Native and therefore cannot practice their traditional subsistence harvesting (Langdon, 2016).

Literature Review

To date, research on blood quantum is widely from a stance that focuses on the laws related to the establishment of blood quantum requirements for tribal status with American Indian tribes. Most research does not even consider the Alaska Native populations, which are under very different requirements following the passage of the Alaska Native Claims Settlement Act in 1971 to establish regional shareholders. There is a significant lack of research

that focuses on the over 200 Alaska Native tribes that only as recently as 2017 became federally recognized with inherent sovereignty that federal recognition gives to tribes (UAF Department of Tribal Governance, n.d.), which leaves a significant gap in literature that relates to the impact of these laws on Alaska Native people.

Kim Tallbear (2013) conducted research that gave the American Indian people recognition as researchers and not data subjects. Tallbear identifies the issues with DNA testing and how it has been used to identify American Indian blood, which has led to an increase in corporations capitalizing on American Indian people to sell their products to identify American Indian descent. Additionally, DNA testing has also led to geneticist researchers taking blood samples to conduct research unrelated to original consent to falsify IRB paperwork for the benefit of Indigenous-related research. Tallbear reminds us that blood quantum and tribal identity is far more than DNA testing. By focusing on molecular concepts for identification as an Indigenous person, we are discounting all the other efforts related to tribal and cultural identity that create controversies among the various American Indian groups as they navigate culture, traditions, and tribalism (Lyons, 2010).

Further examination into how blood quantum qualifies as a metric of tribal membership and what tribal membership is connected to in terms of place, belonging, and identity indicated how colonization efforts in which tribal blood is the determinant factor for an American Indian person to be included in the tribal role were damaging, but also challenges how the bloodline does not align with tribal citizenship and the scenarios in which that idea is confronted (Rodriguez-Lonebear, 2021). The impacts of almost 600 federally

recognized American Indian reservations using blood quantum as the determinant of who can be a citizen of that nation is seen in efforts of trying to decolonize tribal enrollment. Michael Yellow Bird (2010) shares his personal experience with attempting just that, and he identifies the topic of blood quantum to be "one of the touchiest of all issues among Indigenous Peoples" (pp. 179). Yellow Bird recalls his presentation at a tribal elders' conference in 1995 where he shared the issues with data and proposed a new criterion that does not include blood quantum. The elders on the panel at that time were uninterested in the options to combat blood quantum requirements. With blood quantum requirements embedded in so many tribal requirements, it is important that we consider the impacts of the eventual dilution of Indigenous blood in those that are still actively participating in their cultures. Should the person who meets blood quantum requirements, but their child does not due to the increase in mixed races, who also continues to learn and teach the culture to that child have to watch their child be punished for not meeting these colonizing practices?

Methods

Qualtrics Survey

The Qualtrics online survey tool was used to develop the online survey because it has a user-friendly experience for building and managing the survey. A free tool to use, Qualtrics allowed the survey to be built in a completely anonymous way. From the analysis side, all user information was private, including IP addresses. This was important because this research is meant to capture personal experiences through difficult dialogues, and giving participants the ease of mind that they will not be identifiable in their responses

meant a higher likelihood of more responses.

At the launch of the survey, CAPTCHA was not initially set up, which resulted in over 1,100 spam responses to the survey. It is assumed that this was done to access the link to the raffle survey that was set up for those participating in the research project. This scenario was not considered when building the survey and was edited to add the CAPTCHA after catching on to what was happening. Once the survey closed on March 26, 2023, a colleague shared methods of filtering out the junk responses in the response spreadsheet.

Social Media Data Mining

Data mining social media sites like Twitter and Facebook as part of this research project was conducted to have additional considerations of what individuals in these spaces are saying about blood quantum and tribal status. However, the consideration of social media does not come without its own risks and warnings, the biggest of which is that there is no way of knowing for sure whether the conversations are being started and guided by Indigenous persons. The searches on social media were conducted without logging in to the platforms to ensure that all results that populated were openly available to the public on the World Wide Web.

Social media data mining has the potential to be a great resource for obtaining insight into perspectives on blood quantum laws, but the undertaking requires many more hours of devotion to the search and archiving of data to be captured. With the limitations of this study, only a short description of the results was provided for two of the major social media platforms.

Data Analysis

Qualtrics Survey

1,188 responses were collected during the survey period. I first filtered by status response type and removed 15 marked spam. I then sorted by user language and removed responses from China (100), Taiwan (2), the Netherlands (1), Japan (3), Finland (1), and Spain (5). From there, I sorted by duration. To find the duration in which responses were removed, I searched for the first response that had meaningful answers related to the survey, and used that time as my lowest time to complete the survey, was less than 199 seconds (94). Finally, I examined suspicious patterns in the remaining responses. To do this, I sorted by question 14, which let me see questions 11-15 in a row. From there, I removed duplicates (178), copy/pasted answers (227), and those where no responses were recorded (547). There were 15 usable responses for this study. All 15 responses affirmed that they were over the age of 18, identified as Alaska Native or American Indian, and consented to participate in the study. Of the 15 participants, Figure 1 shows five (5) were between the ages of 18-29, four (4) were between the ages of 30-39, four (4) were between the ages of 40-49, one (1) was between the age of 50-59, and one (1) was at or above the age of 60.

Figure 2. Corporation and tribal status breakdown of participants.

Figure 2. ***Corporation and tribal status breakdown of participants.***

Participants were asked about their status as an Alaska Native Corporation (ANC) shareholder or shareholder descendent, and membership in an Alaska Native or American Indian tribe (Figure 2). Of the 15 responses, 73.33% are current ANC shareholders or descendents, and 80% are current members of a tribe. To be considered an ANC shareholder or descendent, shareholders are eligible—meaning they meet the 1/4 or more blood quantum requirement—if they are an Alaska Native that was born before 11:59 P.M. on December 18, 1971, and descendants are those that are documented as being of lineal descent of an original shareholder for a particular ANC (ANCSA Regional Association).

Tribal requirements vary between each tribe. Just because a person is not a part of an ANC does not mean that they are not part of a tribe; the same can be said vice versa. In the continental United States, tribal status for American Indians generally is contingent on blood quantum and tribal involvement for consideration of being accepted into the tribe (Spruhan, 2007).

Also examined were how blood quantum requirements impacted membership or enrollment into a tribe (Figure 3). Participants indicated that eight (8) have blood quantum requirements, two (2) did not, and five (5) did not know. There are a few considerations to consider for those that do not know, such as whether individuals even know what tribe they might belong to if they have no family history to go from, and even whether or not being a tribe member is an option based on tribal requirements outside of blood quantum.

Figure 4. Impact Likert scale statements of participants.

Question	Not at all		Somewhat		A lot	
Blood quantum requirements have impacted me.	13.33%	2	40.00%	6	46.67%	7
Tribes or corporations lowering the requirements have or would impact me.	20.00%	3	26.67%	4	53.33%	8
Blood quantum and/or tribal status impacts my self-identity	6.67%	1	46.67%	7	46.67%	7

Figure 3. Blood quantum requirements for tribal status breakdown of participants.

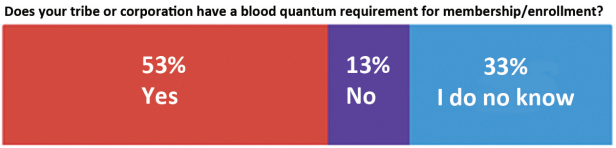

Figure 3. *Blood quantum requirements for tribal status breakdown of participants.*

Participants were asked to provide impact statements related to blood quantum and tribal status. As part of the narrative collection, a Likert summary (Figure 4) was collected to get an idea of where the various perspectives were on a data scale. Seven (7) participants indicated that they have been impacted by blood quantum requirements, six (6) indicated only somewhat impact, and two (2) were not impacted at all; eight (8) participants indicated that tribes or corporations lowering the blood quantum requirements would impact them, four (4) said they would be impacted somewhat, and three (3) would not be impacted at all; and finally, seven (7) participants indicated that blood quantum and/or tribal status have

impacted their self-identity, seven (7) have been somewhat impacted, and one (1) has not been impacted at all.

Twitter

To conduct targeted searches, the results were isolated by searching for results that included the terms "Indigenous," "blood quantum," and "tribal status." This was necessary because initial searches on the social media platform for just "blood quantum" resulted in discussions on the zombie movie called *Blood Quantum*. To ensure that the data collection was targeted for the purposes of this research project, limiting the results allowed the researcher to consider a smaller pool of discussion, which aligns with the survey results having a small collection of results.

Four (4) results, including the tweet posted by the researcher to recruit participants in the research survey, were populated. The most recent discussion occurred in October 2022, that noted "what makes someone Native" as an issue of Indigeneity. Another shares concern with the limitations of tribal status due to blood quantum.

There was also a response that indicated that tribal status is determined by the specific tribe, but that blood quantum is not a notion of it–the issue there being that it is documented in the United States that while tribes are able to determine what to use as their requirements for tribal consideration, it is widely known that that status is dependent on how much "Indian blood" a person has of a particular cultural type (i.e., American Indian tribes who have at least 1/4 documentation of cultural affiliation to be a part of that tribe, such as Leech Lake where you have to prove you have at least 25 percent Ojibwa blood to be a tribal citizen) (Martin, 2012).

Facebook

Targeted searches on Facebook were a bit more complicated as the combination of "blood quantum," "tribal status," and "Indigenous" brought very few public results. However, a search for "blood quantum colonial construct" resulted in a handful of public posts that targeted the statement "blood quantum is a colonial construct," with one post having almost 1,000 responses. Most responses appeared to indicate agreement with the colonial construct, but they also indicated that many find themselves ineligible for tribal status due to their blood quantum being too low.

Indigenous Perspectives

The impact of this study comes from the participant responses to the impact questions. It was necessary for this study to prioritize the qualitative and impactful statements made by the participants in order to see how personal input aligns with the literature and studies that have contributed to blood quantum and tribal status in westernized research practices. Below are participant responses to four of the questions participants were prompted with, including a short summary of each impact question.

In what ways have blood quantum requirements impacted you?

In what ways have blood quantum requirements impacted you?
"It has prevented me from belonging to a specific corporation, thus impacting my status as a shareholder/descendant, and my ability to receive (sic) health care outside of Alaska."
"This idea of blood quantum requirements (most common requirement 1/4 'Indian') will prevent my future descendants, who are raised in rich cultural environments and educated of history and heritage, from becoming tribal/corporation members. They will not be able to claim the same sovereignties and opportunities I have because they will, according to the colonizer, lack the blood quantum requirement…Therefore, this colonized perspective should be abolished and deemed null."
"No fur sewing/exclusion form cultural activities."
"Blood quantum requirements have impacted my perception of indigenous culture and their views on what being indigenous means."
"I can't hunt and work with marine animal furs."
"Its (sic) made me feel inferior when applying for assistance, grants, etc."
"Eventually I worry that my future grandchildren will not be 'enough' native to benefit from the support services."
"Because my blood quantum is low, it's hard not to feel less Indigenous, or sometimes not Indigenous at all. Blood quantum isn't everything but it's hard not to find value in something that so many other people do."
"Being unable to apply for certain scholarships for college, being unable to apply for certain help within my tribe, feeling like I don't belong."
"Tribal status affect (sic) my self-identity."
"Blood quantum makes me feel like a fractured person. And like I'm not enough."
"People think I am less Native because they have a higher blood quantum. We are not dogs/horses with a pedigree. It's gross."
"They have impacted my emotional wellbeing as I am continuously fighting the notion that I am not 'Tlingit enough' even though I am enrolled with the tribe."
"It made me sad and feeling lost that although I am Native by blood, I am not legally Native. I wanted to be myself fully without wondering if I 'deserved' to consider myself Native, as my grandmother and matrilineal ancestors did. As my daughter would be."

When asked the ways in which blood quantum requirement have impacted participants, the key themes in the responses were feelings of being excluded and not being able to access traditional cultural resources or services available to tribal members. Cultural activities and traditional practices are important to Alaska Native and American Indian peoples, and being told that their blood quantum impacts those practices is harmful to not only these participants, but the future generations.

In what ways would/have tribes or corporations lowering the requirements impact you?

In what ways would/have tribes or corporations lowering the requirements impact you?
"I would potentially be able to belong to a corporation, allowing me to benefit from the federal programs available to shareholders/descendants."
"I think that lowering requirements would have affects I cannot predict but I would love to see a de-colonized change in our systems."
"I come from a Landless tribe so if they ever get land and form a corporation and have blood quantum requirements I might not make the cut."
"Only that it made me feel inferior.
"My future grandchildren will benefit from both native corporations and their tribal identity."
"Of course if my traditional community lowered their blood quantum requirements and i were able to enroll as a member, I'd feel a stronger sense of connection and feel more confident telling people that I am an Indigenous person."
"This would create a safer space for those that identify with the culture and want to crlebrate (sic) our traditions and practices. It could create an even larger community of people who want to stand together."
"I'd like to see blood quantum gone, not lowered. Descendency would be my preference for any kind of Indigenous enrollment."
"We should be proud that we hid our culture in our lineage. Native is Native."
"Lowering the requirements would make me feel more welcome/comfortable in engaging with tribal communities as it would lessen the anxiety that I feel stemming from the notion that I may not be 'Indigenous enough.'"
"Recognition for the struggle against racism and sexism in our society. Safety net. Sacred land access that can only be passed down within the tribe."

When asked how lowering the blood quantum requirements in tribes or corporations might impact participants, the key themes in responses were feelings of belonging by being eligible to enroll, feelings of not belonging because of ineligibility, and feelings of benefitting from the tribe or corporations and the resources available from them. There are also strong feelings of the impact to cultural identity for those that are not a part of a tribe or corporation, or those whose descendants may not be enrolled in the future.

What might be the benefits, advantages, or disadvantages of lowering or removing the requirements?

What might be the benefits, advantages, or disadvantages of lowering or removing the requirements?
"Lowering the requirements would allow people of no tribes with mixed quantum to join and belong to a corporation."
"Enrolled number of tribal members would increase, thus bringing more federal recognition, more opportunities to educate both indigenous and non-indigenous people of who we are and our history, more pride in who we are as a people.
"More people can access services tribe and Corp provide."
"As long as you can prove that you're native it should never come up again. The benefit of that would be higher self esteem."
"Benefits include the inclusiveness of lowering/removing the blood quantum requirement.
"Advantages include access to support services, disadvantages of lowering or removing the requirements is we haven't come up with a healthy way to split our resources so that everyone in comunity (sic) benefits from the limited resources."
"It'd be more beneficial to have a wider group of voices and experiences be considered a status member of the tribe, and it ensures that policies enacted by the federal government that banked on the eventual 'extinction' of Native people don't come to pass. Some disadvantages though would be a larger strain on potentially limited resources."
"If lowering it may impact my future grandchildren and great grandchildren. My husband is not Native. So 4 of my children's blood quantum is lower then (sic) mine."

When asked the possible benefits, advantages, or disadvantages of lowing or removing blood quantum requirements for tribal or corporation status, participants once again mentioned belonging and improving the strength and unity of community members that are able to enroll in a tribe or corporation. Alternatively, responses also indicate consideration of the impact to the tribes or corporations with the lowing of requirements, as the resources being made available to too many may have negative impacts overall by limiting them due to resource caps.

In what ways have blood quantum and/or tribal status impacted your self-identity?

In what ways have blood quantum and/or tribal status impacted your self-identity?
"Feeling like I am part of several races, yet I am not native enough to join specific tribes or corporations. This causes me to feel inadequate and confused on how I fit into the Alaska native culture."
"I often feel I am 'not native enough.'"
"I often feel 'not enough' Native."
"As a Native Dance Group leader I'm very proud of my tribal status so I would say that it benefits my self esteem and awareness."
"Other people…don't believe me to be Indigenous or Indigenous enough to talk about Indigenous issues, and it's hard not to believe they're right sometimes with how low my blood quantum is."
"I am proud of my tribal and Alaska Native regional corporation enrollment, but blood quantum makes me sad and angry. Mine isn't even accurate—it leaves out one of the two Native groups to which I belong. Why am I being legally defined as less than I am?"
"I have felt like I am not enough and don't belong in a Native space."
"Seeing the fraction/percentage of my blood quantified in such a way instills a very deep insecurity and I often avoid conversations about percentages because of this. Why should I be identified with a number, not even a whole number? Personally, it feels dehumanizing."

When asked how blood quantum and tribal status has impacted participant identity as an Alaska Native or American Indian, the key themes are those of feeling inadequate or "less than" due to the fracture created by the requirements. "Not Native enough" was spoken in various ways throughout the participant responses to this question, and the feeling of belonging impacts how deeply one

feels connected to their cultural identity. Additionally, being able to have the conversation about blood quantum and Indigenous issues without the stigma that comes with it may help those participants that lack their cultural identity have a means to work through the insecurities that come with cultural traumas connected to blood quantum and tribal status.

