Science and Culture: Readings for Writers

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Preface

As writing teachers, the broader movement toward adopting and creating open educational resources has become central to our pedagogy. This volume extends the work we did creating a previous resource, *The Culture of Science*, which was intended specifically for students at our institution, the University of Oregon. Supported by a digital scholarship award from the UO Libraries and working in collaboration with OER librarians Rayne Vieger and Allia Service, this new project is intended for a wider educational audience of students teachers in a range of disciplines interested in exploring the impact of science and its history on modern life. We have intentionally selected materials from a wide range of genres, modalities, and creators in an effort to expand the ways we all think about and engage with science.

Recently, the state of Oregon has adopted common learning outcomes for the first-year writing sequence that inspired the development of this resource. Every student who completes the university-level writing requirement should be able to achieve the following goals:

- Apply rhetorical concepts to achieve writing goals within a given discourse community.
- Engage in research and writing as recursive and inquiry-based processes, participating in the communal and

conversational nature of academic discourses.

- Develop strategies for generating, drafting, revising, and editing texts based on feedback and reflection.
- Reflect on knowledge and skills developed in this and other courses and potential transfer to future contexts.

We have made every effort to cultivate themes and select articles, videos, and other media that will help students meet these goals with instructional support.

In addition, we have selected texts based on several specific aims:

- Provide a balance of gender, racial, and geographical representation among authors, creators, and topics.
- Offer accessibility, both physical accessibility and accessibility of content.
- Cultivate a blend of engaging genres and modes building on a central concept and blending rhetorical tools (appeals, voice, style, etc.) to effectively communicate with and about science for various audiences.
- Inspire effective discussions, assignments, essays and other learning activities designed to help instructors guide students toward proficiency (and mastery) of university-level writing sequence outcomes.

While we have made every effort to select resources that are freely available via the Internet, in some cases we have chosen materials that are only available through library databases due to the quality of their scholarship. Such selections are indicative that further advances are needed to make all such high-quality materials open and available to the public.

While using this resource, if you notice that a link is no longer working or identify any other issues with the material, please reach

out and let us know: srust[at]uoregon.edu or jenee[at]uoregon.edu. We'd also love to hear about how you're using it.

Special thanks to our Assistant Editor Sofia Caradonna, a senior majoring in Environmental Studies at the University of Oregon who provided exceptional research support.

—Stephen Rust, Senior Instructor of English, and Jenée Wilde, Senior Instructor of English, University of Oregon

MEDIA ATTRIBUTION

Introduction

Science and Culture is a resource intended for college and secondary students to engage with scientific concepts, facts, and history as they relate to society in the United States and globally. We created this resource specifically for students in our first-year writing classes to develop informed analyses and arguments. However, the multimodality, diversity of voices, and range of topics should appeal to anyone interested in exploring these themes.Our diverse students, whether or not they are science majors, benefit greatly from understanding the broader culture of academic inquiry and their place as scholars within it. *Science and Culture* allows students to see particular knowledge debates across natural and social sciences, humanities, and creative arts as happening in the contexts of people who share ideas, argue claims, and through cooperative processes come to agreement over time about what constitutes knowledge. Science, like the arts, is imperfect and ever-evolving but also represents our best effort as humans to understand ourselves and our world. The themes in this volume have been cultivated to engage readers not merely as receptors of information but as active participants in this ongoing process of knowledge building.

Without dismissing the wealth of information and understanding of the world that science has given humanity, it's important to begin by questioning the assumptions that underlie modern Western

science. As such, **Unit 1: The Culture of Science** explores questions of objectivity, the relationship between science and the humanities, the role of Indigenous knowledge, and how scientists are grappling with racism, past and present.

Unit 2: Communicating Science examines various ways that scientists must communicate their ideas to various and sometimes skeptical public audiences. While the topics in this unit might seem quite diverse—from COVID-19 to climate change, chimpanzees to science fiction cinema and virtual museums, they share a common interest in inviting us to think about how scientists communicate their ideas in engaging and interactive ways.

