GREEN MUSEUMS WAKING UP THE WORLD:

INDIGENOUS AND MAINSTREAM APPROACHES

TO EXPLORING SUSTAINABILITY

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree

of

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in

American Studies

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DEDICATION

Dedicated with love and appreciation to Cassidy Anne Medicine Horse, whose constant support and encouragement made this endeavor possible.

VITA

Jennifer Néso'eóó'e Woodcock-Medicine Horse, daughter of Charlene Mayne Woodcock and William Edward Woodcock III, was born in Miles City Montana, in 1963. She graduated from Berkeley High School, obtained a Bachelor of Arts in Anthropology from the University of California at Berkeley, and a Master of Arts in Native American Studies at Montana State University-Bozeman.

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ABSTRACT

Mainstream and Indigenous Museums are ideally situated, both geographically and culturally, to educate the public about complex twenty-first century environmental issues. The most effective approaches to understanding, addressing, and adapting to these climate changes can be conveyed by museums, incorporating a holistic methodology utilizing the knowledge, observations and ideas of both Western and Indigenous peoples, and directed toward the young people of the world most impacted by climate disruption.

This qualitative research was conceptualized iteratively within an Indigenous research methodology, using a combination of Western and Indigenous research approaches to create a hybrid methodology that would satisfy academic requirements, yet foster the community required to successfully answer the research question. Although a formal list of interview questions was developed, the qualitative interviews were primarily conducted in an informal conversational manner, allowing the respondents to tell their stories and include what they felt was relevant. A snowball strategy was employed to generate the potential interviews, as well as scouting potential interviews at the American Alliance of Museums (AAM) and Association of Tribal Archives Libraries and Museums (ATALM) annual conferences during the years 2011—2015. One hundred and three interviews were conducted at ten institutions; all interviews were conducted in-person on-site at the home institutions. Approximately half of the interviews were conducted at the Smithsonian Institution as the result of a Smithsonian Research Fellowship.

The interview respondents were forthcoming about their experiences and observations regarding sustainability initiatives at their institutions. The interviews suggest that it is indeed possible for museums to address issues of climate disruption and sustainability efficaciously, utilizing both Western and Indigenous scientific knowledges to educate and engage the public. However, few American museums are currently attempting this task fraught with challenges, although museums are uniquely able to undertake this crucial work.

The collaborative work catalyzed by the Cosmic Serpent and Native Universe NSF-funded research projects serves as a tested model to inspire museums to design their own initiatives. Citizen Science initiatives, engaging museums with their constituent youth, provide a promising way of conveying complex environmental information in a palatable manner to youth of various ages and cultural backgrounds.

CHAPTER ONE:

INTRODUCTION

> A strange blight crept over the area and everything began to change. Some evil spell had settled on the community: mysterious maladies swept the flocks of chickens; the cattle and sheep sickened and died. Everywhere was a shadow of death. The farmers spoke of much illness among their families. In the town the doctors had become more and more puzzled by new kinds of sickness appearing among their patients. There had been several sudden and unexplained deaths, not only among adults but even among children . . . . There was a strange stillness. The birds, for example—where had they gone? Many people spoke of them, puzzled and disturbed. The feeding stations in the backyards were deserted. It was spring without voices . . . . The apple trees were coming into bloom but no bees droned among the blossoms, so there was no pollination and there would be no fruit. The roadsides, once so attractive, were now lined with browned and withered vegetation as though swept by fire. These, too, were silent, deserted by all living things. Even the streams were now lifeless. Anglers no longer visited them, for all the fish had died . . . . No witchcraft, no enemy action had silenced the birth of new life in this stricken world. The people had done it themselves . . . . every one of these disasters has actually happened somewhere, and many real communities have already suffered a substantial number of them. A grim specter has crept upon us almost unnoticed, and this . . . . tragedy may easily become a stark reality we all shall know. What has already silenced the voices of spring in countless towns in America?
>
> *Silent Spring* Rachel Carson, 1962[1]

After half a century, Rachel Carson's call to action, *Silent Spring*, remains a prescient reminder that although collectively we have brought upon ourselves the catastrophic results of anthropogenic climate change, the reparative actions required to move towards global sustainability are

---

[1] Rachel Carson, Lois Darling, and Louis Darling, *Silent Spring* (Boston Cambridge, Mass.:

imperative from each and every one of us. Carson's work, primarily focused on the overt toxicity of our petroleum-based economy, is still fundamentally germane today, as human-induced global climate change is simply another facet and consequence of the deep problem she so cogently defined for us in the 1960s. Her heroic life of public service is a model to us all of the positive impact generated by a courageous, undeterred individual striving for the betterment of our planet, thinking ahead for the welfare of generations to come, and disavowing the plea, "what can one person do?" and serves as the inspiration for my dissertation research. (Figure 1)



Figure 1. Rachel Carson with kids in the woods near her home. October 1962.[2]
PHOTO COURTESY: LIFE MAGAZINE, © 1962 ALFRED EISENSTAEDT (TIME & LIFE PICTURES)

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[2] "Rachel Carson and a Childhood Sense of Wonder | Wisconsinacademy.Org," accessed March 27, 2017, https://wisconsinacademy.org/magazine/rachel-carson-and-childhood-sense-wonder.

Is it Possible for Museums to Address Issues of Climate Change?

Is it possible for museums to address issues of climate change and sustainability efficaciously, utilizing both Western and Indigenous scientific knowledges, to educate and engage the public? My research finds that it is indeed possible but that few American museums are currently attempting this challenging task, and that museums are uniquely able and qualified to under-

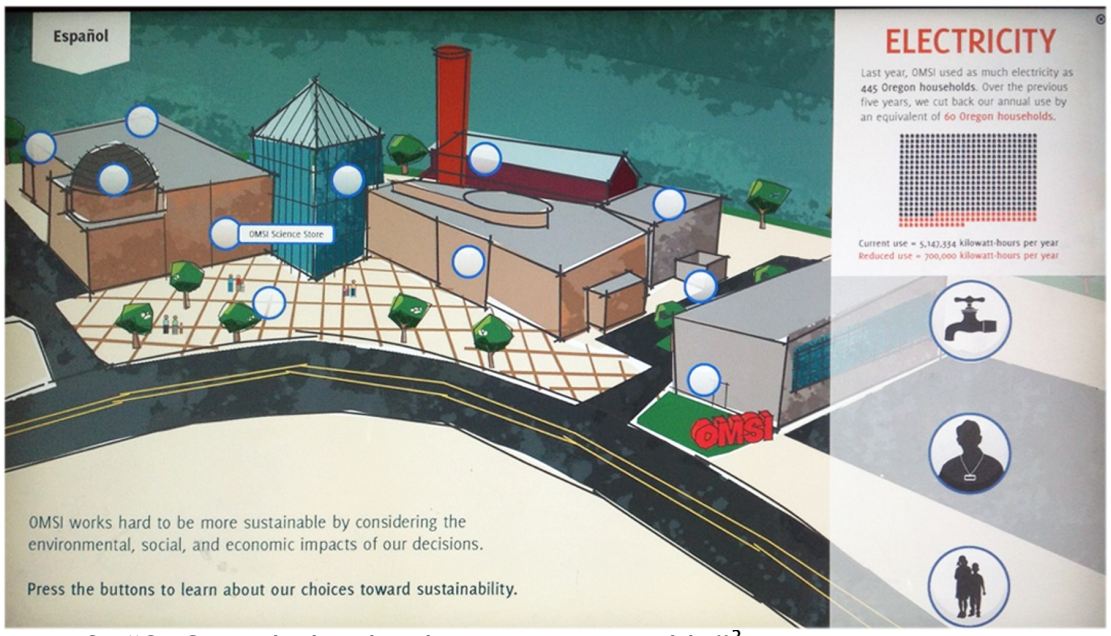

Figure 2. "OMSI works hard to be more sustainable"[3]
PHOTO COURTESY: J WOODCOCK-MH 2015

take this crucial work. (Figure 2) The opportunities for museums to work collaboratively with their Indigenous neighbors, creating revolutionary new approaches to building community and expanding pooled knowledge are on the

---

[3] Oregon Museum of Science and Industry—Sustainability screen from information kiosk in lobby.

vanguard of twenty-first century innovative museum practice; they require concerted effort to satisfactorily bring to fruition. Climate disruption is a slow-motion disaster of epic proportions, inexorably changing our world beyond imagining. One of the most effective approaches to understanding, addressing, and adapting to these changes can be conveyed by museums, incorporating a holistic methodology utilizing the knowledge, observations and ideas of both Western and Indigenous peoples, and directed toward the young people of the world who will be most impacted by this debacle.

Catastrophic climate disruption is the defining issue of the twenty-first century, affecting every arena of life on our planet-food security, economic stability, political alliances, access to potable water, safety from hazardous weather, and for a growing number, the ability to physically remain in our communities, especially for coastal dwellers as sea levels continue to rise. Anthropogenically-induced climate disruption is already wreaking havoc worldwide; although we are in the early stages of this new Anthropocene era, the ability to equivocate regarding both the causes and results of this phenomenon is behind us; there is far too much verifiable scientific research from a wide spectrum of fields, all converging on the single conclusion that anthropogenic activity over the last century or so has resulted in a cascading set of physical consequences that are, at this point, probably irreversible.[4]

---

[4] Peter U. Clark et al., "Consequences of Twenty-First-Century Policy for Multi-Millennial Climate and Sea-Level Change," *Nature Climate Change* 6, no. 4 (April 2016): 360–69, https://doi.org/10.1038/nclimate2923. 362.



Figure 3. Twitter post on Snowmaggedon 2015 meme.[5]
PHOTO COURTESY: CATHY HOLLAND



Figure 4. "People dig out the three snow plows stuck in Mt. Pleasant."
PHOTO COURTESY: WASHINGTON POST.[6]



Figure 5. Arid Colorado landscape.
PHOTO COURTESY: J WOODCOCK-MH OCTOBER, 2016

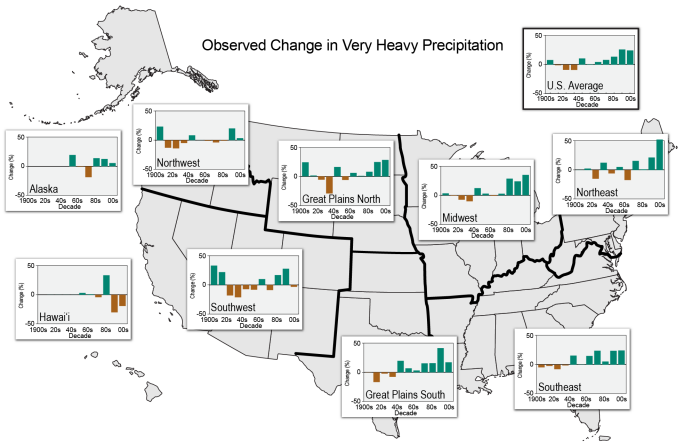

Figure 6. "Observed Change in Very Heavy Precipitation"[7]
IMAGE COURTESY: NOAA NCDC / CICS-NC

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[5] Cathy Holland, "Get the Milk and Bread! #blizzardof2015 #Snowmageddonpic.Twitter.Com/Htx0upK3AB," microblog, *@cathymholland* (blog), January 26, 2015, https://twitter.com/cathymholland/status/559706561149276162.

[6] "Capital Weather Gang - Snowmageddon: Must-See Photos and Videos," Washington Post, Washington Post. Capital Weather Gang, February 13, 2010, http://voices.washingtonpost.com/capitalweathergang/2010/02/snowmageddon_must-see_videos.html.

[7] "Observed Change in Very Heavy Precipitation | GlobalChange.Gov," accessed March 27, 2017, http://www.globalchange.gov/browse/multimedia/observed-change-very-heavy-precipitation.

(Figures 3-6) A partial list of these consequences includes calamitous weather events, invasive species proliferation, unpredictable agricultural norms, rising sea levels, increased fires, environmentally displaced populations, ruinous flooding, ravaging drought, the precipitous loss of Arctic and Antarctic sea ice and the escalation of earth's sixth mass extinction event, resulting in the severe loss of biodiversity.[8]

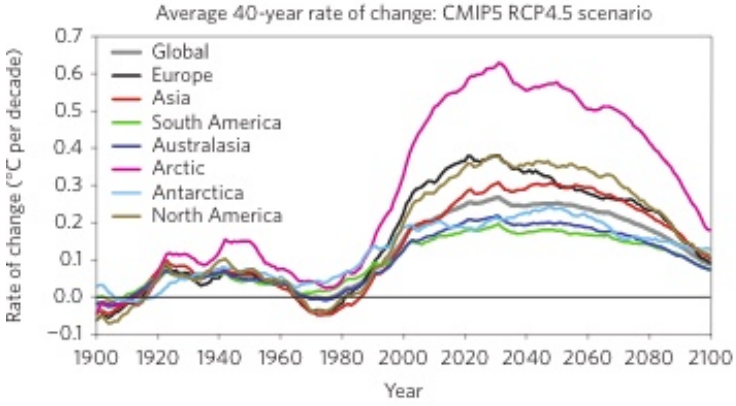

Figure 7. 40-year rate of climate change, projected with current data.[9]
PHOTO COURTESY: IPCC

Smith, et al, process historical and contemporary climate data using the Global Change Assessment Model to generate robust projections that indicate anthropogenic climate disruption is accelerating (Figure 7):

> We find that present trends in greenhouse-gas and aerosol emissions are now moving the Earth system into a regime in terms of multi-decadal rates of change that are unprecedented for at least the past 1,000 years. The rate of global-mean temperature

---

[8] Libby Robin, Sverker Sorlin, and Paul Warde, *The Future of Nature* (Yale University Press, 2013). 364-5.

[9] "Near-Term Acceleration in the Rate of Temperature Change," *Nature Climate Change*, accessed December 25, 2016, https://doi.org/10.1038/nclimate2552.

> increase in the CMIP5 (ref. 3) archive over 40-year periods increases to 0.25 ± 0.05 °C (1σ) per decade by 2020, an average greater than peak rates of change during the previoUS one to two millennia. Regional rates of change in Europe, North America and the Arctic are higher than the global average. Research on the impacts of such near-term rates of change is urgently needed.[10]

This finding is corroborated by the Intergovernmental Panel on Climate Change (IPCC), which states in their latest report:

> Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century[11] . . . . Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.[12]

The IPCC's report is unequivocal in its findings, and since the intervening four years has not seen "substantial and sustained reductions in greenhouse gas emissions," quite the reverse in fact, as we exceeded the irrevocable 400-ppm

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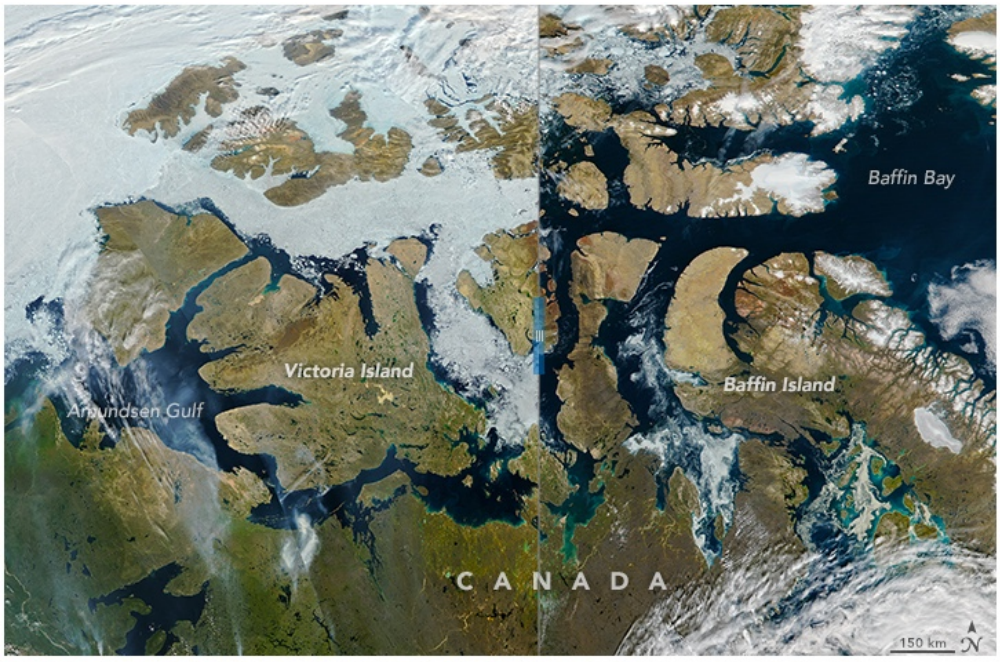
[10] "Near-Term Acceleration in the Rate of Temperature Change." 333.

[11] Rajendra K. Pachauri and Leo A. Meyer, "Climate Change 2014 Synthesis Report Summary for Policymakers. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change" (Geneva, Switzerland: Intergovernmental Panel on Climate Change, 2015), http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full_wcover.pdf.

[12] Pachauri and Meyer. 56.



Satellite imagery showing the Northwest Passage in 2013, a relatively "icy" year by modern standards, and 2016.

Figure 8. Northwest Passage comparison 2013 and 2016.[13]
PHOTO COURTESY: NASA

CO_2 marker in September 2016.[14] It would seem that as a result of political stalemates at a global level in negotiating the reduction of greenhouse gas emissions, we have by default chosen an irreversible path for future generations. In short, given the current trajectory, this is a problem rapidly increasing in scale and severity, especially in the Arctic, Europe, and North America. The exceedingly sharp rate of change in the Arctic is tied to the melting of Arctic sea ice; current estimations indicate the Arctic will be ice-

---

[13] "This Is What the Ice-Free Northwest Passage Looks Like," accessed April 18, 2017, http://www.climatecentral.org/news/ice-free-northwest-passage-20624.

[14] Brian Kahn, "The World Passes 400 PPM Threshold. Permanently," Climate Central: Researching and reporting the science and impacts of climate change, accessed March 29, 2018, http://www.climatecentral.org/news/world-passes-400-ppm-threshold-permanently-20738.

free by mid-century, and ice-free during the summer well before that. (Figure 8) Already, the partial opening of the Northwest Passage in 2007, then fully in 2015, has provided commercial opportunities awaited since the 1400s. "NORTHWEST PASSAGE EXPLORER: Voyage to the top of the world through majestic waterways, spectacular glaciers, and towering fjords…. where nature is truly wild and landscapes are absolutely breathtaking,"[15] blares the headline of Crystal Cruises, who announce that their ship:

> Crystal Serenity returns to the Northwest Passage in 2017 promising unprecedented adventures and unsurpassed luxury. Follow in the footsteps of intrepid explorers as you sail through unparalleled landscapes of grand glaciers, stunning fjords, and rare wildlife sightings as you learn the Arctic culture and its fascinating people. Plus, enjoy **Crystal Unexpected Adventures** your chance to explore this magnificent region on truly **spontaneous** excursions! This is the ***ultimate expedition f***or the true explorer! Be part of the Northwest Passage cruise-every explorer's dream expedition-and discover what's in store on your next Crystal adventure![16]

It is an exceedingly poignant and painful irony that the two pages advertising this luxurious cruise lure their potential customers by featuring magnificent polar bears. (Figures 9-12) Polar bears, *Ursus maritimus*, teetering on the brink of extinction, are the iconic representation of climate disruption, as their reliance on year-round sea ice determines their ability to survive, as it does for a number of Arctic fauna, such as the less charismatic walrus.[17]

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[15] "Northwest Passage Cruise | Luxury Northwest Passage Cruises," accessed April 18, 2017, http://www.crystalcruises.com/northwest-passage-cruise.

[16] "Voyage," accessed April 18, 2017, http://www.crystalcruises.com/voyage/details/northwest-passage-explorer-7320.

[17] "Without Action on Climate Change, Say Goodbye to Polar Bears - The Washington Post,"

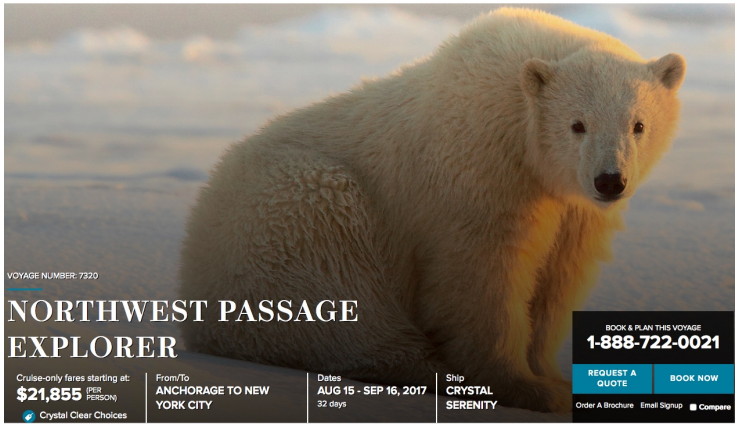

Figure 9. Northwest Passage Explorer ad.
PHOTO AND IMAGE COURTESY: CRYSTAL CRUISES

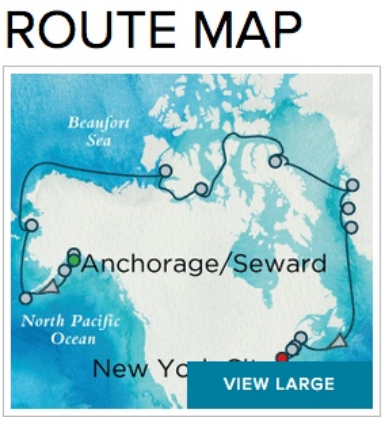

Figure 10. Ice-free route.



More than two-thirds of the world's polar bears will be killed off by 2050 — the species completely gone from Alaska — because of thinning sea ice from global warming in the Arctic, government scientists forecast. (Subhankar Banerjee/Associated Press)

Figure 11. Polar bear on thin ice.[18]
PHOTO COURTESY: BANERJEE/ASSOC. PRESS



An estimated 35,000 walrus gather on shore north of Point Lay, Alaska. A decline in sea ice in the Arctic region of the Chukchi Sea is forcing female walruses and their young to "haul out" to land. (NOAA via Agence France-Presse)

Figure 12. Walruses forced ashore.[19]
PHOTO COURTESY: NOAA

The opening of the Northwest Passage, or in other words, the elimination of vital summer sea ice, is scarcely cause for celebration for anyone with a fondness for these photogenic bears. Since Crystal Cruises lump together the opportunity to observe both wildlife and Native people, one must

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accessed April 18, 2017, https://www.washingtonpost.com/news/energy-environment/wp/2017/01/09/without-action-on-climate-change-say-goodbye-to-polar-bears/.

[18] "Without Action on Climate Change, Say Goodbye to Polar Bears - The Washington Post."

[19] Ibid.

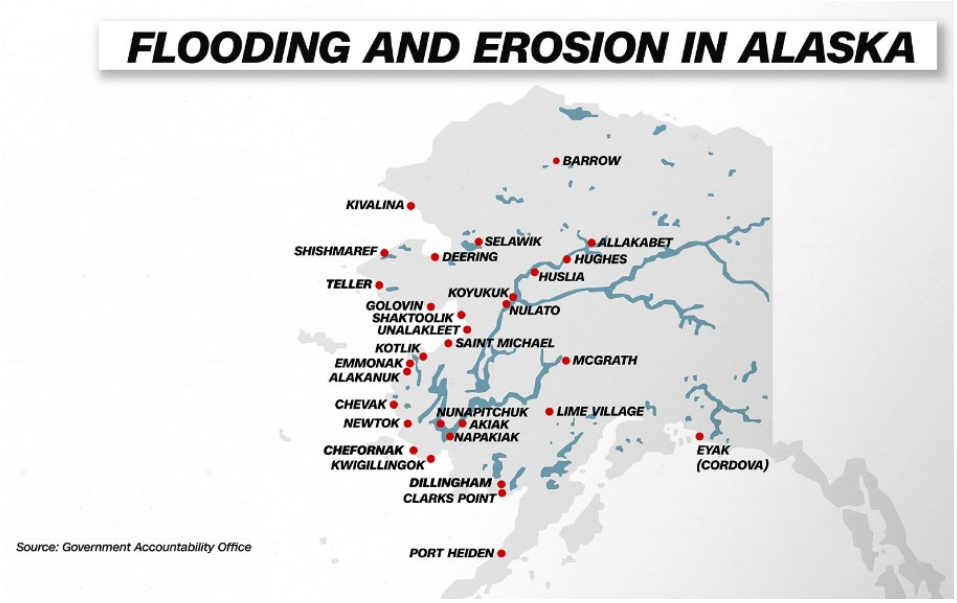

Figure 13. 31 Alaskan villages in imminent peril. (Shishmaref, NW Alaska)
FIGURE COURTESY: U.S. GOVERNMENT ACCOUNTABILITY OFFICE

question whether their claim that voyagers will "learn the Arctic culture," (which one they do not specify) "and its fascinating people," includes the fact that their serendipitous Northwest Passage is a result of the Arctic sea melt which has essentially resulted in the evacuation of Arctic villages such as Shishmaref, on the northwest coast of Alaska. CNN journalist John Sutter reports that, "31 villages in Alaska face 'imminent' threats from erosion and other issues related to climate change, according to a Government Accountability Office report; and that 12 of them were exploring relocation options because of warming."[20] (Figure 13)

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[20]John D. Sutter CNN Video by Bryce Urbany and John D. Sutter, "Tragedy of a Village Built on Ice," CNN, accessed April 15, 2018, https://www.cnn.com/2017/03/29/US/sutter-shishmaref-esau-tragedy/index.html.

One wonders if their cruise ship sports a prow figurehead of Nero; it would seem fitting. The disingenuity of capitalizing on this kind of commercial opportunity is underscored by the collaboratively developed United States Fish and Wildlife Polar Bear Conservation Management Plan released January 9, 2017, that states,

> Going forward, conservation of polar bears will require the collective will and collaboration of nations and Native communities, of government agencies and private organizations, of scientists and subsistence hunters. This Plan reflects the diverse input of several of those stakeholders. It also emphasizes local engagement, from the oil and gas Industry activities on the North Slope of Alaska that keep employees safe and minimize defense-of-life kills, to the Alaska Native peoples who have lived with and depended on polar bears for thousands of years and will be integral to conservation of the species going forward.
> Although the Plan satisfies the statutory requirements of the ESA and the MMPA, it is more broadly focused than a typical recovery or conservation plan. At its core, the Plan contains a set of fundamental goals reflecting shared values of diverse stakeholders. The goals focus on conservation of polar bears while recognizing values associated with subsistence take, human safety, and economic activity.[21]

It is these shared values—recognition of common environmental goals and finding ways to work towards them, whether cross-culturally, through interagency efforts, or collaboration between countries—that are both key and urgent. NOAA's peer-reviewed "Arctic Report Card 2017" concludes that the "Arctic shows no sign of returning to (the) reliably frozen region of recent past decades," and that "Arctic tundra is experiencing increased greenness and

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[21] Michael Runge and Jennifer Kohout, "Polar Bear (Ursus Maritimus) Conservation Management Plan, Final. U.S. Fish and Wildlife, Region 7, Anchorage, Alaska." (U.S. Fish and Wildlife, December 20, 2016), https://www.fws.gov/alaska/fisheries/mmm/polarbear/pbmain.htm. 5.

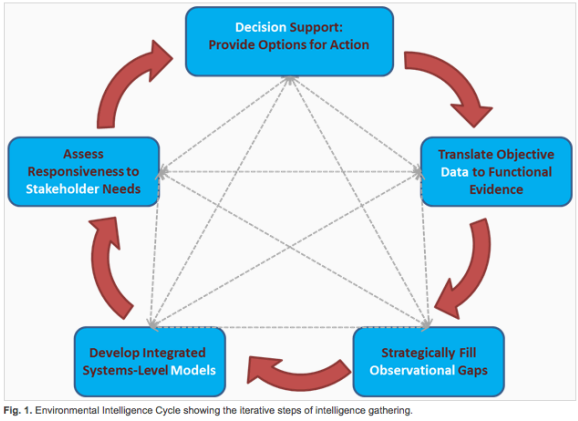

Fig. 1. Environmental Intelligence Cycle showing the iterative steps of intelligence gathering.

Figure 14. NOAA Collecting Information.[22]
IMAGE COURTESY: NOAA

Table 1. Societal Benefit Areas for the Arctic, as identified in 2016 through collaborations between the U.S. Science and Technology Policy Institute (STPI) and the international Sustaining Arctic Observing Networks (SAON).

- Disaster Preparedness
- Environmental Quality
- Food Security
- Fundamental Understanding of Arctic Systems
- Human Health
- Infrastructure and Operations
- Marine and Coastal Ecosystems and Processes
- Natural Resources
- Resilient Communities
- Sociocultural Services
- Terrestrial and Freshwater Ecosystems and Processes
- Weather and Climate

Figure 15. Human outcomes related to Arctic warming.[23]
IMAGE COURTESY: NOAA

record permafrost warming."[24] In recognition of the irreversible nature of Arctic change, they have devised an iterative data collection strategy, and a set of "societal benefit areas" to monitor. (Figures 14-15) NOAA reports more extensively in their 2017 Arctic Program executive summary that:

> There are many strong signals that continue to indicate that the Arctic environmental system has reached a 'new normal.' While modulated by natural variability in regional and seasonal fluctuations, this 'new normal' is characterized by Arctic air temperatures that are warming at double the rate of the global temperature increase. Accordingly, there are pronounced decade-long declines in the extent and volume of the sea ice cover, the extent and duration of the winter snow cover, and the mass of the Greenland Ice Sheet and Arctic glaciers. Temperatures are increasing in the surface of the Arctic Ocean, contributing to later formation of the sea ice cover in the autumn. Temperatures are also increasing in the permafrost on the adjacent continents.

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[22] Runge and Kohout. 31.

[23] "Collecting Environmental Intelligence in the New Arctic," Arctic Program, accessed April 16, 2018, https://www.arctic.noaa.gov/Report-Card/Report-Card-2017/ArtMID/7798/ArticleID/691/Collecting-Environmental-Intelligence-in-the-New-Arctic.

[24] "Arctic Report Card: Update for 2017," NOAA Arctic Program, 2018, https://www.arctic.noaa.gov/Report-Card/Report-Card-2017.

> Arctic paleo-reconstructions, which extend back millions of years, indicate that the magnitude and pace of the 21st century sea-ice decline and surface ocean warming is unprecedented in at least the last 1,500 years and likely much longer.
> The persistence of the environmental conditions that define the Arctic's 'new normal' has enabled increases in Arctic Ocean primary productivity, which forms the basis of the marine food web. Additionally, above ground vegetation is also expanding and affecting hydrological dynamics, carbon and nutrient cycling, the surface energy balance, and the habits of wild and domesticated plant eaters. The pervasive changes in the environment influence resource management protocols, including those established for fisheries and wildfires, and directly affecting the people living in Arctic communities. The unprecedented rate and global reach of these changes highlight the pressing need to prepare for and adapt to the New Arctic, enabled by more effective and timely communication of observations to scientists, policymakers, and residents.[25]

What is not being explicitly spelled out in their report is the anticipated result of this reported permafrost melt and arctic greening. Arctic permafrost has accounted for a quarter of the land mass in the Northern hemisphere; it has served as kind of biological safe for thousands of years, isolating fifteen million gallons of highly toxic mercury,[26] as well as twice the amount of carbon dioxide and methane currently in the atmosphere.[27] Cracking open this safe is akin to opening Pandora's chest—the albedo of earth's great ice sheets has reflected sunlight back into the atmosphere, deflecting warming, as did snowy

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[25] "Executive Summary," Arctic Program, accessed April 16, 2018, https://www.arctic.noaa.gov/Report-Card/Report-Card-2017/ArtMID/7798/ArticleID/685/Executive-Summary.