In what ways have blood quantum and/or tribal status impacted your self-identity?

Conclusion

Blood quantum is a colonial construct that came from Victorian ideologies meant to erase Indigenous identity to remove any government responsibility to Indigenous peoples. By utilizing colonial constructs that fracture identity (Hopkins, 2016) and isolating blood quantum conversations—including identity and belonging—primarily in academic settings, capturing various Indigenous voices helps Indigenous peoples share their personal experiences related to blood quantum, tribal status, and identity. When it comes to Indigenous rights to self- determination, tribes get to make whatever rules or laws they see fit to determine who its people are (Ratteree & Hill, 2017, pp. 78). Further research in this area should be explored to structure the conversation around blood quantum and tribal status in meaningful ways that capture the true impacts this colonized construct has on Indigenous peoples today. Fractured identities only feed the seeds of generational trauma, and it is through the encompassing and reimagination of cultural identity and practices that tribes and villages can reimagine how to keep their cultures and traditions alive in a time of dilution following settler colonialism.

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Sea Bears to Ocean Badgers

Keefer Brown

University of Alaska Southeast

Communicating Science: BIOL311

Dr. Heidi Pearson

Abstract

By chronicling how the scientific understanding of pinnipeds has changed, one can gain a broader perspective of how pinnipeds have and will continue to adapt. Understanding the evolutionary origins and geographic distribution of Pinnipedia has advanced over a century of research. Genetic research and the discovery of extinct species have expanded the family's fossil record to some of its most basal members. Although the fossil record of pinnipeds in the Southern Hemisphere remains largely unknown due to research bias favoring the Northern Hemisphere, recent discoveries in Canada demonstrate how pinnipeds transitioned from life in rivers to marine environments. Using past publications and fossils collected at the Burke Museum of Natural History and Culture, this study assesses how the understanding of pinniped morphology, evolution, and distribution developed over a century of scientific advancement Research began with the formative publication (Sclater, 1897) on pinniped distribution, and progressed with genetic research over pinnipeds' closest phylogenetic relatives. Studying pinniped genetics and the fossils of basal species shows that pinnipeds share a single common North American ancestor, which, akin to modern pinnipeds and mustelids, relied on tactile perception of its environment. However, a comparative lack of fossils in the Southern Hemisphere has left much of pinniped prehistory unknown. Despite significant gaps in the fossil record, the use of vibrissae as a primary sensory organ in modern and basal pinnipeds demonstrates how evolutionary history influences contemporary life. Even though the evolutionary history of pinnipeds may appear irrelevant to the modern day, the morphology of ancient pinnipeds influences the survival of

pinnipeds in the present. As climate change and pollution threatens the future of modern pinnipeds, using recent fossil discoveries to reconstruct the adaptations that allowed Pinnipedia to survive in the past can offer insight into their ability to adapt to anthropogenic threats.

Introduction

Today, pinnipeds face threats such as loss of breeding space, interference from anthropogenic noise pollution, and a lack of prey due to rising ocean temperatures. The factors behind these threats are complex, but by studying the past, researchers may gain insight into how pinnipeds can be conserved. While modern science has a well-developed understanding of how cetaceans made the transition from terrestrial to marine mammals, a comparative lack of fossils has left our understanding of pinniped origins incomplete. Despite pinniped evolution being less understood, through discoveries in the fossil record and advancements in genomic technology, the mystery of pinniped origins is significantly clearer now than when research began. As morphology and behavior are influenced by evolution, understanding how pinnipeds evolved and survived in the past could be used to influence conservation. With a better understanding of pinniped evolutionary history and adaptations, we can better recognize what helped them survive in the past and how they could survive in the future.

Research

The formative work of Zoologist Philip Sclater (1897) was the first publication to postulate the geographic origin of pinnipeds prior to the pinniped clade's contemporary distribution. In his initial assessment of contemporary pinniped relatedness and distribution,

Sclater (1897) correctly identifies the three groups which comprise Pinnipedia: phocids (true seals), otarrids (sea lions), and odobenids (walrus). Sclater (1897) briefly notes the use of the term "sea bear" as an alternative colloquial term for sea lions. From a historical perspective, the use of the term "sea bear" in common vernacular may indicate that only decades after the publication of *On the Origin of Species* (Darwin, 1859), the public was already aware of the morphological similarities between Otariids and Ursids. Even though Sclater (1897) does not assert an evolutionary relationship between bears and pinnipeds, the established colloquial term "sea bear" may serve as an indication of how the connection between pinnipeds and ursids was perceived at this time.

Using observational accounts whose accuracy has since been questioned, Sclater (1897) determined the approximate range of pinniped species and their subsequent biodiversity. Based on both the Antarctic having a greater phocid and otariid diversity than either of the previous oceans, and the present distribution of monk seal (Monachini spp.) populations, Sclaterconcludes that the Antarctic Ocean is the point of origin for Pinnipedia from which the clade later spread into the Pacific Ocean and finally the Atlantic. However, this model of pinniped distribution is no longer accepted due to fossil and genetic discoveries. To explain why the pinnipeds spread out from Antarctica in this specific order, it was hypothesized at the time that a land bridge connected South America and Africa. This land bridge would have halted theestablishment of pinnipeds in the Atlantic Ocean until its recession, while offering monk seals aconti nuous strip of land that could have been used to establish populations in the Gulf of Mexico and the Mediterranean since

Sclater (1897) argues that monk seals would be unable to cross the Atlantic if it was open ocean.

Contrary to the southern origin of pinnipeds according to Sclater (1897), the work of Raymond and David Pierotti (1980) hypothesizes that pinnipeds evolved in a temperate climate as highly sexually dimorphic animals who exhibited clear physical differences between the sexes. As some pinnipeds evolved to survive colder climates, sexually dimorphic morphology became reduced in accordance with environmental pressures. Secondly, in accordance with the diphyletic model of pinniped phylogeny, which asserted that pinnipeds originated from two different groups, Pierotti and Pierotti (1980) asserts that pinniped reproduction can be divided into two categories based on their evolutionary ancestry. Under this reconstruction of pinniped phylogeny, Pierotti and Pierotti (1980) argues that reducing heat loss in a cold climate was a primary selective pressure behind pinniped breeding behavior, as well as the general loss of sexual dimorphism in phocids compared to the other family groups. Although the combination of blubber and fur can compensate for heat loss in both the terrestrial and marine environments, the reduced ambient temperature of the air relative to the water makes hauling out for an extended period an inefficient use of energy for polar phocids. This disparity in energy efficiency results in ice seals spending more time in the water when not nursing their young, and is further compounded by phocid breeding and nursing largely taking place on pack ice, which, while safer from predators, is also mobile and less stable than breeding on land.

Even though Pierotti and Pierotti (1980) recognizes that territoriality still exists in polar phocids (for example, guarding the

breathing holes of females to prevent other males from gaining breeding access, such guarding is only a viable strategy for short periods of time, due to polar phocids competing and copulating in the water, and territories shifting with ice rather than remaining static), Pierotti (1980) hypothesizes that these factors kept polar phocids from developing the harem reproductive strategy like otariids and odobenids, resulting in reduced sexual dimorphism within phocids. The Pierotti and Pierotti (1980) hypotheses--breeding strategy is dependent on the environment, and can subsequently be divided into two categories based on phylogenetic grouping--are seemingly discredited by elephant seals and grey seals. Both phocids exhibit sexual dimorphism akin to otariids and odobenids, with males that breed with a harem of females in a well-defined territory. The study does not regard elephant seals as a counterpoint to its assertions. Instead, Pierotti and Pierotti (1980) asserts that phocids, which demonstrate high sexual dimorphism and harem breeding, have retained the basal behavioral and morphological traits of pinnipedian due to not breeding in the same environmental conditions as ice seals, and subsequently not relying on pack ice. Ultimately, Pierotti and Pierotti (1980) concludes that basal pinnipeds likely inhabited temperate environments before later adapting to the cold–but, while this conclusion would eventually be supported by modern research, the author's diphyletic perspective of pinnipeds became controversial.

Despite genetic evidence in the 1980's and '90's supporting monophyly, Koretsky (2003) argues that the results of the molecular studies should be reviewed due to insufficient fossil evidence and disregard for the morphological differences between phocids and

otariids. At the time of this publication (Koretsky 2003), the earliest phocid fossils had been found in the Mediterranean, while both odobenid and otariid fossils had been found in the North Pacific. Although genetic evidence supporting the monophyletic model suggested a common North American ancestor, the state of the fossil record in 2003 appeared to support phocids originating in the Atlantic–while walrus and sea lions evolved in the Pacific--which supports the diphyletic origin rather than being descended from a common ancestor as suggested by monophyly. In addition to this, Koretsky (2003) focuses on otarriids' and odobenids' ability to rotate their elongated flippers for easy traversal on land, which contrasts with the reduced flippers of phocids that are unable to support their bodies in an upright position. Given that the calcaneum astragalus and arctoid ankle joint are also present in ursids, the absence of these structures in phocids further supports the conclusion of Koretsky (2003); odobenids and otariids share a common ancestor with ursids, while the mustelid derived phocids evolved a similar appearance convergently.

With advancements in genetics and the pinniped fossil record, Arnason et al. (2006) refutes Koretsky's assertion that seals were unrelated to sea lions and walrus, while hypothesizing a fresh-water origin of pinnipeds which would later be supported by the discovery of Puijila Darwini in 2009. Using the genomes of 39 species, Arnason et al. (2006) constructed a phylogenetic model linking the pinniped genes to other members of Carnivora. Contrary to the diphyletic model, the resulting phylogenetic tree supported the conception of Pinnipedia as a united clade with phocids, otariids, and odobenids, diverging from a single common ancestor approximately

33 million years ago. This conclusion is further supported by the discovery of early pinniped fossils in southeastern North America. Although this entails pinnipeds diversified on the other side of the continent from where sea lions and walrus coexisted in the Pacific, both the genetic and physical evidence now show that phocids were present in North America instead of being confined to the Mediterranean. Taking the location of where the pinniped fossils were found in connection with their shared genetic lineage, Arnason et al. (2006) concludes that rather than evolving in separate oceans, the common ancestor of Pinnipedia likely evolved in a freshwater environment before populations of basal pinnipeds spread out to either side of the North American continent through river systems, before eventually adapting into marine species. The discovery that pinnipeds originated from a freshwater common ancestor that diversified after populations spread into the Atlantic and Pacific oceans both refutes the argument of Koretsky (2003)--that pinnipedia could not be a monophyletic due to its families evolving in different oceans--and strengthens the evolutionary relationship between early pinnipeds and mustelids. However, by asserting that basal pinnipeds may have had a similar lifestyle to that of contemporary freshwater otters, this raises the question of how the significant sexual dimorphism observed in some modern pinniped species evolved.

In a comparative analysis of basal and contemporary pinniped morphology, Cullen (2014) aims to identify sexual dimorphism in basal pinnipeds and their mating strategy prior to diversification. Akin to the findings of Pierotti (1980), Cullen (2014) notes a correlation in the morphology of pinnipeds with pronounced sexually dimorphic features and the utilization of a harem mating

strategy, one male controlling a territory with multiple females. By contrast, pinnipeds with less overt dimorphism adopt a weakly polygynous mating strategy–males mating with multiple females but without an established territory (Cullen, 2014). Taking this correlation into account after collecting data on extant taxa, which showed that the skulls of male pinnipeds have larger average proportions regardless of family group, Cullen (2014) asserts that information regarding the mating habits of extinct pinnipeds can be derived from measurementsof their fossilized skulls and dentition . In contrast to Pierotti (1980), which concluded pinniped sexual dimorphism became reduced as some species adapted to living on ice, Cullen (2014) shows that climate was not the contributing factor. The measurements of Enaliarctos emlongi indicate that it was a highly dimorphic species that may have mated in harems, but the older and more mustelid-like taxa, Puijila darwini and Potamotherium, showed minimal sexual dimorphism consistent with modern mustelids. Based on these measurements, Cullen (2014) concluded that weakly polygynous mating was the ancestral trait of Pinnipedia, while harem mating developed in some taxa shortly after the clade's transition from fresh to salt water in response to increased selective pressure. One such selective pressure pinnipeds faced following their transition from freshwater to the marine environment were changes in sea surface temperature, which, in addition to impacting the survival of modern pinniped populations, likely slowed the radiation of early otariids in the Pacific Ocean.

Using genetic information gathered from sea lions and fur seals, Churchill, Boessenecker, and Clementz (2014) tracked the geographic history of otariids from their evolutionary origins in the

North Pacific to the location of current Southern Hemisphere populations in the absence of fossil remains. To create a genetic map of otariid biogeograpgy, 229 specimens were collected during the study to provide a significant sample size of otariid phylogeny. Although this was the largest genetic sampling of otariids of its time, the authors acknowledge that the scope of their reconstruction may still be limited due to only thoroughly representing four branches of the Otariida family. Despite this, Churchill et al. (2014) showed that, rather than migrating out of the North Pacific in a single migratory event once conditions further south were favorable, the dispersal of otariids into the Southern Hemisphere occurred in a series of staggered waves that began with South America 7-6 million years ago (Figure 1). When correlating the spread of otariids into the Southern Hemisphere with climatic data from the Miocene period, Churchill et al. (2014) hypothesized that the Southern spread of otariids was limited to periods of high productivity and low sea surface temperature. Applying this to pinnipeds in the Anthropocene, the findings of Churchill et al. (2014) demonstrate how, even in prehistory, pinnipeds are vulnerable to changes in sea surface temperature and food availability, just as high sea surface temperatures limited the spread of Miocene otariids–similar conditions under anthropogenic climate change could restrict their ranges to progressively smaller areas.

Churchill et al.'s (2014) use of genomic evidence to discern the distribution of prehistoric pinnipeds in the Southern Hemisphere was necessary due to a relative lack of pinniped fossils in the region. To understand this disparity in fossils, Valenzuela-Toro and Pyenson (2019) conducted a historiographical investigation

of pinniped publications to uncover why this disparity exists in the fossil record, and how a lack of diversity in science impairs the understanding of pinnipeds. Of the 1,296 total occurrences of pinniped fossils published from the 1850's to 2019, Valenzuela-Toro and Pyenson (2019) determined that 90% pertained to specimens in the Northern Hemisphere. While 388 fossil specimens seem like an adequate variety of species for these publications to describe given the rarity of fossilized remains, 60 of these specimens originate solely from Ontocetus emmonsi, while a further 23% of the species are known from isolated bones. Valenzuela-Toro and Pyenson (2019) argue that Ontocetus, a species of walrus that lived in what is now Florida, is the most well-documented prehistoric pinniped that serves to demonstrate a Eurocentric bias in pinniped publications. Although Valenzuela-Toro and Pyenson (2019) do not claim that this is intentional, the best-known species being found in America and Europe shows that the greater number of paleontologists living in these countries has a direct impact on which parts of the fossil record are studied. To combat the Northern Hemisphere bias and expand knowledge of extinct pinnipeds in the Southern Hemisphere, research and publications must incorporate a more diverse range of voices instead of continuing the dominance of the Northern Hemisphere. Be that as it may, one of the most important basal pinnipeds has been recovered from the Northern Hemisphere. Potamotherium, an otter-like pinniped from the Miocene epoch, has a notably well-preserved skull compared to other fossil remains. In addition to the specimen possessing many morphological features that help to bridge the gap between pinnipeds and mustelids, a study of its skull by Lyras (2023) produced an endocast of the

animal's brain, which demonstrates that the tactile information gathered from vibrissae was just as vital to pinnipeds in prehistory as it is in contemporary species.

Potamotherium's mustelid-like morphology and position near the base of pinniped phylogeny helped to discredit Ursidae as the closest relatives of Pinnipedia. Beyond their webbed feet, skeletal proportions, and otter-like lifestyle, Potamotherium's well-preserved skull provided insight into its sensory acuity. Although internal organs do not fossilize, the skull is preserved under the right conditions where sediment can fill the brain cavity and create an endocast of the brain. By CT-scanning this endocast, Lyras (2023) recreated a digital copy of the brain, which allowed researchers to study the prominence of individual sections and their corresponding functions. Using the CT scans, Lyras (2023) determined that, in addition to Potamotherium's brain possessing a similar shape to mustelids, the coronal gyrus was notably enlarged compared to other terrestrial species. In modern pinnipeds and mustelids, the development of the coronal gyrus correlates to vibrissae acuity, which indicates that while the whiskers of Potamotherium would not have been as acute as derived pinnipeds, tactile perception of the environment through vibrissae would have still served as the primary form of prey detection for basal pinnipeds even prior to the clade's oceanic transition. Along with tactile sensitivity, another sense that is vital to pinniped survival is hearing–an ever-increasing risk from anthropogenic noise pollution in the modern age.