In recent decades, science has made great strides in deepening our understanding of life on planet Earth, questioning out-dated assumptions that prioritizes human life and devalues animals, fungi, and plant life as lesser beings. Recognizing animal studies as a vibrant interdisciplinary field, **Unit 3: Life on Earth—Our Non-Human Kin** opens up new pathways for understanding the natural world not as separate from us but as intimately intertwined with human life.

As Western medicine continues to develop new strategies for protecting and enriching human life, today's health providers are developing a greater appreciation for the value of traditional knowledge. **Unit 4: Biomedical Science** presents non-Western and Indigenous perspectives on health while at the same time considering cutting-edge science and technological advancements. By juxtaposing these topics, we hope that students will gain a deeper ethical engagement with the power and perils of biomedical approaches across traditions and cultures.

Changes are good that you've heard a lot about climate change in recent years. It is a global concern, yet one that often feels abstract or distant from everyday life. For those living near the Earth's poles,

however, the effects of climate change are readily apparent and already impacting daily life. By shining a light on this situation, **Unit 5: Arctic Ice** invites us to understand our interdependence with the global environment in a visceral way. Like the selections in all the units, the scholars, filmmakers, educators, and artists included here are raising their collective voices to inspire change.

CHAPTER 1

Unit 1: The Culture of Science

"The Bitter Aftertaste of Technical Sweetness." Heather E. Douglas. *Frankenstein, or the Modern Prometheus: Annotated for Scientists, Engineers, and Creators of All Kinds,* edited by David H. Guston, et al., MIT Press, 2017, pp. 247–251.

Abstract: In this essay, science and society professor Heather E. Douglass explores how the pursuit of "technical sweetness" affected both Victor Frankenstein's work and the work of the atomic scientists in the 1930s and 1940s.

- **Supplement: "Why There are New Assessments of Oppenheimer's Role in History."** William Brangham and Courtney Norris. *PBS News Hour.* 26 Dec. 2022 (8 minutes).

Abstract: Physicist J. Robert Oppenheimer led the Manhattan Project to develop nuclear weapons during World War II and is perhaps best known as the "Father of the Atomic Bomb." But he was a complicated man. As William Brangham explains, there are new assessments of his role in history.

"Objectivity is a Myth that Harms the Practice and Diversity of Forensic Science." Allysha Powanda Winburn and Chaunesey M.J. Clemmons. *Forensic Science International: Synergy*, vol. 3, 2021, pp. 100196, doi: 10.1016/j.fsisyn.2021.100196.

Abstract: Forensic scientists have long held that objectivity is a core tenet of our analyses and the expert-witness statements that can result. Certainly, the rhetoric of objectivity holds an undeniable allure given the fact that we, unlike many other scientists, may testify to our results in a court of law. However, our faith in objectivity is complicated by the facts that: (1) pure scientific objectivity does not exist; and (2) espousing the myth of objectivity is neither neutral nor benign. The authors consider both points and conclude with recommendations for a strong, realistic, and ethical practice of forensic science that does not require faith in a dangerous myth.

- **Supplement: "Seeing How It Is: Can Empirical Observation Lead Us to the Truth?"** With panelists Steve Fuller, Angela Saini, Rupert Sheldrake, Peter Atkins, hosted by Danielle Sands. *Institute of Art and Ideas*, 16 July 2022 (43 minutes).

Abstract: From Newton to Darwin, Curie to Einstein, science has been built on empirical observation. Now the very idea of neutral observation is under threat. In a postmodern world it is claimed all observation is perspectival, everything we see is influenced by what we already think. Heisenberg, the founder of quantum mechanics, went further arguing that observing reality was not even possible. Are we at sea in a world of competing models? Or is it time to reassert the value of empirical

observation, supported perhaps by machine learning and big data, as a means of choosing between incompatible theories?

"Why Science Needs the Humanities to Solve Climate Change." Steven D. Allison and Tyrus Miller. *The Conversation*, 1 Aug. 2019.