[26] Craig Welch PUBLISHED February 6 and 2018, "Melting Arctic Permafrost Could Release Tons of Toxic Mercury," National Geographic News, February 6, 2018, https://news.nationalgeographic.com/2018/02/melting-arctic-permafrost-toxic-mercury-environment/.

[27] Henry Fountain, "Alaska's Permafrost Is Thawing," *The New York Times*, August 23, 2017, sec. Climate, https://www.nytimes.com/interactive/2017/08/23/climate/alaska-permafrost-thawing.html.

permafrost. As both of these melt, they are replaced by dark ocean, and dark vegetative cover, both of which absorb heat, shifting these regions from serving as a sink, to acting as a net source of greenhouse emissions—estimated at 1.5 billion tons annually.[28]

With these controls gone, the rate of global warming is expected to increase significantly. The Arctic and Antarctic melted ice will result in greatly increased sea levels, already noticeable in some parts of the world. The Arctic Research Consortium of the United States (ARCUS), reports that Greenland's ice sheet alone is enough to raise sea levels by 6.5 meters. This increase is already being felt by Indigenous communities in the Arctic and the Pacific, who may be seen as canaries in this minefield of climate disruption. To mention a few illustrative examples: As the permafrost underlying the four-hundred-year-old Inupiat village of Shishmaref, Alaska melts and erodes, and the sea level rises, the entire village of 600 citizens has had to face evacuation from their traditional homeland, voting in August, 2016 to move their community inland, after $27 million in coastal protection measures proved unsuccessful. (Figure 16) In the Pacific, residents of the Solomon and Marshall Islands are also experiencing sea level rise. (Figure 17) Their low, narrow atoll islands are particularly susceptible to even small rises in ocean level; not only are there issues of engulfment, but even small rises in sea water cause contamination of the fresh water table. As well, increasing storm activity results in surges that

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[28] Fountain.



Figure 16. Shishmaref, Alaska.[29]
PHOTO COURTESY: AP/DIANA HAECKER



Figure 17. Abandoned Kiribati home.[30]
PHOTO COURTESY: REUTERS/ DAVID GRAY

flood the shallow islands, contaminating fresh water sources, and washing away homes and crops.[31] The government of the Pacific Kiribati atoll of thirty-three islands, home to 100,000 people, has purchased land on the island of Fiji to accommodate their imminent evacuation, although many I-Kiribati citizens are determined to find a solution allowing them to remain in their home.[32] Young people from fifteen Pacific island nations have formed Pacific Climate Warriors, joining with the environmental organization 350.org to work towards

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[29] Christopher Mele and Daniel Victor, "Reeling From Effects of Climate Change, Alaskan Village Votes to Relocate," *The New York Times*, August 19, 2016, http://www.nytimes.com/2016/08/20/us/shishmaref-alaska-elocate-vote-climate-change.html.

[30] "An Entire Island Nation Is Preparing to Evacuate to Fiji Before They Sink into the Pacific | Earth First! Newswire," accessed December 25, 2016, http://earthfirstjournal.org/newswire/2014/07/03/an-entire-island-nation-is-preparing-to-evacuate-to-fiji-before-they-sink-into-the-pacific/.

[31] Ian Kelman, "Island Evacuation," *Forced Migration Review* 31, no. Climate Change and Displacement (October 2008): 20–21, http://www.fmreview.org/sites/fmr/files/FMRdownloads/en/FMRpdfs/FMR31/20-21.pdf.

[32] "Kiribati President: Climate-Induced Migration Is 5 Years Away | Climate Home - Climate Change News," accessed December 25, 2016, http://www.climatechangenews.com/2016/02/18/kiribati-president-climate-induced-migration-is-5-years-away/.

"Kiribati Locals Not Going Anywhere As They Fight The Rising Tide - BuzzFeed News," accessed December 25, 2016, https://www.buzzfeed.com/alexlee/a-song-for-kiribati?utm_term=.uy3jGK4vz9#.wpxPZ51vJX.

protecting their homeland.[33]

Issues of race, power, geography and ethnicity are intertwined with how these situations are conceptualized by government, media, and the general population. Indigenous coastal Alaskans, U.S. citizens, have been contending for years with climate disruption forced evacuations. However, on May 5, 2016, the *New York Times* published a story titled "Resettling the First American 'Climate Refugees,'" referring to the $48 million resettlement of Isle de Jean Charles, LA, residents.[34] The authors do note that among the Isle de Jean Charles evacuees are Biloxi-Chitimacha-Choctaw families who have lived on the island since time immemorial. *The Times* overlooks the critical fact that these are not the first American Climate Refugees; Native Alaskans have contended with these issues for years. The U.S. Department of Housing and Urban Development allocated $1 billion in 2016 through their National Disaster Resilience Competition to fund climate disruption adaptation initiatives in thirteen states.[35]

The tools to combat this environmental Armageddon require immense funding to implement on a governmental or global scale. The World Bank

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[33] "350 Pacific – Pacific Climate Warriors," accessed December 25, 2016, http://350pacific.org/pacific-climate-warriors/.

[34] Coral Davenport and Campbell Robertson, "Resettling the First American 'Climate Refugees,'" *The New York Times*, May 2, 2016, http://www.nytimes.com/2016/05/03/us/resettling-the-first-american-climate-refugees.html.

[35] George Gonzales, "HUDNo_16-006 HUD AWARDS $1 BILLION THROUGH NATIONAL DISASTER RESILIENCE COMPETITION," Press Release (U.S. Department of Housing and Urban Development (HUD), January 21, 2016), https://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2016/HUDNo_16-006.

estimates:

> The funding required for mitigation, adaptation, and technology is massive. In developing countries mitigation could cost $140 to $175 billion a year over the next 20 years (with associated financing needs of $265 to $565 billion); over the period 2010 to 2050 adaptation investments could average $30 to $100 billion a year (in round numbers).[36]

Global warming and climate disruption are increasing rapidly. In 2014 we reached an unprecedented 400-ppm CO_2 (parts per million of carbon dioxide), well past the 350-ppm CO_2 safe cap, and far past the 275-ppm CO_2 in which the world thrived throughout the Holocene, approximately the last 12,000 years, until the advent of the Anthropocene with the industrial revolution approximately 200 years ago.[37] The National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory Global Monitoring Division released December 5, 2016; data that reported a steadily increasing rise of CO_2, 402.31-ppm as of October 2016.[38]

Turning to that ubiquitous provider of publicly accessible information, Google, a December 23, 2016 search of the term *Sustainability* yields about 179,000,000 results, *Climate change* yields about 161,000,000 results, while *Sustainability solutions* retrieves only about 3,790,000 results—suggesting that

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[36] "World Development Report 2010," accessed September 5, 2016, http://siteresources.worldbank.org/INTWDRS/Resources/477365-1327504426766/8389626-1327510418796/Chapter-6.pdf.

[37] Richard A. Betts et al., "El Nino and a Record CO2 Rise," *Nature Climate Change* 6, no. 9 (September 2016): 806–10, https://doi.org/10.1038/nclimate3063; "AHR 52 (May 2012): Ben Dibley: 'The Shape of Things to Come': Seven Theses on the Anthropocene and Attachment," 52, accessed August 23, 2016, http://www.australianhumanitiesreview.org/archive/Issue-May-2012/dibley.html.

[38] "ESRL Global Monitoring Division - Global Greenhouse Gas Reference Network," accessed December 24, 2016, https://www.esrl.noaa.gov/gmd/ccgg/trends/global.html.

there is an active public interest in the problem, and how to address it, but far fewer ideas regarding a viable solution.[39] In contrast, *Indigenous climate change* yields about 33,200,000 results, and *Traditional knowledge climate change* yields about 12,300,000 results. Sadly, a search of *Museums climate change* offers only about 1,380,000 results, and *Museums traditional knowledge climate change* generates about 1,290,000 results.[40] Although this is the very rawest of un-curated data and utterly unscientific, it is a rough contemporary indicator of interest and easily retrievable information and it underscores a disconnect between public interest in climate change, Indigenous climate change knowledge and activism, and museum connections with either topic.[41]

Museums are uniquely positioned, societally and geographically, to address this gap by conveying both scientific and cultural information to the public, suggesting proactive or adaptive behaviors, and inspiring our young people to take on this critical challenge. The consequences of anthropogenic

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[39] "Sustainability - Google Search," accessed December 24, 2016, https://www.google.com/search?q=sustainability&ie=utf-8&oe=utf-8; "Climate Change - Google Search," accessed December 24, 2016, https://www.google.com/search?q=climate+change&ie=utf-8&oe=utf-8; "Sustainability Solutions - Google Search," accessed December 24, 2016, https://www.google.com/search?q=sustainability&ie=utf-8&oe=utf-8#q=sustainability+solutions.

[40] "Museums Climate Change - Google Search," accessed December 24, 2016, https://www.google.com/search?q=climate+change&ie=utf-8&oe=utf-8#q=museums+climate+change; "Museums Traditional Knowledge Climate Change - Google Search," accessed December 25, 2016, https://www.google.com/search?q=museums+traditional+knowledge+climate+change&ie=utf-8&oe=utf-8.

[41] "Indigenous Climate Change - Google Search," accessed December 24, 2016, https://www.google.com/search?q=climate+change&ie=utf-8&oe=utf-8#q=indigenous+climate+change; "Traditional Knowledge Climate Change - Google Search," accessed December 24, 2016, https://www.google.com/search?q=climate+change&ie=utf-8&oe=utf-8#q=traditional+knowledge+climate+change.

climate disruption would appear to be an irremediable situation, affecting each and every human being on this planet for generations to come. However, it is not in the Carson tradition to throw up one's hands at a challenge, and walk away. I posit that this challenge is laid at the feet of our museum community.

As I will expand upon later, I believe that this challenge is most feasibly taken up by museums, since politicians, the media, and our schools have each become incapacitated in contending productively with this issue, although individual entities among these larger wholes are doing good work. Politicians have politicized what is a scientific issue, the media have focused on controversy rather than solution, and our schools are so focused on attempting to pass federal standards tests that they have precious little time left over to prepare children academically to deal with climate change.

The privileged level of public trust and community access garnered by museums carries with it a responsibility to present meaningful, carefully researched topics to their public. Museums are singularly capable of presenting these scientific facts in a heuristic and engaging context, presenting their visitors with a focus on sustainability, and generating conversations regarding how *green* practices may be introduced into the daily lives of their homes and communities.

Museums, embedded in their communities, are uniquely able to employ an iterative pedagogical approach, inculcating and incorporating citizen



Figure 18. *Connected Worlds* teaches Sustainability science at the NYSCI.[42]
PHOTO COURTESY: J WOODCOCK-MH. AUGUST 15, 2015

scientists to develop locally meaningful, relevant and timely knowledge. (Figure 18) *Connected Worlds*, developed by the New York Hall of Science in collaboration with Design I/O, uses interactive gestural and locational sensing technology in thirty-minute play sessions to teach basic principles of sustainability science and environmental processes to visitors. Participants ranging from toddler-age to seniors are briefly instructed by docents for approximately ten minutes regarding the purpose of the exhibit and the hand or body gestures that will trigger actions within *Connected Worlds*. Then the visitors are let loose to tend to their habitat in the 2,300-square foot arena, housing a 38-foot tall waterfall and six differing habitats. During the afternoon that I spent with this exhibit, I observed that the museum guests seemed to be, virtually without exception, entranced by this enchanting experience, staying

[42] "Connected Worlds on Vimeo," accessed April 3, 2017, https://vimeo.com/131725811.

until the last minutes of their session, and many getting back in line for another turn.[43] Between turns, many children spent time reading the placards and kiosk information about the exhibit.

U.S. museums have made significant strides in incorporating sustainable infrastructure in their physical plants and in reducing their energy use. For the most part, however, they have been quite conservative in addressing climate disruption pedagogically with their visitors. Initial attempts at creating data-driven exhibits were not well-received by the public and left development staff in a quandary regarding how to proceed.

Public Attitudes Regarding Climate Change

The American public overall appears to be incognizant regarding the concept of climate disruption. In the fields of climate disruption and sustainability research and activism there currently exist key groups of scientists, environmental activists, and Indigenous scholars and activists who are vigorously pursuing knowledge and solutions. However, the general public resides, for the most part, outside of this work and conversation. In 1980, Dr. Isaac Asimov, Boston University professor of biochemistry and science visionary, reflected,

> There is a cult of ignorance in the United States, and there always has been. The strain of anti-intellectualism has been a constant

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[43] "NYSCI | Connected Worlds," accessed April 3, 2017, http://nysci.org/connected-worlds/.

> thread winding its way through our political and cultural life, nurtured by the false notion that democracy means that 'my ignorance is just as good as your knowledge' . . . . Now we have a new slogan on the part of the obscurantists: 'Don't trust the experts!' . . . . We have a new buzzword, too, for anyone who admires competence, knowledge, learning and skill, and who wishes to spread it around. People like that are called 'elitists.' . . . . I believe that every human being with a physically normal brain can learn a great deal and can be surprisingly intellectual. I believe that what we badly need is social approval of learning and social rewards for learning.[44]

Asimov's dark assessment is, perhaps, a reflection of America's plummeting literacy in reading, mathematics, and the sciences. It is emotionally much easier to scorn and deride something that is incomprehensible due to one's own ignorance than it is to admit the ignorance and ask for help in understanding a complex issue. If this is the case, it explains, in part, the skeptical attitude of a large portion of the American public regarding climate disruption and the ensuing catastrophes we can expect. Deciphering a NOAA report is technically beyond the ability of most Americans now, so it is simpler to rely on the inflammatory "reporting" of Fox News to gain information. Asimov's acerbic assessment of American popular culture remains pointedly accurate almost forty years later, and highlights several issues that hinder progress in educating the public about climate disruption. The American public's reticence to engage in intellectual pursuits appears to be a trend accelerating with time. One could point to the dwindling literacy rate in the United States as both causal and symptomatic. Inadequate

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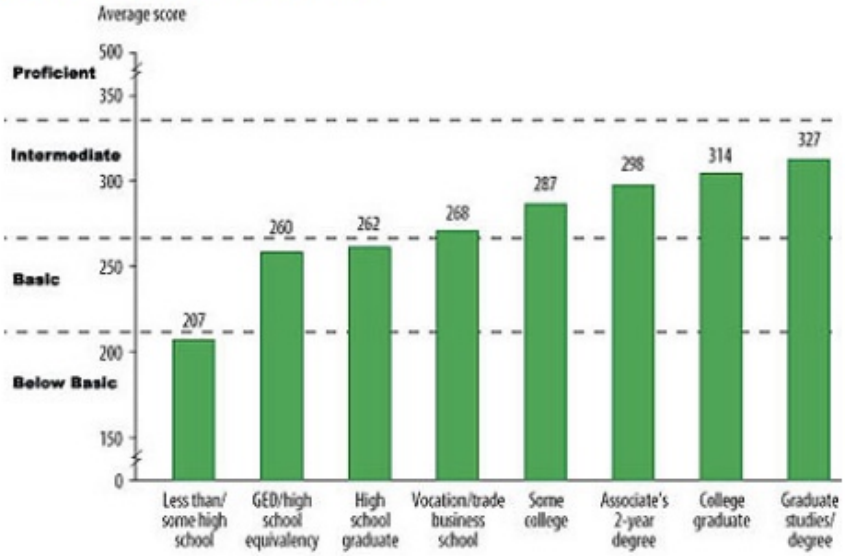
[44] Isaac Asimov, "A Cult of Ignorance," *Newsweek*, April 7, 2012.

Demographics -> Education

Performance in 2003

- Literacy increased with the completion of more education

Prose literacy by educational attainment: 2003



NOTE: Adults are defined as people 16 years of age and older living in households or prisons.Adults who could not be interviewed due to language spoken or cognitive or mental disabilities (3 percent in 2003 and 4 percent in 1992) are excluded from this table.
SOURCE: U.S.Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2003 National Assessment of Adult Literacy.

Figure 19. U.S. Dept. of Education, Adult Prose Literacy in America.[45]
IMAGE COURTESY: U.S. DEPARTMENT OF EDUCATION

literacy skills create a daunting challenge of the critical thinking required in unraveling complicated scientific arguments to reveal their core principles.

The National Center for Education Statistics (NCES), a bureau of the U.S. Department of Education, reports that as of 2003, only thirteen percent of adults over the age of sixteen exhibit a *Proficient* level of prose literacy, and

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[45] "National Assessment of Adult Literacy (NAAL) - Demographics - Education," accessed December 25, 2016, https://nces.ed.gov/naal/kf_dem_edu.asp.

an additional forty-four percent function at an *Intermediate* level. Forty-three percent function at a *Basic* or *Below Basic* level; 11 million are *illiterate*. The NCES statistics show a decline in proficiency from their previous 1992 testing.[46] (Figures 19-20) Shockingly, although a college level education correlated with improved prose literacy, the average American college graduate is operating at significantly below a proficient level of literacy.

The NCES defines prose literacy as:

> The knowledge and skills needed to perform prose tasks, (i.e., to search, comprehend, and Use continuoUS texts). Examples include editorials, news stories, brochures, and instructional materials.

They define quantitative literacy as:

> The knowledge and skills required to perform quantitative tasks, (i.e., to identify and perform computations, either alone or sequentially, using numbers embedded in printed materials). Examples include balancing a checkbook, figuring out a tip, completing an order form or determining the amount.[47]

This prevalent level of functional inadequacy poses a serious problem for Museums and developers of educational content. If the material is "dumbed down" to the point of being readily accessible by the majority, it is all too easy to lose the complexity of content that can hold the interest, or, ideally, inspire the visitor to new reflections and understandings of the topic at hand. If this level of educational adequacy seems dismal, one need merely turn to the NCES

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[46] Asimov, "A Cult of Ignorance"; U.S. Department of Education and Institute of Education Sciences, *National Assessment of Adult Literacy (NAAL): A First Look at the Literacy of America's Adults in the 21st Century* (ED Pubs, 2006), http://nces.ed.gov/NAAL/PDF/2006470.PDF.

[47] "National Assessment of Adult Literacy (NAAL) - Three Types of Literacy," accessed December 25, 2016, https://nces.ed.gov/naal/literacytypes.asp.

Average quantative literacy scores of adults by age: 1992 and 2003

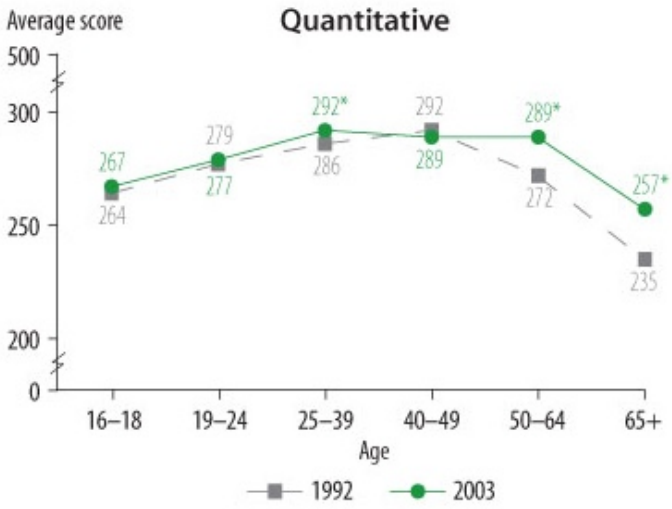

Figure 20. U.S. Dept. of Education, Adult Quantitative Literacy in America.[48]
IMAGE COURTESY: U.S. DEPARTMENT OF EDUCATION

scoring for quantitative literacy to become truly depressed. (Figure 20)

Public apathy regarding knowledge has been compounded by faulty methods of knowledge conveyance. Data-driven communication approaches of Western scientists and the politicized communication of environmental activists have not proven to be engaging for the American public. Indigenous Traditional Ecological Knowledge has not typically been introduced to the mainstream public as a valuable source of information and inspiration, by the media, by schools, by ms, or by any other common source. Instead, this knowledge has typically been dismissed as *primitive* or *myth*.[49]

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[48] "National Assessment of Adult Literacy (NAAL) - Demographics - Race/Age," accessed December 25, 2016, https://nces.ed.gov/naal/kf_dem_race.asp.

[49] Leah Dilworth, *Imagining Indians in the Southwest : Persistent Visions of a Primitive Past*

A typical example of this dismissive or uninformed attitude regarding traditional ecological knowledge may be seen in recent newspaper and magazine treatments of Indigenous buffalo hunting, although the newspaper article regarding the Madison Buffalo Jump has at least moved to the point of considering Indigenous competency. (Figures 21-22) The irony regarding the particular topic of Indigenous buffalo hunting in North America is that the buffalo jump technique was highly technical, required extensive organization and planning without the benefit of cell phones or email, and was remarkably



Figure 21. Primitive buffalo hunting.[50]

IMAGE COURTESY: TRUE WEST MAGAZINE



Figure 22. Sophisticated buffalo jump.[51]

IMAGE COURTESY: BOZEMAN DAILY CHRONICLE

(Washington D.C.: Smithsonian Institution Press, 1996).

[50] Cogburn, "How Did Indians Bring Down Buffalo With Primitive Weapons?" True West Magazine (blog), April 16, 2012, http://www.truewestmagazine.com/how-did-indians-bring-down-buffalo-with-primitive-weapons/.

[51] Ben Pierce, "The Buffalo Jump – Civilized and Sophisticated?," *Bozeman Daily Chronicle*, October 16, 2014, https://durangoherald.com/articles/80482-the-buffalo-jump-x2013-civilized-and-sophisticated.

efficient at providing net calories. Jack Brink, Curator of Archaeology at the Royal Alberta Museum notes, "Through millions of years of adaption, mass killing of bison on the Great Plains of North America, using jumps and wooden corrals, was the most productive food-getting enterprise ever devised by human beings."[52] The Head-Smashed-In Buffalo Jump World Heritage Site[53] in Alberta, Canada, is an inspiring example of a government-run museum that is managed collaboratively with the local Indigenous peoples for whom the buffalo jump was a central part of life in pre-contact times. Head-Smashed-In



Figure 23. Tour at HSI Buffalo Jump with Blackfoot docent.[54]



Figure 24. Docent with children inside HSI Interpretive center.[55]

PHOTOS COURTESY: ALBERTA PAST

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[52] Jack W. Brink, *Imagining Head-Smashed-In: Aboriginal Buffalo Hunting on the Northern Plains* (Edmonton: UBC Press, 2008). 3-6.

[53] "Head-Smashed-In Buffalo Jump World Heritage Site," accessed April 3, 2017, http://history.alberta.ca/headsmashedin/.

[54] Albertapast, *Hsi_tour_lrg*, May 20, 2011, photo, May 20, 2011, https://www.flickr.com/photos/albertapast/5740065179/.

[55] Albertapast, *Hsi_tipicamp_lrg*, November 24, 2005, photo, November 24, 2005, https://www.flickr.com/photos/albertapast/5740617968/.

draws its docents from Blood, Pikuni, and Blackfoot descendants who are invested in telling their history accurately and from an Indigenous perspective, and who were centrally involved in the planning and creation of the heritage center, creating exhibit materials and acting as arbiters of cultural accuracy and propriety. (Figures 23-24)

This museum is unusual in that it is about a physical land feature, the jump, that has accrued many millennia of cultural historical laminae; however, an uninformed person could travel past the jump oblivious to its presence, merely registering it as a geological feature—a bluff among bluffs. The physical encounter provides the intellectual learning experience one would expect. The museum is built into the bluff in the most unobtrusive way possible, and the brilliant thing about Head-Smashed-In is that one can walk up on top to the jump itself, taking it from a mere abstraction to a physical experience.

Many Western representations of Indigenous use of buffalo jumps have a decidedly *yee-haw* quality, such as this remarkably fanciful interpretation by William Leigh, (Figure 25) which is iconic in its almost total lack of understanding of the actual buffalo jump technique, yet exhibiting rampant enthusiasm for manufacturing a dramatic and entertaining scenario. Sarah Laughlin notes,

> Dr. Edward Weyer, former editor of . . . *Natural History*, described *Buffalo Drive*, painted circa 1947 by W.R. Leigh, as "one of the very remarkable animal paintings of all time."[56]

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[56] "Points West Online: W.R. Leigh's Buffalo Drive," Buffalo Bill Center of the West,



Figure 25. "Buffalo Drive" William R. Leigh, 1947.[57]
IMAGE COURTESY: BUFFALO BILL CENTER OF THE WEST

and observes,

> *Buffalo Drive* was considered a snapshot of history when it was first shown at the Grand Central Art Galleries in 1948. The work was praised by western enthusiasts and anthropologists for its authenticity.[58]

And indeed, it is quite remarkable. Remarkable for its brazen lack of interest in accurately representing this hunting technique. For example, the haphazard representation of hunting is ludicrous—Leigh shows a hunter with a nice baseball batter's stance ready to club a buffalo, another hunter atop a frantic horse, ready to spear an escapee buffalo in the posterior with a giant

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February 8, 2015, https://centerofthewest.org/2015/02/08/points-west-online-wr-leighs-buffalo-drive/.

[57] "Points West Online."

[58] Ibid.

lance, and a pair of Native men flapping tiny hides far away from the stampeding buffalo, no cairns in sight. To top it off, we see tiny people far below—the cliff is far too tall to be accurate.

Charles Marion Russell's 1914 painting, *Driving Buffalo Over a Cliff*, (Figure 26) is a much more accurate depiction of a buffalo jump, including the presence of women waiting to take on their portion of the work, butchering and preparing the meat and hides. He depicts hunters not perched precariously on the edge of the cliff, but back where they would have been, herding the buffalo ahead to the cliff edge. For contextualization, (Figure 27) the bluff at Head-Smashed-In is now silted in to about half its original height, but one can note in the photograph the fresh water available at the foot of the cliff.



Figure 26. Driving Buffalo over a Cliff.[59]
PAINTING COURTESY: CHARLES M. RUSSELL.



Figure 27. Head-Smashed-In, North view.[60]
PHOTO COURTESY: KEN THOMAS

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[59] Charles Marion Russell, *Driving Buffalo Over the Cliff*, 1914, Painting - watercolor ink and gouache on board, 1914, http://www.the-athenaeum.org/art/detail.php?ID=19337.

[60] Ken Thomas, *Head-Smashed-In Buffalo Jump, in Southern Alberta*, September 10, 2006, Photograph, September 10, 2006, https://commons.wikimedia.org/wiki/File:Head-Smashed-In_Buffalo_Jump-27527-2.jpg.

Indigenous North Americans perfected a number of techniques over the millennia for hunting buffalo, including among others: trapping them in constructed pounds, driving them into dead end ravines, and using drive lines to force buffalo over cliffs. The cliff needs to be tall enough to kill the buffalo on impact, or injure them sufficiently that the hunter can kill the animal without undue danger. However, the cliff needs to be short enough that the end result isn't mangled buffalo burger. The drive lines are linear rows of stone cairns, converging on the jump location; hunters would hide behind the cairns, jumping out as the buffalo passed, frightening them into continuing to run. The landscape needs to have a slight rise, masking the horizon so that the buffalo are unaware of the cliff until it is too late. The wind direction needs to be away from the drivelines, so that the buffalo do not hear or smell the hunters. The location must have fresh water for the massive butchering endeavor following the hunt. All of this required pre-planning by numerous bands of people, without modern communication technologies.

The cavalier misrepresentation of this highly involved hunting technique by individuals like Leigh underscores the deep importance of the collaborative work being done at Head-Smashed-In, and the resulting authenticity of information available to visitors.

On the day that I visited Head-Smashed-In during the summer of 2006, there was no wind at all, it was a lovely still day. As I sat on the edge of the bluff, looking out across the vast landscape, I could clearly hear the lowing of

cattle several miles away. I had read closely the riveting book, *Imagining Head-Smashed-In*,[61] I had spent several hours in the heritage center, looking at the exhibits, and I had several years of graduate archaeological work studying High Plains buffalo hunting, but it was not until I had the physical experience with the landscape at that particular location that I truly grasped the subtlety and complexity of the buffalo jump technique. When Indigenous cultures are referred to, or categorized as *land-based cultures*, it is because the ways of life developed over thousands of years are integrally intertwined with cultural ways of knowing and perceiving the world. It is as though a story that is fascinating in two dimensions on paper leaps into a multidimensional form in the landscape that holds it. Reading about Head-Smashed-In was gripping, but visiting in person put the entirety of that knowledge base into a much more sophisticated and nuanced framework of understanding.

My dissertation research focuses specifically on American museums; in an extended study, Head-Smashed-In would be a key museum for inclusion, as would the Glenbow Museum, and several other Canadian institutions that have been working collaboratively with First Nations peoples to Indigenize museums and universities in a progressive way. *Indigenizing the Academy*, expressing the intent to infuse and revitalize academia with Indigenous knowledge, experience, and values, is an oft-heard phrase and goal within the Indigenous academic community. However, this concept is far less apparent in the

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[61] Brink, *Imagining Head-Smashed-In*.

museum world. In a more expansive study, there are numerous museums around the world, for example, in Australia, New Zealand, and England that are actively undertaking these issues; it would be valuable to create a more comprehensive assessment and network.

I would suggest that the environmental data observations of millions of individuals, accrued over many millennia, couched in cultural contexts of community survival and thrivance are far more likely to resonate for the general public, if presented carefully in culturally respectful ways. Currently, only a tiny number of American museums have seriously attempted to engage the public on issues of climate disruption, and an even smaller number have collaboratively created environmental exhibits with their Indigenous communities. The work of the *Cosmic Serpent* and *Native Universe* project participant museums, discussed in chapter three, serve as an example of how this work bridging tribal and mainstream communities can be accomplished. Museums, because they provide both exhibits as well as interactive education, have the capacity to present both problems and solutions to the public, and in a context that most people will find trustworthy. A primary challenge in undertaking this work is to avoid the facile stereotyping that often accompanies Western perceptions of Indigenous cultures, knowledge and beliefs.

Future generations will pay a steep price if we don't change our behavior and choices and choose a paradigm of cultural and material

sustainability. Even the most conservative climate modeling yields catastrophic predictions for the world and its citizens in this century. The children and young adults of today face changes as drastic as those of our grand and great-grandparents, who were born into a world rapidly transitioning from a pace defined by humans and the diurnal cycle, to a pace determined by the speed of electrons and wave particles across wires, fiber-optic cable, and satellites. While our forebears primarily experienced benefits—such as refrigeration of food, antibiotics, interstellar space travel and domestic lighting, bought on carbon credit—our descendants face steep costs, such as radical reduction of biodiversity, catastrophic storms and droughts, unpredictable food supplies, and severe domestic water shortages, as that charged credit goes into collection.