Hearing in Pinnipedia is often overlooked due to Clades' reliance on tactile perception, but Taszus (2023) notes a significant distinction between when comparing the cochlear morphology of

seals to otters and terrestrial Carnivorans. Despite their common ancestry and similar use of vibrissae, the CT scans conducted by Taszus (2023) showed that the inner-ear canals of pinnipeds are wide and flattened compared to the narrow pyramidal canals found in otters. Functionally, this morphological distinction demonstrates that pinnipeds can hear a wider variety of low frequency sounds when submerged, while otters can more easily perceive high frequency sounds through the air. Comparing these results to terrestrial Carnivorans–although sea otters were shown to have a lower hearing range than terrestrial mustelids–the hearing range of pinnipeds overlapped more with ursids than any mustelid in the study. Taszus (2023) argues that the prey of both seals and bears produce low frequencies, while otters do not experience the same selective pressure from bivalves. Although hearing prey at greater depths is beneficial for pinniped foraging, like cetaceans, having a heightened sensitivity to underwater low frequencies makes pinnipeds vulnerable to noise pollution and interference from anthropogenic activity in the oceans.

Conclusion

From being regarded as sea bears that were kept out of the Atlantic by a land bridge, to the decades of debate over their origin, and most recently technology revealing the neural anatomy of their most basal members, the study of pinniped evolution has dramatically advanced since it began. While the fossil disparity between the Northern and Southern Hemispheres shows that much of pinniped evolutionary history is still unknown, what has been identified still has useful applications to the threats modern pinnipeds face from anthropogenic climate change. Studying what sea surface temperatures pinnipeds were able to tolerate in prehistory could

serve as a foundation for studying how their movements will change as climate change continues to raise contemporary sea surface temperature, and reduce their haul-out space necessary for breeding. Additionally, understanding the hearing range of pinnipeds and the detection of vibrations through their vibrissae has been vital to their foraging since the beginning; conservationists may be able to produce more informed regulations to combat noise pollution. Although the evolutionary development of pinnipeds in prehistory may appear irrelevant to the modern world, the environmental and biological changes pinnipeds have experienced throughout their evolutionary history has left an indelible mark on their modern biology. By understanding the past and present of Pinnipedia along with how our understanding of it has progressed, we can help to assure that pinnipeds can continue to adapt in the future and aid in the stability of their marine ecosystem.

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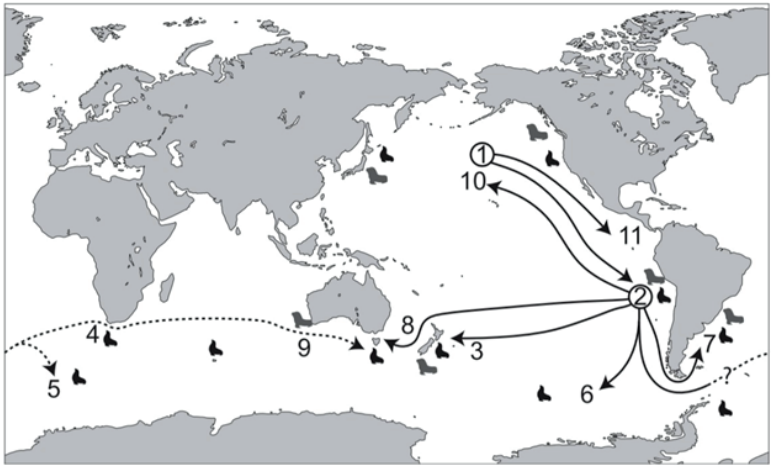

Figure 1. A reconstruction of otariid distribution based on genomic evidence. Churchill et. al., (2014).

Pharmaceutical Waste Threats on Soil Biota, Water Quality, and Public Health

Emilion Boyd-Tucker

University of Alaska Southeast

Communicating Science: BIOL S311

Dr. Heidi Pearson

Abstract

Pharmaceutical waste consists of chemical compounds that pose health risks to microorganisms, plants, and subsequently, humans. Pharmaceutical compounds (PCs) in water sources are derived from urban, agricultural, and sewage treatment center water runoff. Many pharmaceuticals contain persistent heavy metals and halogenated compounds that bioaccumulate in organismal matter. The potential for bioconcentration of pharmaceutical waste and its metabolites is poorly understood. However, when observing population growth, bacterial strains were inhibited due to the presence of antibiotics and synthetic estrogens in water samples. Some risks of human exposure to PCs include: hormonal imbalances, ingestion of antibiotic resistant bacteria, inhibition of brain activity, and hypersensitivity to biochemical reactants in the body. Studies demonstrate that the addition of pharmaceutical compounds into ecosystems threatens microfauna and primary producers' biological fitness. This has caused cascading adverse effects towards upper trophic levels and subsequent community diversity. One remediation method of pharmaceutical waste pollution involves the utilization of biochars (BCs), which are composed of carbon material from organic matter, as they effectively increase the water capacity of soil and have the potential to remove pharmaceutical waste due to their porosity. The application of reverse osmosis filtration in wastewater treatment centers is another possible solution to decontaminate domestic water sources such as drinking and agricultural waters. Overall, as remediation efforts continue to be explored, concentrations of pharmaceutical waste in said waters requires further research in order to understand the long-term PC exposure effects and imple-

ment government regulations that enforce their removal at water treatment facilities–thus, protecting soil biota, water quality, and public health.

Introduction

As the global population continues to rise and chemical-based medications are increasingly used to treat disease and other ailments, pharmaceutical waste compounds and their metabolites continue to accumulate in sewage and ground water. Although these medicinal treatments are often essential for human health and survival, the large-scale impacts on flora, soil biota, and consequently human consumption of pharmaceutical waste compounds, have yet to be understood. Some sources of pharmaceutical waste are landfill seepage, health care facilities, human and livestock waste, negligent drug disposal, and pharmaceutical manufacturing plants (Sharma et al., 2021). The most common forms of pharmaceutical compounds (PCs) found in the environment include antibiotics, anti-inflammatory drugs, lipid or fat regulators, steroids, hormones, cancer therapeutics, and beta-blockers otherwise known as blood pressure medications (Nikolaou et al., 2007). The prevalence of PCs in domestic water sources is concerning, as the reactive nature and consequences of their interactions with other chemical species and pharmaceutical metabolites in a given environment are unknown.

However, it is known that the presence of these pharmaceutical contaminants can hinder plant development–bacteria can become highly resistant to antibiotics, and the biological fitness of microorganisms is adversely affected (Bartrons et al., 2017). Human exposure to pharmaceuticals and personal care products (PPCPs), defined as chemical compounds found in cosmetics, skin care prod-

ucts, hair care, cleaning products, and fragrances, include risks such as hormonal imbalances, ingestion of antibiotic resistant bacteria, inhibition of brain activity, and hypersensitivity to biochemical reactants in the body (Kuchangi et al., 2023; Keerthanan et al., 2021). Currently, the U.S. Federal Government has a list of chemicals, metals, and other contaminants that must be removed from wastewater before being released, but PCs are not included (Lakeside Equipment Corporation, 2023). Despite some attention being raised about the issue, only four compounds found in birth control and antibiotics now are being considered for testing and removal conducted at water treatment centers, but definitive removal action has yet to occur. Removing PCs by utilizing reverse osmosis (RO) filtration or biochar (BC) application may be potential solutions, but great research efforts must be conducted to explore these avenues. To ensure the safety and reliability of essential water sources for both the public and environmental health, wastewater treatment centers and management of pharmaceutical waste disposal must effectively remove these compounds before they harm communities and ecosystem biodiversity.

Classifying Pharmaceutical Waste

There are different types of pharmaceutical waste–including hazardous waste, non-waste, and their decomposed metabolites. To define, metabolites are broken-down small molecules that result from the products and intermediates of biochemical cellular processes, such as degradation and elimination (Yang et al. 2022). The Environmental Protection Agency (EPA) classifies hazardous waste as possessing properties that make it dangerous or potentially harmful to human health or the environment including compounds such

as pharmaceutical chemicals, cancer therapeutics, and beta-blockers or medications used to treat high blood pressure, known as hypertension, and irregular heartbeats, known as arrhythmias (EPA 2023; Nikolaou et al., 2007). Once these hazardous pharmaceutical compounds decompose, the chemical properties of their metabolites are vast yet unclear regarding their effects on soil and water quality. One example of a hazardous pharmaceutical waste compound is the blood thinner Warfarin, most widely known by its brand name Coumadin® (Justad, 2010). As a water-soluble medication with anticoagulant properties, Warfarin is used to treat conditions involving frequent blood clot formation but is also utilized as a rat poison (Justad, 2010). As for the protocol in a pharmacy, all disposable products that encounter Warfarin need to be disposed of in a specified, sealed bucket including gloves, paper towels, and tablet bottles that contain and have subsequently been contaminated by the medication (EPA, 2023). Furthermore, all surfaces that have been physically contacted by Warfarin must be thoroughly cleaned with 70% isopropyl alcohol to avoid contact and possible adverse health effects with the hazardous waste outsourced and incinerated separately, in which the ash is disposed of in a permitted hazardous waste landfill (EPA, 2023). These protocols are important to avoid risks to community members and environmental contamination from toxic compounds. Non-hazardous waste implies that the compound is not regulated by the Resource Conservation and Recovery Act (RCRA), which determines proper management of hazardous and non-hazardous waste (EPA, 2023). This fact does not necessarily imply that the chemical does not decompose or affect an environment without negative impacts, but some examples of

non-hazardous pharmaceutical waste include over the counter medication, antibiotics, birth control, testosterone injections, anti-inflammatory medications, and eye drops (EPA, 2023). Antibiotics are biological active compounds that are used in livestock animals and humans to prevent and treat bacterial diseases (Keerthanan et al., 2021). Furthermore, anti-inflammatory drugs such as Ibuprofen, or Motrin ®, and Acetaminophen, or Tylenol ® are also widely used as pharmaceutical products, and they are frequently found in the environment due to their unwarranted use (Keerthanan et al., 2021). In addition, given the high use of birth control, synthetic hormones, like an estrogen hormone ethinylestradiol, are abundantly prevalent in the environment (Keerthanan et al., 2021). Additionally, as previously stated, beta blockers or blood pressure regulators such as atenolol, metoprolol, and nadolol are also commonly detected in the environment due to the fact that they are prescribed worldwide (Nikolaou et al., 2007). Meanwhile, blood lipid regulators, antiepileptic medications, and stimulants, like caffeine, "are observed in the environment from tens of mg/L to thousands of ng/L," (Keerthanan et al., 2021). When these non-hazardous wastes expire at a pharmacy, they are also compiled into boxes and shipped to locations to be incinerated or potentially recycled if deemed acceptable (EPA, 2023). There are a variety of complex ways in which these determinations of reusing or eliminating the PCs are made, yet despite the thorough efforts to have proper disposal methods, much pharmaceutical waste is still dispersed into local environments from a multitude of sources.

Sources of Pharmaceutical Waste

The sources of pharmaceutical waste are extensive and complicated. Human waste is a major contributor to PC presence and contamination because many active medications are not metabolized by the body, and are instead excreted through urine and feces (Price and Patel 2023). This refers to the bioavailability of a medication, or in other words, the extent that a medication can be completely available to its biological destinations in the body (Price and Patel 2023). Human waste eventually makes its way to sewage treatment centers where it is not required to remove pharmaceutical compounds. Subsequently, pharmaceutical compounds become present in commercially grown crops from the practice of using raw and treated wastewater from these sewage facilities as indicated amongst the many sources of PCs in Figure 1, thus causing soil contamination by both PCs and their metabolites (Sharma et al. 2021). Furthermore, applied biosolids, or treated sewage sludge, contribute to pharmaceutical waste and contamination as they are nutrient-rich organic materials that result from sewage treatment facilities (Prosser and Sibley, 2015). Although biosolids are a beneficial resource that have essential plant nutrients, they have been shown to contain numerous PCs, thus creating concerns over the adverse effects associated with pharmaceutical waste in both terrestrial and aquatic ecosystems (Prosser and Sibley, 2015). A study from Prosser and Sibley (2015) demonstrates that levels of PCs are detected in higher concentrations in sediments compared to water from treatment plants with the presence of seventeen different pharmaceutical compounds in sediments, as well as soil from various marsh areas in Canada. Therefore, it can be deduced that sediments can act as a

sink to accumulate pharmaceutical compounds.

Another method in which pharmaceuticals end up in water sources is due to inappropriate medication disposal. It has been found through studies that more than 50% of patients in the United States flush their medications down the toilet, and less that 1% return their unused pharmaceuticals to the pharmacy (Insani et al., 2020). However, it is known that the most common form of disposing of unused medications is by throwing them in the garbage, in which they end up in the landfill (Bartrons et al., 2017). Subsequently, landfill seepage is a major contributor to pharmaceutical waste accumulation in groundwater and aquatic ecosystems. Lastly, pharmaceutical compounds become present in both agricultural and drinking water due to the manure and excrements of livestock, as many animals are injected with growth hormones and antibiotics during mass farming production; consequently furthering the threats of limiting the biodiversity of an environment (Martinez and Cuautle, 2017).

There is emphasis on the necessity of removing PCs from wastewater treatment centers across the U.S. to protect local water sources, soil biota, and ecosystem biodiversity. It is important to protect biodiversity as it involves the genetic properties and characteristics of individuals in a population, along with the abundance and distribution patterns of individuals in a given species. Interactions between different species at the community level (with their physical environment) and the ecosystem level can become disturbed through the elimination of a keystone species (Martinez and Cuautle, 2017). It is highly plausible to interrupt an essential species with the presence of pharmaceuticals, as plants and microorganisms

are the base of trophic systems in a given environment and can be both vulnerable and sensitive to polluting chemical compounds.

All these modes of transportation of PCs into the environment are problematic because the stability and environmental metabolism of PCs are unknown factors that can regulate the prevalence and reactive nature of various chemical compounds in the environment (Maculewicz et al., 2022). Assessing pharmaceutical waste persistence and concentrations are crucial in understanding the ecological consequences to given soil biota, and subsequently higher trophic levels. Biodegradation, photolysis, reduction/oxidation reactions, and hydrolysis are all mechanisms in which compounds can decompose into smaller products or metabolites that have their own unintended and unpredictable adverse effects to a given environment or water body (Keerthanan et al., 2021). To continue, the rate of decomposition of pharmaceutical compounds in the environment depends on the conditions such as temperature, sunlight exposure, microbial activity, and the medium they are exposed to like soil, sediment, air, or water (Keerthanan et al., 2021).

Human and Environmental Risks

Once PCs are in the environment or present in drinking water, there are a variety of human health concerns due to exposure. Plants accumulate and metabolize pharmaceutical compounds at toxic concentrations. The dietary intake of contaminated plants can pose a risk to ecosystems and potentially have a harmful impact on human health. Consuming contaminated vegetables can develop antibiotic-resistant pathogens in the human body, leaving humans at high risk of complex health complications (Kostich et al., 2014). Not to mention, the increasing biomagnification risks of contam-

inants as pharmaceutical compounds are magnified through each trophic level of the food web (as depicted in Figure 1) from plants, to cows, to people. Further, some other medical issues, such as a weak estrogenic activity, immediate sensitivity to crucial chemical reactions in the body, and inhibition of the enzyme responsible for the activity of the central nervous system have also been reported (Bartrons, 2017). Additionally, bacteria frequently encounter antibiotics in the environment in the soil, as well as in our bodies and those of animals. Through mutation and selection, bacteria can develop defense mechanisms against antibiotics in which antibiotic resistant bacteria mostly survive these encounters and then multiply in the same manner (Sharma et al., 2020). This results in an increased chance of people being infected with antibiotic resistant disease-causing bacteria, leading to increased complications, prolonged hospital stays, and an increased risk of death in humans (Sharma et al., 2020).

Potential Solutions

One potential solution to eliminating pharmaceutical waste from drinking, agricultural, and environmental water sources is by implementing reverse osmosis filtration at every wastewater treatment center across the nation. RO is the process where pressure forces water through a semi-permeable membrane, creating a stream of treated water known as permeate and a stream of wastewater called concentrate (EPA, 2023). These systems can potentially remove water contaminants such as lead, volatile organic compounds, arsenic, bacteria, viruses, and pharmaceutical waste compounds (EPA, 2023). There are some detriments to this process, though, as it does produce a large amount of waste-concentrated

water. The benefits of a safer level of public and environmental health may outweigh the waste produced, though. While RO filtration can improve water quality, it generates about five gallons of reject water for every gallon of permeate produced (EPA, 2023). The production and improvement of efficient RO technology can act as a more immediate solution to unsafe PC concentrations in wastewater treatment centers.