> **Abstract:** Solving the world's climate problems will require tapping into brainpower beyond science. That's why the authors—an ecologist and a humanities dean—team up to rethink climate solutions. Recently they developed a program to embed humanities graduate students in science teams, an idea that climate research centers are also exploring.

"Weaving Traditional Ecological Knowledge into Biological Education: A Call to Action." Robin Wall Kimmerer. *BioScience*, vol. 52, no. 5, May 2002, pp. 432–438.

> **Abstract:** Should Western science be valued over other forms of knowledge? In this peer-reviewed scientific article, plant ecologist Robin Wall Kimmerer explores why the traditional ecological knowledge of indigenous peoples should be recognized as "complementary and equivalent" to scientific knowledge and included in university science curricula.

"Unnatural Selection: How Racism Warps Scientific Truths." Abacki Beck. *Bitch Media*, 5 Oct. 2017.

> **Abstract:** In this article, social activist Abacki Beck critiques

the assumption that scientific truths are "largely unbiased, nonpartisan, and universal" by examining how science is "wrought with violent, racist histories assumed as truth and presented as for the good of humanity." Bitch Media is an online media organization whose mission is to provide and encourage an engaged, thoughtful feminist response to mainstream media and popular culture.

CASE STUDY: RACISM IN SCIENCE

"From Birth to Death: Black Americans and a Lifetime of Disparities." Kat Stafford. *Associated Press*, 23 May 2023.

Abstract: From birth to death, Black Americans fare worse in measures of health compared to their white counterparts. They have higher rates of infant and maternal mortality, higher incidence of asthma during childhood, more difficulty treating mental health as teens, and greater rates of high blood pressure, Alzheimer's disease and other illnesses. *The Associated Press* spent the past year exploring how the legacy of racism in America has laid the foundation for the health inequities that Black people face.

- Chapter One, Birth: Why do so many Black women die in pregnancy? One reason: Doctors don't take them seriously. Includes AP radio story (3 minutes) and video (5 minutes).
- Chapter Two, Childhood: Black children are more likely to have asthma. A lot

comes down to where they live. Includes AP radio story (3 minutes) and video (5 minutes).

- Chapter Three, Teen Years: Black kids face racism before they even start school. It's driving a major mental health crisis.
- Chapter 4, Adulthood: High blood pressure plagues many Black Americans. Combined with COVID, it's catastrophic. Includes AP radio story (3 minutes) and video (4 minutes).
- Chapter 5, Elders: A lifetime of racism makes Alzheimer's more common in Black Americans. Includes two videos (2 minutes and 5 minutes).
- Medical Racism in History: The health inequities documented in this project have their roots in a long history of medical racism. The AP has collected a small sample of that history related to every phase of life. Includes video (2 minutes).

"Racism: Overcoming Science's Toxic Legacy." A *Nature* special issue. 20 Oct. 2022.

Abstract: For centuries, science has built a legacy of excluding people of color and those from other historically marginalized groups from the scientific enterprise. Institutions and scientists have used research to underpin discriminatory thinking, and have prioritized research

outputs that ignore and further disadvantage marginalized people. *Nature* has played a part in creating this racist legacy. After the killing of George Floyd by police in Minneapolis, Minnesota, in 2020, *Nature* committed to becoming an agent of change, and helping to end discriminatory practices and systemic racism. This special issue is part of that commitment, and the first in this journal's history to be guest-edited.