The Indigenous phrase *the Seventh Generation* refers to the philosophy that we stand in the middle, and should refer back to the knowledge of the generations of our parents, grandparents and great-grandparents, to serve in making decisions that hold in mind the best interests and future of our children, grandchildren, and great-grandchildren. The *Seventh Generation* is an inherently conservative philosophy in the best sense of the word, one that if utilized today could save much strife and distress in the coming decades of the twenty-first century.

The National Science Foundation, in their workshop series, *Science: Becoming the Messenger*, suggested that finding common ground is a critical

step towards sharing knowledge. We all had parents or grandparents who utilized strategies for surviving the droughts and poverty of the Great Depression, and we have children or grandchildren for whom we should act today. The United Nations Department of Economic and Social Affairs estimates that the world population will be 9.7 billion people by the year 2050, and 11.2 billion at the turn of the century, 2100,[62] compared to 7.3 billion today.[63]

A most crucial issue at stake is the water needed for survival in the future. The UNESCO Institute for Water Education estimates that world water consumption for production needs in 2050 may increase by as much as 130% relative to the year 2000.[64] Simultaneously, due to global warming, this increased demand for water will be met by increasingly arid conditions and decreasing availability of readily available potable water. The Indigenous concept of *the Seventh Generation* has a universal applicability that makes it an invaluable tool for communicating the immediacy and urgency of attending to climate disruption and sustainability initiatives. The Anishinaabe people encode cultural knowledge regarding migration, colonization and thrivance in their prophecy of The Seven Fires. The Seventh Fire is described thusly by Anishinaabe elder, Edward Benton-Banai:

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[62] "World Population Projected to Reach 9.7 Billion by 2050 | UN DESA | United Nations Department of Economic and Social Affairs," accessed December 28, 2016, 2015-report.html.

[63] "Population Clock," accessed December 28, 2016, http://www.census.gov/popclock/.

[64] A.E. Ercin and A.Y. Hoekstra, "Water Footprint Scenarios for 2050: A Global Analysis and Case Study for Europe" (Delft, the Netherlands: UNESCO-IHE Institute for Water Education, September 2012), http://waterfootprint.org/media/downloads/Report59-WaterFootprintScenarios2050.pdf.

> In the time of the Seventh Fire a Osh-ki-bi-ma-di-zeeg (New People) will emerge. They will retrace their steps to what was left by the trail. Their steps will take them to the elders who they will ask to guide them on to their journey. But many of the elders will have fallen asleep. They will awaken to this new time with nothing to offer. Some of the elders will be silent out of fear. Some of the elders will be silent because no one will ask anything of them . . . . If the New People will remain strong in their quest, the Waterdrum of the Midewiwin Lodge will again sound its voice. There will be a re-birth of the Anishinaabe nation and a re-kindling of old flames. The Sacred Fire will again be lit.[65]

This prophecy of the Seventh Fire is interpreted by many Anishinaabe people as referring to contemporary times, and that "this young generation would lead the people out of darkness, making our nations strong and whole again."[66]

For the twelve millennia duration of the Holocene era, Indigenous cultural norms precluded the inexorable slide into global environmental chaos that has accompanied the industrial revolution. Therefore, at a time of urgent need for functional antidotes to this looming disaster, it is expedient to take heed of historic and current Indigenous philosophies and knowledge regarding both sustainability practices and the capabilities of youth leadership and introduce these concepts as appropriate to the broader public.

Museums as a Conduit of Information and Ideas

Mainstream and Indigenous museums are ideally situated, both

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[65] Edward Benton-Banai, *The Mishomis Book: The Voice of the Ojibway*, 2nd edition (University of Minnesota Press, 2010). 91-92.

[66] Amy Bergstrom, Linda Miller Cleary, and Thomas D. Peacock, *The Seventh Generation: Native Students Speak about Finding the Good Path* (ERIC Clearinghouse on Rural Education and Small Schools, Charleston, W.V., 2003).

geographically and culturally, to educate the public about complex twenty-first century environmental issues. However, simply defining the word *museum* has become more nuanced in an era that, if not yet post-colonial, is slowly moving along that cultural trajectory in the twenty-first century. The Oxford Dictionary defines *museum* as,

> A building in which objects of historical, scientific, artistic, or cultural interest are stored and exhibited . . . . Early 17th century (denoting a university building, specifically one erected at Alexandria by Ptolemy Soter): via Latin from Greek mouseion 'seat of the Muses', based on mousa 'muse'.[67]

The International Council on Museums (ICOM) revised their official definition of *museum* in 2007 to read:

> A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment.[68]

While the common perception of a museum may be that of a physical building housing tangible artifacts, it would be a semantic misjudgment to construe the conceptual category of museum too narrowly in the context of this research, for two reasons.

First, the term *museum* may be perceived as pejorative in some, if not many, Indigenous communities, which prefer terms such as *cultural center* for

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[67] "Museum: Definition of Museum in Oxford Dictionary (American English) (US)," accessed August 11, 2016, http://www.oxforddictionaries.com/us/definition/american_english/museum.

[68] "Museum Definition- ICOM," accessed August 11, 2016, http://icom.museum/the-vision/museum-definition/.

their institutions that hold and share cultural knowledge and objects. For example, the National Association of Tribal Historic Preservation Officers provides a website, TribalMuseums.org, however, the web page itself is titled "Tribal Museums and Cultural Centers."[69] While the term *museum* is unlikely to conjure culturally inflammatory connotations in the general public, Indigenous communities, subject to centuries of colonial plundering, may have antagonistic associations with the term, preferring one connoting cultural transmission rather than a literal objectification.[70]

Second, the cognitive set of *museums* as pertains to environmental education logically includes near cousins such as aquaria, botanical gardens, zoological gardens, Park Service visitor centers and nature centers, planetariums, and science centers. These kinds of institutions all serve a museum-like function in holding objects or objectified representations of non-human entities such as gorillas, rocks or galaxies, and in presenting this environmental information to the public. While this research focuses specifically on traditional museums and cultural centers, a robust examination of these more informal learning centers would be a valuable next step in defining this field.

The Institute of Museum and Library Services (IMLS) documents 35,000

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[69] "Tribal Museums & Cultural Centers," accessed August 11, 2016, http://tribalmuseums.org/about.html.

[70] Moira G. Simpson, *Making Representations : Museums in the Post-Colonial Era* (London ; New York: Routledge, 1996), http://www.loc.gov/catdir/enhancements/fy0648/96011517-d.html.

museums and museum-like institutions in the United States.[71] The American Alliance of Museums (AAM) estimates 33,000 museums in the United States, of which AAM has issued accreditation status to 1,065[72] museums. Many fine smaller museums have not applied for or achieved accreditation through AAM, such as the People's Center tribal museum of the Salish, Pend d'Oreille and Kootenai tribes located in Pablo, Montana,[73] or the Range Riders Museum in Miles City, Montana.[74] Museums and cultural centers are ubiquitous in America. It is a very rare community, even in quite small localities, that is without either a museum dedicated to a specific topic, or at the very least, a city, county, or tribal historical museum. Twenty-six percent of American museums are located rural communities. [75] These physical locations of cultural transmission reticulated across the American landscape afford a unique opportunity to snare the public into engaging with the cognate topics of climate disruption and sustainability.

The tangible presence of so many museums in the United States underscores the cultural corollary that museums are widely perceived as

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[71] "Museum Universe Data File," Institute of Museum and Library Services, June 3, 2015, https://www.imls.gov/research-evaluation/data-collection/museum-universe-data-file.

[72] "The Alliance Announces Six Newly Accredited Museums and Nine Museums Re-Accredited," *American Alliance of Museums* (blog), March 6, 2017, https://www.aam-us.org/2017/03/06/the-alliance-announces-six-newly-accredited-museums-and-nine-museums-re-accredited/.

[73] "The People's Center Museum and Gift Shop," accessed August 11, 2016, http://peoplescenter.org/.

[74] "Range Riders Museum," accessed August 11, 2016, http://www.rangeridersmuseum.com/.

[75] "Museum Facts & Data," *American Alliance of Museums* (blog), January 24, 2018, https://www.aam-us.org/programs/about-museums/museum-facts-data/.

trusted sources of information by a majority of Americans, a conclusion underscored by AAM research:

> Museums are considered educational by 98% of Americans, across all ages, races, and geographical locations. Museums are considered the most trustworthy source of information in America, rated higher than local papers, nonprofits researchers, the U.S. government, or academic researchers. Museums preserve and protect more than a billion objects. Museums are considered a more reliable source of historical information than books, teachers or even personal accounts by relatives. Support for museums is robust regardless of political persuasion. Ninety-five percent of Americans would approve of lawmakers who acted to support museums. The number is consistently high for respondents who consider themselves politically liberal (97%), moderate (95%), or conservative (93%).[76]

In addition, Americans enjoy visiting museums:

> There are approximately 850 million visits each year to American museums, more than the attendance for all major league sporting events and theme parks combined (483 million in 2011). Museums also receive millions of online visits each year. Museum volunteers contribute a million hours of service every week. Museums receive approximately 55 million visits each year from students in school groups. Since 2014, hundreds of museums have facilitated more than 750,000 museum visits for low-income Americans through the Museums for All program.[77]

From a geographical, semiotic perspective, American communities almost always literally point out their museums from billboards punctuating the outlying landscape, inviting travelers to enter into their community and engage with local stories in their museums. This pervasive intertwining with American life and landscape positions museums to pursue heuristic projects with their constituent populace, using their sturdy foundation of trust and affection upon

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[76] "Museum Facts & Data."
[77] Ibid.

which to build new understandings about challenging topics.

Primary among these challenging topics is climate disruption. Anthropogenically instigated climate disruption has been irrefutably established by the worldwide scientific community and accepted among most nations as a core issue facing all world citizens.[78] Quietly creeping up upon us for more than a century, climate disruption is now storming down upon the world with flooding cities, droughts, dying forests, rising sea levels, displaced villages, stranded polar bears, ruined crops and catastrophes of all kinds.[79] Climate disruption presents all world citizens with a panoply of increasingly alarming consequences as the time window for proactive action shrinks, and insufficient numbers of nations have taken significant action to counteract these environmental catastrophes.



Figure 28. Corns, beans and squash.[80]
PHOTO COURTESY: J WOODCOCK-MH AUGUST, 2011

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[78] "United Nations and Climate Change," accessed August 11, 2016, http://www.un.org/sustainabledevelopment/climatechange/.

[79] Randal Jackson, "Global Climate Change: Effects," Climate Change: Vital Signs of the Planet, accessed August 11, 2016, http://climate.nasa.gov/effects.

[80] Corns, beans and squash being grown traditionally in the Mayan town of Chamula, in Chiapas, Mexico. It is interesting to note that the Tzeltal and Tzotzil Mayan people of Chiapas seemingly utilize every square foot of arable land near their homes—corn grows in town and on the sides of very steep hills. The traditional CBS complex, the "three sisters" of corn, beans and squash is still very commonly grown.

Indigenous communities have, through trial and error over millennia, developed functional and philosophical approaches to living successfully in their particular environments. (Figure 28) These adaptive strategies, which have often been dismissed both by academics and by popular culture as archaic in the industrial age, have a great deal to offer world cultures as a whole. Careful, culturally cognizant, collaborative studies of Indigenous museums provide useful information regarding how Indigenous cultural paradigms may be presented accurately and respectfully to the public, information that is of great value to non-Indigenous museums seeking fresh ways of engaging their visitors.

This nexus of the deep environmental and cultural sustainability knowledge held by traditional Indigenous communities, intersecting with the nodes of museums across the human landscape to engage people with more functional sustainability approaches would seem to be a beacon of catalytic possibility. As yet, however, it is a virtually unexplored academic field. The Indigenous Education Institute, founded by a pioneer in this field, Navajo/Cherokee astronomer Dr. Nancy Maryboy, has been vital in engaging museums in this work, through the National Science Foundation-funded projects, “Cosmic Serpent: Collaboration with Integrity,” “Native Universe: Indigenous Voice in Science Museums,” and most recently the international

initiative, "Indigenous Ways of Informal Science Education" (I-WISE).[81]

Language as a Performative Tool for Change

Critical to the success of any meaningful work in this field is a rigorous perlustration of the language being used to discuss and identify both museums and Indigenous people. Centuries of colonization and oppression have saturated and nuanced the English language with words and phrases that are racist. This common language is if not blatantly then subtly demeaning, yet tends to be accepted for the sake of expediency. At the dawn of the twenty-first century, it is far past time to address these cultural insults, replacing degrading language with more respectful and inclusive words.

Analysis of progressive museums offers current best practices in communicating with the mainstream public, perhaps more accurately referred to as the medial or aggregate public. A signal point of contention faced in engaging in cross-cultural work of this nature is in reconstructing Western perceptions regarding the cognitive and cultural competence and sophistication of Indigenous people and communities. To refer to Western cultures as *mainstream* carries with it the implicit and enduring notion that Indigenous cultures are but subservient trickles.

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[81] N. Maryboy et al., "Ways of Knowing from Father Sky: Native and Western Research Protocols - From Paradox to Collaboration," vol. 36, 2006, 2066, http://adsabs.harvard.edu/abs/2006cosp...36.2066M; L. M. Peticolas et al., "Lessons Learned from Cosmic Serpent, a Professional Development Project for Informal Educators on Science and Native Ways of Knowing," *AGU Fall Meeting Abstracts* 33 (December 1, 2010), http://adsabs.harvard.edu/abs/2010AGUFMED33B..10P.

During my research travels, when discussing this particular point of language with museum personnel, I was offered the perspective that the trickles are what form the mainstream, so therefore it is not a pejorative term. Although this is a valid perspective, it is a more sophisticated interpretation of the term than I suspect is generally understood by the American public, adept at *othering* non-White people. Although this could appear to some as a picayune misadventure into semantics, it is emblematic of a deep and divisive cultural rift between Indigenous and Western communities—a rift entrenched by centuries of colonial incivility and nescience. To expand upon the aphorism "if nothing changes, nothing changes," as a point of research methodology, I am deliberately experimenting with substitutions of commonly used words for those less depreciative of people of color.

The English language, grown within a hierarchical paradigm, does not gracefully hold the concept of equal but different entities, so the search for an English term to replace *mainstream* has been challenging and awkward. However, in subsequent chapters I am replacing the term *mainstream public* with *aggregate public*;[82] aggregate is a term that accurately defines a large mixed populace without the weighted implication of superiority. I am replacing *mainstream museum* with *medial museum*; the term *medial,* also unfreighted with hierarchical overtones, is defined by the *Oxford Dictionary* as "situated in

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[82] Aggregate, defined by the Oxford Dictionary: "A whole formed by combining several separate elements." "Aggregate - Definition of Aggregate in English from the Oxford Dictionary," accessed August 11, 2016, http://www.oxforddictionaries.com/definition/english/aggregate.

the middle."[83] There is language associated with responses to climate disruption that has also become if not pejorative, then distressingly vague from being stretched too thin across too many topics. Key among these is the term *sustainability*, a term that has also been so widely used and applied to so many different kinds of situations that it has become diluted, however, one is nonplussed when searching for a better term. It can refer to both environmental and cultural contexts, and refers to the conservative use of resources, although it is not thought of as a *conservative* concept.

A term, or concept, that is particularly pertinent to this dissertation research is the idea of the *other*, often referred to academically as *othering*. *Othering* reflects the hegemonic exclusion or unnecessary identification and classification of people in culturally non-dominant demographic categories. In this research work, it is my observation that children and Indigenous people are frequently seen as the *other*, and subject to micro-aggressions within museum contexts. This can often manifest in museums as a presentation of Indigenous culture that implies that these people exist solely in the past. My observations regarding American children in museums and in our culture generally are that *othering* of them is reflected in assumptions that they are insufficiently intelligent to grasp subtle or complex ideas.

Climate change is a term that has generally replaced *global warming*,

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[83] "Medial: Definition of Medial in Oxford Dictionary (American English) (US)," accessed September 1, 2016, http://www.oxforddictionaries.com/us/definition/american_english/medial.

but that has been so used and abused as to have become relatively meaningless. *Global warming*, as a term, became essentially useless when skeptics noted cold snaps, mistaking weather for climate. Unfortunately, perhaps especially in the United States, *climate change* has become a highly politicized buzz phrase, a piece of jargon that carries a burden of nuance and innuendo, rather than a neutral description of current and future conditions. For this reason, I prefer *climate disruption*—whether one attributes climate disruption to anthropogenic causes, a natural cycle, or the hand of a malevolent god—it is quite evident and a more accurately descriptive term.

The proper terminology for referring to the popular culture in the United States, residents of the United States, or concepts referring in some way to the United States is a challenge. Technically, it is correct to use United States or U.S. because taken literally, the term *American* refers to people living in North, Central, or South America. However, this is a dissertation written in a department of American Studies, not U.S. Studies, and the implications are quite different. *American* has cultural nuances, reflecting a wide-spread sense of *White privilege*, but also a spectacular level of what I would like to call *Petro-privilege*. The term *U.S.* has political nuances. Virtually every museum or museum organization in the United States that refers to U.S. affiliation uses the term American—as in, American Alliance of Museums, National Museum of the American Indian, or American Museum of Natural History. The term *American* is recognized world-wide to refer to members of Euro-American

culture, justly or not. Canadians do not refer to themselves as Americans, nor do Mexicans, at least not in my recollection. It is remarkably graceless to say United Statesians. The primary difficulty with substituting *citizens or residents of the United States* for *Americans*, is that the United States holds many people of sovereign status—Native nations—whom it is inappropriate, insensitive, or inaccurate to refer to as inclusive with medial American culture. As well, there are many people of papered or unpapered immigration status who are potentially equally culturally incongruent with medial American culture. They are understood as included in the term *residents of the United States*, but may or may not be included in *Americans* depending on the nuance of the statement. For these reasons, to recognize that Native nations members and recent immigrants to the United States may not be part of some of the problems that I discuss, I use the terms *America* and *American* in the cultural sense, and *United States* or *U.S.* in the political sense, as is widely adhered to in American Studies literature.

The bitter legacy of colonialism within the field of museum studies warrants reframing the constituent language, even if somewhat awkwardly, in an effort to discuss equitably the estimable work of Indigenous institutions, elders, and scientists, without reverting to language that inadvertently undermines the very task at hand. This dissertation research strives to ascertain the most affective and effective arguments and strategies employed by both Indigenous and non-Indigenous museums to pursue better educating the

aggregate public about pressing environmental concerns.

The people who will both reap the hardest consequences from climate disruption, as well as be most challenged to devise the necessary solutions, are the children of today and of the next generation. It is incumbent for museums to leverage their position of trust to inspire and mentor their constituent youth in crafting the imaginative solutions required to maintain a habitable planet. The collaborative methods of forging community between tribal communities and museum communities to create exhibits such as *Roots of Wisdom*, the innovative Oregon Museum of Science and Industry exhibit, promise fertile ground for growing new connections and ways of communicating science to children in a manner that both sparks their intellectual interest as well as their sense of belonging and responsibility to the global community.[84]

Ecocriticism and Settler Colonialism

The theoretical concepts of *Ecocriticism* and *Settler Colonialism* both offer valuable perspectives in relation to this research. Ecocriticism, broadly defined as the interdisciplinary study of the environment, with a humanities focus on how it is viewed in literature, film, media and art, gives a useful perspective from which to evaluate environmentally oriented museum programming. Timothy Clark, in *Ecocriticism on the Edge: the Anthropocene as a Threshold Concept*, discusses the issue of *scale framing*:

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[84] "Roots of Wisdom," accessed September 3, 2016, http://omsi.edu/exhibitions/row/.

> The Anthropocene is itself an emergent 'scale effect'. That is, at a certain, indeterminate threshold, numerous human actions, insignificant in themselves (heating a house, clearing trees, flying between continents, forest management) come together to form a new, imponderable physical event, altering the basic ecological cycles of the planet. 'Scale framing' is recognized in discussions of environmental and other politics as a strategy for representing complex issues in ways that make them more amenable to thought or overview, while at the same time running grave risks of being a simplification and even evasion. Hence essays on scale framing are often also exercises on cognitive bias, whether intentional or accidental . . . . As the contingent emergent sum of innumerable and probably incalculable processes happening across the earth at divergent time scales, a 'tipping point' per se is neither unitary nor representable in any one, sufficient image. Scale effects in particular defy sensuoUS representation or any plot confined, say, to human-to-human dramas and intentions, demanding new, innovative modes of writing that have yet to convincingly emerge.[85]

Scale framing is a concept of particular utility to museums when assessing how best to communicate information to visitors regarding Anthropocene issues such as global climate disruption. Climate disruption is occurring on such a vast scale in time and space that it is a challenge to communicate in a way that will feel relevant to the museum visitor. As Clark points out, it is easy to oversimplify in an attempt to create a manageable concept. Museums have found that scientific bar charts are not a viable way of communicating climate disruption—they may be accurate, but they are stultifying. This leaves less objective methods; referring to Clark's ideas regarding the potential pitfalls of scale framing is an intellectually rigorous way

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[85] Timothy Clark, *Ecocriticism on the Edge: The Anthropocene as a Threshold Concept* (London ; New York: Bloomsbury Academic, 2015). 72-80.

to reality-check the viability of a potential exhibit.

An excellent example of this kind of exhibit done well is the exhibit *Nature's Fury: The Science of Natural Disasters*, (Figure 29) originally developed at the Field Museum in Chicago. Some locally specific content was created and included when it was staged at the American Museum of Natural History in New York. A particularly compelling component was the *Hurricane Sandy Storm Surge Interactive Map*. This touch-screen enabled map is projected from above onto a table cut to the shape of the city of New York, at



Figure 29. Hurricane Sandy Storm Surge Interactive Map.
PHOTO COURTESY: J WOODCOCK-MH, 2015

about knee level for an adult. The computer projection follows the storm surge through the city, visually demonstrating how and why the storm surge affected particular areas of the city.[86] The American Museum of Natural History is a major tourist destination, but it also is a primary community museum for local New Yorkers. As such, this exhibit provided a compelling way to explain a tragedy that had personally affected many residents, but was perhaps difficult to grasp as a whole, beyond one's residential block. This exhibit clearly articulated the entire event, in such a way that even a small child could readily understand, and was physically available to small children, since the projection surface was at about eye level of a small child, and a comfortable viewing level for, say, an average 8-12 year old. I observed visitors for perhaps twenty minutes, and this particular installation was both of immediate interest, but also held many visitors' attention through several cycles, as they followed the information regarding the flooding of New York City. This exhibit literally models scale framing at an effective and accurate scale.

The theory of *Settler Colonialism* is well explored in the field of American Studies, but much less so in Museum Studies, although it has much to offer. In essence, colonial studies considers the temporary relationship between a dominating and subjugated country; Settler Colonialism examines the evolving ramifications of permanent immigration and cultural domination

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[86] "Superstorm Sandy," AMNH - Nature's Fury: The Science of Natural Disasters, accessed March 23, 2018, https://www.amnh.org/exhibitions/nature-s-fury-the-science-of-natural-disasters/hurricanes/superstorm-sandy.

of existing peoples. Examples of colonialism are rampant in African nations, where European nations invaded, extracted resources, but did not remain permanently. The United States, Australia, and Canada are examples of settler colonialism; European nations invaded, extracted resources, appropriated the entirety of the geographical landscape, and subjugated the inhabitants.

With colonialism, the primary events of domination are in the past and may be dealt with as history. For example, Bantu peoples have lived in the Congo region for approximately 90,000 years. King Leopold II of Belgium acquired the rights to the Congo at the Berlin Conference of 1885, promptly privatizing it for himself, ironically renaming it the Congo Free State, essentially enslaving the Congolese and forcing them to produce rubber. On June 30, 1960, the Congolese declared independence, electing Patrice Lumumba as Prime Minister. The century of colonial oppression was devastating for the Congolese, and they are scarcely without problems since; however, they rule themselves.

Settler colonialism denotes an ongoing domination and remains a destabilizing force. The Indigenous peoples of the United States, Australia, and Canada all are living daily with cultural and geographical consequences of colonial actions. For example, the recent protests against the construction of numerous oil pipelines by Canadian and Native American nations and allies is illustrative of the kinds of cognitive dissonance dealt with in settler colonialist environments. These Native *water protectors* are culturally grounded in land

stewardship, but they are forced to contend with land depredation, and when doing so, are made vulnerable to government-sanctioned violence, despite their engagement in peaceful protests.

The relationship of settler colonialism to museums resides in the presentation of Native peoples to the public; many American museums have presented, or are still presenting information about Native peoples as though they are in the past tense. In the latter 1800s, it was widely thought that American Native peoples would be extinct or fully assimilated by the early 1900s. Indeed, many Americans think that is precisely what happened, and are startled to find that Native peoples are quite alive and culturally strong today. When I worked in Montana State University's Department of Native American Studies, with some frequency I would receive phone calls in which the caller would remark that they were very interested in Indian culture, but that there were no Indians in their state—which I thought would be an interesting news flash to their resident Native tribes. As noted by Walter Hixon, "In settler societies colonizing discourse invariably depicted the indigene as a pre-modern primitive and moreover as a member of a vanishing race. Death and destruction became normalized insofar as the indigene was after all part of a dying race. This rationalizing discourse helped justify dispossession, assuage guilt, and establish a framework for historical denial. To end the discussion with Wounded Knee, ignoring the twentieth-century, would be to affirm the colonial

mythology of the vanishing race."[87] Many museums holding Native collections have exhibited them in such a way that one could walk out believing that the represented tribe was no more. One thinks of the many glass cases of dusty southwest baskets, unattributed to a maker, and without contemporary contextualization. This oversight makes sense interpreted through the lens of Lorenzo Veracini, who notes, "In the case of *settler* colonial contexts a specific narrative form produces a situation in which there is no intuitive narrative of settler decolonization, and . . . a narrative gap contributes crucially to the invisibility of anti-colonial struggles in settler colonial contexts."[88] In the United States, the issues of settler colonialism can be muddied by racial issues. Mahmood Mamdani, director of the Makerere Institute of Social Research, observes,

> If America's greatest social successes have been registered on the frontier of race, the same cannot be said of the frontier of colonialism. If the race question marks the cutting edge of American reform, the native question highlights the limits of that reform. The thrUst of American struggles has been to deracialize but not to decolonize. A deracialized America still remains a settler society and a settler state.
> Not only are there important differences in the political and social location of African Americans and American Indians, these differences also translate into the lack of a shared perspective on emancipation and strategies for it. For the settler, African Americans signified labor; in contrast, American Indians were the source of land. If settlers sought to master African slaves as individuals, they set about conquering American Indians as entire tribes. In the language of the law, the African American was like a

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[87] W. Hixson, *American Settler Colonialism: A History*, 2013 edition (New York, NY: Palgrave Macmillan, 2013). 185.

[88] Lorenzo Veracini, *By Lorenzo Veracini: Settler Colonialism: A Theoretical Overview* (Paperback, 2010). 105.

> dog that could be tamed, but the Indian American was more like a cat that remained wild. If African Americans faced the alternative between returning to Africa and a struggle for equal citizenship in America—with Marcus Garvey calling for return and W. E. B. Du Bois for equal citizenship—the Native American could make no such distinction. Native American groups continue to call for a pale semblance of independence through tribal sovereignty. From this point of view, a struggle for equal citizenship looks like a masked acceptance of final defeat: total colonization.[89]

For museums, this makes discussions of race rather than of colonialism much simpler to present to a public that will elect an African-American president, but turn a blind eye to widespread forced extraction of resources by on Native American reservations. John Dorst, discussing visual and cinematic representations of Mato Tipila argues,

> The current conflict over Bear's Lodge/Devils Tower needs to be placed in the context of this colonial (and twenty-first) visuality. Historically, the Native American claim on this site, as symbolized by its narrative traditions, has largely been contained through the simple and familiar colonial mechanisms of selective deafness and trivialization. In recent years Indian voices have become more insistent in their call for some form of reappropriation. As a result, new forms of containment have come into play. I will take as a premise that whoever establishes and controls the definitive view, literal and metaphorical, of the site occupies thereby the position of cultural ownership. Access to that vantage point will be strictly policed. In the postcolonial context this policing is less likely to take the heavy-handed form of coercive suppression than to rely on subtle incorporation through the liberal discourse of inclusiveness and balance.[90]

Setting aside the arguable notion of postcolonialism, Dorst's thoughts regarding visual representations of Mato Tipila and cultural appropriation

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[89] Mahmood Mamdani, "Settler Colonialism: Then and Now," *Critical Inquiry* 41, no. 3 (March 1, 2015): 596–614, https://doi.org/10.1086/680088. 607.

[90] Dorst, John, "Postcolonial Encounters: Narrative Constructions of Devil's Tower National Monument," in *Post-Colonial America* (University of Illinois Press, 2000), 303–20.

through control of the *definitive view* apply quite specifically to museums. His argument is exemplified by a problematic exhibit created by the University of Utah Natural History Museum, titled *Native Voices*, which I visited in September 2014. *Native Voices* is reported as "Designed in consultation with Utah's Indian community, this exhibition depicts Native American art and culture and interprets the deep memory and contemporary presence of Utah's Indigenous people."[91] I would observe that if a viable degree of collaboration had occurred, they would have decided whether they were representing Indians, Native Americans, or Indigenous people—covering all bases in their brief web page devoted to the exhibition merely underscores this deficit. What makes this contemporary exhibit so disturbing is the unacknowledged subtext of colonialism.

I was quite excited to have the opportunity to visit this natural history museum in its new building, as I had seen a number of conference presentations regarding its outstanding dedication to green construction and landscaping practices. From a sustainability or *green practices* perspective, it was outstanding. As I progressed through the floors, I was impressed with their excellent presentation of Utah's geology. Their exhibits on historic pottery and flint knapping were well done as well, including scientific information about the techniques involved.

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[91] "Native Voices," University of Utah Natural History Museum, accessed March 23, 2018, /museum/exhibits/native-voices.

It was quite startling to emerge on the top floor directly into an exhibit regarding contemporary Native people. Museums have a dark history with Indigenous people, filled with appropriation of artifacts, sacred objects, human remains, and misrepresentation of cultures. For natural history museums to display people is a residual tentacle of the *human zoos* phenomenon popular in the 1800s, ensnaring the public into a kind of participatory racism. This othering of Indigenous people was horrific then, it is no less problematic now, even if done prettily. The main problem with this exhibit is a complete lack of contextualization, and an assumption that if it used to be acceptable to represent Native peoples in natural history museums between the dire wolf skeleton and the rock specimens, then it must still be appropriate to do so, understanding of course that non-Native people's place is in history museums.