With such a lack of research or knowledge on long-term effects, there are more solutions that can be proposed. The application of biochars can be considered in which organic waste matter that has been heated through pyrolysis can be utilized as an adsorbent for pharmaceuticals. Pyrolysis is the process of heating organic waste matter to produce a charcoal-like substance called biochar (Caban et al., 2020). The porosity and polar sites of biochars either repulse or attract certain pharmaceuticals, thus allowing a study by Caban et al., (2020) to suggest that crop-derived biochars have a high potential to be used for removing PCs from agricultural soil and its respective biota. However, further research needs to be conducted to determine actual protocol of its use, especially regarding the soil properties.

Conclusion

With frequent water treatment at sewage treatment facilities and continued research on the adverse effects of pharmaceutical waste on humans and ecological systems, a better understanding of the exposure to the toxicants can be obtained. Additional government regulations and policies are needed to enforce the removal of PPCPs at water and sewage treatment facilities to protect groundwater, crops, microorganisms, and the public. Only once

these conditions are understood regarding the long-term effects of pharmaceuticals in our drinking and agricultural waters along with aquatic and soil biota, the EPA can create appropriate water quality regulations at water treatment facilities.

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Figure:

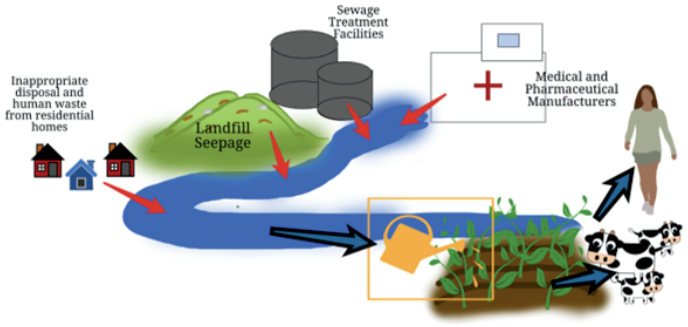

Figure 1 : Image created depicting the path of pharmaceutical waste (indicated by red arrows) from various sources into an aquatic system. Pharmaceutical compounds and their metabolites (indicated by blue arrows) are then transferred from the water body used in agriculture to crops and their subsequent higher trophic levels (i.e. cows, people).

Critical Performance 4: Theory of Teaching and Learning

Kristine Toms

University of Alaska Southeast

Learner/Learning Process: ED333

Dr. Jeffrey Lofthaus

I am extremely excited to become an elementary teacher. I will enjoy teaching any grade, but I feel that I can make the most difference teaching second or third grade, because that is where they are beginning to develop the bigger foundational skills that their academic success is built upon––reading fluency, writing, and multiplication. I have learned a lot at Larson Elementary over the last six years with my practicum in a second-grade classroom, and as a Records Specialist working with the special education and MTSS processes, along with my experiences as a reading and mathematics tutor and substitute teacher. I feel very fortunate to have worked so closely with the Instructional Coach over the years, and to have had my practicum with such a wonderful teacher with excellent classroom management skills. My teaching philosophy and classroom ideas reflect evidence-based research and my professional experience at the school.

Development

Children in the elementary grades are at a wonderful age to teach since they are at a crucial stage for cognitive development that schools are able to influence (Bronfenbrenner, 1999; Berk, 2018; Miller, 2011; Trawick-Smith, 2018). While some elementary-aged children may have problems with abstract thought and hypothetical situations, they are in the process of developing moral reasoning and objective thought, as well as learning to problem solve, infer meaning and relationships, understand perception differences, and order and classify objects along with performing mathematical operations (Piaget, 1964).

Social, moral, and emotional development is also critical during this time, with children learning moral reasoning, consid-

ering intentions, and comparing themselves to others. I agree with Erikson's psychosocial theory that elementary-aged children are especially susceptible to developing a negative self-image that may hurt their learning (Erikson, 1968). So, encouraging students to be successful is important. This is also a reason why I believe it is important to establish a safe, positive, and supportive classroom community, especially with schools having increased influence on their social development (Erikson, 1968), along with the importance of students learning cooperation (Piaget, 1932) and prosocial behaviors (Eisenberg, 2001).

Learning Theory

My professional experience as a K-2 reading tutor includes instruction using the science of a reading-based phonics program, UFLI Foundations. So, I have seen how beneficial explicit and systematic direct instruction can be. I have also seen students struggle when they do not have a good foundation in the basics (e.g., decoding, phonics, multiplication facts). However, I have also learned the benefits of project-based and cooperative learning constructivist teaching methods that are founded on Dewey's (1897), Piaget's (1964), and Vygotsky's (1978) theories. The graduate course I took in reading apprenticeship had us learn and practice specific strategies based on this method of teaching. I feel it is important to include opportunities for student-centered learning, especially since significant academic benefits for students have been found, including decoding skills (Foster & Knapp, 2013; Knapp, 2016). But, I also think we should continue to focus on building basic academic skills that are well-defined with direct instruction (Dean et al., 2012; Dick et al., 2015; Frontier & Rickabaugh, 2014).

Motivation

Motivating students so they are eager to learn is a key component of effective instruction (Driscoll, 2005). I often use praise and other rewards with students to increase motivation, but I have learned it is important to do so for their efforts instead of ability (Goslin, 2003; Schunk, 2016; Yeager & Dweck, 2012). As a tutor, I rewarded students for improvements in their reading fluency scores instead of for the highest scores. I also saw how providing scaffolding so students can be successful in reading more challenging texts can greatly increase their motivation, since motivation increases as a task gets more difficult (Atkinson, 1958). I also increase motivation by having high expectations (Hinnant et al., 2009; Good & Brophy, 2018), remembering to give lots of opportunities for small successes (through questions, etc.), providing immediate and specific feedback, and having consistent expectations and follow-through (Schunk, 2016).

Classroom Management

Since effective classroom management can provide a positive and productive learning environment that increases student learning and achievement (La Paro et al., 2004; Allen et al., 2013), I am thankful to have had my practicum with a teacher who has excellent classroom management skills and that I have had a chance to apply what I have learned as a substitute teacher. These skills include having clear expectations and routines, managing transitions (Babkie, 2006), and using group reward systems (Thorne & Kamps, 2008). I have also learned how important it is to ensure my lessons are well structured and prepared, and to maintain group focus during lessons by using frequent active response opportunities such as choral

responses and whiteboards for the students to hold up, along with actively walking around the classroom to monitor and help students (Simonsen et al., 2008).

As a tutor, I also used effective classroom management strategies such as teaching with enthusiasm (Patrick et al., 2000), which comes naturally to me, and having a small number of class rules that are clear and explicitly taught (Simonsen et al., 2008). Our Instructional Coach also had us teach with a sense of urgency since increasing engaged time and teaching at a rapid pace has been found to increase learning (Barnes, 2013; Dean et al., 2012; Edwards, 2014; Jones & Jones, 2016; Manning & Bucher, 2013; Wentzel & Brophy, 2014), especially since our curriculum interleaved the concepts so we were not teaching for mastery.

Standards and Assessment

I have considerable experience with AIMSweb benchmark and progress monitoring assessments as well as supporting teachers during MAP testing as a tutor. Even though I hate the idea of teaching to a test, the reality is that students need to learn the skills to do well on these tests, and I recognize the benefit of these assessments in helping me develop my lessons. It is important for educators to be knowledgeable of the academic standards for their grade level and to ensure their teaching objectives, instruction, and classroom assessments are all aligned (Brookhart & Nitko, 2015; Buhle & Blachowicz, 2008/2009; Lloyd et al., 2013; McAfee et al., 2016; Waugh & Gronlund, 2013). However, since student achievement scores on standardized tests improve, the more instruction covers what is tested (Lloyd et al., 2013; Popham, 2014; Russell & Airasian, 2012), and since some of these tests include advanced

concepts traditionally taught in higher grades, I think it is also important for educators to look ahead and collaborate with the teachers in the higher grades to introduce some of these concepts to students sooner. Teachers can also help students increase their scores by training them in test-taking and relaxation techniques (Dockterman & Weber, 2017; Minahan, 2018).

Diversity

Even though I think it is important for students to gain a strong academic foundation, I am not a big fan of homework, keeping in mind how diverse and busy our students and their families are. Offering students choices and making lessons meaningful to my diverse community of learners based on their interests and backgrounds is important (Doubet & Hockett, 2015). Teachers should consider all learners when developing their lessons, and what scaffolding and other means of access and assessment may benefit the whole class. Some possible ways I can provide differentiation to support my students is to let students redo projects and tests if they do poorly on them (Guskey, 2011; Tomlinson & Moon, 2013; Wormeli, 2011), use visual cues (Mayer, 2008), teach with enthusiasm (Cooper, 2014; Patrick, et al., 2000), and support the use of technology and accessibility devices (Grant & Basye, 2014; Gura, 2016; Wilson, 2014). Part of building a classroom community also involves frequent communication with families and building a partnership with them (Epstein et al., 2002; Mendler, 2012). This includes communicating about good news, not just bad, since this can reinforce positive behaviors and significantly increase student engagement (Kraft & Dougherty, 2013). As a Records Specialist, I regularly communicated with families to schedule all special educa-

tion meetings. This is something I enjoyed. I value building positive relationships with families and encouraging their participation in the classroom, recognizing that not all will be able to. It is also important for schools to continue to provide planned academic and social activities and events to increase school-wide family engagement (Banks et al., 2023). I have enjoyed providing support for these events as a staff member, which is something I plan to continue as a teacher.

Foundations

Using evidence-based instructional strategies is an increasing focus for educators today (Cheung & Xie, 2021). Having a teaching philosophy supported by research-based theory and evidence, applying these practices, and remaining open to revising them based on new research and experience is key to being an "informed, reflective, and responsive educator" (School of Education, 2011, p. 10). Through my formal education at the University of Alaska Southeast and professional experiences in education, I have formed a teaching philosophy that I plan to continue to develop through experience and advancing my knowledge of evidence-based practices as a lifelong learner. In the near future, this includes completing the Master of Education, Reading Specialist degree I started coursework for, and becoming LETRS certified.

Discussion

Through reflection on my academic and professional experiences, I formed some possible ideas to consider implementing within my classroom. However, I recognize that not all may be feasible and that I also need to consider the vision and priorities of my principal, school, and district. These ideas specifically address

second grade at Larson Elementary, but may be useful at similar schools within the district.

Mathematics

The iReady mathematics curriculum seems to have a top-down approach, where students are asked to solve many word problems using the different strategies they have learned. This curriculum leads well to cooperative learning, such as having students share the strategies they used. However, ensuring students develop arithmetic fact fluency is also important since it can support higher-level mathematics proficiency (Price et al., 2013; Arroyo et al., 2011; Tronsky & Royer, 2003). Even though there are concerns about creating anxiety for children with timed fact practice (Boaler, 2014), this traditional method for children to learn arithmetic facts has been found to increase accuracy (Rea & Modigliani, 1985) and automaticity with daily practice (Jazbutis, et al., 2023; Knowles, 2010; Rickard et al., 2008). Furthermore, using this type of distributed practice (Ebbinghouse, 1885/1964) can significantly increase long-term retention (Kang et al., 2016; Roediger & Karpicke, 2006). Therefore, it is recommended for classrooms to spend around 10 minutes a day to "build fluent retrieval of basic arithmetic facts" (Gersten et al., 2009, p. 6). The online i-Ready mathematics pathways provides some individualized math fluency practice, but I believe we should offer more starting in second grade. The third-grade teachers at Larson Elementary use printed Rocket Math worksheets for timed drills that the students progress through at their own pace, so one student may be on 3s while another is on 8s. As a third-grade mathematics tutor, I saw students struggle to solve the curriculum's daily mathematics workbook questions (often word

problems) that assumed they already knew their multiplication facts. I saw the students try to use other strategies, such as grouping dots on a page, and how time-consuming and frustrated they got with this. I also saw the benefits of providing daily timed multiplication fact drills instead of weekly. The class that provided this five-minute timed practice daily had all students become successful in learning their multiplication facts and getting through to division, whereas most of the students in the other class who did this weekly did not progress as well. Later, when my own son attended third grade at Larson Elementary, I noticed something else. His class used a new form of Rocket Math worksheets that did not follow the traditional orderly progression (learning 2s before 3s and so on). Instead, each worksheet had a mixture of facts (e.g., 2s, 3s & 4s). My son, who usually does well academically, ended up struggling to learn them. I have heard of other students from that class who had the same difficulty, so I think this approach is better as a review instead.

With some standardized tests like MAP being adaptive so that students are potentially answering questions above grade level, I think looking ahead to see what we can do to prepare students better is important. I can see how adding 5-10 minutes of mathematics fact practice daily using the Rocket Math worksheets that use an orderly progression could greatly benefit second-grade students. I propose starting with addition, but with daily practice, most students should be able to progress to at least start multiplication to be better prepared for 3rd grade, instead of just focusing on teaching skip counting (2NBT.2) and having the students work with equal groups of objects (2.OA.3-4) to do this (MSBSD, 2021c). Teachers can also further coordinate with the higher-grade level teachers

to see what other mathematics skills may benefit students, and see about the feasibility of introducing some of these concepts sooner.

Reading Fluency

I had the privilege of teaching the science of reading based phonics program, UFLI Foundations, as part of a team of K-2 Tier 2 reading tutors, so I have developed a good understanding and appreciation for this type of instruction. However, we also saw how it only addresses one part of Scarborough's Reading Rope (2001) and how students need much more than just phonics instruction to become fluent readers. At first, we followed the recommended pace of teaching two lessons a week, but our weekly oral reading fluency progress monitoring scores did not show as much growth as we had hoped. Since our intervention groups were during the classrooms' literacy blocks and the students were not reading at home, we worried they were not getting enough reading practice. So, we decided to slow down the pace of our lessons to allow more time for daily practice reading-leveled texts in addition to the program's easier decodable texts. We saw great progress with this change, and I just wish we had done it sooner. There is debate about whether leveled texts should be used (Osborn & Massey, 2022); however, I find them to be the closest texts we have to AIMSweb oral reading fluency probes, and since the greater the overlap there is with instruction and assessments, the more achievement scores improve (Lloyd et al., 2013; Popham, 2014; Russell & Airasian, 2012), I think they are very valuable. In addition, I found that they can be used to provide students with scaffolded practice with complex texts. The Common Core State Standards suggest that students should start reading complex texts in second grade (Osborn & Massey, 2022), and the

Matanuska-Susitna Borough's Reading Standards (2021a) provides a range of reading and levels of complexity. Research has shown significant gains in reading fluency and comprehension for struggling readers in second and third grade who read texts above their instructional levels with assistance from more capable peers within structured dyads (Brown et al., 2018). A study done by Eldredge and Quinn (1988) found that reading scores of second-grade students doubled that of the control group, and studies by Brown et al. (2018) and Morgan (1997) found that second and third-grade students who read texts two years above their instructional levels had the greatest gains at an average improvement of over 2.5 grade levels, double that of the control group, with reading 15 minutes daily for 95 days over a span of around five months.

Many of my second graders were able to read the second-grade stories with ease near the end of the year, so I worked with the third-grade teachers to provide more challenging texts. However, I was surprised to find that my students could read these just as well. I ended up finding that the beginning fourth-grade level texts introduced multisyllabic words and were the perfect difficulty level for scaffolded instruction. Not only were my students' fluency scoresimproving, but so was their enthusiasm for reading and their sense of pride and confidence as readers. I think of phonics and decodables as a great way to practice targeted skills, but I think it is also important to provide students with daily practice reading grade-level texts similar to what is used for AIMSweb (I believe i-Ready has some), and to provide scaffolding so students can successfully access more complex texts. Since distributed practice (Ebbinghouse, 1885/1964) can result in big academic gains (Kang

et al., 2016; Roediger &; Karpicke, 2006), it makes sense that we should add in daily extra practice for the skills we are the most concerned with, like reading fluency.

Writing

The final ideas I will share are simple and easy to implement. Second-grade students at Larson Elementary write in their journals in the mornings during centers; each day, they respond to a new prompt. Some students write a paragraph while others struggle to write anything down; most are somewhere in between with a few incomplete sentences and many mistakes. I have learned how important writing practice in journals can be, but that revision is a crucial step (Calkins,1994; AIR, 2021). This step is currently missing, so I would like to continue with daily writing in journals, but develop one throughout the week so there is a chance for review, feedback, and revision. With some standardized tests now including a part where students type their writing on the computer, we could possibly look at introducing this step to the writing process. These ideas are supported by the Matanuska-Susitna Borough School District 2nd Grade Writing Standards (2021a) and K-2 Information and Technology Literacy Standards (2021b).

Conclusion

Even though I highly value academics and love how excited students get when they are supported to learn challenging subjects, I also recognize the importance of incorporating other engaging activities and learning opportunities within my classroom, such as technology and the arts, since they have been found to promote creativity, engagement, learning, and communication skills as well as a positive classroom community (Bowen & Kisida, 2023; Cham-

bers et al., 2006, 2008; McCrudden & Rapp, 2017; Renkl & Scheiter, 2017; Ruppert, S., 2006; Schnotz & Wagner, 2018; Takacs et al., 2015). A constant theme for my teaching philosophy is that I value using a variety of evidence-based instructional approaches. I plan to continue actively developing my understanding and skills of these methods to become the best teacher I can, to prepare my students for their futures.