- Editorial: How *Nature* Contributed to Science's Discriminatory History
- Editorial: Ending Racism is Key to Better Science—A Message from Nature's Guest Editors

Part One: Witnessing Racism

- Feature: 'It's a Constant Hum': A Planetary Geologist Calls Out Racism in Academia
- Feature: The First Indigenous Female Surgeon in Canada Is Battling for Health Justice
- Feature: The Geoscientist Fighting For Universities to Confront Systemic Racism
- Feature: 'There's No Space For Us': An Indigenous-Health Researcher Battles Racism in Australia
- Feature: 'I Was Treated as if I Was Dirty': A Paediatrician Decries Racism Against African Scientists

Part Two: Systemic Racism

- Feature: Computer Science Has a Racism Problem: These Researchers Want to Fix It
- News & Views forum: Skin Colour Affects the Accuracy of Medical Oxygen Sensors

Part Three: Building a Fairer Future

- Careers feature: Imperialism's Long Shadow: The Uk Universities Grappling with a Colonial Past
- Comment: Counter the Weaponization of Genetics Research by Extremists
- News & Views in retrospect: The Unseen Black Faces of AI Algorithms
- Where I work: A Jamaican Medicinal-Plant Scientist Explores His African Roots

CHAPTER 2

Unit 2: Communicating Science

"Toward Effective Government Communication Strategies in the Era of Covid-19." Bernadette Hyland-Wood, John Gardner, Julie Leask, and Ullrich K.H. Ecker. *Humanities and Social Sciences Communications*, vol. 8, 2021.

> **Abstract:** Governments play a critical role in the relationship between science and culture. During the first year of the global Covid-19 pandemic, several countries successfully reduced their COVID-19 infection rates, while others were overwhelmed. The reasons for the differences are complex but were due in part to the speed and scale of governmental intervention and how communities reacted to the scientific information provided by governments. This article draws on key findings from scholarship in multiple disciplines to highlight some fundamental characteristics of effective governmental crisis communication.

- **Supplement:** *In/Vulnerable*. Reveal and The Nib. *Reveal.com*, 2020.

Abstract: *In/Vulnerable* is a comics series illustrated by Thi

Bui that captures both the shared experience of the pandemic and the ways it laid bare the stark disparities that shape our lives.

"What Separates Us from Chimpanzees." Jane Goodall. *Ted.com*, 2003 (29 minutes).

Abstract: Dr. Jane Goodall has been researching chimpanzees for more than 60 years and is considered the world's foremost expert on this species. She is also considered a gifted communicator about the relationship between science and culture. The primatologist says the only real difference between humans and chimps is our sophisticated language. She urges us to start using this knowledge to change the world.

- **Supplement: "Dr. Jane Goodall on Living with Chimps, Their Language, and the Possibility of Bigfoot."** *Jimmy Kimmel Live*, 13 April 2023 (9 minutes).

Abstract: In this 2023 interview with late-night talk show host Jimmy Kimmel, Dr. Goodall talks about her lifelong love of animals, being a women in science, bonding with the chimp named David Greybeard, chimp "language" and tools, being open to the idea that Bigfoot might exist, and her new Apple TV+ series "Jane".

NASA Climate Change website. *United States National Aeronautics and Space Administration,* 2009–present.

> **Abstract:** NASA multimedia climate change website invites users to explore the current scientific evidence about climate change and its effects (from global temperatures, changes in sea ice, carbon dioxide levels and more), information about scientific consensus on the issue, and potential solutions to mitigating the most severe impacts of global warming. Resources for educators and children are included on the site.

"Climate Change and the Significance of Religion." Mike Hulme. *Economic and Political Weekly*, vol. 52, no. 28, 2017, pp. 14–17. *JSTOR*. *Note: Requires access to JSTOR via your college or public library.

> **Abstract**: In this provocative article, geographer Mike Hulme argues that dealing with climate changes solely as a scientific issue will be insufficient to solve this global crisis. While there is much to learn and discuss when it comes to how the world's religions are addressing climate change, Hulme contends that religion can and must play a greater role in helping leaders understand how people respond positively or negatively to scientific information and communication about this issue.

"The Science of Black Panther." Andy Howell. *FilmThreat*, 22 January 2019.

> **Abstract:** This multimedia article by astronomer and physicist Andy Howell explores the technologically advanced world of Wakanda (as represented in the 2018 film version of *Black Panther*) in relation to real-world science through sections devoted to meteorites, *vibranium*,

interactive holograms, geographic isolationism, and cinematic portrayals of scientists. Each section includes a corresponding Science vs. Cinema video segment.