It is, of course, completely plausible to propose that *all* people belong in the natural history museum, since we are all mammals living amongst the other mammals. If one walked into the top floor, and half the exhibit was devoted to Native people, and the other half to Mormon people, it would have made a powerful statement of inclusivity and peoples' place in nature. If there had been signage that said they were making use of their historic Native cultural materials downstairs, as was previously traditional in museums, but that they wanted us to know that Native people are not extinct, that would have been progressive. Neither of these was done. What was done was signage that is truly presumptuous in that it purports to present a Native perspective, yet is

written in the third person. The text of *New Choices, New Dreams* reads,

> *Adaptation to a changing world is rooted in traditional values*
>
> Being an Indian in 21st-century America means balancing a distinctive heritage with the challenges of today's global institutions and cultures. Utah's Indigenous people treasure their homelands and political sovereignty. They respect their languages and cultural roots. And they take pride in their families and identities. Still, they seek education, information, work and technology outside their own communities as they adapt their lives to a changing landscape. Here they share stories of their losses and aspirations in the contemporary world. (Figure 30)

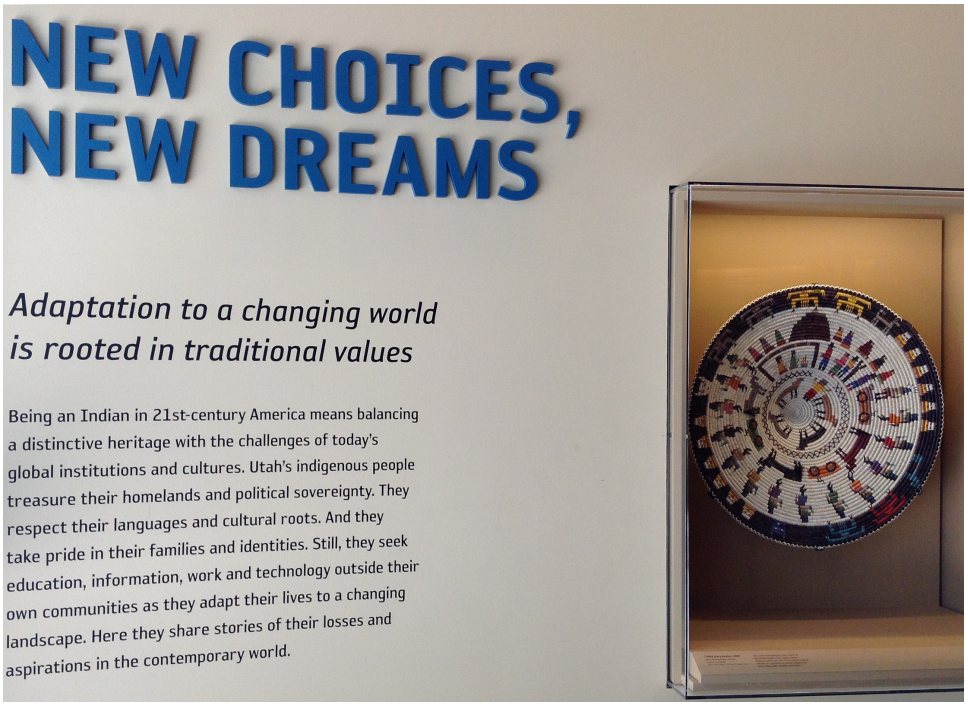

Figure 30. "Native Voices", "New Choices, New Dreams" panel
PHOTO COURTESY: J WOODCOCK-MH, 2014

I was accompanied by a Nimi'ipuu person on this museum visit; she was so offended by the patriarchal tone that after reading the first panel and taking a quick look, she left the museum. Although there are numerous images



Figure 31. “Native Voices” storytelling circle
PHOTO COURTESY: J WOODCOCK-MH, 2014

and stories from contemporary people, the centrally located storytelling pit is surrounded by floor-to-ceiling banners of what look like Edward Curtis photos—which subliminally suggests to the viewer that despite the modernity around the periphery, the central story is about people long dead. (Figure 31)

I do not doubt that this exhibit was created with the best of intentions, but unfortunately the end result illustrates the point made by Dorst, that colonialism is perpetuated by the holder of the definitive view. Museums are culturally positioned as the holders and explicators of the definitive view, so they are in a position to either preserve a colonialist status quo, or to recognize this hazard and truly work collaboratively with Native partners to present a re-appropriated Indigenous perspective. Settler Colonialism theory

offers a useful grounding and body of literature from which to contemplate and evaluate these issues.

In summary, we find our physical and cultural worlds changing very rapidly, and the tools with which we might address this change are elusive for several reasons. Our physical world has experienced many warming and cooling cycles, some extreme almost beyond imagining. However, the rate at which our world is changing is unprecedented, and we cannot point our fingers at a mighty oncoming asteroid; we have brought this upon ourselves. We are well into a catastrophic extinction event—not only are charismatic megafauna such as the black rhinoceros going extinct, but so are a plethora of creatures that support the base of our biome.

In America, we stand by idly as the bees that pollinate our crops die from neonicotinoid poisoning rather than eliminate the toxins and protect our food security. Our ice sheets and permafrost are melting at unprecedented rates, yet we do nothing substantial to stop it. Our houses are burning down on the West coast, and being washed away on the East coast; yet we do nothing meaningful to address it. Scientists have made it explicitly clear that the consequences of climate disruption are a direct result of carbon emissions into the atmosphere, yet we authorize new pipelines knowing the cost to future generations. The political power exerted by the petroleum industry in our government, our media, and our schools has purchased an American willful obtuseness regarding catastrophic climate change and personal responsibility.

This could seem like a mystery until one reviews U.S. Department of Education testing data, and realizes that it has been decades since the average American had the literacy to really understand the scientific reporting on this myriad of interconnected issues, and thus is without the tools to think these complex issues through on his or her own. In contrast to the general public, Indigenous people are at greater risk from climate change, and more active in seeking solutions, although this has not yet been widely recognised by the public. Due to common cultural norms of land stewardship, oral history, and valuing of community well-being, Indigenous people tend to have a better understanding of climate change and anthropogenic issues and a more active sense of responsibility in contending with them than does the general public. For example, one need look no further than the courageous Water Protectors, in their stalwart efforts to halt the production of a new pipeline that would surely leak and contaminate the waters along its path. It is time that the American people recognize and embrace the environmental and cultural knowledge and leadership of our Indigenous peoples. This dire view of American apathy can be changed, and it can be changed in a generation. I posit that if American museums step forward as champions of their communities; work collaboratively with their constituent Indigenous communities; work together as a networked alliance of museums; take on the challenge of educating children about science, about personal responsibility to the greater community, and about the joy of creating solutions, that this dilemma can be solved.

CHAPTER TWO:

EMERGENT PRACTICES: THEORY AND METHODS

Theoretical Approaches and Methodological Strategies

The wide array of unique, specific experiences regarding climate disruption, sustainability, and perceptions regarding Anthropocene issues is the reason why I am interested in these questions at a human and individual scale – why do people engage and learn about climate disruption and sustainability one way, but find another way tedious? Why do they want, or not want, to pursue sustainability at work, or at home? How do they perceive their current behavior in relation to outcomes affecting future generations? And do they care? These *why do people behave the way they do* questions lend themselves to an anthropological lens. Since I am studying museums as culture groups, and my question is regarding their cultural practices around sustainability, it is logical to frame this work as an ethnography. The data collection for this research consists of individual in-depth interviews and in-person museum observations.

Sarah Tracy offers in her journal article, "Qualitative Quality,"[92] a pedagogical set of research criteria: worthy topic, rich rigor, sincerity, credibility, resonance, significant contribution, ethics, and, meaningful contribution. This is an excellent list against which to measure one's work. As

[92] S. J. Tracy, "Qualitative Quality: Eight 'Big-Tent' Criteria for Excellent Qualitative Research," *Qualitative Inquiry* 16, no. 10 (October 1, 2010): 837–51, https://doi.org/10.1177/1077800410383121. 306.

she puts it, her guidelines float above any particular methodology or theoretical approach—they are adaptable and differentiate ends from means. It is very important to check back to a list like this, if employing a somewhat unorthodox methodological approach, in order to maintain academic rigor. Tracy suggests, "Guidelines provide a path to expertise." "A language of best practices provides the option to frame our work, if desired, as systematic and structured, something that may be helpful when dialoguing with people who cling tightly to rules of their own." "Part of making scholarship powerful is talking in ways that are appreciated by a variety of audiences, including grant agencies, government officials, and media contacts—many of whom are unfamiliar with the methodology of qualitative research." Tracy's very practical suggestions offer a useful set of basic building blocks for constructing a methodological framework.

Esther Oliver presents the idea of Critical Communicative Methodology (CCM) in her interesting journal article, "Cultural Intelligence to Overcome Educational Exclusion."[93] CCM is a concept of egalitarian dialogue, positing that without the inclusion of the voice of the un-Othered Other, the social conditions that cause discrimination are not addressed. Oliver defines the key idea of intersubjectivity as "the interaction between subjects capable of language and action creating meaning together," and notes that, "to promote

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[93] E. Oliver et al., "Cultural Intelligence to Overcome Educational Exclusion," *Qualitative Inquiry* 17, no. 3 (February 4, 2011): 267–76, https://doi.org/10.1177/1077800410397805.

this joint interpretation of the situation being studied, the CCM generates the spaces and conditions required to record the contributions of those being researched." Although the article is cluttered with jargon, the premises are outstanding and bear contemplation when constructing a methodological approach to interviewing participants.

Kate McCoy, in "Toward a Methodology of Encounters," comments:

> While a serious consequence of oversimplification is remaining stuck in limited ways of understanding and intervening in the world, resisting oversimplification entails a great deal of risk, especially in recent years as the definition of what counts as research and what counts as science, especially in education, has been narrowing in what Pati Later calls a 'repositivization' of qualitative research in these neoliberal times.[94]

McCoy advocates for moving away from an oversimplified, mechanistic approach to qualitative research, striving for a "troubling" approach that asks complex questions, welcomes the unexpected, and attempts to be useful in the world. I found that my museum interviews suggest that McCoy's approach is specifically useful in this particular dissertation research, allowing for the emergence of complex and fruitful conversations with participants.

Othering, the behavioral platform upon which hegemonic societies are built—favoring culturally designated insiders whilst excluding individuals or groups lacking specific criteria—is a persistent problem in museums. Michael

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[94] K. McCoy, "Toward a Methodology of Encounters: Opening to Complexity in Qualitative Research," *Qualitative Inquiry* 18, no. 9 (October 3, 2012): 762–72, https://doi.org/10.1177/1077800412453018.

Krumer-Nevo's article, "Writing Against Othering,"[95] offers techniques to avoid Othering, including narrative, dialogue and reflexivity, and suggests that "writing that resists the production of Othering ...returns the participant and her history to the foreground; it is contextual, specific and particular; it is written out of a situated position and uses reflexivity as an organizing principle." In relation to this doctoral research, Krumer-Nevo's observations are quite pertinent.

Since we all come from Indigenous backgrounds at some near or far distance, how do we reach across temporal and spatial distances to reconnect a commonality at a level where we can absorb Indigenous knowledge, without inadvertently Othering the very Indigenous people to whom we are turning for deep cultural wisdom? Krumer-Nevo notes, "Research thus always performs in the arena of the politics of representation," and warns, "Giving the researcher their stories has made the participants dependent on the latter's interpretations, ideologies, and writing styles." This is a serious issue to think through, since the "Sociological definition of Othering as ascribing moral codes of inferiority to difference" can readily be overlooked in a culture steeped in White privilege.

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[95] M. Krumer-Nevo and M. Sidi, "Writing Against Othering," *Qualitative Inquiry* 18, no. 4 (March 1, 2012): 299–309, https://doi.org/10.1177/1077800411433546.

Qualitative Ethnography: A Polemic Polaroid

Although a quantitative approach might be preferable for research on green infrastructure, examining iterations of machinery, it would be unsatisfactory in examining the nuances of human behavior involved in pedagogy. A qualitative ethnographic approach permits the subtleties of opinion, and the outliers of experience of members of the museum community to be given a useful voice, creating a detailed picture of success and failure in museum pedagogical efforts. A qualitative approach is highly preferable in conducting interviews with museum staff, as initial interviews have proven that the starting list of questions asked in all interviews has led in unexpected and diverse directions. A quantitative approach would inadvertently eliminate anecdotal information, a key resource of this research.

Because my dissertation research is unique in that it documents a cusp point in museum practices regarding both climate disruption and collaborative Indigenous inclusion from a multiplicity of perspectives within the museum community, I have chosen to give a detailed accounting of my methods and methodology. Having had the experience of attempting to reconstruct the circumstances of inadequately-labeled archaeological artifacts, if my oral histories are useful to a future historian, I hope to save them the annoyance of trying to intuit how I conducted my interviews, and what shaped them.

My methodological paradigm is a reflexive and anthropological approach to conducting qualitative ethnographic research, informed by and incorporating

key elements of Indigenous Methodology. Due to my strong personal opinions on the topics under consideration, I am fully cognizant that a self-aware reflexive stance is of critical importance in maintaining a credible level of receptivity in my observations and evaluation of data. However, it is neither my goal nor intent to attempt the production of a politically, morally, or ethically neutral body of work. I contend that at this critical juncture in world history, cultivating a posture of scientific neutrality regarding climate disruption is fundamentally unethical when a shared body of data and working hypotheses are so badly needed. As a scientific community, it is past time to cut to the chase, discard obfuscating professional stances, and generate research that can actually be of value in addressing the widespread anthropogenic changes affecting our globe and its inhabitants. The supposition that museums can or ought to maintain a position of neutrality regarding climate disruption is no longer ethically viable when our population is so desperately in need of accurate and understandable knowledge, explanations, and practical guidance.

This dissertation research is essentially qualitative, as it is founded on conversational interviews exploring the experience, knowledge, opinions and vision of museum personnel, collected at a pivotal moment in world history as we confront the onset of climate disruption. It is the intent of this dissertation to provide a set of ideas and practices honed by staff at larger museums, which may be of use and inspiration to smaller museums without a budget for experimentation. This pivotal moment, the melting tip of the iceberg, so to

speak, marks the widely recognizable onset of anthropogenic consequences as they begin to cascade upon us in the early twenty-first century. The research data and findings are in no way replicable, as these interviews capture a very particular point in time, space and perspective reflected by each interview subject. Neither is the data itself *objective*, for the same reasons, as each individual's responses reflect their personal knowledge and opinions, as well as, to some extent, the institutional culture of their home museum. The analysis of this data is a rational assessment of this disparate collection, culling and offering the valuable gems of experience shared by these museum professionals for the greater good.

The practical methodology for this research has been an evolving process. Because this field of research is so new, creating a dissertation from existing published research material was neither practicably feasible, nor in any way desirable. The museum personnel and educators pursuing this work, for the most part have been very focused on developing this emergent field, without the luxury of taking time from their work to write and publish their findings until quite recently.

Until American Museum of Natural History former curator, Dr. Jennifer Newell, established the networking web presence "Museums and Climate Change Network: A Space for Sharing Resources and Inspiration,"[96] there were

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[96] "Museums and Climate Change Network," accessed December 31, 2016, http://www.amnh.org/our-research/anthropology/projects/museums-and-climate-change-network.

virtually no avenues for American museum staff to share ideas or ponder problems regarding climate disruption and sustainability outside their own institutions. The extent to which this communication siloing has curbed the exchange of ideas in the museum world across the country cannot be overestimated, and Dr. Newell is to be highly commended for the extensive effort involved in creating the Museums and Climate Change Network. The network page has grown from twenty-one individuals in nine countries in 2016, to forty-three in 2018; but still represents a tiny fraction of the museum staff that would find this network invaluable. Sarah Sutton, author of *The Green Museum*,[97] also manages an online blog, "Sustainable Museums,"[98] which although full of useful information, is not a networking device. The pragmatic consequence of this disconnection among museum personnel was that mapping out a research plan and proposed set of interviews was much less linear than expected, since ascertaining the most likely prospects was not readily accomplished through researching online. Robert R. Janes founded, and with David Jensen, co-chairs the Canada-based Coalition of Museums for Climate Justice (CMCJ). CMCJ is managed by a seven-person advisory board as of April 2017, and has an eponymous Facebook[99] page with 538 members, a Twitter

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[97] Sarah S. Brophy, *The Green Museum: A Primer on Environmental Practice*, Second Edition (Lanham, MD: AltaMira Press, 2013).

[98] Sarah Sutton, "Sustainable Museums," Sustainable Museums, accessed January 3, 2017, https://sustainablemuseums.blogspot.com/.

[99] "Coalition of Museums for Climate Justice," accessed April 17, 2018, https://www.facebook.com/groups/MuseumsforClimateJustice/.

presence at @Museums4Climate, and web page.[100] The web page has many interesting information resources and welcomes blog postings, but doesn't list a network, per se. However, their Facebook page does list the network of 538 members who are accessible through Facebook message function. The Facebook page, attentively hosted by Dr. Christine Castle, has daily postings from members on a wide array of related topics, and is a very useful resource.

Selection of Museums

With approximately 35,000 museums to choose from in the United States alone, the selection process required clear parameters. Initially, it seemed that the selection process would be relatively straightforward. Because not all museums use their websites to showcase their climate disruption or sustainability initiatives, it was not a practical choice to Google 35,000 museums looking for appropriate candidates, even with precise search criteria.

My primary selection criterion was that the museums must be actively pursuing both institutional sustainability initiatives and be pedagogically engaged with the public. Second, I wanted a range including both large and medium-sized institutions, and third, a selection of both mainstream and Indigenous institutions. The purpose in specifically selecting medium and large

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[100] "Coalition of Museums for Climate Justice – Building Museums' Capacity to Promote Awareness, Mitigation & Resilience in the Face of Climate Change," accessed April 17, 2018, https://coalitionofmuseumsforclimatejustice.wordpress.com/.

Exhibit I-3: Operating Budget Ranges for Each Discipline Group

Museum Discipline Group	n=	Operating Budget Cut Offs Defining Museum Size		
		Small	Medium	Large
Aquarium/Zoo	85	Less than $3,478,945	$3,478,945-$15,669,330	More than $15,669,330
Arboretum/botanical garden	68	Less than $1,002,641	$1,002,641-$2,890,012	More than $2,890,012
Art	393	Less than $874,555	$874,555-$2,899,092	More than $2,899,092
Children/Youth	107	Less than $466,430	$466,430-$1,982,699	More than $1,982,699
History	577	Less than $193,425	$193,425-$761,212	More than $761,212
Natural history/anthropology	78	Less than $745,471	$745,471-$2,959,130	More than $2,959,130
Nature Center	56	Less than $383,270	$383,270-$1,024,000	More than $1,024,000
Science/technology museum	92	Less than $1,063,353	$1,063,353-$5,475,416	More than $5,475,416
General museum	361	Less than $419,741	$419,741-$2,037,391	More than $2,037,391

Figure 32. Operating Budget Ranges for Each Discipline Group[101]
IMAGE COURTESY: IMLS

museums was to assess the experience garnered by well-funded institutions, with the intent to share this experience with small museums that lack the budget for experimentation on a challenging topic.

This seemingly simple shuffling of museums into three basic categories—

[101] Alice Apley et al., "Supporting Museums – Serving Communities: An Evaluation of the Museums for America Program. Full Report." Full Report (Washington, D.C.: Institute of Museum and Library Services, September 2011). 1-4.

small, medium, and large—in practice was a complicated task. The U.S. federal granting agency, the Institute of Museum and Library Services (IMLS), defines small, medium and large museums in terms of annual budget, divided by nine topical museum categories, each budgeted at different levels. (Figure 32) The American Alliance of Museums also determines small, medium and large museum categories based on budget criteria, but does not make their classification criteria readily accessible. However, Latham and Simmons have obtained the AAM criteria and succinctly summarize the problematic issues involved in a budget-based classification scheme:

> The American Alliance of Museums classifies museums by size based on the institution's annual budget, using the following categories:
>
> Less than $350,000
> $350,000 to $499,000
> $500,000 to $999,000
> $1,000,000 to $2,999,999
> $3,000,000 to $4,999,999
> $5,000,000 to $14,999,999
> More than $15,000,000
>
> A problem with classification by budget size is that far more than half of U.S. museums are in the first category (budgets of less than $350,000). Another problem is that a mere budget number does not tell us much about the museum, because ultimately the quality of the collection . . . is more important than the number of objects in the collection or the size of the budget. A museum with a large budget may be poorly managed, while a museum with a small budget may be managed expertly. However, budget categories may be useful if we also consider factors such as the number and nature of objects in the collection, the number of staff members and how well they perform their jobs, the size of the museum audience and how well the audience is served, etc.[102]

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[102] Kiersten F. Latham and John E. Simmons, *Foundations of Museum Studies: Evolving Systems of Knowledge* (Santa Barbara, California: Libraries Unlimited, 2014). 78.

On AAM's Center for the Future of Museums, February 4, 2014 "Small Museums in an Age of Scale" blog, Elizabeth Merritt interviewed Michael Edson, co-founder of the U.N. Live Museum, then Chief of Information Technology and New Media for the Smithsonian American Art Museum. Although the terms big and small museums are used, they are not specifically defined, being understood in context. Edson makes several particularly insightful observations:

> When we think of the old kind of 'big' in museums…maybe we're talking about making blockbuster exhibitions: we usually think of branding, concept development, and traditional marketing to get a physical audience through the doors, and there are limits to how big that can grow. And big organizations can play that game better than small ones, so they win. But the Internet isn't like that: It's a new game. Reddit has spent $0 on marketing and PR. Zero. And in December they had 5.8 billion page views, 100 million unique users, 20 million votes. And it's a site about curiosity, discussion, question asking. Isn't that our business too? Barak Obama answers questions on Reddit. Our Smithsonian curators answer questions on Reddit. The top three 'Ask me anything' sessions on Reddit are Barak Obama, Bill Gates, and Sir David Attenborough.
>
> The point I'm making isn't that every museum should be TED, it's that every museum *could* be TED. Museums can, with small teams and not much money, now work at enormous scale – – interactively, compassionately, and with deep impact on individuals across the globe. That's never been true before. Ever. And it's only just getting started: 2.4 billion people are now online (the last time I checked) and the next 5 billion are not far behind. For institutions that aspire to have a big impact on the world, scale isn't just another goal or tactical option: it redefines what they can be, how big they can dream, and—most importantly—what we should expect them to accomplish for us, with us, in society.[103]

Edson's scalar perspective is particularly interesting in our increasingly

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[103] Elizabeth Merritt, "Small Museums in an Age of Scale," *American Alliance of Museums* (blog), February 4, 2014, https://www.aam-us.org/2014/02/04/small-museums-in-an-age-of-scale/.

digital and connected world. Whether people are enthusiastic about the ability to interface digitally with friends or strangers, exchanging information in a nanosecond, or would prefer an old rotary dial telephone to an iPhone, nevertheless, the world is moving at high speed into the swamp of connectivity. As Edson points out, single individuals or small organizations, if they have a good topic and it goes viral, can establish and maintain a significant web presence. This adds another small, medium, and large scale classification scheme.

One could tally the percentage of digitized and accessible collections and exhibits, the number of web hits, the number of web-based inquiries of museum staff; however, this has yet to become an expectation. When requesting interviews, I was often met with surprise when I requested interviews with Information Technology staff. Meaningful digital access is both an issue of environmental sustainability as well as of social justice: A student in Busby, Montana may not have the financial resources to travel to Washington D.C. to visit the National Museum of the American Indian; however, the NMAI has significant digitized materials available online.

This criterion is not one that has yet become meaningful, although it is worth noting that there are a number of very interesting museums that exist solely in a cyber-geographical context. Two extremely different examples

include the Natural History Museum,[104] and the Valentino Garavani Virtual Museum. The Natural History Museum is a fundamentally activist museum,



Figure 33. The NHM BUS, AAM Atlanta 2015.
PHOTO: J WOODCOCK-MH



Figure 34. The NHM-Lummi Totem Pole Journey in Portland.
PHOTO COURTESY: THE NATURAL HISTORY MUSEUM

engaging in, for example, initiating the push for museums to divest from carbon funding, and working closely with Native nations. It has mobile and pop-up exhibits and a bus; but also has a website, YouTube channel,[105]Twitter,[106] and a Facebook page[107] with almost 20,000 followers; a strong online presence. Because it is not tied to a bricks and mortar physical institution, it has the ability to focus its presence in a wide variety of physical loci, engaging online visitors who would not physically be able to come to it. (Figures 33-34)

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[104] "Museumhive Meetup: Museums and Activism," *The Natural History Museum* (blog), April 27, 2017, http://thenaturalhistorymuseum.org/events/museumhive-meetup-museums-and-action-w-beka-economopoulos/.

[105] "The Natural History Museum," YouTube, accessed June 9, 2018, https://www.youtube.com/channel/UCMBBYHDnN2tSX_iMOET3ReQ.

[106] "The NHM," Tweet, twitter.com/The_NHM, April 26, 2018, https://twitter.com/_aploy/status/989475432109170690.

[107] "The Natural History Museum - Home," The Natural History Museum, accessed June 9, 2018, https://www.facebook.com/TheNaturalHistoryMuseum/.



Figure 35. The Valentino Garavani Museum[108]
PHOTO COURTESY: THE VALENTINO GARAVANI MUSEUM

In stark contrast is the Valentino Garavani Virtual Museum. As reported by the digital magazine, Business of Fashion:

> At a news conference Monday morning, live-streamed on YouTube and emceed by the actress Anne Hathaway, Valentino Garavani and long-time business partner Giancarlo Giammetti unveiled the Valentino Garavani Virtual Museum, a downloadable desktop application that showcases almost five decades of the designer's work, drawing on a database of over 180 videos and 5000 images, including Valentino's original sketches. A fashion first, the digital museum invites users to navigate a series of immersive galleries, organised by theme and rendered in 3-D, that in the physical world would stretch over 10,000 square meters. Funded entirely by Mr. Giammetti and Mr. Garavani at a reported cost of several million dollars, the virtual museum, which is free to access, serves no direct commercial purpose . . . . and exists for the sole aim of securing the designer's legacy.[109]

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[108] "Valentino Garavani Museum Enter the Museum," Valentino Garavani Museum, accessed June 9, 2018, http://www.valentinogaravanimuseum.com/.
[109] BOF Team, "Inside Valentino Garavani's Virtual Museum," *The Business of Fashion*

Although there are not readily available visitor statistics for the Valentino online museum, the corresponding Facebook page has almost 27,000 followers.[110] (Figure 35) Facebook does not note the number of singular page visits, so the approximately 27,000 followers are arguably equivalent to repeat visitors at brick and mortar institutions. The digital Valentino Museum offers a singular opportunity for fashion students or couture fans worldwide to examine in detail the body of work of this designer, in a contextual way impossible by accessing single digitized images of his works physically held in museum collections. Not to argue the pros and cons of the value of *real stuff*, a separate discussion, it is crucial to point out that the digital world can be a critical factor in classifying a museum as small, medium or large, if one is either classifying by head count, or by number of objects—in this case digital records.

ICOM, the International Council of Museums, prodigious in their digital library of museological resources, also declines to define museum classification criteria, although they supply a large array of both philosophical and pragmatic tools, so they were not a useful source of guidance in this regard.[111]

British think-tank Nesta approached this conundrum from a different

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Digital Scorecard (blog), December 7, 2011, https://www.businessoffashion.com/articles/digital-scorecard/digital-scorecard-valentino-garavani-virtual-museum.

[110] "Valentino Garavani Virtual Museum - Posts," accessed June 9, 2018, https://www.facebook.com/valentinogaravaniarchives/.

[111] "Standards & Guidelines- ICOM," accessed May 11, 2018, http://icom.museum/professional-standards/standards-guidelines/.

direction, conducting research regarding the efficacy of Using self-reported FourSquare museum visitation check-ins to create a model estimating total visitorship. Nesta's criterion for museum size is based on the number of annual visitations.[112] (Figure 36)

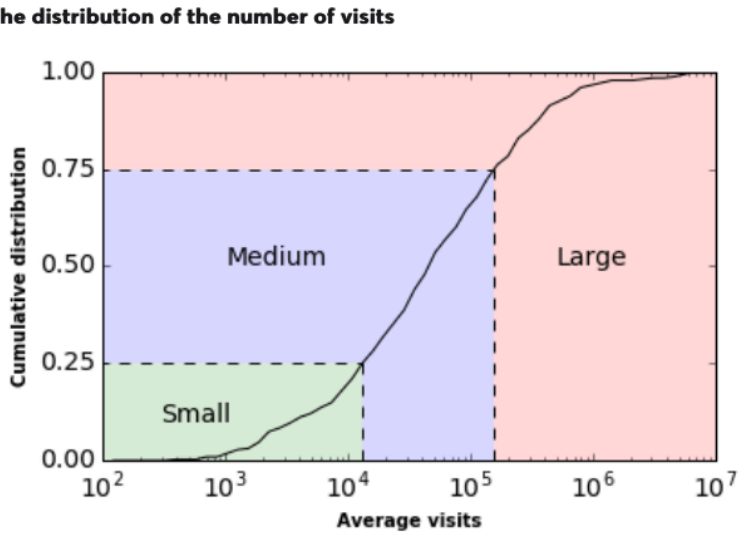

Figure 36. Museum size determined by number of visits.[113]
IMAGE COURTESY: NESTA (NOTE: X-AXIS IS IN LOGARITHMIC SCALE)

For the purposes of this research, I classified the Smithsonian Museums, the California Academy of Sciences, and the American Museum of Natural History as large museums; the Denver Museum of Nature and Science, the Anchorage Museum, and the Oregon Museum of Science and Industry I classified as medium-sized museums. In contrast, I specifically chose audience size and

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[112] "Digital Footsteps: Can You Measure Museum Visits without Counting Them? | Nesta," November 11, 2016, https://www.nesta.org.uk/blog/digital-footsteps-can-you-measure-museum-visits-without-counting-them.

[113] "Digital Footsteps."

focus as the selection criterion for the Indigenous museums—the NMAI, the Alaska Native Heritage Center, and the Makah Museum and Cultural Research Center. Because it is the intent of this research to provide *trickle down* experience from well-funded large and medium museums for the benefit of smaller museums, I did not choose to include a smaller museum in the sample of non-tribal museums. I did include smaller museums in the Indigenous museum set, in part because there are few large tribal museums, and because I wanted to observe the interactions of Indigenous museums within their communities at regional scales. I chose the museums that were welcoming and fit the general criteria—the categorization of museums by size is a complex and ineffable challenge.

It was not difficult to assess my primary selection criterion for the medial museums—active participation in sustainability initiatives—because I could readily access information about their activity through conference presentations, staff publications, museum web sites and personal conversations with staff members at conferences. The 35,000 museums in the United States provided an adequate pool for my limited sample. Most medial museums were eliminated swiftly due to a notable lack of any kind of sustainability initiatives, or if they had them, an absence of any pedagogical presentation of this work. There remained a small handful of suitable museums that were disinclined to participate in this research project, leaving me with the medial museums included in this study.