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Ecofeminism in Appalachian Literature: Sensuous and Spiritual Embodiment in *Fair and Tender Ladies* by Lee Smith

Samantha M. Zelley

University of Alaska Southeast

Southern Women's Literature in the Twentieth Century: ENGL S418

Professor Jay D. Szczepanski

An underappreciated subdisciplinary sphere in literature that provides rich opportunities for ecocritical and ecofeminist thought is Appalachian literature, particularly that which is written by Southern women. According to Carole Ganim, women's literature about the Appalachian landscape dances between the binaries of body and mind, nature and spirit, showcasing a union between the physical world and the psychological, philosophical, moral, and political aspects of earth-centered existence (Ganim 258). *Fair and Tender Ladies* by Lee Smith provides particular wealth for these frameworks. The life of the epistolary novel's protagonist, Ivy Rowe, is situated in the heart of Appalachia in West Virginia. Smith herself is from a coal-mining town in Virginia (Wikipedia Contributors), attaching personal credibility to the novel's natural landscape, socioeconomic relationships, understanding of Appalachian femininity, and, especially potent to this article, an appreciation for environmental exploitation contextualized in the culture of coal (Bodenhamer) that is specific to Appalachia. In *Fair and Tender Ladies*, Ivy serves as a mirror and conduit of the Appalachian landscape in its sacred and sensual contexts, effectively critiquing the logic of extraction as it applies to the coal industry and environmental exploitation of pastoral landscapes in Appalachia.

The logic of extraction is essential to environmental degradation on a global scale and is especially potent to coal as an industry and culture in Appalachia. Succinctly defined by Rebecca R. Scott in Removing Mountains, the logic of extraction is "the habit of viewing the Earth as property [which] is related to other forms of domination, such as the domestication of animals" (Scott 8). There is a perceived binary in Western cultures between the human/nonhu-

man binary, with humans being the privileged signifier—economic interests are pursued at the expense of the environment, which is the fundamental base logic for massive environmental exploitation and degradation, in this case, the coal industry. Importantly, this logic as it pertains to the coal industry is not merely an Appalachian problem, but is an American problem—our energy sources in the United States have indeed improved dramatically since the 20th century. However, we still rely on coal for 9.8 percent of our energy consumption ("Use of Coal") as greenhouse gas emissions continue rising. Thus, applying literary ecocritical and ecofeminist thought to the culture of the coal industry has broad and important implications including and beyond Appalachia.

In *Fair and Tender Ladies*, Ivy grows up in Sugar Fork, a pastoral landscape where she develops an acute awareness and appreciation for Appalachia, particularly the imagery of the Appalachian mountains and their watersheds. In a letter that she writes to her deceased father, she writes "Oh Daddy dont you rember how you took us up the mountain ever year about this time to gather birch sap, it was so sweet and tart on yor tongue, and you said, Slow down, slow down now, Ivy, This is the taste of Spring" (Lee 82, underline and grammar original). From her time as a young girl, Ivy attaches a certain sentimentality to her rural Appalachian landscape—however, the rural lifestyle her family leads is materially one of poverty.

Indeed, Ivy's family's subsistence lifestyle importantly connects her to the rural Appalachian landscape, but Lee effectively critiques the falsely idealized pastoral myth that is commonly associated with rural living in Appalachia. Writing to her wealthy grandfather whom she has never met, Ivy pleads "My daddy is sick

now Momma is not pretty no more but crys all the time now I thoght you migt want to know this I thoght you migt want to help out some iffen you knowed it and send some money to us…We have not got hardly a thing up here now but meal and taters and shucky beans" (Lee 24). As a growing child, Ivy attempts to reconcile the beauty and refuge of the Appalachian landscape with the material realities of being poor and hungry.

After living in Majestic for a short time, Ivy moves to Diamond—a coal-mining town. The town is named after its main economic driver, the Diamond Mining Company. At first, Ivy's outlook on the town's economy is sympathetic, even enthusiastic:

> "Diamond, Va., picture it if you can. If you stand in the bottom by Diamond Creek looking up the mountain, as I did yesterday in the pale pearly early morning light…it is just fantastic! Row upon row of houses and people in every one like bees in a hive…It seems to have sprung from the mountain already-made like mushrooms spring up on the mountain after rain…The company will buy you everything if you live here… It seems like a giant play town to me, or like paradise." (Lee 137).

Economic and resource security are novelties to Ivy that she associates with the coal industry, resulting from the "vast ideological construction implying that coal mining is the impetus for economic and resource security in West Virginia" (Bodenhamer 1145). However, interestingly, her admiration of Diamond's landscape is still rich with natural imagery—she compares suburban housing developments to "bees in a hive" and "mushrooms [sprung] up on the mountain after rain" (Lee 137). During her time in Diamond as

a young mother, the economic security associated with coal mining in Appalachia allures her as she uses natural imagery to mediate between urban development and her sacred landscape.

However, the ultimate catalyst that collapses, literally, her rather optimistic outlook of the coal industry is the collapse of the Diamond Coal Mine, where the "only way [rescuers] could identify the bodies was by the check number on them. The men were black, smoking…The groaning and suffering was terrible" (Lee 175). To Ivy's surprise, her dear childhood friend, Oakley Fox, emerges from the mine: "The huge black mouth of the mine yawned smokey and wide before me, and three men came walking out. One of them was Oakley" (Lee 176). After she recounts the collapse of the coal mine in a letter to her deceased sister, Silvaney, rather instantaneously, she says "Oakley and me got married. And we will be leaving here" (Lee 177). The collapse of the coal mine suddenly became personal to Ivy, wherein she realizes the environmental and spiritual risk of degradation—these are non-negotiables for Ivy, as she does not hesitate to leave Diamond and return to Sugar Fork, her sacred rural space in Appalachia. She, again, recalls her father's relationship to her family's land, repeating almost as a mantra or prayer: "I can hear Daddy saying, Slow down, slow down now, Ivy. This is the taste of Spring" (Lee 177).

Ivy's return to Sugar Fork is spiritual—"I would just as soon sit in the breezeway looking out at Bethel Mountain, as to go to church. I would just as soon sink into this soft warm darkness where I have been for years" (Lee 206). Although her husband, Oakley, participates in the Christian faith, Ivy connects with a nature-based spirituality rooted in topophilia—a deep, sacred love for the land.

Through a Christian framework, Ivy's spiritual relationship to the land is rather Pagan, as mysticism and folklore also mediate between herself and the Appalachian landscape, such that is passed down to her through her grandmother's oral storytelling. This exemplifies the Scots, Irish, and Scots-Irish diaspora influence of storytelling, folklore, and land-based spirituality in Southern Appalachia (Tull 6-7), particularly when Ivy describes the ritual of planting potatoes on the farm:

"We planted our potatos in the dark of the moon, later that spring, just Oakley and me. We planted when the signs were in the legs. Granny came by the house that afternoon to say, It is a fine night for planting potatos, so that is what we did…Oakley says he doesn't believe a word of this plant in the dark of the moon stuff. But it is fun." (Lee 190)

Thus, Ivy's spiritual relationship to the Appalachian landscape as a sacred space is mediated by her ancestral relationship with her family's farm in Sugar Fork, which is itself mediated, particularly through Ivy's grandmother, by folklore and mysticism. It is this relationship upon which her acute awareness of environmental extraction and degradation is based, which is foundational to her ultimate performance of environmental activism towards the end of the novel.

Ivy's spiritual relationship to the land eventually bridges to the sensual when she meets Honey Breeding, the "bee man" (Lee 210) who comes to Ivy's and Oakley's land to help them rear honeybees to farm, well...honey. Whether or not Honey Breeding is a real human being or a figment of Ivy's environmental imagination is unclear, and both propositions are useful to the argument that Ivy's

relationship to the Appalachian landscape is both sacred and sensual. In a letter to her sister, Ethel, Ivy herself ponders the possibility that she imagined him, writing "Honey Breeding did not seem quite real. He seemed more like a woods creature fetched up somehow from the forest, created out of fancy, on a whim. [He] seemed like a man that I had made up in the cool dark springhouse, like a man I had immaginned until he came true" (Lee 214). Whether he is a real or imagined person, he becomes the embodiment of Ivy's environmental imagination and topophylic relationality, which allows her to transcend, if only briefly, the monotonous routine of being a rural housewife and mother which pulls her down into a dissociative depression. Thus, "the spell of the sensuous" (Abram) becomes the balm for Ivy, which embodies relationality to the land that kindles her environmental awareness and activism. When Honey Breeding first arrives at the farm in Sugar Fork, Ivy and her children are home, but Oakley is not—this is necessary for the following scenes to unfold, wherein a sensual relationship between Ivy and Honey grows at the expense of Oakley's trust and Ivy's marital fidelity. Watching him from the window, Ivy writes "he just knew we were watching him!...he untied the neck of his sack and reached down in there and came up with a big piece of dripping honeycomb and placed it down in the beegum, on those cross sticks. Then he put the head back on the beegum and licked his fingers" (Lee 215). Ivy also notes that he "didn't wear a hat" and "didn't have no gloves," repeatedly looking back at the house as "somehow he just knew we were watching" (Lee 215). Like a honeybee herself, the somatic and sensual experience tendered to her by Honey Breeding draws her to follow him to the Appalachian mountains—her beehive.

During her time in the mountains with Honey Breeding, she lives a hunter-gatherer lifestyle, where "[they] drank right out of a spring…washed [themselves] off in a little creek…ate huckleberries and blue berries and nuts and greens and whatever Honey could catch—a squirrel, a rabbit" (Lee 235). Though she depends on the land and Honey Breeding directly for nourishment during this brief mountain getaway, though, she ultimately becomes famished and "skinny as a rail" (Lee 236), at which point she returns to Sugar Fork, never to see Honey Breeding again. She returns to the harrowing news that her child, LuIda, passed away while she was gone. The Judeo-Christian reading of Ivy's return to the death of her child is that this is a consequence of God's wrath against marital infidelity, though I propose, instead, that Ivy's experience with Honey Breeding is fully embodied: the spiritual and sensuous relationship to the Appalachian landscape is a double-edged sword, one of beauty and connection, one of pain and punishment. It is this embodied experience, perception of, and relationship to the land that supports Ivy's environmental imagination and activism. These allow her to act as a conduit and mirror of the Appalachian landscape, functioning as both protector and the protected.

Ivy acutely notices how environmental extraction and degradation are impacting the geomorphology of her sacred rural space, before and especially after her fling with Honey Breeding. In a letter to her grown son, Danny Ray, she writes "We are like a kingdom unto our own selves. Everybody has took everything out of here now—first the trees, then the coal, then the children. We have been robbed and left for dead" (Lee 295). Ivy's perspective calls attention to how it is the most economically impoverished individuals and

communities who suffer most from extractive pursuits such as coal mining (Lohmann), of whom she and her family are included.

Ivy is particularly sensitive to the Appalachian mountains, a rich image in the context of mountaintop removal (MTR) in Appalachia. From the time Ivy was a young girl, she paid particular attention to the mountains as the center of her natural and spiritual landscapes and the geography of storytelling in her childhood. The family farm is on Blue Star Mountain, which, to Ivy, "don't seem so blue nether, when your up here. But is it the prettiest place in the world" (Lee 13). MTR is a "coal-mining technique [that] is permanently altering the topography of the Appalachian Mountains… [wherein] workers use large amounts of underground explosives to loosen the rocks and soil above the coal seam and huge earthmoving machines to remove this overburden and mine the coal" (Scott 1). This process functions to, in Marxist terms, reconfigure "high places [into] low" (Scott 1), which is a pursuit of homogeneity of natural landscapes, mirroring the homogenous framework of modernity. It is precisely through this framework and practices such as MTR that the logic of extraction thrives, whose effect is especially acute in Appalachia. Functioning as a conduit and mirror of the Appalachian landscape, one that is pastoral, sensual, and sacred, MTR is also an eruption of Ivy's self. Though Ivy's grandmother instills in her that a "body can get used to anything" (Lee 199), Ivy does not tolerate this.

Ivy's environmental activism, which culminates in an act of arguably environmental terrorism, is cumulative and profound. Once she catches wind that Peabody Coal Company will be exercising its "right" to mine the land upon which the family farm rests, which was signed away by Ivy's mother in an act of desperation for eco-

nomic security, she puts up a "No Trespassing" sign on the property. She points a gun at a coal worker who drives a bulldozer up to the property's stepping stones, after which he retreats. In her final act, she intrudes and remains on one of the company's dozers against their orders, which draws the attention of news reporters—after which they "backed off for good" (Lee 308). This act is Ivy's consummation of embodied activism which is based on her spiritual and sensuous relationship with the land.

According to David Abram, we as humans negotiate "relationships with every aspect of the sensuous surroundings…The color of the sky, the rush of waves—every aspect of the earthly sensuous could draw us into a relationship fed with curiosity and spiced with danger" (Abram ix). It is our embodied experience through the body, the somatic, that mediates our relationship to the natural world. The logic of extraction, thus, may be contextualized as an antithesis of the sensuous: the disassociated, the fractured, the corrupted. As a conduit and mirror of the pastoral Appalachian landscape, Ivy symbolizes how environmental degradation is of equal poison to the human body—our separateness from the natural world via nature/culture binaries in Western thought is merely a facade.

Importantly, also, Ivy represents how an embodied relationship to the land may function as a balm to the logic of extraction and may serve as fruitful ground upon which to enact effective environmental activism. These are invaluable insights that demand application in our current age of the climate crisis, wherein "to become resilient in an increasingly precarious ecological epoch…'restorying' the landscapes we inhabit is a necessary first step toward 'binding the imagination of our bodies back into the wider

life of the animate earth'" (Vernon 229-230). As exemplified by Ivy, it is our inhabitation of our landscapes through both storytelling and embodied experience that we may naturalize an environmental imagination of reciprocity, sensuality, and sacredness as a response to the logic of extraction.

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Reclamation and Reimagination of Tsimshian Beadwork: A Lost Art in History

Shamai Thacker

University of Alaska Southeast

Northwest Coast Native Art History & Culture ART263-J01/

ART263-JD2

Instructor Emily Moore

Introduction

When I visited the Smithsonian Arctic Studies Center at the Anchorage Museum to study the Living Our Cultures exhibition for another assignment, I went with the intent of studying Tsimshian beadwork. What surprised me was there were only two artifacts in the Tsimshian collection that had beadwork on them: the gwish'na'ba'la (button robe) as shown in Figure 1 that depicts the traditional story "Explanation of the Beaver Hat" in which two princesses and a prince are swallowed by a giant halibut (Boas, n.d.) on the gwish'na'ba'la design and a pair of leggings that depicted a lobster design. I recall comparing the gwish'na'ba'la beadwork to the beadwork done in all of the other cultures and the simplicity and intention of the bead placement compared to other cultures like the Tlingit and Kwakwaka'wakw and it was evident that Tsimshian beadwork was not captured in the ways other cultures artifacts show. So what is the history behind Tsimshian beadwork?

For centuries the history of beadwork on the Northwest Coast of Alaska has widely focused on the Tlingit and Kwakwaka'wakw culture's extravagant beaded regalia. As the colonization of the Northwest Coast tribes became the new way for the Northwest Coast cultures, the art form practices for each community shifted into less traditional practices and the origins of beads and button blanket materials focused more on the early trading between the Czech Republic, Venice, Belgium, and even China (Dawkins, 2019), which in turn shifted origin stories of Northwest Coast beading techniques and leaves gaps in the history of Tsimshian beadwork styles. It is my hope to bridge the history of Northwest Coast beadwork and shape a new perspective on the history of Tsimshian

beadwork and what the art form looks like today.

Northwest Coast Beading

It is documented that the Tsimshian people are credited with the creation of the Chilkat blanket, but the Tlingit people are credited with generations of production for the Chilkat tribe, and thus the Chilkat blanket is most associated with the Tlingit, called a na·xīn in the Haida language (Emmons, 1907). When considering how the narrative of the origin of the Chilkat blanket and the historical shift to a new culture, it can be argued that the same may have been done with Tsimshian beading.

When examining the history of beading on the Northwest Coast, Megan Smetzer—the author of Painful Beauty and other works published in Northwest Coast art publications in which her work widely focuses on Tlingit artifacts like the octopus bag and Chilkat weaving—writes that "the rich yet relatively unexplored history of beading along the Northwest Coast should be understood in relation to the painful beauty of beading across Indigenous North America" (Smetzer, 2021, pp. 180) and serves as a reminder that the ongoing systemic impacts of colonization can be seen in instances such as this, with researchers tracking histories of our Alaska Native cultures and taking threads of stories to construct meaning and sew fragments together to set a foundation for future research.