CASE STUDY: INTERACTIVE MEDIA

University of Oregon Museum of Natural and Cultural History Virtual Exhibits. *University of Oregon*, 2021–present.

> **Abstract:** By exploring these virtual museum exhibits, where you can create your own science and culture adventure with easy clicks of your mouse. The "Explore Oregon" exhibit focuses on the dynamic forces that shape Oregon's landscapes, climate, and ecosystems. Meet giant salmon, Ice Age sloths, and other amazing animals from across the millennia. The "Oregon—Where Past is Present" exhibit delves into the archaeology of the First Americans to inhabit Oregon and the dynamic cultures of today's Indigenous tribes. Other virtual exhibits explore related cultural topics.

"Surfacing." Nicole Starosielski, Erik Loyer, and Shane Brennan. 2016–present.

> **Abstract**: "Surfacing" is a unique multimedia website designed to inform users about the undersea fiber optic cables that distribute digital communications worldwide (including phone calls, text messages, websites, digital videos, and more). From your starting point, you traverse the Pacific Ocean by hopping between network nodes. In

the process, the site shares narratives about the history of the cable network, the companies that construct it, and the ecologies that it runs through.

CHAPTER 3

Unit 3: Life on Earth – Our Nonhuman Kin

"Minds of Their Own: Animals are Smarter Than You Think." Virginia Morell and Jennifer S. Holland. *National Geographic*, vol. 213, no. 3, March 2008, pp. 36–61.

*Note: This link requires a college or public library account with access to the Ebscohost database.

Abstract: The article focuses on the cognitive processes of animals. Attention is paid to scientist Irene Pepperberg's study of an African Gray Parrot and the notion that animals can think. Signs of higher order mental abilities documented by behavior ecologists are mentioned, including good memory, understanding grammar and symbols, self-awareness, and creativity, which have been documented in animals, including border collies, crows, and dolphins.

- **Supplement: "What are Animals Thinking and Feeling."** Carl Safina. *Ted.com*, 2015 (19 minutes).

Abstract: Using discoveries that span ecology, biology and behavioral science, ecologist Carl Safina weaves together stories of whales, wolves, elephants and albatrosses to argue that just as we think, feel, use tools and express emotions, so too do the other creatures that share the Earth with us.

"Charles H. Turner, Pioneer in Animal Cognition." Hiruni Samandi Galpayage Dona and Lars Chittka. *Science*, vol. 370, no. 6515, 2020, pp. 530–531. *Note: This link requires a college or public library account with access to *Science*.

Abstract: In the late 19th and early 20th centuries, Charles Henry Turner (1867–1923) established a research program that was in sharp contrast to prevailing ideas regarding animal behavior and cognition. Despite facing almost insurmountable barriers because of his African American ethnicity, he published more than 70 scientific papers. But his discoveries and conceptual advances failed to gain the recognition they deserved, and his works were later all but forgotten—until recently.

"Ethnobotany in the Nepal Himalaya." Ripu M. Kunwar and Rainer W. Bussmann. *Journal of Ethnobiology and Ethnomedicine*, vol. 4 no. 24, 2008.

Abstract: Indigenous knowledge has become recognized worldwide not only because of its intrinsic value but also because it has a potential instrumental value to science and conservation. In Nepal, the indigenous knowledge of useful and medicinal plants has roots in the remote past.

The present study reviews the indigenous knowledge and use of plant resources of the Nepal Himalayas along the altitudinal and longitudinal gradient. Strengthening the wise use and conservation of indigenous knowledge of useful plants may benefit and improve the living standard of poor people.

"6 Ways Mushrooms Can Save the World." Paul Stamets. *Ted.com*, 2008 (17 minutes).

Abstract: Mycologist Paul Stamets lists 6 ways the mycelium fungus can help save the universe: cleaning polluted soil, making insecticides, treating smallpox and even flu viruses. One of the most watched TED talks with nearly 14 million views between the Ted website and YouTube.