As I conducted my interviews, I found a number of museums doing impressive work, such as the Wild Center[114] in the Adirondacks of New York. However, I had to make the decision to limit my cast of museums due to restrictions of time and budget. Additionally, there were a number of museums that essentially fell into equivalent conceptual categories such as The Exploratorium[115] and the California Academy of Sciences,[116] both large, well-established science museums in San Francisco. In this instance, I decided to include the Cal Academy—established in 1853—with a century and a half of biodiversity research and a quarter-century specifically focused on climate disruption, sustainability, research into Anthropocene issues, efforts on multiple fronts to communicate this science to the public, and a specific goal to serve as a *Leeding* role model to other museums. This was a truly challenging choice, because the Exploratorium has more recently become a shining beacon of both sustainability as well as inclusive initiatives. The Exploratorium was founded in 1969 on the grounds of the 1915 Panama-Pacific Exposition in the northern two-thirds of the Palace of Fine Arts, a vast and lofty space echoing with the myriad clatter and clangs of hands-on science experiments. (Figures 37-38) Increasingly cramped in the seismically unsound Palace, the Exploratorium took up the sustainability gauntlet thrown down by

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[114] "The Wild Center: Our Work," Wild Center, June 1, 2013, http://webassets.wildcenter.org/our-work.

[115] "Conversations About Landscape: Coming to Terms," Exploratorium, February 2, 2017, https://www.exploratorium.edu/visit/calendar/conversations-about-landscape-04-19-17.

[116] "California Academy of Sciences: Planet Vision. A Planetary Perspective." PlanetVision, accessed May 11, 2018, https://www.planetvision.com/.



Figure 37. The Panama Pacific Exposition Palace of Fine Arts c.1919.[117]
PHOTO COURTESY: WIKIMEDIA



Figure 38. Last day in the Palace of Fine Arts.[118]
PHOTO COURTESY: K. WARNOCK

Cal Academy, conducting a formidable 2014 Leed Platinum adaptive remodel of the historic warehouses pre-existing at piers 15-17. With the new facility came a new purpose; the Exploratorium formed and met an objective of becoming the world's largest ZNE (zero net energy) museum, a remarkable achievement for any museum, but especially for their historic 330,000 square foot building.[119] (Figures 39-41) Institutions such as the International Living Future Institute offer ZNE certification.[120]

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[117] "Palace-of-Fine-Arts-1919.Jpg (JPEG Image, 2685 × 649 Pixels) - Scaled (67%)," accessed May 11, 2018, https://upload.wikimedia.org/wikipedia/commons/f/f2/Palace-of-fine-arts-1919.jpg.

[118] "The-Exploratorium-at-The-Palace-of-Fine-Arts-in-San-Francisco-on-Its-Final-Day-Picture-6-January-2-2013-Photo-by-Kevin-Warnock-E1357263848832.Jpg (JPEG Image, 675 × 450 Pixels)," accessed May 11, 2018, http://kevinwarnock.com/wp-content/uploads/2013/01/The-Exploratorium-at-The-Palace-of-Fine-Arts-in-San-Francisco-on-its-final-day-picture-6-January-2-2013-photo-by-Kevin-Warnock-e1357263848832.jpg.

[119] Alison van Diggelen, "SF Exploratorium: World's Largest Net-Zero Museum | Fresh Dialogues," *Fresh Dialogues: Interview Series with Alison van Diggelen* (blog), April 10, 2013, http://www.freshdialogues.com/2013/04/10/sf-exploratorium-worlds-largest-net-zero-museum/; Menlo Spark, "SUSTAINABLE BUILDINGS: Hundreds of Carbon-Neutral and Zero Net Energy Buildings in the U.S. MenloSpark" (Menlo Park, California: MenloSpark, 2017).

[120] "Zero Energy Certification," *International Living Future Institute* (blog), accessed July 7, 2018, https://living-future.org/net-zero/certification/.



Figure 39. The Exploratorium at San Francisco's Pier 15/17.[121]
PHOTO COURTESY: EHDD ARCHITECTS/BRUCE DAMONTE



Figure 40. The Fisher Bay Observatory and Terrace.[122]
PHOTO COURTESY: EHDD ARCHITECTS/BRUCE DAMONTE

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[121] The Exploratorium at San Francisco's Pier 15/17; The outdoor plaza is lined with exhibits that investigate the Bay and surroundings "Exploratorium at Pier 15 | EHDD," accessed May 11, 2018, http://www.ehdd.com/work/exploratorium-at-pier-15.

[122] The Fisher Bay Observatory and Terrace look east showcasing the San Francisco-Oakland Bay Bridge. "Exploratorium at Pier 15 | EHDD."

How to Achieve a ZNE Building:

1. Develop an ***integrated systems approach*** that minimizes energy use and increase comfort, through an air-tight, ***well-insulated*** building shell, design for ***daylighting***, and siting to maximize ***passive cooling and ventilation***.
2. Apply highly ***energy-efficient technologies*** including HVAC, lighting and control equipment.
3. Optimize the way the building operates and how people use it, including ***management of plugged-in devices*** and controls.
4. Install ***renewable generation*** to meet the remaining energy needs of the building ***or utilize carbon free grid power***.

HVAC Systems Play a Key Role. The Heating, ventilation and air conditioning (HVAC) systems designed for ZNE buildings do not use standard packaged units. Four HVAC trends are important:

1. Decoupling ventilation air from space conditioning,
2. Including energy recovery on the return air supply,
3. Moving away from forced-air ducted distribution systems, and
4. integration of ground- (geothermal) or air- source (electric) heat pumps.

Figure 41. How to Achieve a ZNE Building
PHOTO COURTESY: MENLO SPARK

Since I was not proposing a quantitative assessment of the field, I was not constrained by attempting to create a representative sample, nor limited to a rigid set of queries. To achieve useful and representational quantitative results, I would have been bound to using a generic checkbox survey, administered remotely to hundreds of museums. This approach was incompatible with my goal of soliciting the personal stories of engaged museum staff. In retrospect, I believe that I made the correct decision, as most of the interviews unfolded organically, going in directions I could not have predicted. A checkbox survey would have yielded little if any useful information, as the most interesting findings were ones that spontaneously arose in conversation.

To gain a sense of the field, I attended the 2012 annual conference of

the American Alliance of Museums (AAM),[123] attending as many relevant sessions as possible, and assessing the museums with the most apparent focus on climate disruption, or "greening" their institution. I familiarized myself with the AAM's PIC Green Network,[124] attending their sessions and observing the participants. I subsequently attended the 2013, 2015, and 2016 annual AAM meetings, continuing these observations. At the 2012 AAM meeting, I observed that there were relatively few sessions regarding Indigenous museums, and was informed of the existence of the Association of Tribal Archives, Libraries and Museums (ATALM).[125] (Figures 42-43) I then attended the 2013, 2014, 2015, and 2016 annual meetings of ATALM, searching for Indigenous museums actively engaged in climate disruption work. My operating assumption was that since Indigenous peoples around the world are disproportionately affected by climate disruption, that it would be quite straightforward to find a viable group of museums to study. I was to discover that this was more complicated. At all of these meetings I searched out sessions and working groups specifically focused on green museums, climate disruption and museums, and Indigenous museums.

As well, I initiated contact with the persons most engaged in this work. It was crucial to attend these meetings in person, as I was able to assess the "players" in a way that would have been impossible simply through researching

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[123] "The American Alliance of Museums," accessed January 3, 2017, http://www.aam-us.org/home.

[124] "PIC Green Network," accessed January 3, 2017, http://www.aam-us.org/resources/professional-networks/pic-green-network.

[125] "History of ATALM | ATALM," accessed January 3, 2017, http://www.atalm.org/node/27.



Figure 42. Getting your picture taken with a real Indian.[126]
PHOTO COURTESY: J WOODCOCK-MH

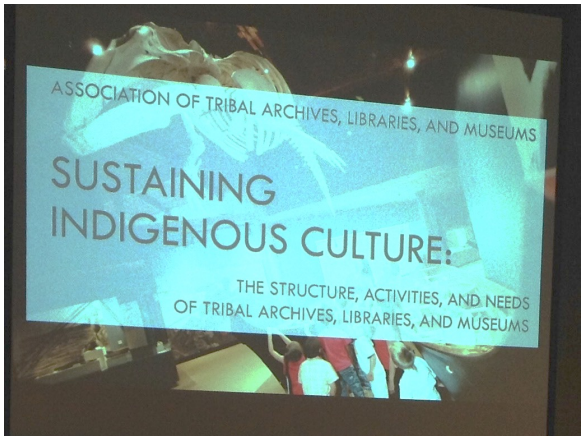

Figure 43. Sustaining Indigenous Culture.[127]
PHOTO COURTESY: J WOODCOCK-MH

online. I was also able to discern what was and was not presented. I was very fortunate to be the recipient of NSF Montana EPSCoR funding, which allowed me to attend these meetings.

At the first conference that I attended, the 2012 AAM meeting, I was excruciatingly aware that I must recoup the travel investment by not simply observing from a safe distance, but actually speaking to strangers and making acquaintances. Much was riding on making contacts at appropriate museums. At the end of the first day, surrounded by five thousand strangers, I found myself alone in the crowd and without any social anchor. Entering the elevator to go to my room, a small group of Native people standing next to me chatted about the National Museum of the American Indian, and made plans for dinner. I thought, "Finally! My people!" As a shy person, I vaulted from my comfort

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[126] American Alliance of Museums annual conference – Minneapolis, MN 2012
[127] Association of Tribal Archives, Libraries and Museums annual conference - Santa Ana Pueblo 2013

zone, blurting out the shortest of elevator speeches: "Could I join you for dinner?" Luckily for me, they acquiesced. My good fortune accompanied me to dinner with James Pepper Henry, then director of the Anchorage Museum and former associate director of the NMAI; Gussie Lehman, staff media producer and editor at the NMAI; Jill Norwood, the NMAI's intern program and fellowship coordinator and Brandie MacDonald, a former NMAI intern. The evening went well, connections were forged, and I left with an invitation to visit the Anchorage Museum to conduct interviews and pursue my research.

Using information gathered through observations and conversations at conferences as well as reading in the field, I developed an extensive wish list of candidate museums, which I then refined by soliciting invitations to visit the museums for the purpose of conducting interviews, and tailored to my available travel budget. This list included significant medial museums, public and private, at large and medium scale, involved in progressive initiatives addressing climate disruption and sustainability, as well as working collaboratively with their Indigenous communities, and what may be thought of as *First Stewards* museums, including institutions at hemispheric, regional and tribally specific scales. Montana NSF EPSCoR generously provided research funds that allowed me to travel to the Denver Museum of Nature and Science (DMNS);[128] the California Academy of Sciences (CAS)[129] in San Francisco,

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[128] "About Us : Denver Museum of Nature & Science," accessed January 3, 2017, http://www.dmns.org/about-us/.

[129] "Institute for Biodiversity Science & Sustainability | California Academy of Sciences,"

California; and the Anchorage Museum[130] and the Alaska Native Heritage Center (ANHC)[131] in Anchorage, Alaska to conduct interviews and observations. The DMNS was a strong candidate because of their established relationship with tribes in Colorado, as well as their commitment to sustainability. The California Academy of Sciences is a key museum in this study, as their entire focus has been geared towards studying biodiversity and educating the public. The Anchorage Museum invited my research; it actively engages both in sustainability and in tribally collaborative and inclusive initiatives. The Alaska Native Heritage Center works directly with Alaska Natives from across the state, many of whom are directly impacted by climate disruption; this was a strong choice for a regionally focused Indigenously run museum.

A 2015 Smithsonian Research Fellowship at the National Museum of the American Indian (NMAI)[132] permitted an extended period in which to conduct in-depth interviews and facilitated adding the Smithsonian National Museum of Natural History (NMNH)[133] as well as additional Smithsonian entities, as relevant.[134] (Figures 44-46) As our nation's foremost museum, the Smithsonian

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accessed January 3, 2017, http://www.calacademy.org/scientists.

[130] "Gyre: The Plastic Ocean - Anchorage Museum at Rasmuson Center," accessed January 3, 2017, https://www.anchoragemuseum.org/exhibits/gyre-the-plastic-ocean/.

[131] "High School Program | Youth | Education & Programs | Alaska Native," accessed January 3, 2017, http://www.alaskanative.net/en/main%2Dnav/education%2Dand%2Dprograms/youth/high%2Dschool%2Dprogram/.

[132] "National Museum of the American Indian," accessed January 3, 2017, http://www.nmai.si.edu/.

[133] "Smithsonian National Museum of Natural History. Research & Collections," accessed January 3, 2017, http://naturalhistory.si.edu/rc/.

[134] "Smithsonian Facilities," accessed January 3, 2017, http://www.sifacilities.si.edu/;



Figure 44. NMAI



Figure 45. Recycling station, Folklife festival

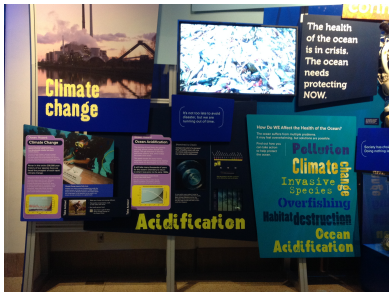

Figure 46. NMNH

PHOTOS COURTESY: J WOODCOCK-MH

offered unique opportunities to observe the vast museums as a whole, as well as compare and contrast the component museums and departments—the National Museum of the American Indian, the National Museum of Natural History, Smithsonian Enterprise, Smithsonian Facilities, and the Smithsonian Office of Facilities Management and Reliability. When I arrived for my Research Fellowship, I was told, "The Interns get a lot of direction and guidance, but since you are a Fellow, we assume that you know what you're doing and we will help as needed." "Oh dear," I thought, "where do I even start?" I was anticipating a virtually insuperable challenge in navigating the bureaucracy of such a large institution, consisting of twenty-nine entities and 6,500+ employees. Instead, I was granted the opportunity to interview virtually every person with whom I asked to speak, was included in relevant meetings, granted NMAI intranet access and assisted in networking to a degree I found remarkable. The Smithsonian employees with whom I had contact were

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"Smithsonian Office of Facilities Management & Reliability (OFMR)," accessed January 3, 2017, http://facilities.si.edu/; "Working SI - Smithsonian Enterprises | OHR | Smithsonian," accessed January 3, 2017, https://www.si.edu/OHR/workingsi_SE.

forthcoming and generous with their time and resources beyond any reasonable expectation, for which I am very grateful.



Figure 47. AMNH. Holden's canoe.
PHOTO COURTESY: J WOODCOCK-MH



Figure 48. AMNH
PHOTO COURTESY: J WOODCOCK -MH

These interviews were followed by a set of interviews at the American Museum of Natural History (AMNH) in New York City.[135] (Figures 47-48) The American Museum of Natural History, comparable in many ways with the NMNH, was a useful comparison. Unfortunately, I was not granted the opportunity to arrange interviews prior to my arrival, so this data set is not as complete as I would have wished. Fortunately, I had the opportunity to interview Dr. Jennifer Newell, the AMNH curator most engaged in the climate disruption issues under scrutiny.

Growing familiarity with the ground-breaking work of the Indigenous

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[135] "American Museum of Natural History. Climate Change," accessed January 3, 2017, http://www.amnh.org/exhibitions/climate-change.

Education Institute (IEI)[136] prompted the addition of the Oregon Museum of Science and Industry (OMSI) in Portland, Oregon; an IEI partner, and creator of *Roots of Wisdom: Native Knowledge. Shared Science* [137] (Figures 49-50) an innovative cross-culturally developed exhibit exploring traditional plant use in four Indigenous communities.



Figure 49. OMSI – Roots of Wisdom
PHOTO COURTESY: J WOODCOCK-MH

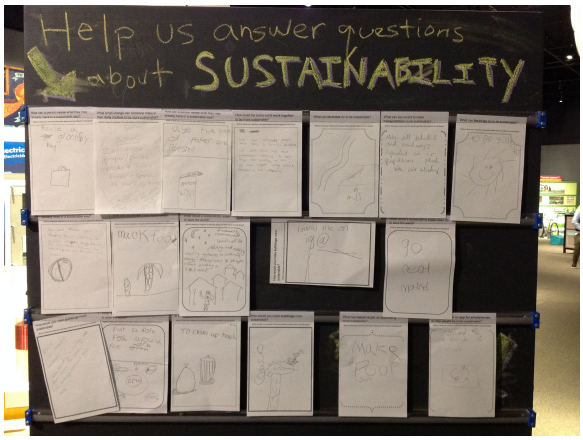

Figure 50. OMSI Sustainability
PHOTO COURTESY: J WOODCOCK-MH

While the NMAI and the Alaska Native Heritage Center fulfilled well the hemispheric and regional Indigenous museum categories, I searched for an excellent candidate for the tribally specific museum, and settled on the Makah Museum and Cultural Research Center (MCRC) located in Neah Bay, Washington, on the Makah Reservation.[138] This museum, opened in 1979, exemplifies tribal sovereignty nurturing cultural heritage; it is an Indigenously conceived and

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[136] Nancy C Maryboy, "Indigenous Education Institute," accessed January 3, 2017, http://indigenousedu.org/wp/.

[137] "Roots of Wisdom." accessed January 3, 2017, http://omsi.edu/exhibitions/row/

[138] "Makah Museum (Neah Bay, Washington)," accessed January 3, 2017, http://makahmuseum.com/.

manifested museum, operated by and for the Makah citizens, using Makah cultural concepts. (Figures 51-52)



Figure 51. Makah sign
PHOTO COURTESY: J WOODCOCK-MH



Figure 52. Makah Trashcan
PHOTO COURTESY: J WOODCOCK-MH

Although this group of museums generated one hundred and three interviews (Table 1), daunting to sift through, simultaneously, it is a very abbreviated list of the museums doing good work. It is limited to museums in the United States, and limited as well to museums that welcomed participation in this research despite the inconvenience to their staff. The reader may question why specific institutions were not included; the pragmatic constraints of time, financing, and dissertation deadlines confined this research to the current list. This field would be well served by more extensive research in the future; it is my hope that the inevitable gaps in this work will inspire others to expand this research into climate disruption, sustainability and the inclusion of Indigenous perspectives in museums. (Figure 53)

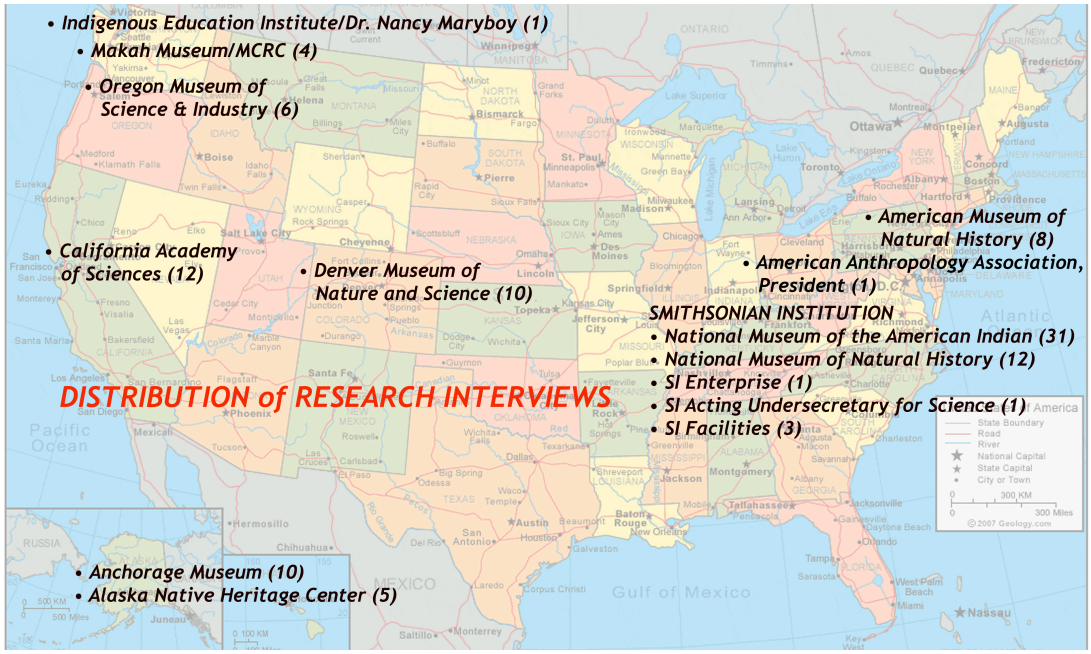

Figure 53. Distribution of dissertation research interviews.
IMAGE COURTESY: J WOODCOCK MH / BASE MAP GEOLOGY.COM

Selection of Interview Subjects

The process of identifying potential interview subjects and then requesting the interviews was highly variable from institution to institution. Each museum has its own nuanced institutional culture; some were quite formal, while others were much more casual in their interactions with me. As I identified the specific museums that I wished to include in my research, I scoured their web sites, and, if possible, found individuals familiar with the institutional culture to give me pointers. The primary issue was one of efficiency and tact: whom I should contact at the institution to initiate the research relationship.

Some institutions preferred a top-down approach, the assumption being

that I ought to start with the director's office and have him or her orchestrate the interview process. These institutions tended to perceive direct contact with their employees as socially awkward and presumptuous. Other institutions did not want the director's office encumbered with the administrative minutiae of a visiting researcher, preferring that I make contact with a relevant staff member to provide me with orientation and work more independently within their institution. It was not always clear where museums fell in this continuum, and I preferred to err on the side of formality if I was unsure, contacting the director's office, introducing myself, and asking permission to visit the institution to conduct interviews.

Essentially, I relied on two interview sampling approaches. In the first category, where I worked with the director's office, I provided the director's administrative assistants with a wish list of specific individuals or of individuals in specific job categories whom I wished to interview, and relied on their assistance in selecting and scheduling the interviews. In the second category, where I accessed the institution horizontally, I relied partially on a snowball sampling approach, asking my initial contact to recommend other staff members within the institution whom they deemed likely interview subjects. At these museums I also emailed individuals directly, explaining my research and requesting an interview. A primary goal in my selection process was to acquire an arc of perspectives, including individuals in administration, facilities, curatorial, information technology, gift shops, cafes, archives, exhibit develop-

Table 1. Schedule of Conducted Interviews

SIZE/KIND	MUSEUM/ENTITY	INTERVIEW #	DATE of INTERVIEW	INTERVIEW LENGTH	# MINUTES	PER MUSEUM
LARGE	Cal Academy of Sciences	1	January 8, 2013	52:59	53 minutes	732 minutes
MEDIAL	Cal Academy of Sciences	2	January 8, 2013	1:30:00	90 minutes	61 average
	Cal Academy of Sciences	3	January 8, 2013	39:26	39 minutes	
	Cal Academy of Sciences	4	January 8, 2013	58:42	59 minutes	
	Cal Academy of Sciences	5	January 9, 2013	2:00:00	120 minutes	
	Cal Academy of Sciences	6	January 9, 2013	44:49	45 minutes	
	Cal Academy of Sciences	7	January 9, 2013	56:31	57 minutes	
	Cal Academy of Sciences	8	January 9, 2013	1:06:12	66 minutes	
	Cal Academy of Sciences	9	January 10, 2013	34:59	35 minutes	
	Cal Academy of Sciences	10	February 22, 2016	1:19:23	79 minutes	
	Cal Academy of Sciences	11	February 24, 2016	56:06	56 minutes	
	Cal Academy of Sciences	12	February 29, 2016	33:14	33 minutes	
MEDIUM	Denver Museum of Nature and Science	13	Sept 3, 2012	3:20:00	200 minutes	874 minutes
MEDIAL	Denver Museum of Nature and Science	14	Sept 4, 2012	44:37	45 minutes	87 average
	Denver Museum of Nature and Science	15	Sept 4, 2012	1:17:58	78 minutes	
	Denver Museum of Nature and Science	16	Sept 7, 2012	28:06	28 minutes	
	Denver Museum of Nature and Science	17	Sept 6, 2012	1:04:51	65 minutes	
	Denver Museum of Nature and Science	18	Sept 6, 2012	30:50	31 minutes	
	Denver Museum of Nature and Science	19	Sept 6, 2012	2:46:40	167 minutes	
	Denver Museum of Nature and Science	20	November 16, 2015	31:34	32 minutes	
	Denver Museum of Nature and Science	21	November 16, 2015	3:02:28	182 minutes	
	Denver Museum of Nature and Science	22	November 16, 2015	46:23	46 minutes	
MEDIUM	Alaska Native Heritage Center	23	October 31, 2012	1:20:32	81 minutes	295 minutes
INDIGENOUS	Alaska Native Heritage Center	24	October 31, 2012	1:20:32	81 minutes	59 average
	Alaska Native Heritage Center	25	October 31, 2012	29:54	30 minutes	
	Alaska Native Heritage Center	26	October 31, 2012	54:03	54 minutes	
	Alaska Native Heritage Center	27	November 1, 2012	49:06	49 minutes	
MEDIUM	Anchorage Museum	28	October 29, 2012	39:39	40 minutes	525 minutes
MEDIAL	Anchorage Museum	29	October 29, 2012	49:52	50 minutes	53 average
	Anchorage Museum	30	October 29, 2012	42:55	43 minutes	
	Anchorage Museum	31	October 29, 2012	32:01	32 minutes	
	Anchorage Museum	32	October 29, 2012	1:06:19	66 minutes	
	Anchorage Museum	33	October 29, 2012	1:03:33	64 minutes	
	Anchorage Museum	34	October 30, 2012	55:28	55 minutes	
	Anchorage Museum	35	October 30, 2012	49:32	50 minutes	
	Anchorage Museum	36	October 30, 2012	47:13	47 minutes	
	Anchorage Museum	37	November 1, 2012	1:18:23	78 minutes	
LARGE	Smithsonian-NMAI	38	July 13, 2015	1:04:02	64 minutes	2041 minutes
INDIGENOUS	Smithsonian-NMAI	39	July 14, 2015	45:48	46 minutes	76 average
	Smithsonian-NMAI	40	July 17, 2015	1:26:30	86 minutes	
	Smithsonian-NMAI	41	July 21, 2015	1:04:56	65 minutes	
	Smithsonian-NMAI	42	July 21, 2015	1:05:19	65 minutes	
	Smithsonian-NMAI	43	July 22, 2015	53:01	53 minutes	
	Smithsonian-NMAI	44	July 22, 2015	1:40:08	100 minutes	
	Smithsonian-NMAI	45	July 22, 2015	59:01	59 minutes	
	Smithsonian-NMAI	46	July 24, 2015	55:58	56 minutes	
	Smithsonian-NMAI	47	July 24, 2015	2:36:16	156 minutes	
	Smithsonian-NMAI	48	July 28, 2015	54:46	55 minutes	
	Smithsonian-NMAI	49	July 28, 2015	1:09:05	69 minutes	
	Smithsonian-NMAI	50	July 10, 2015	2:07:10	127 minutes	
	Smithsonian-NMAI	51	September 15, 2015	2:17:59	138 minutes	
	Smithsonian-NMAI	52	July 10, 2015	1:24:04	84 minutes	
	Smithsonian-NMAI	53	July 16, 2015	1:25:44	86 minutes	
	Smithsonian-NMAI	54	July 16, 2015	36:32	37 minutes	
	Smithsonian-NMAI	55	July 16, 2015	1:11:54	72 minutes	
	Smithsonian-NMAI	56	July 16, 2015	1:13:15	73 minutes	
	Smithsonian-NMAI	57	July 17, 2015	1:25:13	85 minutes	
	Smithsonian-NMAI	58	July, 2015	60:00	60 minutes	
	Smithsonian-NMAI	59	July 14, 2015	1:01:53	62 minutes	
	Smithsonian-NMAI	60	July 23, 2015	1:11:56	72 minutes	
	Smithsonian-NMAI	61	July 23, 2015	1:28:48	89 minutes	
	Smithsonian-NMAI	62	July 23, 2015	1:01:51	62 minutes	
	Smithsonian-NMAI	63	July 17, 2015	1:37:49	98 minutes	
	Smithsonian-NMAI	64	July 31, 2015	21:36	22 minutes	
LARGE	Smithsonian-NMNH	65	December 3, 2015	1:23:24	83 minutes	1115 minutes
MEDIAL	Smithsonian-NMNH	66	July 29, 2015	01:21:29	81 minutes	93 average
	Smithsonian-NMNH	67	July 29, 2015	01:15:04	75 minutes	
	Smithsonian-NMNH	68	July 30, 2015	01:46:03	106 minutes	
	Smithsonian-NMNH	69	September 6, 2015	01:03:06	63 minutes	
	Smithsonian-NMNH	70	September 17, 2015	01:26:22	86 minutes	
	Smithsonian-NMNH	71	July 8, 2015	54:26	54 minutes	
	Smithsonian-NMNH	72	August 4, 2015	01:15:27	75 minutes	
	Smithsonian-NMNH	73	July 1-30, 2015	05:50:58	351 minutes	
	Smithsonian-NMNH	74	July 22-27, 2015	49:51	50 minutes	
	Smithsonian-NMNH	75	September 8, 2015	52:36	53 minutes	
	Smithsonian-NMNH	76	July 28, 2015	38:25	38 minutes	
	Smithsonian Enterprise	77	July 28, 2015	51:18	51 minutes	
	Smithsonian Int Und Sec Science	78	July 24, 2015	21:01	21 minutes	
	Smithsonian Facilities	79	September 8, 2015	59:11	59 minutes	226 minutes
	Smithsonian Facilities	80	June 30, 2015	1:22:26	82 minutes	75 average
	Smithsonian Facilities	81	July 23, 2015	1:25:02	85 minutes	
LARGE	American Museum of Natural History	82	September 14, 2015	1:29:46	90 minutes	514 minutes
MEDIAL	American Museum of Natural History	83	August 10, 2015	1:01:18	61 minutes	64 average
	American Museum of Natural History	84	August 10, 2015	51:52	52 minutes	
	American Museum of Natural History	85	August 12, 2015	1:25:05	85 minutes	
	American Museum of Natural History	86	August 12, 2015	1:13:51	74 minutes	
	American Museum of Natural History	87	August 12, 2015	32:18	32 minutes	
	American Museum of Natural History	88	August 13, 2015	46:05	46 minutes	
	American Museum of Natural History	89	August 13, 2015	1:13:51	74 minutes	
MEDIUM	Oregon Museum of Science & Industry	90	December 10, 2015	54:57	55 minutes	328 minutes
MEDIAL	Oregon Museum of Science & Industry	91	December 10, 2015	45:31	46 minutes	47 average
	Oregon Museum of Science & Industry	92	December 11, 2015	42:14	42 minutes	
	Oregon Museum of Science & Industry	93	December 11, 2015	34:14	34 minutes	
	Oregon Museum of Science & Industry	94	December 11, 2015	1:01:02	61 minutes	
	Oregon Museum of Science & Industry	95	December 10, 2015	1:02:07	62 minutes	
	Oregon Museum of Science & Industry	96	December 10, 2015	28:02	28 minutes	
SMALL	Makah Museum	97	February 17, 2016	2:02:54	123 minutes	467 minutes
INDIGENOUS	Makah Museum	98	February 16, 2016	51:56	52 minutes	93 average
	Makah Museum	99	February 18, 2016	44:30	45 minutes	
	Makah Museum	100	February 17, 2016	1:30:04	90 minutes	
	Makah Museum	101	February 17, 2016	2:36:39	157 minutes	
	Indigenous Education Institute	102	February 17-18, 2016	2:01:31	121 minutes	
	American Anthropological Association	103	February 19, 2016	59:10	59 minutes	
	Total Interviews:	103	Jan 2013 - Feb 2016	Total minutes:	7,368 minutes	
				Average Interview:	71.54 minutes	

ment, and so forth. Because each individual and each department regarded the research issues from a different vantage, I was able to get a more holistic impression of each institution by casting my interview net as widely as possible. For example, while I might obtain a big picture sustainability vision from a museum director emphasizing the importance of "green team" participation, the janitorial staff could tell me whether individuals were actually recycling or not, whether the vision was being manifested on the ground.