Revitalization

The twentieth century marked a turning point for women beaders along the Northwest Coast, especially among the Tlingit cultures. During a time when settlers condemned ceremonial regalia created by men, work completed by women that depicted cultural strength and resilience was unrecognized and thereby ignored by

the same people condemning other Northwest Coast art forms (Jonaitis, 2021). Smetzer notes that Indigenous women's artwork "positions Indigenous women and their wealth of knowledge as central to the process of decolonization" (Bunn-Marcus and Jonaitis, 2022, pp. 128-129), a process that began during the 1960's and 1970's when Indigenous artists began to develop new ways to improve their beadwork design by incorporating new mediums such as semiprecious stones, shells such as dentalia, ivory, and glass beads obtained through imports along the trade-route of the Northwest Coast (Dawkins, 2019).

Storytelling

The Tsimshian gwish'na'ba'la in Figure 1 is an example of how cultural stories and totem representations come together in a medium produced by Indigenous women who translated the stories into the regalia that honors the clan utilizing the materials obtained from the trade to create new forms of representation that settlers did not recognize. David Boxley, a Tsimshian carver from Metlakatla, Alaska, shared in 2009 that "the Eagle clan came from Alaska down to British Columbia, and one of their canoes was upended by a monster halibut. This design shows the halibut and the people that it took" for the artifact description on the Smithsonian Learning Lab website.

The Tsimshian Mythology by Franz Boaz (n.d.) tells the story of "Explanation of the Beaver Hat." In this iteration, Boaz writes that a great war between the Eagle clan and the Ganha'da, who lived on opposite sides of a river, after the death of a princess and prince from each side; the prince of Ganha'da had killed his wife out of jealousy and the family of the princess from the Eagle clan exacted

revenge. Once the great war began, the Ganha'da were most successful and drove the remaining Eagle clan members south, during which time they lost their crest and copper at the mouth of the river as they sought a new place to call home after leaving most of their possessions behind, fleeing from the war. After leaving the mouth of the river, the Eagle clan came upon an inlet where they set up camp. Boaz writes:

> "On the following day three of their young people went out in a canoe across the inlet; and when they reached the foot of a steep cliff, behold! a large halibut came up, opened its mouth, and swallowed the canoe with the three persons — two princesses and one prince. The people on the other side saw it. Therefore two of their brave men went to kill the monster who had devoured their prince and their princesses. They crossed the inlet in their canoe, having their large knives tied to the right [wrist]. As soon as they reached the foot of the steep rock, a halibut came up, opened its mouth, and swallowed the canoe with the two brave men; but as soon as the halibut had swallowed them, they cut it inside with their knives. They cut up its intestines until it died. Then the supernatural halibut felt the pains in its stomach, jumped out of the water, and struck the water with its tail. It swam around the inlet, and finally ran ashore and died there. Then those who had remained alive went down to the beach, and saw that the great supernatural halibut was dead. They cut it open, and saw the two canoes and five persons. Then they sang their mourning-song" (pp. 271).

The story continues to share how one of the surviving

princes discovered a beaver hut in his time grieving over the loss of his family. The beaver had copper for its eyes, claws, and teeth, and the clan decided to kill the beaver to harvest the copper to replace what they had lost when fleeing the great war. When this happened, the beaver became part of the clan crest, and no other clan could use the beaver as it was now a sacred being to the Eagle clan (pp. 272).

Storytelling in Tsimshian Artforms

The story of the halibut and the two princesses and one prince is beautifully represented in the Tsimshian gwish'na'ba'la. When I saw this piece at the Anchorage Museum—before even looking at the description of it—I could clearly see that the piece represented a story of three people and a halibut. However, as a visitor to the exhibit, it was left up to me to discover what that story really was. After closer inspection of the piece in Figures 2-5, I realized that I was examining and learning a story.

Figure 2, the top of the gwish'na'ba'la—the tail—depicts what I see as one of the princesses in the story. This part of the piece has archival information written on it and there appears to be a line of beads around the outline missing compared to other beaded portions. Also apparent is that there are no beads added to the nose of this figure. The middle, Figure 3, looks to be the prince. I came to this assumption because the other two likenesses in this piece (Figures 2 and 4) have abalone buttons around their faces, whereas the one in the middle does not. However, there is every likelihood that the absence of the abalone buttons was either intentional—or a possibility of the piece not being completed—due to the ribs of the halibut also not having buttons like the others from the middle down to the head. As a Tsimshian beader telling a story through this

piece, it is likely that the lack of buttons or beads in certain parts of the gwish'na'ba'la is done intentionally to represent the lore in some way.

The head of the gwish'na'ba'la (Figure 5) is very clearly that of a halibut but also appears to have a secondary face added to the nose area. The white seed beads in this piece are used to outline the key features, but they really stand out in the teeth of the halibut. Using the beads in this way guides the viewer to consider the fish as a monster; as it is told in the Tsimshian lore. There again appears to be intentionality where abalone buttons are not added to the applique of the face, including a few areas where beads have fallen off.

The Tsimshian gwish'na'ba'la is a demonstration of how Indigenous art creators transformed their methods of storytelling with traditional works like button robes throughout the impacts of settler colonialism. Like the Tlingit, the Tsimshian gwish'na'ba'la tells a traditional story in a way that created meaning and belonging to the creator and the wearer of the gwish'na'ba'la (Yohe & Greeves, 2019, pp. 270).

Reimagination of Tsimshian Beadwork

With so little documented evidence of Tsimshian beadwork in publicly available published works, I tried and failed to draw a connection between my own beadwork practices and the Tsimshian culture. My cultural identity was a mystery for most of my life due to the historical traumas that my Alaska Native family faced and how that ultimately impacted me and my brother. Having little to no knowledge of my cultural identity growing up—and continuing to struggle with it even today—my hope of learning what I can

about beading for my own cultural development was halted.

Personal Reclamation

I was around 10 years old in the early 1990s when I picked up a needle and thread with size 11 seed beads. My introduction to beading did not come in a traditional form. My mom was interested in Native American dreamcatchers and mandalas, and I grew up watching her work with pony and bone beads. I remember flipping through Shipwreck Beads catalogs as a young girl. Hundreds of pages of beads of all sizes and types, leathers, feathers, bindings, and fasteners. My mom's interest in dreamcatchers is where my beading instinct started. I picked up one of my mom's leather-wrapped hoops and a roll of sinew and looked at one of the dreamcatcher patterns my mom was trying to complete. What was taking her a lot of time to learn and understand came to me naturally. It seemed that the pattern and ways to incorporate beads into the design were already engrained in me.

Not long after that, my mom took us to a local bead store so she could find some bone beads to finish one of her projects. As she shopped for her materials, I browsed the seed bead section. I left with three hanks of colorful beads, a spool of Nymo thread (that I still have), some fasteners, a loom, and needles. I had no idea what I was doing, but I had a vision, and I was determined to make it come to life. I started beading before dial-up Internet became available and well before online beading guides were popular. I taught myself how to make daisy chain bracelets and necklaces that I gifted to my friends while also teaching myself how to set up a small loom and beading more intricate designs with much trial and error. I honestly don't think I ever completed a loom beading project before beading

became too expensive for my impoverished family and my interests were forced to shift.

I stopped beading around 2002 and did not pick it up again until almost 20 years later in 2020. My participation in the Cultural Identity Project (CIP) at the University of Alaska Anchorage included a beaded medicine bag that participants completed during the CIP course sessions. Beading the medicine bag (Figure 6) meant learning a new method of beading that I was unfamiliar with—hand-sewing. Not only was the method new, but so was the material. We were hand-sewing our chosen designs onto leather of some sort. I can still feel the needle pokes and hard calluses on the tips of my fingers from pushing the needle in as I learned this new method. The Elder teaching us how to hand-sew taught me new terminology like "single needle sewing" while "tacking" (sewing the bead in place by going over the thread line of beads to create the shape) or "double needle sewing" in which one strand of thread is used to thread beads and the other strand is used to tack the bead line down.

What I learned during that time was that there are many different methods to complete some beading styles, and during that learning period, I discovered my own strengths and weaknesses in beading. My biggest learning experience, though, came in the spring of 2021 when I started beading more. I began hand-sewing designs that simply came to me as I practiced, like Figure 7. I slowly started to recognize that my beading passion was being guided by the knowledge and connection to my ancestry as I completed my second undergraduate degree and participated in Alaska Native program work for my profession.

As I stepped into an empowering place of healing and

connection through my beadwork, I was faced with traumas relating to my Native identity that ultimately led to my putting my beading aside as I navigated the healing process. Ultimately, this led to a hiatus that lasted over a year. The attack on my identity made me feel that I did not have the right to create the beadwork that I was. As quickly as I felt empowered, I was disempowered and gaslighted to think that I did not belong.

The process of healing from that event was unlike any I have ever had. What saved my connection with my newly discovered cultural identity was my ancestor's language. I started taking the Tsimshian language in the fall of 2022 during a time that I was questioning completing my degree program, my sense of belonging, and myself as a whole person. That class saved my mental and emotional connection to my heritage. The connection to my language helped me salvage my connection with my beading.

Conclusion

Tsimshian beadwork does not have a rich history that has been captured in research publications or oral histories that have been transcribed throughout the years, making this research project an ambitious and difficult topic. The Tsimshian gwish'na'ba'la is merely a drop in the history of beading for this culture but acts as a steppingstone for addressing the gap in critical historical research for this Tsimshian art form.

I have picked up my needle and thread once more and find that the inspirational work I completed in 2021 for myself—such as those in Figures 8-9—was merely a steppingstone for my own connection to this craft. While the history of Tsimshian beading appears to be dormant in the reclamation process of the various

Northwest Coast art forms and research publications, the practice of beading in my own journey has opened a new perspective in that just because there aren't traditional rules or designs to examine and implement, does not mean that there is not an ancestral connection that guides the creation process in these types of works.

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Figures

Figure 1

Unknown Tsimshian artist, gwish'na'ba'la "button robe" c. 1876, Smithsonian Arctic StudiesCenter, Living Our Cultures exhibition.

Note: "'The Eagle clan came from Alaska down to British Columbia, and one of their canoes was upended by a monster halibut. This design shows the halibut and the people that it took.'

David Boxley, 2009" (Smithsonian Learning Lab).

Figure 2

Unknown Tsimshian artist, gwish'na'ba'la "button robe" c. 1876, Smithsonian Arctic Studies Center, Living Our Cultures exhibition.

Note: A zoomed image of the tail portion of the gwish'na'ba'la.

Figure 3

Unknown Tsimshian artist, gwish'na'ba'la "button robe" c. 1876, Smithsonian Arctic Studies Center, Living Our Cultures exhibition.

Note: The second image moving down from the tail.

Figure 4

Unknown Tsimshian artist, gwish'na'ba'la "button robe" c. 1876, Smithsonian Arctic Studies Center, Living Our Cultures exhibition.

Note: The second image moving down from the tail.

Figure 5

Unknown Tsimshian artist, gwish'na'ba'la "button robe" c. 1876, Smithsonian Arctic Studies Center, Living Our Cultures exhibition.

Note: The head of the halibut.

Figure 6

Shamai Thacker, hand-sewn medicine pouch, c. 2020.

Note: This was the first hand-sewn project completed by the artist.

Figure 7

Shamai Thacker, hand-sewn barrette. Crystal rhinestone with copper kissed glass bead roped edge. Dyed pig skin leather backing. 4-3/4:" wide x 4-¼" long.

Note: This piece won 2nd place at the 2022 Alaska State Fair.

Figure 8

Shamai Thacker, earrings with a carved bone centerpiece and braided edging. 3” long. 1-¾” Wide.

Note: This piece won 2nd place at the 2022 Alaska State Fair.

Figure 9

Shamai Thacker, hoop earring with brick-stitch design and rope design edge. 3” wide x 3” long.

Gender Norms, Accountability, and Transgender Persons

Abigail Grenier

University of Alaska Southeast

Sociology of Gender: SOCS377

Dr. Kasia Polanska

Gender is deeply built into the social structure and organization of societies, with gender and sex being employed to create, reify, and sustain differences between people and establish inequalities based on gender hierarchies that generally value males, men, and masculinity over other gender and sex categories (Gagné & Tewksbury, 1998; Kimmel, 2000; Risman et al., 2018). Gender is present across individual, interactional, and institutional levels, and understanding of gender in social sciences recognizes gender as a socially constructed phenomenon—rather than an inherent aspect of biology—and in West and Zimmerman's (1987) framing, as an accomplishment for which people are accountable to each other (Kimmel, 2000; Risman et al., 2018). The accountability of gender is intrinsically tied to sex and sex categorization, with a normalization of particular gender expressions as acceptable and worthwhile—namely: masculinity, heterosexuality, and cisgender identity—and an otherization and punishment of those who do not conform (Gagné & Tewksbury, 1998; Kane, 2006; West & Zimmerman, 1987). Transgender people, simply by their nature in not identifying with their sex assigned at birth, challenge normative gender systems and hierarchies that conflate sex with gender, interacting with gendered systems and doing gender in unique ways, but they may also reproduce gender hierarchies in working to achieve recognition as their gender identity. Further, trans people's disruption to normative understandings of gender can be met with transphobia and violence, and highlights aspects of how gender systems and accountability to normative constructions of gender function.

West and Zimmerman's (1987) "doing gender" framework is one of the most commonly utilized perspectives of gender in socio-

logical research (Risman et al., 2018). West and Zimmerman (1987) conceptualized gender as a routine accomplishment embedded within everyday interactions. West and Zimmerman (1987) extricated gender from sex by distinguishing between gender, sex, and sex category, putting forth that gender is activity meant to manage social identification into a sex category, with sex category being the application of criteria that utilizes sexed social displays that assume an indication of biological sex classification as male or female (e.g., assumptions of chromosomes or genitalia based on readily available information from both secondary sex characteristics and behavior). That is, gender is not dependent on one's sex, but is instead activity meant to claim membership within a particular sex category and is managed in light of normative conceptions, attitudes, and activities associated with one's sex category (West & Zimmerman, 1987). Normative conceptions of gender and gender displays further assume that there are essential masculine and feminine natures that align with sex. To "do" gender is to engage in behavior wherein one is at risk of gender assessment by others and its achievement is a social-relational accomplishment that is present across individual, interactional, and institutional realms. Failure to do gender in accordance with broader social expectations of one's sex category is met with accountability that may come in the form of punishment for deviating from existing standards of what is "natural" and "right" and, through this accountability, gender and its normative conceptions legitimize themselves (West & Zimmerman, 1987).

Gender accountability is a fundamental aspect of doing gender and is a driving motivator in creating difference with normative conceptions of appropriate gender conduct serving as the

template that guides social interaction and which is reinforced by social and political institutions (Kane, 2006; Miller & Grollman, 2015). Normative conceptions of gender elevate certain methods of doing gender over others, with hegemonic masculinity holding dominance as the most right and correct (i.e. normative) conception of gender (Connell & Messerschmidt, 2005; Kane, 2006). Hegemonic masculinity stands as a pattern of practice that allows for the dominance of men over women and is the form of masculinity that is most culturally exalted (Connell & Messerschmidt, 2005; Kane, 2006). Hegemonic masculinity differs by culture and time, and stands in relation to other masculinities as the measuring stick of gender normalcy, made ascendant through culture, institution, and persuasion (Connell & Messerschmidt, 2005; Kane, 2006). Hegemonic masculinity subordinates nonhegemonic masculinities and in its legitimization of male privilege and dominance over women also legitimizes race, class, and sexual orientation hierarchies (Connell & Messerschmidt, 2005; Kane, 2006). Masculinities are in constant relation with femininities, and while there are normative conceptions of femininity, the asymmetrical nature of patriarchal systems prevents a true hegemonic femininity; instead, emphasized femininity, characterized by compliance, nurturance, and empathy, serves as the correlate to hegemonic masculinity (Connell & Messerschmidt; Risman et al., 2018).

Normative conceptions of gender impose specific and sex-based parameters of what it is to be a man or a woman and leave no true space for those whose identity does not conform to these standards (Miller & Grollman, 2015). The prevalence of gender and gender hierarchies across societies is backed by cultural socialization

and institutional forces (Kimmel, 2000). These environments foster the development of folk theories of gender, which are beliefs about what gender is and how it is determined that provide causal explanations and intuitive reasoning for sex and gender categorization and normative gender present throughout people's lives (Rad et al., 2019). Individuals with more conservative and traditional views with folk theories based more on conventional binary gender systems tend to exhibit less support for transgender persons' self-identified gender, and men tend to express more anti-transgender and transphobic attitudes than women (Rad et al., 2019). The association of conventional and traditional views with transphobic sentiment, along with the greater tendency for men to express such sentiment, is an aspect of a belief in a gender and sex hierarchy that upholds patriarchal views of sex that hold men and masculinity as more worthwhile than women and femininity. Patriarchal and inequitable gender structures rely on the denial of non-normative gender and sex expression through transphobia, homophobia, and gender differentiation; gay men and trans women particularly degrade the false belief of male superiority as such individuals refuse normative and hegemonic masculinity, "lessening" themselves from the supposed height of male cisheterosexuality (Kimmel, 2000; Rad et al., 2019; Rismen et al., 2018; Yavorsky, 2016).