- **Supplement: Fantastic Fungi website.**

Abstract: This multimedia website includes a fungi news journal, an photo-illustrated fungi field guide, experimental virtual reality animation videos, and the trailer for the full-length *Fantastic Fungi* documentary film.

"Extremophiles: Resilient Microorganisms that Help us Understand Our Past—and Future." Jaz L. Millar. *The Conversation*, 10 August 2021.

Abstract: In the depths of the ocean, in volcanic springs, under four meters of ice: almost anywhere scientists can

think of to look for life on Earth, we have found it. The methods these microorganisms employ to survive the extreme have taught us how to protect our bodies better, how to copy DNA to better diagnose illnesses and how life survived 100 million years of a global Ice Age.

CASE STUDY: INTERACTIVE MEDIA

"Bear 71." Jeremy Mendes, Leanne Allison, and the National Film Board of Canada. 2012 (20 minutes).

> **Abstract**: "Bear 71" is the true story of a female grizzly bear monitored by the Canadian wildlife conservation offices from 2001–2009. She lived her life under near constant surveillance that was tracked and logged as data. The resulting interactive documentary illuminates the ways that science sees the world as data, qualifying and quantifying everything, rather than experiencing and interacting. The grainy images gathered from motion-capture cameras over 10 years by various scientists reveal the hidden life of the forest.

Atlas of Common Freshwater Macroinvertebrates of Eastern North America. *National Science Foundation*, 2019.

> **Abstract:** This reference atlas developed from a larger collaboration among scientists from multiple universities (the Learning to See, Seeing to Learn project) is an interdisciplinary research and development effort to create an innovative new kind of teaching and learning resource for aquatic insect identification to support citizen science

identification activities. This National Science Foundation supported project brings together expertise in entomology, learning sciences, software engineering, water quality biomonitoring, and design.

CHAPTER 4

Unit 4: Biomedical Science

"When the East Meets the West: The Future of Traditional Chinese Medicine in the 21st Century." Jane Qiu. *National Science Review*, vol. 2, no. 3, 1 Sept. 2015, pp. 377–380.

> **Abstract:** Does Traditional Chinese Medicine (TCM) have anything to offer Western science and medicine, or should its philosophy and approaches to healthcare be considered pseudoscientific? In this forum, six panelists from diverse medical, governmental, and scientific backgrounds discuss the differences between Traditional Chinese Medicine and Western science and medicine, recent progress in TCM research, and key challenges in modernizing this ancient practice.

"The Healers Project: Decolonizing Knowledge within Afro-Indigenous Traditions." Ana-Maurine Lara and Alaí Reyes-Santos. *University of Oregon*, 2016.

> **Abstract:** This interactive blog seeks to interrogate and to interrupt the colonial gaze that historically vilifies and

demeans our elders as "uneducated," or "simple," or "primitive," and that deems their knowledge simply "folklore," "popular religion," or "superstition." In order to interrupt the colonial gaze that has historically vilified Afro-Indigenous women healers, we conversed with them directly and actively recognized their societal role as knowledge producers. Their knowledge and perspectives offer us tools—through storytelling, healing modalities, crafts, dance, ritual, and music—to confront racism, gender inequities, xenophobia and the very real threats produced by limited access to healthcare.

- **Supplement: "Traditional Medicines."** MyHealth.Alberta.Ca. *YouTube* (23 minutes).

  Abstract: There is a notion that traditional medicines should be respected, honored, and better understood by all people, especially those who work in the circle of care. This storytelling project uses the power of sharing stories to facilitate safe, meaningful, and respectful conversations between health care professionals and indigenous communities.

"Update: Famous Tumors." *Radiolab*, 22 Oct. 2013 (68 minutes; HeLa cells story starts at 35 minutes).