One of the key selection issues in this process was that access to museum employee directories via the Internet was very inconsistent. I knew a few particular individuals whom I wished to interview because of their publications, their reputation, or their conference presentations. However, for the most part, to create an interview list in advance, I was reliant on museums' revealing their staff online. Having worked for a decade in a university, I expected this to be transparent, as on a daily basis I easily accessed other universities' employee directories. However, in the museum world, I found that this kind of transparency or access to employee directories tends to be much more guarded. Some museums do not post a publicly available employee directory at all, and some post their scientific or scholarly staff, but not their administrative, exhibits or facilities employees. Because of the constraints of time and finances, in order to maximize the available time, I was strongly motivated to schedule interviews in advance of my arrival at each institution.

Although I strived to gain interviews with holders of equivalent positions at each museum, this was not always possible.

My initial museum research visit was at the Denver Museum of Nature and Science. Because of my interest in immersive visualization technology, in other words, planetaria, as a method of conveying science information, I timed my visit to coincide with DMNS' hosting of the Jackson Hole Wildlife Film Symposium and Science Media Competition. This prestigious film festival showcases the best available new work in science film and media, so it was advantageous to be able to attend sessions between interviews with DMNS staff. Part of my dissertation work has involved creating a 30-minute documentary about climate disruption and Indigenous cultural sustainability—essentially a feasibility study demonstrating that a film suitable for museum use can be created economically, and with the potential to be developed for planetarium display as well.

In 2010, the National Oceanic and Atmospheric Administration (NOAA) funded a $1.25 million three-year grant to Worldviews Network,[139] a project designed to engage and educate the public about contemporary ecological issues, Using Indigenous ecological knowledge as a storytelling lens and using the immersive learning opportunities of planetaria in heretofore unexplored ways, deploying the array of digital geographical information systems resources

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[139] "Worldviews Network | About," accessed January 22, 2017, http://www.worldviews.net/about.html; "Worldviews Network on Vimeo," accessed January 22, 2017, https://vimeo.com/worldviews.



Figure 54. Valley Oaks: An Ecological Journey Through Time.
PHOTO COURTESY: WORLDVIEWS NETWORK



Figure 55. Where Condor meets Eagle.[140]
PHOTO COURTESY: WORLDVIEWS NETWORK

now available. Instead of simply casting yet another galactic star show on the dome, the Worldviews Network projects, such as Cal Academy's "Valley Oaks: An Ecological Journey Through Time,"[141] tell a local environmental story that is introduced by a scientist who supplements the presentation with pertinent live-time streamed visual data. The Worldviews Network is a consortium of fourteen partners, primarily museum-based digital planetaria, including among others, the California Academy of Sciences, Denver Museum of Nature and Science, and the American Museum of Natural History. (Figures 54-55) This participation contributed to my decision to include these three museums in my research group. I had developed connections through California Academy of Sciences'

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[140] Where Condor meets Eagle: Traditional knowledge, Ecosystems & Biodiversity brought together an invited delegation of Indigenous educators and community leaders from Minnesota and Bolivia in an afternoon of visual storytelling and cultural exchange in the Bell Museum's ExploraDome.https://web.archive.org/web/20160521142010/http://worldviews.net:80/condor-meets-eagle/

[141] "Valley Oaks: An Ecological Journey Through Time | The Elumenati," accessed January 22, 2017, http://www.elumenati.com/research/valley-oaks-an-ecological-journey-through-time/.

Worldviews Network principal investigator, Dr. Healy Hamilton, who directed me to her Worldviews Network colleague, Dr. Ka Chun Yu at the Denver Museum of Nature and Science. The DMNS does not list a full directory, but does list their museum scientists,[142] which gave me a starting point. Dr. Yu was generous with his time, not only with his interview, but also in connecting me with other key people at the museum, who in turn helped me to network. At this time, I had not considered including café and gift shop managers, but was able to revisit the museum and include them in my second round of interviews conducted in 2015.

The following month, October 2012, I took James Pepper Henry up on his offer to host my research at the Anchorage Museum at Rasmuson Center.[143] This interview experience was in direct contrast to my previous experience at the DMNS. At the DMNS, I had no prior acquaintance with Dr. Yu, and relied on his goodwill to assist me in making contact with the appropriate people. As well, since it was my first interview experience, I was hesitant in my interviews as I felt my way along a dusky path. As we discovered at the American Alliance of Museums annual meeting in Minneapolis, during his tenure at the National Museum of the American Indian, Director Pepper Henry, a member of the Kaw nation, worked closely with my aunt, who as a Southern Cheyenne ceremonial woman, shares values both cultural and academic. The discovery of this first-

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[142] "Museum Scientists : Denver Museum of Nature & Science," accessed January 22, 2017, http://www.dmns.org/science/museum-scientists/.

[143] "Home - Anchorage Museum at Rasmuson Center," accessed January 22, 2017, https://www.anchoragemUSeum.org/.

level social connection not only broke the ice initially, but also caused a sort of social bridge, or credibility on spec to be extended to me as I became better acquainted with Director Pepper Henry and his museum. Although my research was the grounds upon which I would prove the legitimacy of my scholarship, my kinship ties suggested that I should be given the opportunity to prove myself.

I would note that this social interaction exemplifies the Indigenous values expressed by Shawn Wilson in his classic, *Research is Ceremony*. I found time after time that Indigenous interview respondents would seek some sort of kinship tie or grounding as we introduced ourselves, a cultural table upon which to meet, and such was much less the case or absent with non-Indigenous interview respondents. In the cases where mutuality and connections were established at the beginning, it was much easier to enter the flow of the interview conversation, at least from the interviewer perspective.

When I arranged my travel to Anchorage, Director Pepper Henry introduced me to his museum and staff, and had his office arrange and schedule all of my interviews. Because he fully understood the goals of my research, and obviously knew his staff well, it could not have been a smoother experience to go from one interview to another, without having to try to schedule interviews on the fly. As well, because the directive and scheduling requests came from the director's office, I believe that staff people were inclined to participate as fully as possible in the research interviews, even when they were not sure how their participation was pertinent. Unfortunately,

I was not able to interview the gift café or gift shop managers at the Anchorage Museum; I had not yet calculated the importance of these two museum positions in museum sustainability, and I was not able to return to Anchorage at a later time.

Advantageously, the Alaska Native Heritage Center is also in Anchorage; I arranged the duration of my visit to permit interviews at both institutions, moving between the two as scheduling determined. I believe that because Director Pepper Henry was hosting my research at the Anchorage Museum, which works collaboratively with the ANHC, the director of the ANHC was willing to allow me to also conduct interviews and observations at their institution. While I interviewed a pertinent cross-section of employees at the Anchorage Museum, a relatively large institution, I was permitted long interviews with all available staff at the ANHC, a much smaller institution. This gave the opportunity for a more in-depth research experience and I found the responses in general to be more frank and forthcoming, in part due to the informality of the interview setting.

The California Academy of Sciences was the fourth museum in this first set of interviews, and a quite different research experience from the first three. At the DMNS, my visit to the museum was my first time there, and my social connections were by referral. At the Anchorage Museum, my visit was also a first visit, but my social connection was established prior to arrival. My visit to the Alaska Native Heritage Center was also a first visit, with no prior

social grounding. At Cal Academy, my experience was of a very different nature and tone. Some of my earliest childhood memories are of visiting Cal Academy, at that time still located in its 1916 building in San Francisco's 1,017-acre Golden Gate Park. My experience with Cal Academy was iterative—during my childhood my family visited this museum many times, as I have continued to do as an adult. After the Loma Prieta earthquake in 1989, the museum re-evaluated its mission, revised its vision statement, and in 2008 reopened in their LEED Double Platinum[144] facility designed by Renzo Piano. As a visitor, I had a long-standing relationship with the museum and familiarity with its permanent collections, visiting exhibits, and mission of biospheric sustainability research. I was intimately familiar with the face the museum presents to the public; infatuated might be an apt appraisal. As a researcher, I approached the museum from an entirely different perspective, so it was very interesting to contextualize the observations of the museum staff with my own observations as a visitor over the years. This familiarity and iterative experience of the museum was unique to this one museum out of my entire research pool.

Cal Academy provides extensive information online regarding their scientific staff, but almost nothing about their non-research staff. I was able to make a short list of specific people I wished to contact, and initiated my research at the museum with a request to then-Director Gregory Farrington.

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[144] California Academy of Sciences, "The California Academy of Sciences Receives Second LEED Platinum Rating From U.S. Green Building Council," California Academy of Sciences, accessed July 11, 2018, https://www.calacademy.org/press/releases/the-california-academy-of-sciences-receives-second-leed-platinum-rating-from-us-green.

Dr. Farrington referred me to his executive assistant, who assisted me in making contact with employees and setting up interviews. As I conducted the initial set of interviews, these staff members advised me of other valuable people for me to contact for interviews, so the process was organic in nature, and successful in leading me to a wide cross section of employees.

Following this first set of interviews that concluded in January 2013, I took a hiatus in conducting interviews until June 2015. During this interim time, I considered my interview findings from the first four museums, concentrated on studying Indigenous Research Methodology (IRM), and mulled how IRM could be effectively and authentically incorporated into the interview methods and strategies for my second set of museum research visits.

The California Academy of Sciences and the Smithsonian Institution were favorites on my original wish list of possible research site museums. Fortuitously, I was granted a Smithsonian Research Fellowship by the National Museum of the American Indian. Although the NMAI lists a few of their research staff online, the majority of their staff are not readily discernible from their public website, as is also the case with the National Museum of Natural History, and the Smithsonian Facilities departments. In my research application, I submitted a table of twenty-nine job categories and sixteen particular individuals as a potential starting point for interviews, and Jill Norwood was very helpful in assisting me with initial contacts. I had considerable concern in advance of my arrival regarding the possibility that everyone would be too busy

to talk to me, and that scheduling interviews would be a challenge. At the April 2015 American Alliance of Museums conference, I scoured the presenter list for Smithsonian staff whom I might be able to meet, hoping to make a few connections prior to my arrival in June. In particular, I tracked down Dr. Eric Hollinger, repatriation archaeologist for the National Museum of Natural History. As a former archaeologist myself, I thought that at least we would share a common ground on which to start a conversation. He was cordial and told me to look him up when I arrived at the Smithsonian that summer.

My NMAI fellowship formally started July 6th, however, I arrived in Washington D.C. in late June. I timed my arrival to enable accomplishing additional goals beyond simply conducting research interviews and observations at the NMAI. Arriving in June allowed me to volunteer with the sustainability team for part of the two-week Smithsonian Folklife Festival, Peru Pachamama. I was also able to conduct interviews with Smithsonian Facilities staff prior to the beginning of my NMAI fellowship, giving me a broad picture of sustainability goals and initiatives at the Smithsonian as a whole. Timing my fellowship in July permitted me to be present for and volunteer with the NMAI's annual Living Earth Festival held July 17-19th.

My preconceived notions of the Smithsonian Institution as a vast and monolithic entity swathed in encumbering red tape led me to anticipate encountering tortuous obstacles in developing a solid, diverse slate of interview candidates. Much to my surprise and relief, I was to find that this could not

have been farther from the truth. Vast it is, encompassing nineteen museums, the national zoo, nine research facilities, as well as administrative and support departments and offices, the institutional bureaucracy of the Smithsonian is informed by an institutional investment in the success of interns and fellows. I found that because of my formal Research Fellow status at the NMAI, virtually every Smithsonian employee whom I encountered, from janitors to museum directors, were cooperative and generous with their time in support of my research endeavor. Additionally, I suspect that because my research was regarding the work of the Smithsonian itself, rather than directed towards investigations of the collections, museum staff were engaged and interested in showcasing successes and discussing challenges regarding their institution. I found remarkable the level of camaraderie and institutional pride and loyalty despite a number of trying circumstances experienced by some employees or divisions. This collaborative spirit was a boon to my work, as employees were well networked across the museums and the institution as a whole, making connections and introductions on my behalf. With circa 6,500 employees, utilizing a snowball introduction method was vital.

When I arrived in June, I conducted a few interviews in the office of Smithsonian Facilities, starting with the director, and following her suggestions regarding key individuals to interview. I then spent a number of days volunteering with the sustainability team at a resource recovery station for the

Smithsonian Folklife Festival, Peru Pachamama,[145] I found that for the duration of my time at the Smithsonian, again, and again, I would be asked if I had met with or talked to Eric Hollinger, the archaeologist I had tracked down at the AAM meeting. As it turns out, of the nearly 20,000 employees, fellows and volunteers at the Smithsonian,[146] Dr. Hollinger is the most avid sustainability instigator and enforcer outside of the Facilities department. I had accidentally enlisted my best possible research ally before I set foot in Washington. Dr. Hollinger was integrally involved in the sustainability efforts of the Folklife Festival, and meeting him at the onset of my visit was very helpful in initiating a collegial friendship and clarifying my purpose at the Smithsonian. Dr. Hollinger provided me with many introductions as well as many hours of his own time discussing sustainability and the pertinent issues at the Smithsonian, across the institution.

This introductory period in late June allowed me to network and set up interviews in advance at the National Museum of the American Indian. The formality of my Fellowship allowed me to come and go as I wished; allocated a desk and computer with intranet access, I was able to search the interior directories into the late hours, finding likely interview candidates and relevant documents.

In all, I was able to interview almost fifty Smithsonian employees across

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[145] "Striving for Sustainability at the Festival | Smithsonian Folklife Festival," accessed February 6, 2017, http://www.festival.si.edu/blog/2015/striving-for-sustainability-at-the-festival/.

[146] "About | Smithsonian," accessed February 6, 2017, https://www.si.edu/About.

a broad spectrum of roles. Some staff were away for the summer, thus not available in person. However, I was able to interview several people in the fall, when I returned to Washington D.C. for the 2015 ATALM conference. The Smithsonian's lively cross-entity social networking, fluidity of bureaucratic protocols, and transparency as a public institution all enabled the interview selection process.

I proceeded directly from the Smithsonian to the American Museum of Natural History (AMNH), in New York City in August. I allocated two weeks with the hope of procuring about twenty interviews. The AMNH is also a large museum, with hundreds of staff and volunteers. I had eagerly anticipated this research visit, since the AMNH is very active in the field of climate disruption studies and home to scientific luminaries such as Dr. Neil DeGrasse Tyson, an outspoken Anthropocene scholar, astronomer, and the director of the Hayden Planetarium. The AMNH posts a directory of scientific staff of 838 individuals, identified with their job title. Some individuals have an email and/or phone contact information and a very few provide a short bio of research interests. To locate any of this information, one must click through the name to the following page, if provided.[147] The result was that it was quite difficult to ascertain in advance who would be most likely to be interested and able to provide pithy interviews; the process required extensive online researching,

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[147] "Staff Directory," accessed February 6, 2017, http://www.amnh.org/our-research/staff-directory.

mining LinkedIn profiles and so forth. Administrative and support staff were not listed online, and were virtually impossible to discover through online research.

Nevertheless, I created a wish list of sixty-eight individuals and programs, hoping that if I could interview a third of these, I would generate a strong picture of Anthropocene work at the AMNH. The correct protocol for arranging a research visit was very difficult to determine. None of the emails that I sent in advance were returned. I initiated contact by email in May to the individual responsible for educational internships, and when I finally made contact in July, a plan was suggested that would have been satisfactory.

However, when I arrived in August, no interviews had been arranged, and the individual with whom I had been in contact was not available. It had been made clear to me that it would not be appropriate for me to contact AMNH staff directly. Fortunately, a second individual became aware of the situation upon my arrival and with her assistant, went out of her way to assist me in arranging interviews. Although the protocol held for refraining from emailing staff directly, several individuals whom I interviewed recommended others. My observation was that departmental siloing at the AMNH was fairly intense, so it was quite difficult to obtain the breadth of interviews I had been hoping for, especially with so little notice. In all, I was able to obtain eight interviews, including the key interview with Dr. Jennifer Newell. Unfortunately, I was not able to interview any facilities, exhibits, gift shop, café or archives staff, so it is impossible to make direct comparisons in those

areas, merely by inference from my personal observations.

The Oregon Museum of Science and Industry (OMSI) offered the opportunity to explore collaborative exhibit development—I was particularly interested in visiting OMSI because of their unique exhibit, *Roots of Wisdom*.



Figure 56. 'Roots of Wisdom' Aloha Aina: Love of the Land installation
PHOTO COURTESY: J WOODCOCK-MH

This exhibit explicitly explores scientific knowledge from an Indigenous perspective. It was created in collaboration with the Indigenous groups represented and Dr. Nancy Maryboy and her colleagues at the Indigenous

Education Institute. [148] My entrée to OMSI was through Dr. Victoria Coats, the OMSI manager of exhibit research and development and key in developing *Roots of Wisdom*. (Figure 56) My time at OMSI was focused on the experiences of staff specifically involved in the creation of this exhibit, although I was also able to interview the store manager as well. The timing of this research trip turned out to be somewhat problematic, as many staff were away on a trip to an historic factory location in Portland. I was able to go on this fascinating trip; however, it was not an opportunity to conduct interviews. OMSI is active in environmental education, and as a lead museum in a city characterized by a long history of overt environmental activism, it would be well worth a return visit to engage with a broader swath of staff on a wider set of issues.

My final museum visit was to the Makah Museum and Cultural Research Center. I first encountered the Makah Museum through their documentary, "A Gift from the Past,"[149] which details the exposure of their pre-contact village at the far western tip of the Olympic peninsula, Ozette, and their subsequent journey as a tribe in acquiring an archaeologist, the excavation of the imperiled site, and the creation of their museum to showcase their finds. My initial contact was with Dr. Janine Ledford, the museum and cultural center director, who gave me permission to interview her and her available staff. I conducted four interviews, and felt that as a small museum, where staff had

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[148] "Roots of Wisdom," accessed September 3, 2016, http://omsi.edu/exhibitions/row/.

[149] *A Gift From the Past Makah Indian Nation History Video* (Media Resources Associates, Inc., n.d.).

worked for many years, served in multiple functions, and were generous in taking time for my interviews I was able to accomplish my research goals. I was also able to have a fifth informal conversation with an MCRC Trustee that was very informative.

In summary, my interview selection process was unique to each museum. Large institutions did not necessarily result in either an easier or more impeded process due to bureaucracy or siloing of personnel in specific divisions. Small institutions tended to allow easier access to a greater percentage of the staff. However, the exigencies of a small staff with many responsibilities tended to result in employees being unavailable because they had been called away from the museum on a task.

Individual In-Depth Interviews

In-depth interviews were conducted with museum staff, university faculty, and affiliated professionals, to determine their thoughts and observations regarding anthropogenic and climate disruption initiatives and the inclusion of Indigenous perspectives and traditional knowledge, especially as pertaining to their own institutions. Individual interviews were conducted, as possible, with museum administration, facilities, curation, programming, media, education, exhibit development, café, bookstore, archives, collections care, technology and docent staff. Preliminary interviews demonstrated that a flexible approach is ideal.

Because of scheduling and time constraints of the interviewee, some

interviews were as short as half an hour, while others extended to several hours or in a few cases extended over multiple days or visits. Using a starting list of specific questions did prove useful, however. Asking very open-ended questions allowed quite interesting information to emerge organically. Interviewing staff from this broad spectrum of jobs permits a full range of perspectives on the research topic, since different departments and individuals within the institutions had very different experiences in implementing initiatives. All the interviews were conducted in-person, at the interviewee's workplace. I was queried a number of times, rather skeptically, by various people regarding my practice of travelling to each museum to conduct the interviews face-to-face.

It was suggested by several colleagues that I could save a great deal of time and money by expediently sitting in the comfort of my study and interviewing over Skype or by telephone. I believe that if I had been conducting a small number of interviews at a museum with which I was already familiar, and with people whom I already knew well—then that kind of physically and emotionally distanced interview technique may have been adequate. However, I felt that taking this easy and cheap approach to collecting my data would end up disastrously incomplete, without nuance of any kind, and little or no relationship-building would have occurred.

Conducting the Interviews

After brainstorming my overall research project, and getting a feel for the field, my next step was to undertake the task of navigating the requirements of the Montana State University Institutional Review Board (IRB); which included providing a list of interview questions for my research participants (Table 2), describing a research plan, and creating an interview consent form. I discovered that the MSU IRB process was geared toward hard science; my initial estimate of sixty conversational interviews was met with skepticism and required an iterative process to acquire approval.

Prior to each interview, I researched each interviewee as thoroughly as possible, as well as their institution. I looked them up on Google, LinkedIn, Academia.edu, ResearchGate, and read any available research papers or books if possible. This gave me a starting point to understand what interested them, and thus, what probable direction they would like to take the interview and what areas of expertise that might be germane. I tried to remember to get a time frame from each person before we started talking so that I could be sure to get my core questions asked before time ran out.

In most circumstances, the interviewee preferred to be interviewed in his or her own office space. A few people shared an office, their office was too small, or they worked in an open office situation, in which case we would usually conduct the interview in a conference room. Although conference rooms tended to provide a sterile surrounding, they did permit me to choose

where I sat in relation to the interviewee, which was convenient. If we met in their office, I sat where they placed me, which was usually fine. However, occasionally the spatial dynamic was awkward for conducting the interview. In several cases the guest chair was positioned considerably too far into North American social distance (4'-12') or public distance (12'-25'),[150] thus distance obstructed the process. Ideally, chairs were positioned diagonally and about four feet apart, signaling a personal conversation within the social code of North American proxemics. I did not presume to relocate my chair in these cases as in each instance it appeared that the positioning was strategic and deliberate. There were several cases in executive offices in which the guest seating was positioned at public distance, but the interviewee relocated us to an interview area arranged in a more amenable configuration. The other challenging spatial issue that I encountered on occasion was the lack of a good surface on which to set up my recording gear.

I dual-recorded each interview, in case of disaster. This turned out to be a good decision since in two cases one of the recording devices malfunctioned. I used the standard built-in microphones on my iPad and MacBook Air, which delivered adequate sound quality. I subsequently found that the iPad recordings in .caf format were incompatible with Dragon transcription software, however this incompatibility was rectified with file format

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[150] CReducation, "Proxemics," Nonverbal Communication for Educators, accessed July 11, 2018, http://creducation.net/resources/nonverbal_communication/proxemics.html.

conversion software. I then found that *Dragon for Mac Version 6*, the most advanced commercially available software, was virtually useless for transcribing interviews directly, issuing a nonsensical jumble in almost all cases. More useful was *InqScribe*, a program for direct manual transcription, although a very slow process, indeed. In a small handful of cases there were recording challenges due to external noise if we were located in a café, or lobby area. I took notes on my iPad as needed, but tried to avoid manual note-taking as it seemed disruptive to the conversational flow. Each interviewee signed an IRB interview release for me and verbally consented to be recorded. However, I discovered in my first set of interviews that if I set the iPad and MacBook slightly out of the interviewee's sightline, I believe that many of them forgot that they were being recorded as they became quite frank and unguarded in their answers. If the recording devices were closer in, they tended to be slightly less forthcoming.

I was rapidly to find during my first set of interviews that at each of the museums I visited, my regimented list of interview questions failed to yield the meaty answers I sought. (Table 2) This list of questions was submitted with and approved as part of my Montana State University Institutional Review Board research application. It reflects the state of my knowledge prior to conducting my research, or gaining experience and skill in interviewing. These pragmatic questions were unobjectionable, and I used many of them repeatedly throughout the course of my interviews. However, when I encouraged the

Table 2. Initial list of interview questions (submitted with IRB proposal)

INTERVIEW QUESTIONS

Community and Professional Perspectives on Effective and Affective Museum-Based Sustainability Education

My research is aimed at discerning sustainability best practices, both internally as an institution, and pedagogically with the public.

1. I am interested in learning about what your thoughts are regarding sustainability initiatives at the ___Museum and what you feel has worked well?
2. What sustainability initiatives have been successful that surprised you?
3. What has not worked out so well?
4. What you expected to work that has dead ended and why you think it did?
5. Is there anything you would change, given hindsight? Why?
6. What kind of physical plant initiatives has the museum put in place?
7. Is there a "Green Team"?
8. Is the museum staff actively involved with 'greening things up', or is it an up hill battle with things like biking or recycling?
9. Does the museum offer incentives like bus passes to its employees?
10. Does the museum interact with the public at an institutional level regarding sustainability initiatives?
11. What have you observed to be the most effective mechanisms for communicating ideas regarding sustainability and climate change to the public?
12. And specifically to children, and to adults?
13. Have you found a particular venue such as exhibits, media, conferences or classes to be more or less effective?
14. Given an ideal world and an unlimited budget, what would you like to change or create at the _____ Museum?

interviews into a more relaxed and conversational tone, essentially departing from the established protocol, the fecundity of elucidative anecdotes, data, perspectives, and observations which were imparted to me was truly revelatory. I also realized that the simple questions intended as unconstraining invitations to expand on a given issue could be used to camouflage answers when an interview respondent was reluctant to discuss that topic—a situation for which I did not see an immediately obvious solution. A few interviews fell short because the interviewee gave essentially yes or no answers and were not engaged in the topic.

The research interviews may be seen as falling into a first set of four, and a second set of six. The first set of interviews was conducted between February 2012, and January 2013, using the questions itemized in Table 2. The second set of interviews was conducted a year and a half later, from the summer of 2015 through February 2016. The first set of interviews includes the Denver Museum of Nature and Science, The Anchorage Museum, the Alaska Native Heritage Center, and the California Academy of Sciences; I was able to conduct follow-up interviews at the DMNS and Cal Academy in 2015.

My intent with these initial interviews was to understand how the particular museum had responded to climate disruption by developing sustainability initiatives and how, in turn, they chose to engage the public. I hoped to discern what efforts had met expectations, those not deemed successful, and what causes could be attributed to these successes or failures. I

also inquired whether the museum had engaged in any collaborative initiatives with their local tribal community, and perceptions regarding that experience.

In conducting the first sets of interviews, I discovered forthwith that closed-ended questions were of very limited value, a revelation of no surprise to anyone familiar with interviewing. I also discovered, however, that the most interesting answers to my open-ended questions were the things that I had not thought to ask; these answers fell outside the parameters of my IRB-approved list of questions. This was information tangentially offered, but of great value. For example, at the Denver Museum of Nature and Science, I was repeatedly presented with information, which, pieced together, presented a very strong picture of community networking leading to institutional sustainability. I somewhat distractedly noted this at the time; however, when I conducted interviews later, at more socially siloed museums, it sprang forth as a key and salient point.

During the second set of interviews, for the most part, I maintained a much more fluid and informal interview approach, incorporating storytelling style derived from Indigenous Methodology. In some cases, as with Director Gover of the National Museum of the American Indian, I was asked to submit my interview questions in advance, (Table 3) so that the limited time available for the interview could be used efficiently. In such cases I did my best to construct open- ended questions, so that the interview, although prepared for in advance, remained conversational.

Table 3. Interview Questions for Specific People: Museum Director

SI_NMAI_Gover, Kevin • INTERVIEW QUESTIONS

• **Vision for the NMAI** From a pragmatic standpoint, the NMAI provides the leading example within the Smithsonian Institution as regards recycling and sustainability - how, or does, that relate to or reflect widespread indigenous cultural values?

• **The NMAI is the nation's leading Native museum**, but is an entity within the nation's most public of museums - the SI - how does this seemingly paradoxical relationship affect decisions about content and programming provided to the general public, or to tribal entities? Some of this history, if told fully, is extremely painful and reflects very poorly on the American government and its entities, such as the military. Recalling the challenges with the Enola Gay exhibit - is it challenging to create exhibits or programming that deeply explore some of this history? If it is glossed, that would be equally upsetting to the NMAI's Native constituency - how does the museum find this balance?

• **Museum culture** For the NMAI to be substantially different from any other museum providing Native cultural content to the public, means having a different institutional culture - how does the family/corporate/entity culture of the NMAI reflect the indigeneity of its component staff members? Is this reflected in how the museum operates as a whole? In what ways?

• **Regarding climate disruption and sustainability** It's ironic and unfair that climate disruption is hitting indigenous communities hardest, first, since their predominantly reciprocal and respectful cultural models are not the problem, but could be seen as the solution - what is the vision for the NMAI regarding educating the general public about a) the environmental hazards being faced by many indigenous cultures due to climate change, and b) communicating to the visiting public the resourceful and successful sociocultural approaches to living on the planet developed by indigenous cultures?

• **The relationship between NMAI and the new African American History and Culture Museum**--points of convergence/divergence?

• **The NMAI and the African American museum stand out as specific cultural institutions** among the more general museums of the SI- there are other groups who could make a strong argument for representation - eg, women? Asian/Latino/a Americans, LGBT, etc? Are there any discussions underway about these possibilities?

• **With a goal of providing the public with big picture exhibits about Native culture and history**, such as "Americans", instead of potentially a thousand exhibits about particular tribes – what approaches do you suggest to avoid the kind of pan-Indian generalizations that can lead back to kinds of stereotyping?

• **What is your vision for the NMAI in the coming years**? Given limitless budget and manpower, what would you do?

Table 4. Interview Questions for Specific People: Facilities

Interview Questions_Nancy Bechtol, Nancy • July 1, 2015
Director of the Office of Facilities Engineering and Operations (OFEO)

- How long has Facilities been thinking about sustainability as a goal?
- and formally included in the departmental mission statement?
- The SI institutional mission statement?
- What is the relationship between the individual museums and the Facilities office - are ideas generated and worked on a horizontally, or does the facilities office take charge and administer programs across the system?
- Are all the entities more or less the same? Why or why not?
- What are the more successful initiatives?
- What didn't work out as well as hoped for? Why not?
- Does the Smithsonian or individual museums have some sort of Green teams?
- Is there a mechanism to draw ideas forward?
- What kind of active interactions does the SI have with the public- does Facilities take an active role in any regard, or is its public role mostly in terms of signage and sustainable choices regarding infrastructure - plumbing.

Interview Questions_Gastright, Kendra • September 14, 2015
Director of the Office of Facilities Management and Reliability (OFMR)

- Military experience (Steve Nelson) - sustainability - drilled in as important - Vet Preference hiring - does it give an advantage to a large institution like this? Motivating employees?
- Major challenges in her position - motivating vastly different units in the SI?
- Interactions with the Living in the Anthropocene initiative/
- The Mindfulness Initiative?
- Smithsonian Gardens? Possibility of expanding there - live gardens like at the NMAI?
- Interactions with Restaurant Associates - hang ups with composting - or is that all leveraged through Smithsonian Enterprises?
- What is she finding most gratifying - good progress?
- What would she like to implement?