Folk theories of gender built on conventional binary systems tend to conflate sex, sex category, and gender. The perpetuation of normative gender and beliefs of gender difference as irreconcilable and inherent cannot logically stand when the incomplete biological basis of gender is acknowledged. Understanding of gender, and its common conflation with sex and sex category, may result in differing

views of transgender people who have undergone gender-affirming transition with surgical and hormonal interventions, as through altering their sex they are viewed as aligning more with their identified rather than their assigned gender (Rad et al., 2019). That is, perceived—and actual—changes that bring trans people closer to their identified gender through altering their biology, and thus sex, result in a greater willingness for some to accept them as members of the sex and gender that they identify as (Rad et al., 2019). This is despite the possibility that such individuals may have placed transgender persons into the correct sex category with or without biologically based gender transition due to the tendency for people-to place others into the sex category that seems most appropriate (West & Zimmerman, 1987).

The primacy of sex and sex category in gender determination is further distinguished by the setting in which gender is assessed. Cultural ideologies of gender determination—the social processes of authenticating people's gender and placing them into gender categories in reaction to doing gender in interactions extending to legal, policy, and imaginary determinations—tend toward either biology-based determinations that focus on sex or identity-based determinations that focus on the self-determination of the trans or gender-nonconforming person (Westbrook & Schilt, 2014). These competing cultural ideologies of gender determination are employed in context-dependent manners in response to trans people depending on the perceived threat to gender norms and heterosexuality posed by recognizing their gender (Schilt & Westbrook, 2009; Westbrook & Schilt, 2014).

Public and private relationships indicate the intertwinement

of gender and heterosexuality systems. Nonsexual public relationships, particularly those between people of the same gender, do not involve real or imagined interaction with genitalia and give leeway for trans people's gender to be determined on an identity basis bestowing a "cultural genitalia" that matches with the gender they identify as (Schilt & Westbrook, 2009). Private heterosexual relationships are more stringent, utilizing biological determinations of gender that demand that trans persons' sex (genitalia) matches their gender presentation (Schilt & Westbrook, 2009). The lack of sexual interaction in public relationships and the association of sex and genitalia in private relationships thus results in vastly different reactions to gender determination as trans persons' challenge to the normative sex/gender/sexuality system is made explicit in private settings and may be perceived as a threat cisgender persons' claims to heterosexuality status (Schilt & Westbrook, 2009).

Cultural ideology used to determine gender is further influenced by whether a space is gender-integrated or gender-segregated (Westbrook & Schilt, 2014). Gender-integrated spaces, such as workplaces, tend to utilize identity-based determinations of gender, while gender-segregated spaces, such as bathrooms, tend to utilize biology-based determinations, demanding consistency with sex and gender (Westbrook & Schilt, 2014). The requirements for trans people's gender to match their sex in these different spaces is, again, intertwined with perceived threats to normative cisgender heterosexuality. The undermining of normative binary gender systems may elicit a "gender panic" followed by gender naturalization work to reassert the legitimacy of such systems as natural (Westbrook & Schilt, 2014). Naturalization work may occur interpersonally with

denial of trans persons' gender identity and violence, but also occurs on policy and legal levels such as in the protection of gender-segregated spaces from the imagined threat of trans persons (Schilt & Westbrook, 2009; Westbrook & Schilt, 2014).

Gender panic in response to trans people in many cases may be more specifically termed "penis panic," as the exclusion of trans people from gender-segregated spaces such as bathrooms, sports, and locker rooms is predicated on the biological essentialist notion that males are predisposed to be violent or dangerous to females and will attempt to gain access to female spaces to enact sexual or physical harm (Westbrook & Schilt, 2014). This view then intersects with the conflation of sex and gender to frame trans women as male-bodied individuals who pose a threat to cisgender women (Schilt & Westbrook, 2009; Westbrook & Schilt, 2014). Trans men's gender identity, in turn, does not pose the same assumed threat, and so while trans men may also be limited by biology-based determinations, they are more likely to be evaluated with identity-based determinations and allowed into gender-segregated spaces (Westbrook & Schilt, 2014). The use of two different cultural ideologies of gender determination gives room for people who are not explicitly transphobic to allow challenges to the normative gender system in some domains while simultaneously reinforcing it (Westbrook & Schilt, 2014).

There are significant similarities in how sociocultural forces of gender normativity, accountability, and maintenance of hierarchical systems of power are experienced by trans persons, but experiences also differ depending on gender identity. Trans women, as noted, are often viewed as sexual and physical threats to cis women, but

too, when they are accurately categorized into the sex category that match their gender identity, they experience a downward shift in the gender hierarchy from being viewed as men to being viewed as women (Yavorsky, 2016). Trans men experience the opposite effect, moving upward in the gender hierarchy (Yavorsky, 2016). That is, trans men, women, and nonbinary trans people are all subject to transphobia but the implementation of transphobia interacts with normative gender systems so that trans women experience subjugation both for being women and for being transgender (Yavorsky, 2016). Trans women's subordinate statuses therefore affect them whether they are openly trans or not. Trans women may be pushed into doing gender in stereotypically feminine ways that are not internally felt as accurate to themselves to maintain recognition as members of their gender category and avoid sexism (e.g., a trans woman who would have spoken up in a meeting may refrain due to receiving social punishment—gender accountability—for being perceived as an outspoken woman) (Yavorsky, 2016). As such, trans women are held accountable to normative gender and may replicate unequal gender dynamics to retain their status as women.

The extent of normative gendered power structures is further highlighted in that the perpetration of discrimination and replication of gender hierarchy in interactions tends to be done more by men than by women (Yavorsky, 2016). As noted above, transphobia perpetrated against trans women by cis men may stem from a desire to assert and elevate the male and masculine over other gender statuses and punish those who deviate from masculinity (Yavorsky, 2016). This elevation of masculinity, specifically hegemonic masculinity, is also felt by trans men who, while they may experience the

opposite effect from trans women in gaining respect in social and work contexts, also become subject to the implementation of masculine hierarchies through violence (Connell, 2010; Abelson, 2014). Gender accountability and potential punishment for deviation from masculinity inhibit trans men's transformative gender practices and limits their gender expression to maintain recognition as men, enforcing gender inequality and conformity (Abelson, 2014).

Trans people are not unaware of the predicament of potentially replicating gender hierarchy when they do their gender (Connell, 2010). Discrimination against trans people for sex-gender nonconformity is further emphasized for nonbinary trans people and otherwise gender-nonconforming trans people who attempt to do masculinity or femininity in non-normative ways (Connell, 2010; Miller & Grollman, 2015). The social conformity pressures of accountability enacted through discrimination and loss of relationships may push some trans people to escape through detransition, that is, to live less gender-fulfilling lives as the gender they were assigned at birth to maintain social connection and retain others' perception of their worth (Gagné & Tewksbury, 1998). However, even with pressures, many trans people live as their identified gender and even develop a feminist consciousness due to their positionality as trans people (Connell, 2010; Gagné & Tewksbury, 1998). The management of gendered interactions provides insight into gender systems as trans people interact with and make sense of the discordance between sex, sex category, and gender (Connell, 2010; Gagné & Tewksbury, 1998). Strategies of managing gendered interactions may result in doing normative gender, but may also extend to related concepts of redoing or undoing gender wherein gender is either

done in a new manner or is separated from sex and sex category (Connell, 2010; Miller & Grollman, 2015). Connell (2010) argues that trans people's gender management and accomplishment may be considered a process of doing transgender, as the contextual experiences of trans people's gendered selves and the development of feminist understanding of gendered interactions and norms create particularly trans methods of doing gender.

There is a diversity of methods by which trans people do gender. Some gender expressions may fall within norms, but there are also concerted efforts among trans and genderqueer populations to forge their own gender identities and expression outside of norms (Darwin, 2017). Cultivation of gender through selective expression of masculinity and femininity, as well as intentional combinations to produce an androgynous gender accomplishment among genderqueer people, are often accountable to, and act in relation to, binary transnormative—and therefore to an extent, cisnormative—constructions of gender (Darwin, 2017). These efforts, however, still challenge the beliefs that gender and sex are one and the same and that biological sex difference is the guiding force of behavior and action.

Efforts to move beyond the binary system are matched in broader queer communities through rejection and resistance to heteronormativity in approaches to relationship "rules" and in the socialization of children by avoiding imposing normative gender constraints and offering greater individual choice in gender expression (e.g., offering children clothing, toy, or activity options that may not typically be associated with their sex) (Averett, 2016; Darwin, 2017). Such resistance among parents remains contextually

situated in the level of support and safety they feel is available to their children; that is, expression of gender-sex incongruity is largely supported and at times encouraged, but is weighed against perceived danger for such incongruence (Averett, 2016). The assertion of greater freedom in gender and sexuality expressions, and intentional offering of non-normative gender expression compares to cisgender heterosexual parents' approaches to gender. Among such parents, the gender binary still holds great sway, particularly with boy children as part of the pressure to maintain hegemonic masculinity; however, even among these parents there has been growing resistance to gender norms and acceptance and support of gender nonconformity and variance (Averett, 2016; Rahilly, 2015).

It is evident that transgender people, as individuals whose gender does not align with their sex assigned at birth, face particular pressure to present themselves and do gender to normalized standards so as to attain social identification into the sex category that matches their gender identity. Trans people may face violence, anger, and other forms of aggression and dismissal originating from people's interest in the maintenance of a familiar cisnormative gender hierarchy instilled by numerous sociocultural sources and throughout our interactions, institutions, and imaginations. Trans people do gender in relation to normative gender beliefs and cultural ideologies, occasionally submitting to their demands, but always challenging the legitimacy of a binary sex hierarchy that holds on to difference so as to elevate cisgender heterosexual men over others.

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Song of Myself: Gender Expansion Across the Centuries

A.J Schultz

University of Alaska Southeast

Survey of American Literature 1800-Present: ENGL S226

Professor Kevin Maier

For decades, scholars have been unpacking Walt Whitman's defining work *Song of Myself*, which navigated the complexities of gender and class in America by emphasizing the self and the narrator. In handling these topics, which in Whitman's time were widely seen as taboo, *Song of Myself* was met with strong backlash. Conservatives denounced the poem for its expansive ideas of sex and sexuality, which went against the dominant gender and sex roles in America. The cultural backlash was so intense that a judge in Boston almost took legal action due to *Leaves of Grass* (Whitman's defining collection of poetry, which includes Song of Myself) violating "obscenity laws." Since Whitman's time, cultural opinion has shifted, and there is more tolerance for the challenging of sexual and gender norms. However, debates surrounding feminism, toxic masculinity, and the real definitions of gender and sex are ongoing. In scrutinizing these constructs, it's important to revisit literature from figures like Whitman to better situate our understanding of the "new" in the context of the old.

Whitman's seminal work, *Song of Myself,* is notable for its emphasis on the narrator, the self, and the concept of identity- particularly along class and gender lines. These themes parallel contemporary discourse surrounding "identity politics" (a term coined by black feminists in the 1980s, which has since been co-opted and muddled to refer to a broader cultural shift toward social justice) to refer to the contextualizing of people's life experiences through the lens of one's identity (race, class, gender, sexual orientation, sex, ability, age). These modern discourses have platformed more critical viewpoints on sex and gender, such as the works of philosophers Judith Butler and Ásta, as well as the perspectives of Indigenous

people. These perspectives offer more nuanced understandings of these categories which we can apply to Whitman's work. Established scholarship and interpretations of Whitman's *Song of Myself* are compiled in the complete commentary by Ed Folsom, and Christopher Merrill. The complete commentary offers a foreword, afterword, and analysis for every section of *Song of Myself,* which can serve as a baseline for the discussions surrounding the poem. This commentary can, at times, come off as aggrandizing and overly abstract (like when it describes Whitman as "the poet who discovered that unity is all"). As such, it can sometimes seem as if the commentaries are less concerned with the implications of Whitman's metaphor and its applications to the world, and more with putting Whitman on a pedestal.

In the afterword to Section 11, the authors of The Complete Commentary place a great deal of emphasis on the repetition of the number "twenty-eight". In Section 11, the number is repeated three times in the first stanza to describe the woman's age and the number of men bathing in the ocean. Because of its repetition, there is assumedly some significance to the number itself- otherwise, why wouldn't Whitman choose to emphasize "bathe" instead? Debates surrounding the significance of the number twenty-eight posit several theories, with some interpreting the number as being representative of the states in the union. Though in fact, there were thirty-one states in the union at the time it was written-- this interpretation would claim that the woman in the window, Whitman, and the reader all become the twenty-ninth, thirtieth, and thirty-first bather respectively.

While there is truth in the latter part of this interpretation,

it misses the forest for the trees. The significance here is not in the number, arbitrarily matching the number of states in the union, but in the deeper truth being expressed. That through imagination, through desire and silent, contemplative daydreaming-- the woman, the poet, and the reader all join these men in their expressions of innate freedom. Not sexual, not romantic, not platonic, just human. The significance of this is surprisingly breezed over in the complete commentary, which closes its analysis with the vague assertion that "the true number is one— the expansive identity of the self." Here, the complete commentary falls short of a real exploration of the gender and sex dynamics present in Section 11, paying far too much mind to the comparatively banal repetition of the twenty-eight.

While the commentary does not give these aspects of the poem the attention they warrant, it does address them briefly, describing the fifth through eighth stanzas as a scene in which "the constraints of gender and social conventions are momentarily cast aside," that "Gender itself evaporates." The depiction of gender as a "constraint" is the key assertion of *Song of Myself.* Not only gender, but sex, as Whitman describes the bathers' bellies as "bulging," "puffing and declining with pendant and bending arch," descriptions of the human form which, as stated by the commentary, "adhere equally to aspects of both male and female anatomy."

The ways the woman interacts with the bathers is reminiscent of modern queer literature, such as American poet Audre Lorde's biomythography "Zami: A New Spelling of my Name," in which Lorde's account of her first homosexual experience evokes imagery like the unseen hand passing over the bodies of the men in the sea. "Loving Ginger that night was like coming home to a joy I

was meant for. My hands, wherever I touched, felt right and completing as if I had been born to make love to this woman" (Lorde). I mention Lorde's story because it helps to contextualize how expansive "modern scholarship" is when it comes to Whitman's work. To understand our understanding of Section 11, we need to understand the common lived experiences shared by others, who similarly tell stories of breaking out of social categories and the fear of doing so.

> "...how foolish and far-away those fears seem now, as if loving was some task outside of myself, rather than simply reaching out and letting my own desires guide me" (Lorde).

In her seminal 1990 book, "Gender Trouble: Feminism and the Subversion of Identity," philosopher Judith Butler argues, nearly a century after Whitman, that gender and sex are intertwined, socially constructed categories which adhere rigidly to an imaginary binary, and that neither category is as immutable nor innate as humans have decided they are. Relying on a two-category system like sex, Butler says, in which all peoples are divided into the categories of male or female, man or woman, "depends upon the persistent belief that sex is a natural given on which the social is constructed. Yet if the distinction between nature and culture breaks down, then the naturalistic basis for the binary frame is undermined and the frame itself becomes questionable." (Butler.) The ideas Butler put forward in Gender Trouble were divisive and controversial, and set the tone for decades of scholarly debate amongst feminists and social scientists.

However, these ideas had evidently existed long before Butler expressed them, as her assertions of the construction of sex as a social category like gender map perfectly onto the character of the

woman in the window in Section 11, who transcends these categries of sex and gender to join the bathing men in ignorance and in spite of their shapes which, in an otherwise gender-obsessed world, would define the lives they would be forced to lead. The desires expressed by the woman in the window, and Whitman by proxy, only make sense when you take into consideration the significance of her sex and her gender in relation to her social constraints: she is described as wealthy, "handsomely drest, aft the blinds" of the window which separate her from her innate, human desires. The woman in the window is a human being, an animal, as the twenty-eight men are, but western culture and social structure consign her to this role of opulence which, importantly, she has a desire to escape. Here, Whitman is stating, as Butler does, that while our perceptions of gender are built upon sex, which is itself a construct-- our core humanities cannot help but shine through the boxes we are forced into at birth. These ideas of the construction of sex and gender and the arbitration of their importance are not exclusive to Whitman and Butler, however. Across time, and across the world, these systems of sex and gender function differently, and more expansively. In Manuela Picq and Josi Tikuna's 2019 article "Indigenous Sexualities: Resisting Conquest and Translation" (excerpted from "Sexuality and Translation in World Politics"), the authors delve into how indigenous conceptualizations of gender, sex and sexual orientation defy not only western heteronormative standards, but even the terminology adopted by many queer communities in the English-speaking world (namely, categories like those within the LGBTQ+ umbrella).