Abstract: In this hour of Radiolab: an unflinching look at the good, bad, and ugly side of tumors. Say hello to the growth that killed Ulysses S. Grant, meet Tasmanian Devils battling contagious tumors, and get to know Henrietta Lacks whose HeLa cancer cells changed modern medicine. The episode was first released when Rebecca Skloot's book

about the life and legacy of Lacks had just hit the shelves, and this update comes four years later after some interesting things have happened to both Henrietta's cells and her family.

"Promising Assisted Reproductive Technologies Come with Ethical, Legal and Social Challenges—A Developmental Biologist and a Bioethicist Discuss IVF, Abortion, and the Mice with Two Dads." Keith Latham and Mary Faith Marshall. *The Conversation*, 13 July 2023.

Abstract: New developments in reproductive technologies have the potential to expand access to the experience of pregnancy. However, such advances come with challenges that go far beyond the purely technical into the ethics and implications of cutting-edge research. Developmental biologist Keith Latham and bioethicist Mary Faith Marshall discuss the ethical and technological potential of in vitro gametogenesis and assisted reproductive technology post-Roe.

CASE STUDY: GENE EDITING

"The Age of Genetic Wonder." Juan Enriquez. *Ted.com*, Feb. 2019 (18 minutes).

Abstract: Gene-editing tools like CRISPR enable us to program life at its most fundamental level. But this raises some pressing questions: If we can generate new species from scratch, what should we build? Should we redesign humanity as we know it? Juan Enriquez forecasts the

possible futures of genetic editing, exploring the immense uncertainty and opportunity of this next frontier.

"CRISPR Babies Raise an Uncomfortable Reality—Abiding by Scientific Standards Doesn't Guarantee Ethical Research." J. Benjamin Hurlbut and Jason Scott Rober. *The Conversation*, 3 Dec. 2018.

Abstract: Uncertainty continues to swirl around scientist He Jiankui's gene editing experiment in China. Using CRISPR technology, He modified a gene related to immune function in human embryos and transferred the embryos to their mother's womb, producing twin girls. Many questions about the ethical acceptability of the experiment have focused on ethical oversight and informed consent. These are important issues; compliance with established standards of practice is crucial for public trust in science. But public debate about the experiment should not make the mistake of equating ethical oversight with ethical acceptability. Research that follows the rules is not necessarily good by definition.

"How Human Gene Editing is Moving on After the CRISPR Baby Scandal." Katie Hunt. *CNN*, 9 Mar. 2023.

Abstract: Doctors, scientists, patient advocates and bioethicists gathered in London for the Third International Summit on Human Genome Editing, at which participants reported on advances made in the field and debated the thorny ethical issues posed by the cutting-edge technology.

- **Supplement: "What is gene editing and how could it shape our future?"** Gavin Bowen-Metcalf. *The Conversation*, 14 Feb. 2023.

Abstract: The potential for gene editing technology is astonishing—from treating genetic diseases, modifying food crops to withstanding pesticides or changes in our climate, or even to bring the dodo "back to life", as one company claims it hopes to do. We will only be hearing more about gene editing in the future. So if you want to make sure you understand new updates, you first need to get to grips with what gene editing actually is.

CHAPTER 5

Unit 5: Arctic Ice

"The History of Ice: How Glaciers Became and Endangered Species." Mark Carey. *Environmental History,* vol. 12, July 2007, pp. 497–527.

Abstract: In recent decades, glaciers have become both a key icon for global warming and a type of endangered species. To understand why glaciers are so inexorably tied to global warming and why people lament the loss of ice, University of Oregon professor of Environmental Studies and Geography Mark Carey urges us to look beyond climate science—to culture, history, and power relations. By encompassing diverse meanings, glacier and global warming discourse can offer a platform to implement change in how we communicate about nature, science, imperialism, race, recreation, wilderness, and global power dynamics.

"Exceeding Beringia": Upending Universal Human Events and Wayward Transits in Arctic Spaces." Jen Rose Smith. *Environment and Planning D: Society and Space*. vol. 39, no. 1, 2021, pp. 158–175.