In some cases, especially with my first interview(s) at an institution, I was orienting myself to the institutional culture, and started with a more formal set of questions. This allayed my apprehension regarding the possibility of seeming unprepared if I were to get *test anxiety* and become tongue-tied during the interview. This was the case with my very first interview at the Smithsonian. On my first day at the Smithsonian, I was given the opportunity to

interview Nancy Bechtol, Director of Facilities, who supervises seven major units and 1,800 employees. Director Bechtol generously gave me an hour of her time; I did my best to use her time wisely by asking big picture questions specific to her jurisdiction at the Smithsonian. Despite her gracious and friendly interview, I was thoroughly intimidated. (Table 4)

Two and a half months later I was able to interview her right-hand woman, Kendra Gastright, Director of the Office of Facilities Management and Reliability (OFMR). Director Gastright is impressive in her own right, 900 employees across the Smithsonian under her purview. However, by this time, I had a pretty good overview of the sustainability issues related to Facilities at the Smithsonian, and I was able to conduct a much more informed and fluid interview, with fewer but more specific formal prompting questions. (Table 4) For most interviews, I jotted my questions in as few words as possible; sufficient to remind myself to ask them, but not so that I would be perceived as reading a canned list of interview prompts. If possible, I kept the questions in my lap or otherwise out of sight of the interviewee.

Although I had overarching research questions, in the case of interviews with people employed in jobs such as café or retail manager, or in the case of a particularly interesting interview at the Denver Museum of Nature and Science, zoologist, I was careful to think ahead for specific questions, especially when I was able to compare responses between institutions. (Table 5)

Table 5. Interview Questions Tailored to Specific Position: Zoology

Zoology questions

- Sustainability - animal world -
- Relationship with zoos?
- Collections - choices in reducing? misunderstood?
- Acquisition of rare animals
- Irony of stuffing endangered species, but how else to present and inspire children?
- Horror of zoo prisons, but inspiration of seeing the real thing - how to handle that?
- How to introduce ideas of endangerment?
- In Africa, Arctic, or here in Colorado?
- Teacher program not touching it - how about curation paradigm on that?
- Any feelings of ethical responsibility for a heads up?
- Business constraints?
- Given no constraints, what would you like to do here?

I developed a short list of Indigenous museum questions, although the three museums in my set were markedly different, resulting in much different sets of interviews. This would be a very interesting and productive area for future research. (Table 6)

As I became increasingly informed regarding my topic, I developed a master list of general interview questions, divided into topics related to infrastructure and pedagogy, that I used to guide my observations and conversational questions. (Tables 7-8)

Lastly, I created a set of questions specific to adult and child museum visitors, (Table 9) regarding their perceptions of museum visits. I conducted an interview with one parent/child set; this also would be a fruitful research area.

Table 6. General Interview Questions: Indigenous Museum Practices

Research Questions: Indigenous Museum Practices

Are there issues of stereotyping of Native people as "natural environmentalists" that the Indigenous museums either feel that they must debunk, or can capitalize upon? How do Indigenous museums distinguish for their visitors between these stereotypes and legitimate cultural values of sustainability?

How do Native place-based cultural interpretations of sustainability and climate disruption differ, if it all, from Mainstream approaches to interpreting these subjects?

Do Indigenous museums engage their public in more direct methods, if they are in an especially impacted area, such as the Arctic?

If Indigenous museums do not engage the topics of climate disruption and sustainability with their visitors, as the Alaska Native Heritage Center does not, what is their reasoning for this?

Do Indigenous museums with limited resources feel a pull between addressing cultural sustainability versus environmental sustainability, and if so, how do they address this dilemma?

Table 7. General Interview Questions: Museums' Green Infrastructure

Research Questions: Museums' Green Infrastructure

What are the museum's daily sustainable practices as institutions? For example, does the museum engage in basic practices such as ensuring efficiency in its use of water, gas and electricity? Does it use solar energy, encourage recycling, and serve local organic foods in its cafeteria?

Does the museum encourage sustainable behavior in their employees, such as turning their lights out and their computers off when they leave at night? Does the museum offset costs for bus passes for its employees? Does the museum have "Green Teams" of some sort for its employees or visitors? Is there merely a pedestrian accommodation of rules and regulations, or is there personal buy-in by museum personnel about "Green Policy"? Does the museum have a rewards system of some sort in place for staff's bright ideas regarding sustainable innovations?

Has the museum incorporated alternative energy components such as wind generators, solar panels, or a green roof, if so, how has that worked out? Has the museum chosen to retrofit all or part of its facility, or include Green aspects in new building? Has the museum included sustainability discussion the choices made regarding HVAC or lighting?

Does climate disruption affect curatorial or archival aspects at the museum?

Table 8. General Interview Questions: Museums' Green Pedagogy

Research Questions: Museums' Green Pedagogy

Has the museum created a gallery exhibit about climate disruption, and if so, what was their experience? How did their public react—was it successful? Has the museum tried alternative forms of knowledge conveyance, such as conferences or workshops? If so, how did that work out? Does the museum have a theater or planetarium, and if so, do they show climate disruption or sustainability programming? Does the museum use technology such as iPad stands or informational kiosks to convey this information — if so, how has that worked out?

Does the museum address these issues with child visitors, and if so, how do they convey the technically challenging information regarding climate disruption to younger children? Does the museum have after-school programs for schoolchildren that explore these topics, if so, how do they handle it? Does the museum have teacher-training programs that explore these topics, if so, how do they handle it?

Are the museum docents trained to answer questions about climate disruption and sustainability, and if so, what do they say to members of the public?

Does the museum have a zoo, aquarium, or botanical garden incorporated in their entity, and if so, do they engage in climate disruption or sustainability programming, or address issues of reduced biodiversity as a result of climate change? If so, how has that worked?

Has the museum reached beyond its walls into the community to educate or engage the public on the topics of climate disruption or sustainability and if so, what did they do, and how was it received?

If the museum incorporates Green infrastructure components such as electric hand dryers, reduced flow water toilets, or water bottle friendly water fountains, has the museum installed informative signage to alert the public? If so, has there been a response?

Has the museum cafe incorporated local foods, and if so, does the menu identify this and inform the public about the sustainability aspects of locavore utilization?

Does the museum bookstore or shop include or focus on locally made products, or do they primarily include made-in-China products because they are more affordable? How are these decisions made?

What are the most effective pedagogical approaches for communicating climate disruption /sustainability education?

Are there different approaches that are more effective with different age groups?

Are there different approaches that are more effective with Native or non-Natives?

Are there different approaches that are more effective with employees or visitors?

In what ways can technology be deployed as an effective teaching tool?

Table 9. Interview Questions for Adult and Child Museum Visitors

Museum visitor interview questions

Adult:

I'm interested in hearing about your experiences in visiting museums, but especially science/natural history museums or exhibits –

In particular, today, I'd like to focus in primarily on the quality of your experience as it was affected by those around you.

In general, do you prefer to visit museums on your own or with others?

Have you visited a science/natural history museum or exhibit within the last year or so?

What was it?

Did you go by yourself, or were you accompanied? If in company – with whom?

What was your impression of the museum or exhibit – did it engage your interest?

If you were by yourself, did you read everything, or cherrypick out particular things, and skip over others?

If you were with someone, did their presence affect how you read the informational placques?

Did you feel pressed to move on before you were ready?

Did you spend more time at an installation than you might have on your own?

Do you think being with someone else creates a social space where it is easier or more difficult to focus on the exhibit – and does it make a difference if it is another adult, or children?

If you are visiting alone, does the presence of other museum visitors tend to affect how long you spend with an exhibit?

And a little bit about science exhibits – do you recall visiting an exhibit that touched on climate change?

If so, what did you find memorable?

Did any exhibit like this affect you emotionally? Could you describe that?

What kind of exhibit of this kind would you like to be able to take your daughters to visit?

Kid:

Can you tell me about when you have gone to a museum?

What did you see that was interesting to you?

What was it about it that you liked?

Were there parts of the museum that were boring, why?

Do you like to look around the museum by yourself, or is it better when your mom or dad helps explain things to you?

Have you gone to a museum where someone who works there explains things to you, maybe in a group – a tour – how is that? How about with earphones on?

Do you like museums that have science exhibits about animals and nature? Can you tell me about a museum like that?

Do you ever think the things you see or learn about in museums are scary for some reason?

Do you have a favorite time when you could touch things at a museum?

What would you like to tell me about museums?

My visit to the Alaska Native Heritage Center produced completely unexpected interview results; as did the sum of my research at the Denver Museum of Nature and Science. I took an interregnum from research during which I assessed my preconceptions and interview findings and contemplated my future interviews. In October 2013, I attended the inaugural meeting of the American Indigenous Research Association, held at Salish Kootenai College, featuring keynote speakers Dr. Shawn Wilson, author of *Research is Ceremony: Indigenous Research Methods,* [151] and Dr. Margaret Kovach, author of *Indigenous Methodologies: Characteristics, Conversations and Contexts*.[152] Dr. Lori Lambert presented her research model, "Spider Conceptual Framework" (Figure 57). Reading closely these two substrative texts, then having the opportunity to hear the ideas contextualized by these two key authors, Dr. Lambert's explanation of her Indigenous research paradigm, and other presenters' discussion of their applications of Indigenous research methodology catalyzed a re-evaluation of my own research methodology.

Indigenous Research Methodology is an evolving academic field, and of course reflects to some degree the values and culture of the contributing scholars; I have chosen to adhere most closely to Wilson and Kovach's concepts which include a focus on community, storytelling and reciprocity. I felt that

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[151] Shawn Wilson, *Research Is Ceremony : Indigenous Research Methods* (Black Point, N.S.: Fernwood Pub., 2008), Table of contents only http://www.loc.gov/catdir/toc/fy1002/2008431436.html.

[152] Margaret Kovach, *Indigenous Methodologies : Characteristics, Conversations and Contexts* (Toronto ; Buffalo: University of Toronto Press, 2009).

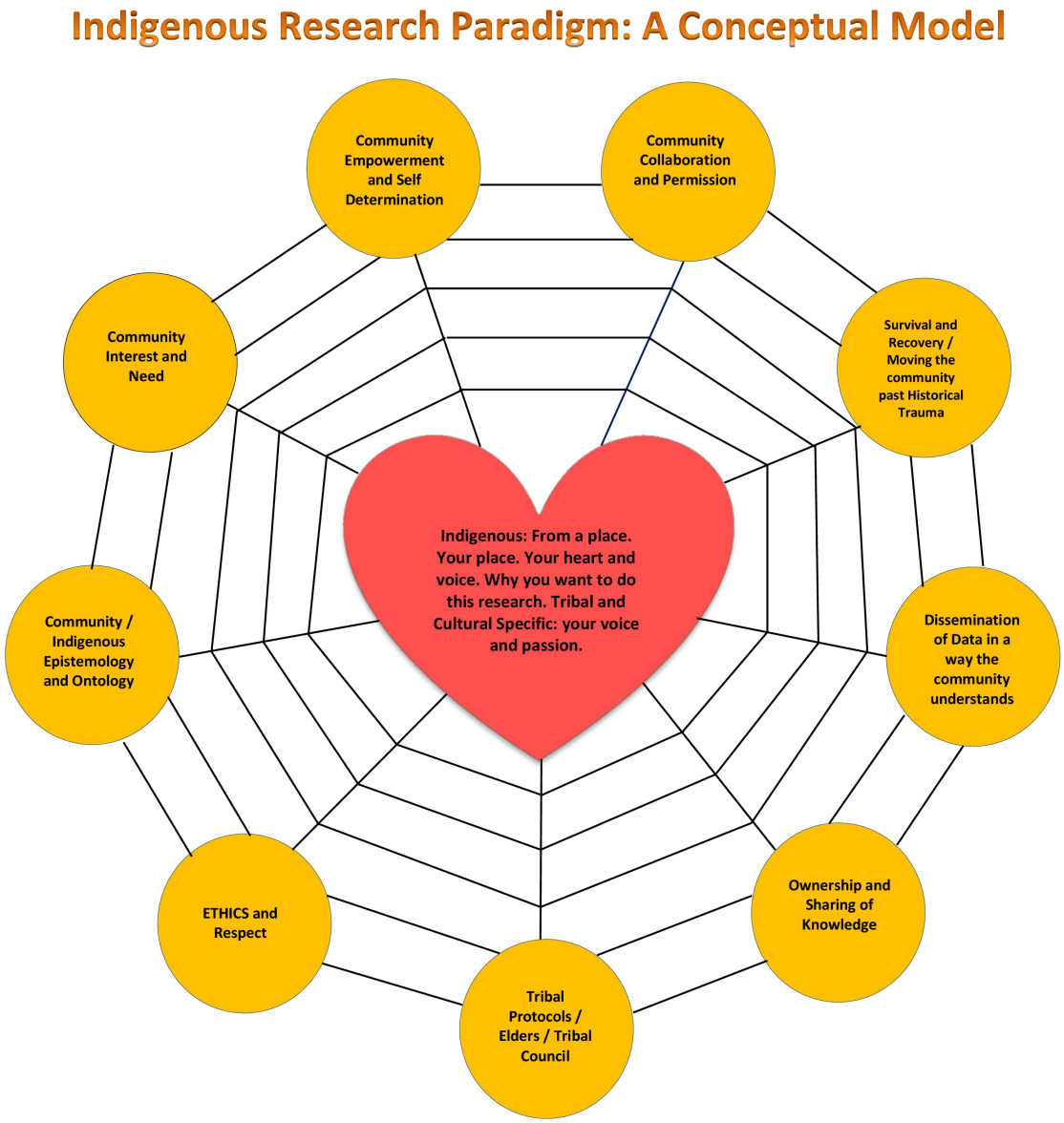

Figure 57. Spider Conceptual Framework developed by Dr. Lori Lambert[153]
IMAGE COURTESY: DR. LORI LAMBERT

stepping away from the rigidity of a formal traditionally academic approach and towards a more inclusive and personal Indigenous research approach could

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[153] Lori Lambert, "Spider Conceptual Framework | American Indigenous Research Association," American Indigenous Research Association, accessed January 4, 2017, http://americanindigenousresearchassociation.org/mission/spider-conceptual-framework/.

only be beneficial in creating more generative interviews. I reflected not only on how to more effectively conduct my remaining interviews, but also how my work could best be used for the greater good of the museum community and the general public on the completion of my research. In conducting the second set of interviews, starting with the Smithsonian, I revised my interview approach. Instead of using a fixed set of questions, I asked the interview respondents to share their experience and stories with me, leaving the interviews very open-ended, and let them flow freely as the subject saw pertinent. I asked the occasional follow-up question if there were specifics that I wanted to hear addressed. I couched the request for these interviews with the understanding that the results were intended to be useful to staff at smaller museums with more restrictive budgets. The time and resources being expended both by myself and by the museum personnel being interviewed was a community effort to share expensive acquired knowledge with smaller museums whose budgets and manpower would not accommodate experiments in sustainability or Indigenous collaboration.

In accordance with Indigenous principles of reciprocity and gifting as an acknowledgement of appreciation and respect, I included gift giving to my interview participants as part of my interview process. Initially, my gifts were either packages of Chatelaine Chocolats, or bags of Bequet caramels, both award-winning confections manufactured in Bozeman, Montana. (Figures 58-59) I selected these as gifts because they were not ostentatious, they seemed to be



Figure 58. Bequet caramel gift.[154]
PHOTO COURTESY: BEQUET CONFECTIONS.



Figure 59. Chatelaine Chocolat gift.[155]
PHOTO COURTESY: CHATELAINE CHOCOLAT.

universally appreciated, they were within a price range that I could afford, and they were excellent local Bozeman products that I could share with my interview subjects as a way of extending a sense of community. With non-Native recipients, these appeared to be well-received gifts. However, a Native recipient handed the bag of caramels back to me, mentioning that they were diabetic and could not take this gift. I was quite chagrined to have overlooked this likelihood, and reassessed my gift-giving protocols.

My mother has volunteered for many years with a Maya women's weaver's cooperative, Jolom Mayaetik,[156] which is located In San Cristobal de

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[154] Bequet Confections, *Bequet Caramel Assorted 8 Oz Gift Bag*, 2017, 2017, https://bequetconfections.com/.

[155] "11pc-Mendiant.jpg accessed January 6, 2017, http://www.chatelainechocolate.com/img/products/11pc-mendiant.jpg.

[156] Inter-American Foundation, *Cooperativa Jolom Mayaetik*, 2013,

las Casas, Chiapas, Mexico. My mother assists these Indigenous artisans with tasks such as locating U.S. markets, and negotiating the import process for their weavings. Many of these weavers speak only Tzotzil or Tzeltal Maya; some also speak Spanish. Their cooperative has allowed this group of Indigenous women to obtain fair trade prices for their work and to become self-supporting at a wage that they have negotiated for themselves. Because of my mother's involvement, I have become very familiar over the years with these Indigenous women's extraordinary products and realized that they could be ideal gifts. The weavings are primarily cotton, although a few items are made of wool, woven on traditional back-strap looms, with details hand-embroidered. (Figures



Figure 60. Jolom Mayaetik guild members.[157]
PHOTO COURTESY: FERIAMAESTROS.COM



Figure 61. Jolom Mayaetik embroidered weavings.[158]
PHOTO COURTESY: TRIPADVISOR

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https://vimeo.com/64842869; "Artisans' Profile: Cooperative Jolom Mayaetik: Maya Weavers Cooperative, Chiapas |," accessed January 4, 2017, http://www.ladap.org/artisans-profile-cooperative-jolom-mayaetik-maya-weavers-cooperative-chiapas/.

[157] Jolom Mayaetik guild members in San Cristobal de las Casas shop "Mayetik-Member2-Large.Jpg (JPEG Image, 700 × 393 Pixels)," accessed January 4, 2017, http://www.feriamaestros.com/mayetik-member2-large.jpg.

[158] "Jolom Mayaetik (San Cristóbal de Las Casas) - Qué Saber Antes de Ir - TripAdvisor," accessed January 4, 2017, https://www.tripadvisor.es/Attraction_Review-g150802-d8627891-Reviews-Jolom_Mayaetik-San_Cristobal_de_las_Casas_Southern_Mexico.html#photos;geo=150802&detail=8627891.



Figure 62. Jolom Mayaetik zipper bags and cell phone bag.[159]
PHOTO COURTESY: J WOODCOCK-MH

60-62) The small weavings, such as zippered rectangular bags and small bags suitable for carrying a wallet or cell phone were gender-neutral, affordable options that would be almost universally appropriate. As well, it offered an opportunity to showcase these Indigenous artists before museum staff likely to appreciate their artistry. I was able to purchase these woven items through my mother as needed for scheduled interviews. These gifts were also well received, without the possible dietary or health issues of a food gift. A few recipients, primarily men, remarked that they were pleased to receive the gift,

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[159] Woodcock-Medicine Horse, *Jolom Mayataek weavings_2012-2017*, Photograph, January 7, 2017.

which they intended to pass along to a female relative or friend. Each item included a tag describing the item, the name of the weaver, and her community, as well as a small tag with a short history of Jolom Mayaetik and its cultural significance. These gifts were ideal at private museums and tribal museums, where gift giving did not abridge any rules.

However, there are strict federal guidelines regarding the kinds and monetary value of gifts which government employees are permitted to receive without incurring penalties. These penalties can be severe, and although the monetary cap for government employee gifts is $20.00,[160] I realized that gifting the Jolom Mayaetik items could be quite awkward for recipients at government museums, such as the Smithsonian. The price that I paid, buying directly from the weavers through my mother, was potentially less than the price for equivalent items at boutiques in Washington D.C., and also would place the recipient in the uncomfortable position of attempting to calculate the value of their gift, to determine whether they could accept it. Clearly, this was an untenable situation.

I solved this dilemma by creating custom calendars, printed by Vistaprint for a modest sum. Although the monetary value of these calendars was minimal, the in-kind value was more dear. (Figure 63) I very carefully culled through the photographs that I had taken primarily at museums and seasonally

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[160] "Do It Right | JMD | Department of Justice," accessed January 9, 2017, https://www.justice.gov/jmd/do-it-right.



Figure 63. Custom printed desk calendars.
PHOTO COURTESY: J WOODCOCK-MH

here in Montana, selecting a dozen images to create an interesting set of photographs that would share a bit of Montana, and be of topical interest to my interview subjects. The calendars were a very successful option. They were light-weight, easy to pack, easy to carry to interviews, and they had an additional benefit. It took me a few minutes to set up my recording technology for each interview and the calendar gave my interviewee something to do while

they waited; I could answer questions about the photographs as I set up and get a conversation going and the ice broken.



Figure 64. Folded business cards with dissertation summary.
PHOTO COURTESY: J WOODCOCK-MH

In addition to the calendar, I also gave each interviewee a double-sided, folded business card. (Figure 64) The front was standard, the back had a brief abstract of my dissertation topic, the interior had a graphic and text describing my research methodology. When I had snowball references I would leave a copy of this card prior to requesting an interview, and was thus able to give the prospective interviewee a quick idea of what I was doing, and why I might want to speak with them in particular.

My anthropological training tends to make me alert to non-verbal body language—of interpersonal positioning and dynamics. As a naturally somewhat shy person, I found the introductory prop of the calendar helpful, but I also used mirroring body posture in an effort to assist development of rapport. At first it was a somewhat abstract item on my to-do list, but I found it seemed to

be quite effective.

The interviews ranged widely in length. A few gave me the half hour they had available, and several individuals were remarkably generous with their time, granting formal interviews that stretched out over days, and at the Smithsonian, conversations and mentorship for the duration of my fellowship, for which I am very appreciative. The average interview lasted about an hour.

Although in my later interviews I did not have a rigid question list, I did create a flexible list of questions tailored to each individual and their particular position, designed to elicit from each person their experiences with sustainability and climate disruption initiatives at their institution. I asked if or how they may have been involved in such initiatives, and their thoughts regarding the outcome. In the case of Indigenous institutions, we also discussed issues related to exhibiting Indigenous culture. Inspired by Bliss Browne's Imagine Chicago project,[161] I tried to remember near the end of the interview to ask each person what their dream or pet project would be, given unlimited resources.

In a Western traditional research methodology, the good-bye on leaving the interview room would probably be the last interaction with the interviewee. When I decided to adhere as much as possible to an Indigenous research methodology, I had to translate that from the abstractions of other

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[161] "Imagine Chicago - Who We Are," accessed May 15, 2017, http://www.imaginechicago.org/who.html.

scholars' texts to the reality of my own work. I made a commitment to myself to include something from all interviews conducted, as a mark of respect. From a Western perspective, we had a data exchange, and I would be free to disregard any data I saw as irrelevant. From an Indigenous perspective, each person gifted me with both their time and their stories, and it is respectful to bear that in mind. My second commitment was to each interviewee—upon transcription, they get a copy with the text I intend to use highlighted; they have the option of either asking me not to use that particular part of the interview, or they may feel that I overlooked something significant to include in my dissertation. I regard this entire venture as collaborative, and each interviewee as a collaborator in the project, with the ability to veto as needed.

Because I was asking questions that delved into issues of institutional culture, some interviewees were remarkably frank. Some asked me to turn off the recording for a period of time, while they filled me in "off-the-record," and then had me re-start the recording to continue their comments. Some simply gave me unguarded answers that I regard as too personal to print; the comments provided context, but could be socially or politically problematic for the individual in their institution if made public. I appreciated the camaraderie, but in transcribing I was careful to flag and avoid any such possible problems, with the back-up mechanism of the interviewee reviewing the transcript for accuracy or elisions.

Museum Observations

In addition to the time spent conducting individual interviews, I allocated time for a close observation of each museum, noting the exhibits, signage, media presentations, bathroom fixtures, and bookstore and café selections. In particular, I was looking for didactic signage intended not merely to point visitors at a resource, but to educate them regarding anthropogenic



Figure 65. Cal Academy Bookstore
PHOTO COURTESY: J WOODCOCK-MH

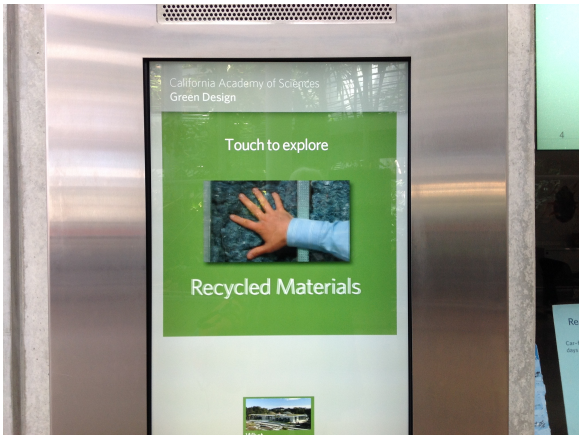

Figure 66. Cal Academy insulation
PHOTO COURTESY: J WOODCOCK-MH

issues. (Figures 65-68) My purpose was both to identify if the museum was pursuing these options, and if so, whether they were making efforts to Use the teaching moment to educate the public, especially in ways that could be taken home.

I preferred to make these observations initially, because I could look at the museum through fresh eyes, without the benefit of the information garnered during interviews. An example of the utility of this approach was borne out by an informal visit to the Smithsonian Air and Space Museum. When

I walked through, I noted virtually no signage or initiatives regarding sustainability, beyond the ubiquitous recycling containers; thus I gained an impression that the Air and Space Museum was minimally engaged with these issues. However, during my interview with senior Smithsonian Facilities administrative staff, I was to learn that the Air and Space Museum is perceived as a sustainability leader among the Smithsonian entities. Every museum is a complex, interdigitated set of departments and personnel. In some museums, initiatives span departments, achieving multiple objectives; in others, departments are more siloed, and although they may fully achieve their own



Figure 67. Water education
PHOTO COURTESY: J WOODCOCK-MH



Figure 68. NMNH Cafeteria
PHOTO COURTESY: J WOODCOCK-MH

objective, a teaching moment with the public is not manifested. The Air and Space Museum was a good example of exemplary sustainability practices that were functionally invisible because they were not communicated in any way to their visitors.

Before my initial visits, I researched each museum as thoroughly as

possible online, through their website and through reviews, journal articles or other documents. I specifically looked for their list of current and past exhibits, searching for those pertaining to climate change, sustainability, anthropogenic issues, or regarding Indigenous culture and science, prioritizing those exhibits for viewing in my visit. As I walked through exhibit halls, I looked first for overtly Anthropocene oriented exhibits, assessing how they had chosen to present the topic. Then, in other exhibits, I searched for either inclusions or exclusions of these topics in exhibit placards and topical sections, taking photos of pertinent signage.

In museum stores, I looked for information placards about climate change, sustainability, fair trade, and local sourcing. I also informally estimated whether the majority of non-book items were made-in-China plastic souvenirs with a short life expectancy, or whether the museum was working with local artisans to supply curios, toys and jewelry souvenirs. In cafés, I looked for information about local sourcing, the environmental sustainability aspects of various foods, and information about sustainability, composting, and recycling associated with their cutlery and condiment dispensers. I looked in hallways for water fountains, and checked to see if that opportunity was used to educate the public about water use, and whether the facility had installed water bottle filler fountains to encourage patrons to avoid plastic bottles. In bathrooms I checked if the paper towel dispensers were manual or automatic, or if they had converted to electric hand dryers, and I noted if toilets were

manual or electric flush. I took photos of fixtures and signage as pertinent. As an avid photographer, I found it reflexively interesting to note the frisson of embarrassment that I felt in photographing these items—it indicated to me that the landscape of bathrooms is not a common topic of conversation, although it became so in my interviews.

I then followed up on these topics as I was able, in interviews with facilities or building managers, and discussed less visible aspects of *green*, environmentally responsible, choices such as HVAC, lighting, landscaping, and recycled display components with the appropriate staff. Early on, in my interviews at the first four museums, I focused on curatorial, exhibits, education, facilities, and administrative staff. Not realizing how informative they would be, I neglected to request interviews with café and museum shop managers, although I was able to include most of these in follow-up visits.

As was notably demonstrated in Dr. William Rathje's signal research, The Tucson Garbage Project,[162] what interviewees genuinely perceive to be the truth may vary from observations made by a more neutral observer. Rathje, a brilliant scholar of Classic Maya studies, received a term paper from a pair of industrious students who had sneakily collected garbage from several homes in wealthy and poor Tucson neighborhoods, analyzed with interesting results. Realizing the enormous potential of using archaeological methods to analyze

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[162] William L. Rathje, *Rubbish!: The Archaeology of Garbage*, 1st edition (New York, NY: HarperCollins Publishers, 1992). 53-78.



Figure 69. William Rathje
IMAGE COURTESY: UNIVERSITY OF ARIZONA



Figure 42: *A student archaeologist sorting household refuse in Tucson, Arizona on behalf of Dr. Rathje's* Projet du Garbàge *in the late 1970s. Image courtesy of the Arizona State Museum Archives.*

Figure 70. Garbologist at work.
PHOTO COURTESY: SCHIFFER

contemporary culture, Rathje started the thirty-year Tucson Garbage Project—popularly referred to by his students as *Le Projet du Garbage*—a study in *modern material culture*, which became international in scope, culminating in the 1,224 page *Encyclopedia of Consumption and Waste*.[163] (Figures 69-70) This project was unique when it was initiated in 1973, gaining Rathje derision from his more fastidious colleagues. However, he persevered and his revolutionary work in behavioral archaeology came to be known as *garbology*, a term that earned its place in the Oxford English Dictionary. Apart from gaining OED validation, Rathje's work proved invaluable in providing epiphanal data regarding diet, biodegradation, hazardous waste, among many other fields.[164] From being the recipient of scorn from long-forgotten colleagues in

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[163] Carl A. Zimring and William L. Rathje, eds., *Encyclopedia of Consumption and Waste: The Social Science of Garbage*, 1 edition (Thousand Oaks, Calif: SAGE Publications, Inc, 2012).

[164] Michael Schiffer, "William L. Rathje, Father of Garbology," *Arizona Anthropologist* Centennial Edition (2015): 78–86.

anthropology, Rathje has emerged as the most relevant of twentieth-century archaeologists, both making meaningful contributions that led to substantially improved life in the United States, through contributions to medical research, for example, as well as paving the way for scholars such as myself to pursue the meaning that contemporary garbage can shed on human behavior. Without Rathje's lead, it would have been a real challenge for me to show up at the Smithsonian and ask to talk about their garbage without being summarily tossed out as garbage myself. Conversant with his work, I found it prudent to conduct as many observations as possible to independently verify facts. It was helpful, if timing permitted, to observe and explore the museum prior to conducting the interviews, because sometimes what I observed would generate a specific question. In a few instances time and scheduling did not permit this prior exploration of the institution.

Reflections on Theory and Methodology

When I began my PhD in American Studies, I had proposed a different topic; one that I soon realized had crippling methodological issues. It was an interesting topic regarding climate disruption, but would have taken a team of ten several years to complete. As I came to this dismaying realization, I concocted a good rationalization for taking Robert Rydell's *Museum History* while I re-evaluated my PhD program, knowing that I would thoroughly enjoy the class. It was to prove a prescient choice; halfway through the semester, I received a paper back with the comment "Have you considered museum

studies?"