> "Juchitán, internationally depicted as a gay paradise, is known for having gender freedoms in stark contrast with

the rest of Mexico. Their Zapotec society recognizes muxes as a third gender (Mirandé 2017, 15). The muxes are people who are biologically male but embody a third gender that is neither male nor female, and who refuse to be translated as transvestite. Muxes were traditionally seen as a blessing from the gods; today they remain an integral part of society" (Picq and Tikuna).

This perspective offers important historical context with which to approach the genderqueer coding present in Section 11. While Whitman's works were controversial, they were not unprecedented; cross-cultural context such as that of the Zapotec society, and several pre-colonial conceptualizations of gender (such as two-spirit) lends credence to the idea that our modern, western ideas of sex-bound gender are yet another oppressive, harmful by-product of European colonization and industrialization.

"Obscene" as some had claimed-- and continue to claim-- that Whitman's imagery was, as our understandings of social construction evolve, so too does our understanding of Whitman, and the knowledge that his understanding of gender was more accurate and grounded in empirical reality than many gave him credit for.

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There And Back Again: Insights Into Shark Migration & Navigation

Holly Hoffbauer

University of Alaska Southeast

Intro to Ichthyology: BIOL 427

Dr. Carolyn Bergstrom

Introduction

Apex predators, such as sharks, have long veiled their movements in mystery, owing to the expansiveness of the oceans and the inherent complexities of studying underwater behaviors for extended periods. Recent advancements in satellite tags, acoustic tracking, and aerial photogrammetry over the last four decades have enabled the global tracking of shark movements and transformed our understanding of shark behavior (Renshaw et al., 2023). This research is pivotal in effective fisheries management and conservation, establishing Marine Protected Areas (MPAs), and informing policy recommendations (Braccini et al., 2018; Renshaw et al., 2023).

While there is a growing emphasis on shark movement ecology, the physiological drivers governing their navigational abilities remain largely unresolved. Traditional theories emphasize reliance on physical senses and environmental cues for short-distance navigation, but the mechanisms governing long-distance navigation remain an enigma. Emerging evidence suggests that sharks possess a unique ability to interpret the Earth's geomagnetic field, yet debates persist regarding the underlying mechanisms (Kalmijn, 1978; Naisbett-Jones & Lohmann, 2022; Montgomery & Walker, 2001; Paulin, 1995). This review aims to provide a comprehensive analysis of the potential mechanisms governing shark navigation, shedding light on both short and long-distance movements.

Intricacies Of Shark Movements & Migration

Animal migration is the natural phenomenon wherein individuals, spanning various species such as birds, insects, sea turtles, fish, whales, and sharks, journey thousands of miles in search of optimal environmental conditions beyond their home range (Alers-

tam & Backman, 2018). Motivations driving these migrations are multifaceted, encompassing evasion of seasonal environmental conditions, seeking alternative food sources, or targeting specific sites crucial for breeding, mating, or hibernation (Alerstam et al., 2003). These movements typically involve intricate decision-making processes and are characterized by a high degree of directionality to minimize energy expenditure (Papastamatiou et al., 2013).

Sharks are known for their varied movement and migration patterns that differ among populations (Doherty et al., 2017). For instance, salmon sharks (Lamna ditropis) undergo seasonal migrations between their feeding grounds in Alaska and the North Pacific Subtropical Gyre, covering hundreds of miles (Weng, 2008). This migration pattern is believed to be driven by the availability of prey, which varies according to the season. Meanwhile, in the Mexican Pacific, tiger sharks (Sphyrna zygaena) migrate from coastal waters to offshore areas as they mature, employing this strategy to broaden their foraging range and minimize competition for resources (Besnard et al., 2023). Conversely, nurse sharks (Ginglymostoma cirratum) make an annual pilgrimage to Dry Tortugas, Florida breeding grounds. This region holds critical importance for the survival of the nurse shark population, prompting dedicated conservation efforts to preserve their habitat (Pratt Jr et al., 2022).

Navigating Familiar Waters Through Cognitive Maps

In numerous studies examining shark movements, it becomes apparent that many shark species consistently demonstrate predictable movement patterns (Papastamatiou et al., 2011). Sharks might employ a "cognitive map" for this type of navigation, relying on experience and memory to navigate repeatedly to known loca-

tions (Meyer et al., 2021). Known as directed walks, individuals optimize their movements by taking relatively straight paths to specific locations. This adaptive behavior suggests an efficient energy conservation strategy and the ability to capitalize on resource "hotspots." The intentional nature of these movements is especially evident when sharks operate within well-defined home ranges, as seen in tiger sharks (Galeocerdo cuvier) navigating between the islands of the Hawaiian Archipelago (Holland et al., 1999). Another example of directed walks is observed in scalloped hammerhead sharks (Sphyrna lewini), as they consistently traverse predetermined paths, swimming from seamounts to forage in the adjacent pelagic environment (Klimley, 1993).

Considering there is limited evidence to show adult sharks transmit foraging traditions to their offspring, it is recognized that a shark's "cognitive map" is primarily shaped through independent exploration (Meyer et al., 2010). Notably, adult thresher sharks showcase more purposeful and directed movements over extensive spatial scales than their juvenile counterparts (Papastamatiou et al., 2011). This study indicates that the observed differences stem from the combined influence of accumulated experience, knowledge of resource distribution, familiarity with "hotspots" and likely heightened sensory capabilities in mature individuals.

Sensory Strategies For Navigating The Unknown

In situations where the location of resources is unknown, random walks become more prevalent, often constrained by the sensory perception capabilities of the shark (Papastamatiou et al., 2011). Sharks may employ their sense of olfaction, sight, and hearing to navigate over shorter distances utilizing environmental cues.

Renowned for their acute sense of smell, an 'olfactory spatial' hypothesis was suggested, which proposed that decoding and mapping odor distributions can aid navigation (Jacobs et al., 2021). Studies on olfaction-mediated navigation are substantiated by research on salmonid species, demonstrating their ability to use odor memories for precise location retrieval (Dittman & Quinn, 1996).

An investigation involving purposefully displaced leopard sharks (Triakis semifasciata) found that sharks with obstructed nares swam slower and appeared more disoriented than the control subjects, which maintained a consistent heading (Nosal et al., 2016). However, the scale of which these odorants can travel is still unknown, but this study proposes that biogenic and abiotic odorants could yield sufficient spatial information to aid navigation. Furthermore, research suggests that background noise, specifically surf breaks in the frequency range of 50–300 Hz—well within the sharks' hearing range—serves as a means for orienting to nearshore environments (Hueter et al., 2012).

Navigating Long-Distances Using Earth's Geomagnetic Field

The current evidence on short-distance shark navigation falls short of fully comprehending their exceptional navigational abilities in a long-distance setting. This limitation arises because the existing evidence becomes less applicable in the pelagic setting of vast expanses of water where conventional geographical features and clear environmental cues are scarce. As a result, the enduring hypotheses shaping our understanding of long-distance shark navigation converge on geomagnetic orientation. Utilizing information from Earth's geomagnetic field (GMF) for navigational purposes was first proposed in the 17th century (Freake et al., 2006). The

discovery of large-scale magnetic gradients that vary predictably across the surface of the Earth led to the hypothesis that animals can recognize and learn a gradient pattern to move within and beyond their home range. For an animal to navigate using the GMF, it must extract directional (compass) and positional (map) information (Naisbett-Jones & Lohmann, 2022). Mechanisms for detection must also be susceptible to perceiving the often weak intensity of the GMF signal, and animals must demonstrate the ability to learn and memorize these gradients (Freake et al., 2006). These challenges underscore the complexity of the mechanism involved in utilizing the GMF for navigation.

A recent pioneering study conducted by Keller et al. (2021) offers compelling evidence to substantiate this hypothesis in sharks. In a controlled experiment, Keller exposed bonnethead sharks (Sphyrna tiburo) to a magnetic signature of a location within the shark's home range, south of their home range, and north of their home range on land. The results revealed that the sharks could discern between the magnetic field of their capture site and a more southerly location. That is when exposed to the southern GMF, the sharks significantly oriented themselves in the direction of their home range. Interestingly, the northern magnetic field failed to elicit a response. The researchers speculated that this lack of response might be attributed to its considerable distance outside the sharks'typical range. The sharks may have yet to learn to respond to the northern magnetic field, which lies far beyond any fields they would have experienced.

Indirect Electroreception

Based on Faraday's Law of Physics, a change in the Earth's

geomagnetic field (GMF) could create an electrical potential difference within a shark. This difference could lead to the flow of an electrical current, transmitting positional information (Montgomery & Walker, 2001).

Sharks possess an inherent electro-sensory system that already responds to weak electric signals, suggesting a plausible indirect detection of the GMF through this system (Adrianov et al., 1974; Newton et al., 2019). This system is known to mediate crucial behaviors in sharks, including orientation towards prey, predator avoidance, and conspecific detection (Newton et al., 2019). The hypothesis linking electroreceptors to navigation was initially proposed and experimentally examined by Kalmijn et al. (1982) and Pals et al. (1982). Experimental observations revealed that species within the subclass elasmobranchs—comprising sharks, skates, and rays—could be trained to orient towards electric dipoles and discern gradients of approximately five nV cm−1, which is within the range of fields produced in seawater through the GMF (Newton et al., 2019). Additionally, the research demonstrated that stingrays (Urobatis jamaicensis) can remember randomly positioned magnetic anomalies even after six months, associating the correct magnetic field with a food reward (Newton & Kajiura, 2017). However, it is necessary to note that this does not conclusively prove that sharks navigate exclusively through their electro-sensory system. Instead, it indicates sharks can distinguish GMF signals, and it is probable that the electro-sensory system is used to mediate it. However, there could be confounding factors that are not fully accounted for in this study that would point to a different pathway.

Direct Magnetoreception

A growing body of studies has begun to explore the concept of a magnetosensory structure in sharks that directly interprets positional information from the GMF. Anderson et al. (2017) have proposed a potential pathway for GMF detection involving magnetosensory structures in the olfactory bulbs, possibly comparable to some teleost and avian species (Beason & Nichols, 1984). For instance, the presence of biogenic magnetite (Fe3O4) in the tissues of certain avian and teleost species suggests a possible pathway. It is theorized that these crystals can align in chains within a cell. When exposed to a magnetic field, the orientation of these chains changes and, as a result, provides directional information. To test this hypothesis, Anderson placed magnets over the location of olfactory bulbs on captive sandbar sharks (Carcharhinus plumbeus) to impair any magnetic stimulus perception of the sharks that contained a magnetoreceptor. Then, the experiment tested the sharks' response to a magnetic stimulus before, during, and after impairment. The sharks exposed to magneto-sensory impairment were less capable of discriminating between magnetic stimuli than those not exposed. While these results cannot definitively prove the existence of a magnetoreceptor structure, they suggest that the electro-sensory system is not the exclusive means by which sharks detect magnetic stimuli.

Conclusion

The ability of sharks to navigate effectively, undertaking precise and repeated migrations, is a fascinating area of exploration. While the exact mechanisms that guide their movements remain unknown, prior studies have exposed the factors that influence short- and long-distance navigation. The intentional and energy-ef-

ficient directed walks observed in various shark species, such as tiger sharks and scalloped hammerheads, underscore the significance of cognitive mapping in their navigation strategies. This revelation beckons further research into the nuanced interplay of memory and experience shaping these optimized movements. Likewise, the reliance on sensory strategies like olfaction, sight, and hearing for short-distance navigation has demonstrated the adaptability of sharks.

However, challenges arise when applied to large-scale pelagic navigation and migrations. The enduring hypothesis of sharks relying on Earth's geomagnetic field gains increasing empirical support, accentuating the need for deeper investigations into the interconnectedness of geomagnetic orientation with other sensory modalities such as electroreception and magnetoreception. To unravel the intricacies of shark navigation, a comprehensive examination of prior studies and continued future research is essential. Future studies should meticulously address potential errors associated with using magnets in impairment studies and interpret results cautiously in field studies, where controlling environmental cues is challenging. Moreover, understanding how human activities, particularly those associated with electromagnetic fields, might disrupt or impact shark navigation is paramount. For instance, constructing offshore wind farms or using sonar technology for oil and gas exploration could interfere with the magnetic fields and other environmental cues sharks rely on for navigation. Such disruptions could have far-reaching implications for the ability of sharks to navigate effectively in their natural environments. Therefore, as we strive to uncover the intricacies of shark navigation, we simultaneously pave the way for shark conservation.

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Writer Biographies

Shamai Thacker: A devoted professional with a passion for creativity and greater equity in Indigenous learning experiences, Shamai Thacker, an Alaska Native of Inupiaq, Tsimshian, and Scottish descent from Clam Gulch, Alaska, weaves personal experiences with a dedication to supporting others. A graduate of the University of Alaska Anchorage's Computer Information and Office Systems (AAS), Technology (BS), and Teaching and Learning (M.Ed.) programs, Shamai currently works as a Training & Development Specialist III at the Alaska Native Tribal Health Consortium. Residing in Anchorage with her family, Shamai continues to pursue education, recently completing the Alaska Native Language & Studies program, and aspires to pursue a Ph.D. in the future. This trajectory is geared towards advancing the empowerment of future generations through culturally responsive teaching and program development.

Keefer Brown: Keefer Brown is a senior marine biology major who enjoys writing and playing tabletop games such as D&D in his spare time. He is passionate about pinnipeds and, after graduating, he hopes to pursue a career that will allow him to aid in pinniped research while spreading awareness for marine mammal conservation.

Emilion Boyd-Tucker: Emilion is a senior at UAS majoring in Biology with a minor in Chemistry. She first
came here in spring 2021 on domestic exchange from New Hampshire and ultimately decided to transfer to UAS. Her commitments other than school include working at a brewery, a pharmacy, and working with a chemist at NOAA conducting an INBRE funded research project. She is eager to narrow down her research goals and utilize her education to make an impact on the scientific community.

Kristine Toms: Kristine Toms lives in Palmer and is a lifelong Alaskan who first started at the University of Alaska Anchorage in 1997. She attended classes when she could throughout the years while working in accounting and administrative positions before becoming a tutor at her son's elementary school. She fell in love with teaching, so she returned to the University of Alaska Southeast two years ago to pursue her bachelors in elementary education. She is excited to be student teaching next year.

Samantha M. Zelley: SamMi (she/they) is a junior pursuing a B.A. degree in English with an emphasis area in Creative Writing and a minor in Environmental Science. Her interdisciplinary academic interests include ecosemiotics, ecocritical and cultural theory, climate change in the Arctic, systems of ontology and epistemology, ecology, and environmental ethics. Beyond her scholarly life, she is a proud dog mom who enjoys rich coffee, crafting, reading, and hiking.

Abigail Grenier: Abigail is a lifelong Alaskan in her senior year of college. She is majoring in psychology at the University of Alaska with further interests in sociology and political science. She hopes to continue her studies after obtaining her bachelor's degree. She greatly enjoys the biking and hiking trails in her area and splits her free time between outdoor activities with her dog and spending time indoors reading, playing piano, playing video games, baking, and spending time with her family.

A.J Schultz: AJ Schultz is a student at the University of Alaska Southeast. He was born in Princeton, New Jersey, and raised in Anchorage, Alaska, before moving to Juneau to pursue higher education. Schultz majors in English with an emphasis in Creative Writing. Additionally, Schultz studies Psychology and Behavioral Health. In academic writing, Schultz takes interest in art, music, sociology, and shifting cultures, focusing on gender and generational divides.

Holly Hoffbauer: Holly Hoffbauer, a graduating senior majoring in Marine Biology with a minor in Mathematics, radiates a passion for the intricate world of marine mammals and wildlife research. Throughout her academic journey, she has demonstrated a steadfast commitment to understanding marine ecosystems and engaged in various research projects, honing her skills in data analysis and scientific inquiry. This semester, Holly is excited to delve into gray research in Sitka, emphasizing her dedication to making meaningful contributions to the field. Beyond academics, Holly Hoffbauer reveals herself as an avid outdoor enthusiast, channeling her love for nature into activities such as training her dog in scent detection work, with aspirations to become a certified Search and Rescue volunteer. As Holly approaches graduation, she envisions contributing her diverse skills, academic acumen, and hands-on experiences to a role in Alaska, aiming to make a lasting impact on marine mammal research and conservation efforts.

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The Juneau Writing Center is ready to help you! We can assist you at any stage of the writing process, from understanding prompts to making final revisions and everything in between. Our services are free to all UAS students, including distance learners.

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The Writing Center, located downstairs in the Egan Library, Room 105, advises students from all disciplines on writing projects. We are a team of strong writers who believe writing is a crucial form of communication for any class and any profession. We aim to help you master your writing skills through attentive, supportive assistance and a genuine interest in what you have to say.

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