Abstract: This scholarly article analyzes 18th century Natural History musings that linked Arctic climate to race and human difference and demonstrates how these musings are associated with human migration and settlement in arctic places. To upend dominant Westernized narratives of arctic landscapes, Smith analyzes the 2016 poem "Exceeding Beringia" by Joan Naviyuk Kane (Inupiaq) wherein Inupiaq relations to more-than-human kin articulate arctic transit and migration as a mutual responsibility.

"Anaiyyun: Prayer for the Whale." *Kiliii Yüyan*, 2019, documentary film (8 minutes).

Abstract: "Anaiyyun: Prayer for the Whale" is a short documentary film that tells the story of an Iñupiaq whaling crew in northern Alaska. Photographer Kiliii Yüyan illuminates the stories of lives bound to the land and sea. Inspired by how Indigenous and local human communities relate to the natural world, he searches for insights through different cultural perspectives. Note: the film contains images of whaling that may be upsetting.

- **Supplement: "Episode 2: Camping on Sea Ice with Whale Hunters."** *National Geographic's Overheard Podcast*, 21 May 2021 (24 minutes).

Abstract: National Geographic photographer Kiliii Yüyan recounts his time living on the Arctic sea ice with Inupiaq whale hunters as he documented how climate change threatens their way of life.

"What's Hidden in Artic Ice." Brendan Howard and Jessica Rogers. Directed by Denys Spolitak. *TED-Ed* animated film, 2023 (6 minutes).

> **Abstract:** In June 2022, a gold miner in the Canadian Yukon working on the traditional lands of the Tr'ondëk Hwëch'in First Nation uncovered the exceptionally well-preserved, frozen remains of a wooly mammoth calf that died 30,000 years ago. And this find isn't the only of its kind. In this short, animated documentary, Brendan Rogers and Jessica Howard uncover secrets buried in the Arctic permafrost.

"Sea Ice, Extremophiles and Life on Extraterrestrial Ocean Worlds." Andrew Martin and Andrew McCinn. *International Journal of Astrobiology*, vol. 17, no. 1, 2018, pp. 1–16.

> **Abstract:** The primary aim of this article is to highlight that sea-ice microbes would be capable of occupying ice-associated biological niches on Europa (a moon of Jupiter) and Enceladus (a moon of Saturn). In future, these sea-ice organisms will likely play a significant role in defining the constraints on habitability beyond Earth and developing a mechanistic framework that contrasts the limits of Earth's biosphere with extra-terrestrial environments of interest to astronomers.

"United States Army Research and Development—Progress Report Number Six— Camp Century." *United States Department of Defense*, 1964 (31 minutes).

> **Abstract:** This government-created documentary tells the story of the construction of Camp Century, Greenland's city

under the ice. After U.S. Army engineers selected the site in May 1959, needed supplies were delivered to the work camp in a remarkable logistical operation across the icecap. Camp Century is now an Arctic Research Center.

CASE STUDY: SCIENCE-INSPIRED ART

"Arkhticós Doloros". Jessie Kleemann. *Vimeo*, performed 20 June 2019 (12 minutes).

> **Abstract:** Greenlandic artist Jessie Kleemann creates work that explores Greenlandic identity, colonial history, myth and the Arctic environment. The performance piece "Arkhticós Doloros" took place on the Greenland Ice Sheet at an area known as the Blue Lake where unprecedented glacier melt is taking place. The elements seem to have a will of their own here as Kleemann enters into a dance where the power shifts continuously from her body to the wind and ice. The performance was created for an academic workshop on the political ecology of ice.

"Greenpeace Holds a Historic Performance with Pianist Ludovico Einaudi on the Arctic Ocean." Ludovico Einaudi. *YouTube*, 19 June 2016 (3 minutes).

> **Abstract:** Using his music to communicate about science, acclaimed Italian composer Ludovico Einaudi performs one of his piano compositions on a floating platform against the backdrop of the Wahlenbergbreen glacier (in Svalbard, Norway), adding his voice to the chorus of people worldwide demanding greater protections for the Arctic.