That evening, I had an epiphany that I could combine everything that I care about most—museums, Indigenous culture, Native science, climate disruption, the Anthropocene, education, kids, American Studies, social and environmental justice, and anthropology—into one cohesive topic. I was given the green light to proceed, and I thought that this research project would be as straightforward in real life as it was neatly planned out in my mind.

This was not to be the case. I did not anticipate the challenges in finding appropriate Native museums with which to work. I could not have foretold the difficulties in obtaining some of my interviews, and regret not having realized at the beginning how interesting and pertinent interviews with café and gift shop managers would prove to be. Numerous people, thankfully not my advisor, made it clear that they thought I was out of my mind to conduct so many interviews and that I could have gotten by with one or two museums, not ten. And certainly not ten in person. Interview transcription proved to be a major challenge, with confounding technical difficulties. Despite these treacherous Heffalump traps,[165] and the persistent feeling that five hundred pages of dissertation have only scratched the surface of this topic and my acquired data, I remain as enthused about this research project today as I did the day that it came to me.

Conducting the interviews in-person turned out to be just as important

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[165] A. A. Milne, *The House At Pooh Corner Deluxe Edition* (Penguin, 2009). Ch 5.

as I thought it would be—the level of detail and nuance that I received in-person could not have been achieved over Skype. The contextualizing museum observations that I was able to make in-person could not have been made in any other way. The value cannot be overrated of being able to walk through each institution and visually assess first-hand the initiatives discussed; museums simply don't post photos online of their compost disposal, or their office recycling bins, or specific exhibit placards. The breadth of the museums included was important too. Each museum provided a different lens on the topic of sustainability and the Anthropocene; the contrast between institutions was thought provoking, and provided a base for more synergistic thinking and questioning.

Perhaps the most important thing, in my opinion, was working hard to understand Indigenous Methodology and to work from that perspective; it created an entirely different and more productive result both in my interviews and in my perspective. Working through Indigenous Methodology transformed this work from being *my project* to being *our project*.

CHAPTER THREE:

CONTEXTUALIZING THE ANTHROPOCENE

Americans in the second decade of the twenty-first century are ill-prepared to contextualize anthropogenic climate change within an evolutionary paradigm that allows a positive response to be developed. A May 2017 Gallup Poll reports that a mere nineteen percent of Americans believe in evolution as a natural process unguided by a god; thirty-eight percent adhere to a Creationist belief that their god created human beings and all other living beings as is, during the last 10,000 years. An additional thirty-eight percent believe that evolution may exist, but that it is guided by the hand of their god, rather than through the processes of natural selection—the scientific appraisal of the evolutionary mechanism.[166]

Clearly, teaching museum visitors about climate disruption and the perilous consequences of pursuing anthropogenic behaviors, behaviors resulting in biotic extinction events, is a challenge when better than three-quarters of the public either do not believe at all in evolution and its dire companion, extinction, or may believe in some sort of evolution, but refuse to take any responsibility, pawning it all off on an enigmatic god. Without a fundamental concept that the actions of human beings actually have consequences, it is

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[166] Gallup Inc, "In U.S., Belief in Creationist View of Humans at New Low," Gallup.com, accessed June 29, 2018, https://news.gallup.com/poll/210956/belief-creationist-view-humans-new-low.aspx.

difficult to get very far in untangling the enormously complicated web of anthropogenic climate disruption and the co-occurring biotic mutagenic disruptions from anthropogenic sources such as the mass release of endocrine disruptors,[167] or fallout from the 2,056 nuclear bombs exploded in the last seventy-five years,[168] resulting in the worldwide contamination of air and water. Through a perfect storm of religious zeal and plummeting science education, the United States has created several generations of citizens who are radically underprepared to attend to ameliorating the catastrophic aspects of the Anthropocene.



Figure 71. The Flintstones family enjoying a car ride.[169]
IMAGE COURTESY: CLIPARTKID/ HANNA BARBERA



Figure 72. Flintstones Bedrock City theme park. Williams, AZ. 2015.[170]
PHOTO COURTESY: MICHELLE ENEMARK FOR ATLAS OBSCURA

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[167] CLS Vilela, JP Bassin, and RS Peixoto, "Water Contamination by Endocrine Disruptors: Impacts, Microbiological Aspects and Trends for Environmental Protection," *Environmental Pollution* 235 (April 2018): 546–59, https://doi.org/10.1016/j.envpol.2017.12.098.

[168] Darryl Kimball, "The Nuclear Testing Tally | Arms Control Association," September 2017, https://www.armscontrol.org/factsheets/nucleartesttally.

[169] The Flintstones family enjoying a car ride with their pet dinosaur. "Flintstones Family Flintstones Characters #AgoQVa - Clipart Kid," accessed April 9, 2017, http://www.clipartkid.com/flintstones-family-flintstones-characters-AgoQVa-clipart/.

[170] "Inside the Derelict Flintstones Theme Park Being Sold for $2 Million - Atlas Obscura," accessed May 14, 2017, http://www.atlasobscura.com/articles/inside-the-derelict-flintstones-theme-park-being-sold-for-2m.

As a result, geology and earth processes, much less the technical definitions of geological eras, are not a common topic of everyday conversation for the average person in the United States, where many people grew up in the 1960s and 1970s watching *The Flintstones*, a televised cartoon serial following the lives of a prehistoric fictional family replete with pet dinosaur. (Figure 71) As recently as 2015, children could still visit the 30-acre Flintstones Bedrock City theme park built in 1972 on Route 66 in Williams, Arizona,[171] (Figure 72) wander through the concrete replicas of the Flintstone and Rubble bungalows, goggle at the giant baby pterosaur erupting from its egg, and fend off their hunger with a fishasaurus sandwich at Barney's Diner. This was one of half a dozen Flintstones theme parks built in the 1960s and 1970s in the U.S. and Canada, including a fairly spectacular version in Kelowna, Canada, that was torn down in the 1990s.[172] This whimsical creation from Hollywood cartoon magnates Hanna-Barbera[173] embedded itself in the American consciousness,[174] and fifty years later, one can walk into a grocery store and buy a full line of Bayer's Flintstones children's vitamins and supplements, "the #1 Brand Pediatricians choice."[175]

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[171] "Inside the Derelict Flintstones Theme Park Being Sold for $2 Million - Atlas Obscura."

[172] Shelly Wutke // Survivemag, *Bedrock City, Kelowna 1980*, 2011, https://www.youtube.com/watch?v=ov0OJbiMaAg.

[173] Norman Rockwell Museum, "Hanna-Barbera - Illustration History," Illustration History: An education resource and archive - Hanna-Barbera, accessed May 14, 2017, http://www.illustrationhistory.org/artists/hanna-barbera.

[174] The Awl, "Amidst of the Rubble of Bedrock City," The Awl, March 24, 2016, https://theawl.com/amidst-of-the-rubble-of-bedrock-city-cceb3ffc3534.

[175] "Multivitamins for Kids | Flintstones Vitamins," accessed May 14, 2017, https://www.flintstonesvitamins.com/vitamin-

This half-century of American fascination with an ultra-kitsch cartoon world where humans coexist with dinosaurs may seem irrelevant to the pressing topic of climate disruption. I suggest, however, that the stories, imagery, and contextualization to which we are repeatedly exposed as children create a bedrock upon which we build our perceptions and expectations of the world around us. For a culture enchanted by Bedrock City, it is not a far stretch to get comfortable with the Creationist ideology that claims this coexistence as literal, Bible-endorsed fact. The Institute for Creation Research alleges:

> Dinosaurs are often portrayed as having lived in a time before man. However, the available evidence shows that man and dinosaur coexisted. Legends of dragons are found among most people groups. For example, there are the stories of Bel and the dragon, the Kulta of Australian aborigines, St. George and the dragon, and of course many Chinese legends. Often, the anatomical descriptions given are consistent, even though they come from separate continents and various times. These depictions match what we know from the fossil evidence of certain dinosaurs. Thus, dinosaurs are known directly from their fossils, and indirectly from cave drawings, tapestries, textiles, figurines, carvings, bas reliefs, and many oral and written eyewitness accounts, most of which are quite old.
> The Bible states that 'every thing that creepeth upon the earth after his kind' was created by God on Day Six of the creation week (Genesis 1:25)—including dinosaurs. On this same day, the first man and woman were also created (Genesis 1:26-27). Over 1,600 years later, Genesis 8:15 records that a pair of each land-dwelling animal 'wherein is the breath of life'—again including dinosaurs—were taken aboard an ark that would have held over 101,000 square feet of floor space. This ensured that a remnant would be preserved through the worldwide watery destruction

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products/?pse=google&matchtype=e&Keyword=flintstones%20vitamins&network=g&placement=&campaignid=393916514&adgroupid=44695349704&device=c&gclid=Cj0KEQjwgODIBRCEqfv60eq65ogBEiQA0ZC5-ZgYORY5lVVXY7NhhPQS3XsECstBbCZpVpCLW7-18WwaAhp88P8HAQ&gclsrc=aw.ds&dclid=CLjA_7347tMCFQhvAQodeicL9w.

that fossilized many pre-Flood dinosaurs.[176]

Their thesis continues for another half a page, concluding with the extraordinary deduction:

> The fact that dinosaur femur soft tissues have been described as 'still squishy' and contain recognizable blood cells also confirms the recency of dinosaur fossil deposition. Science continues to demonstrate that dinosaurs did not predate humans, and that dinosaur kinds did not go extinct (if they all have) until after the Flood, which occurred only thousands of years ago.[177]

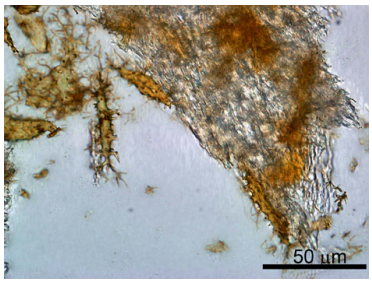

Figure 73. Multiple *B. canadensis* red blood cells.[178]

IMAGE COURTESY: MARY H. SCHWEITZER

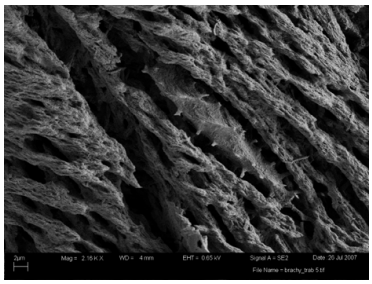

Figure 74. An SEM of demineralized *B. canadensis* bone matrix.[179]

IMAGE COURTESY: MARY H. SCHWEITZER



Figure 75. Mary Schweitzer working in the Lab (ICAL).[180]

PHOTO COURTESY: KELLY GORHAM, MSU

The dinosaur to which the Creationists refer is actually "Bob," the 67 million year old fossil remains of a pregnant female *Tyrannosaurus rex*,

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[176] "Men and Dinosaurs Coexisted | The Institute for Creation Research," accessed May 14, 2017, http://www.icr.org/men-dinosaurs/.

[177] Ibid.

[178] Multiple *B. canadensis* red blood cells surrounded by a white, fibrous matrix "Soft Tissue Preserved in 80-Million-Year-Old Dino Fossil | EARTH Magazine," accessed May 14, 2017, https://www.earthmagazine.org/article/soft-tissue-preserved-80-million-year-old-dino-fossil.

[179] A scanning electron microscope image of demineralized *B. canadensis* bone matrix "Soft Tissue Preserved in 80-Million-Year-Old Dino Fossil | EARTH Magazine."

[180] Mary Schweitzer working in the Imaging and Chemical Analysis Lab (ICAL) at Montana State University in 2007 "Soft Tissue Preserved in 80-Million-Year-Old Dino Fossil | EARTH Magazine."

discovered and excavated in Montana by the Museum of the Rockies,[181] and analyzed by Dr. Mary Schweitzer, a protégé of pre-eminent paleontologist Dr. Jack Horner and a fine scientist in her own right. Schweitzer's ground- breaking lab techniques in mass spectrometry revealed the unexpected—soft tissue remnants that had been encased and preserved during petrification in the surrounding stone matrix. (Figures 73-75) Multiple subsequent discoveries and

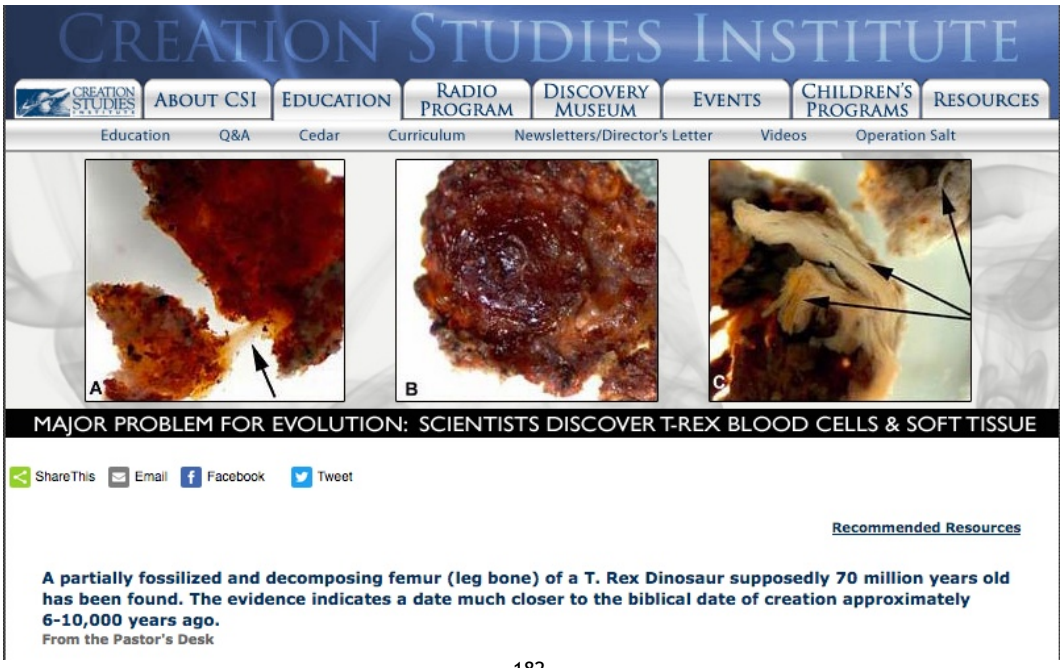

Figure 76. Major Problem for Evolution[182]
IMAGE COURTESY: CREATION STUDIES INSTITUTE

lab findings including another *T. rex*, an atheropod, and a woolly mammoth, among others, have all yielded soft tissue as well, confirming her original

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[181] Helen Fields, "Dinosaur Shocker," Smithsonian, accessed May 14, 2017, http://www.smithsonianmag.com/science-nature/dinosaur-shocker-115306469/.

[182] "Scientists Recover T. Rex Soft Tissue - CSI," accessed May 14, 2017, http://www.creationstudies.org/Education/T_Rex_dinosaur.html.

findings and taking them further, revealing amino acids.[183] Although Schweitzer's first finding twenty years ago was initially regarded with some collegial skepticism, subsequent scientific verifications have acknowledged the validity of her breakthrough work. This is not a scientific hypothesis that in any way suggests coexistence of humans and Cretaceous animals. Although the conceptualization of dinosaurs and humans coexisting may fit in with Creationist ideology, it is not a fact in any scientific paradigm and to attempt to create this impression requires prodigious efforts at disingenuous manipulation of data and information. The images and headline (Figure 76) produced by the Creation Studies Institute, "A partially fossilized and decomposing femur (leg bone) of a T. Rex [*sic*]…" scarcely communicates the idea that the "squishy tissue" was observed through a scanning electron microscope (SEM). Not exactly a leg of lamb left out too long. It is distressing to note that the Creation Studies Institute Pastor presumes their readers to be unfamiliar with the abstruse term, *femur*, providing the useful translation "leg bone." Schweitzer's images clearly communicate from a scientific perspective that the fibrous tissue is being documented at a cellular scale via SEM technology.

Dinosaurs thrived through the Cretaceous era, dying out approximately sixty-five million years ago from naturally occurring climate disruption, be it

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[183] Mary Higby Schweitzer et al., "Molecular Analyses of Dinosaur Osteocytes Support the Presence of Endogenous Molecules," *Bone* 52, no. 1 (January 2013): 414–23, https://doi.org/10.1016/j.bone.2012.10.010.

catastrophically induced. The coexistence assertion of the Creationists could be dismissed as amusing but inconsequential but for the fact that the Creationists, along with "Intelligent Design" advocates and other fundamentalist sects have grown in numbers and especially in political influence in the American population in the late twentieth and early twenty-first centuries, and their anti-evolution beliefs extend further to broader scientific topics, and especially to issues concerning climate disruption.

The Institute for Creation Research offers a number of articles on their web site regarding climate disruption. Their resident expert, Larry Vardiman, Ph.D.—chairman of the Astro/Geophysics Department at ICR—offers this tidbit in his analysis, *Evidence for Global Warming*:

> Global warming may affect some parts of our society negatively but would likely benefit others. In fact, the current warming trend may be returning our global climate closer to that prevalent in the Garden of Eden. Compared to climate changes which have occurred in earth history, a temperature rise of a few degrees is a small fluctuation which will not lead to a complete melting of the polar caps or another ice age. Earth has a stable environmental system with many built-in feedback systems to maintain a uniform climate. It was designed by God and has only been dramatically upset by catastrophic events like the Genesis Flood. Catastrophic climate change will occur again in the future, but only by God's intervention in a sudden, violent conflagration of planet Earth in the end times (II Peter 3:1-12).[184]

Larry Vardiman, P.h.D. [sic] (as he is referred to by 'In Jesus' Name Productions'), Creation Science Hall of Fame inductee,[185] is offered as a

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[184] "Evidence for Global Warming | The Institute for Creation Research," accessed May 14, 2017, http://www.icr.org/article/3233.

[185] "Larry Vardiman - Creation Science Hall of Fame Creation Science Hall of Fame,"

provider of Scientific Peer Review, "joining the Science Review Panel to answer questions and criticisms about the Vapor Canopy and Catastrophic Plate Tectonics."[186] Vardiman is presented by his community as a scientific expert on climate change, publishing articles such as "New Evidence for Global Cooling"[187] in Creationist venues. To the casual reader, they appear to be genuine research; to the informed reader, they are a ludicrous misrepresentation of data—problematic given American demographic trends.

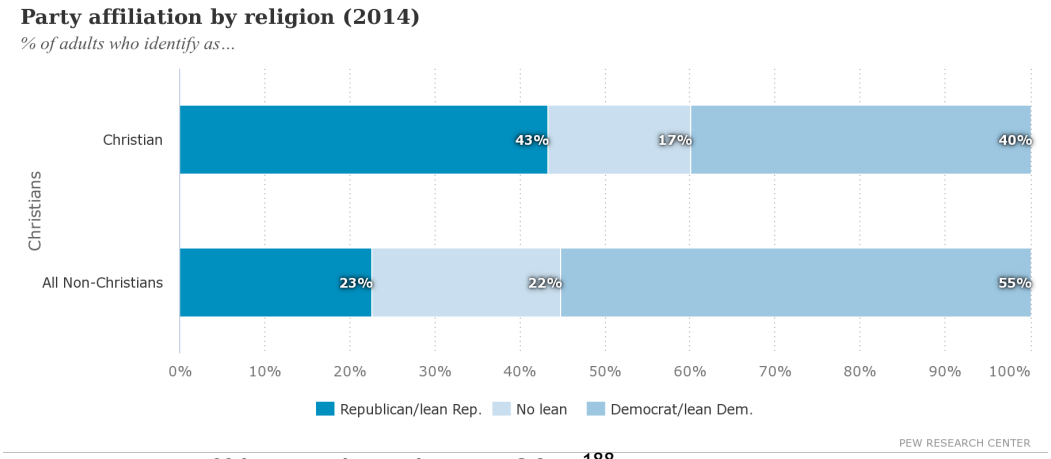

Figure 77. Party Affiliation by religion. 2014[188]
IMAGE COURTESY: PEW RESEARCH CENTER

The Pew Research Center (PRC) finds that 70.6% of Americans identify as Christian, with Evangelical Christians in the majority, numbering 25.4%. Persons

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accessed May 14, 2017, http://creationsciencehalloffame.org/inductees/living/larry-vardiman/.

[186] "Scientific Peer Review - Larry Vardiman, P.h.D.," In Jesus' Name Productions, accessed May 14, 2017, http://www.injesusnameproductions.org/pages/page.asp?page_id=315356.

[187] "New Evidence for Global Cooling | The Institute for Creation Research," accessed May 14, 2017, http://www.icr.org/article/new-evidence-for-global-cooling/.

[188] 1615 L. Street et al., "Religious Landscape Study," *Pew Research Center's Religion & Public Life Project* (blog), May 11, 2015, http://www.pewforum.org/religious-landscape-study/.

of non-Christian and other faiths number 7.4%, and Unaffiliated/Atheist/ Agnostic and undecided number 23.4%[189] The PRC polled to determine political party affiliation by religion. (Figure 77)

It is of interest to note that although most non-Christians in the United States poll as Democratic, Christians are about evenly divided between the two parties. Also of interest is that Pew de facto defines the political system in the United States as binary, rather than multi-party. To delve too deeply into partisan politics is to digress from the point, but it is worth pointing out that our political system does accommodate multiple parties. The Green Party was not taken very seriously by the media or the public in the 2016 general election; however, in enclaves of the country it is quite strong.

For example, the city of Richmond, California, population approximately 100,000, elected a Green Party mayor, Gayle McLaughlin, for two consecutive four-year terms. In 2014 because of term limits, she was re-elected as city councilwoman along with the Richmond Progressive Alliance slate despite Chevron supporting their opponents with $3 million in campaign funding.[190]

The huge 2,900-acre Richmond Chevron refinery opened in 1902,[191] currently employs approximately 1,200 workers, processes about 240,000

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[189] "Religion in America: U.S. Religious Data, Demographics and Statistics | Pew Research Center," accessed May 14, 2017, http://www.pewforum.org/religious-landscape-study/.

[190] Dave Schwab, "Richmond – Green Party Watch," October 31, 2014, http://www.greenpartywatch.org/tag/richmond/.

[191] "The Early Years | History | About Chevron Richmond," accessed May 14, 2017, http://richmond.chevron.com/aboutchevronrichmond/history/early_years.aspx.

barrels of crude oil daily, and is the third largest refinery in California.[192] It has a pair of 750,000 storage tanks, the largest in the United States, providing fuel for marine traffic. Until 1987, the refinery discharged industrial effluent heavily contaminated with mercury and polycyclic aromatic hydrocarbons, polluting nearby Castro Cove and the San Pablo Creek Marsh. In 1987, Chevron moved its discharge location to the deep waters of San Pablo Bay; thus polluting the cove less, and the bay more. However, it has reduced its effluent discharge from 22 million gallons to 5.6 million gallons, and established some filtration procedures. The California Regional Water Quality Control Board's Bay Protection and Toxic Clean-up Program found Chevron liable, required a $20-$30 million clean up of Castro Cove in 2007-2008, and held them accountable for "natural resource damages."[193]

The citizens of the town of Richmond, adjacent to the Chevron refinery, over the last century have experienced the ill effects of multiple petrochemical fires releasing clouds of toxins, as well as water pollution. On August 6, 2012, the oil refinery developed a "catastrophic pipe rupture" that led to a massive fire. The U.S. Chemical Safety Board reported:

> The release, ignition, and subsequent burning of the hydrocarbon process fluid resulted in a large plume of vapor, particulates, and black smoke, which traveled across the surrounding area. This

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[192] "Fire at Chevron Refinery in Richmond - SFGate," accessed May 14, 2017, http://www.sfgate.com/bayarea/article/Fire-at-Chevron-refinery-in-Richmond-3767221.php.

[193] "Castro Cove/Chevron Richmond Refinery: FINAL Damage Assessment and Restoration Plan/Environmental Assessment" (Silver Spring, Maryland: National Oceanic and Atmospheric Administration; United States Fish and Wildlife Service; California Department of Fish and Game, June 2010). P. i-iii

> chain of events resulted in a Community Warning System (CWS) Level 3 alert, and a shelter-in-place advisory (SIP) was issued at 6:38 p.m. for the cities of Richmond, San Pablo, and North Richmond. It was lifted later that night, at 11:12 p.m., after the fire was fully under control. In the weeks following the incident, approximately 15,000 people from the surrounding communities sought medical treatment at nearby medical facilities for ailments including breathing problems, chest pain, shortness of breath, sore throat, and headaches. Approximately 20 of these people were admitted to local hospitals as inpatients for treatment.[194]

Chevron was fined $2 million for the damages resulting from the 2012 fire.



Figure 78. Map of Richmond and Chevron Refinery.[195]
IMAGE COURTESY SFGATE/ESRI



Figure 79. Chevron refinery fire plume. 2013[196]
IMAGE COURTESY: JOHN STOREY/CHRONICLE

Democracy Now reported:

> Chevron pleaded no contest to six criminal charges related to the fire and agreed to submit to additional oversight over the next few years and pay $2 million in fines and restitution as part of a plea deal with state and county prosecutors. Two days earlier,

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[194] U.S. Chemical Safety and Hazard Investigation Board, "Final Investigation Report: Chevron Richmond Refinery #4 Crude Unit Richmond, California. Chevron Richmond Refinery Pipe Rupture and Fire." (Washington DC: U.S. Chemical Safety and Hazard Investigation Board, January 2015).

[195] "Fire at Chevron Refinery in Richmond - SFGate."

[196] Ibid.

> thousands of people marched to condemn safety issues at Chevron's plant and to call for renewable alternatives to fossil fuels. 'The community of Richmond does not deserve and will not stand for these kinds of toxic releases that impact our health and safety and also impact the Sustainability of our planet,' says Richmond Mayor Gayle McLaughlin. Last week, the Richmond City Council voted to file suit against Chevron, citing 'a continuation of years of neglect, lax oversight and corporate indifference to necessary safety inspection and repairs.'[197]

Less than a year later, July 8, 2013, a rupture in a diesel pipe led to a series of explosions and massive fire, requiring evacuations and shelter-in-place warnings of the surrounding community.[198] (Figures 78-79) In an interview by Dave Schwab, former mayor McLaughlin reflects:

> Since 2007, Richmond has approved a business tax increase and defeated a casino development scheme; opposed Immigration & Customs Enforcement raids in the city and created a municipal ID card to aid the undocumented; sought fair property taxation of Chevron and sued the giant oil company over the damage done by a huge refinery fire and explosion last year; and supported 'community policing' initiatives introduced by Richmond Police Chief Chris Magnus, which have helped reduce violence.[199]

Richmond is just one example, but a strong one, demonstrating the viability of a multi-party political system in the United States, in this case at a local scale. At the dawn of the twenty-first century in the United States we are experiencing a radical polarization of political parties, of the wealthy and the poor, the Evangelical and the non-Evangelical, the corporation and the worker, the scientist and the believer, the climate change activist and the climate

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[197] Amy Goodman, "Chevron to Pay $2 Million for 2012 Refinery Fire in Richmond, CA; 200 Arrested at Protest," Democracy Now!, accessed May 14, 2017, http://www.democracynow.org/2013/8/6/chevron_to_pay_2_million_for.

[198] "Fire at Chevron Refinery in Richmond - SFGate."

[199] Schwab, "Richmond – Green Party Watch."

change denier. In this increasingly binary and extremist paradigm, it can only be helpful to culturally locate additional options for contending with difficult issues. It would have been very easy for the city of Richmond to allow itself to be bought and kept quiet, yet they have endured in their steadfast refusal to be bullied by their giant noxious corporate neighbor. They have created a wedge of agency for their working class citizens, and defended the environment in which they live.

It is the unenviable task of museums to navigate these complicated waters with their wide spectrum of visitors in an attempt to communicate scientifically sound environmental information without alienating any particular demographic group. The Pew Research Center (PRC) has conducted a great deal of survey research regarding science knowledge, politics, and religious views, information which is useful for museums to consider when planning programming. This research is very broadly construed and purely quantitative. However, it does provide some useful starting points. For example, (Figure 80), one might think that "being grateful for what you have" would correlate closely with "working to protect the environment," but it does not at all—gratitude ranks at 71% important, while tending the environment ranks a low 22%. Knowing this allows museums to rethink how to present information about environmental protection from a perspective of cherishing God's gifts, given a Christian audience.

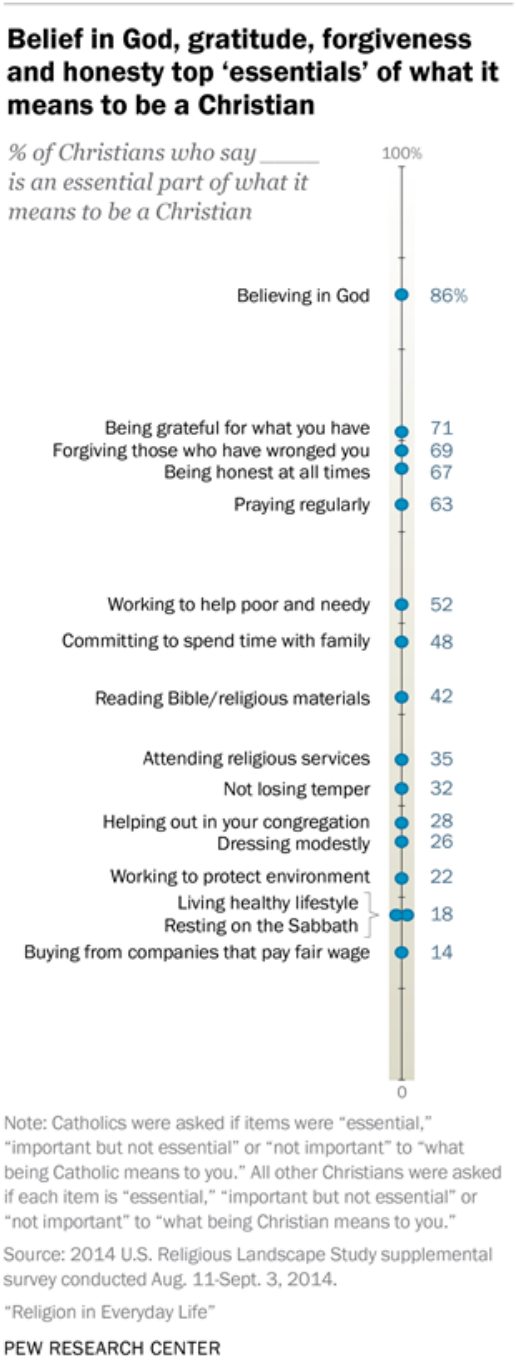

Figure 80. Belief in God 86%, Working to protect the environment, 22%.[200]
IMAGE COURTESY: PEW RESEARCH CENTER

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[200] 1615 L. Street et al., "Religion in Everyday Life," *Pew Research Center's Religion & Public Life Project* (blog), April 12, 2016, http://www.pewforum.org/2016/04/12/religion-in-everyday-life/.



Figure 81. Science: Becoming the Messenger 2012
IMAGE COURTESY: NATIONAL SCIENCE FOUNDATION EPSCOR/PHOTO J WOODCOCK-MH

The National Science Foundation-EPSCoR presented a series of workshops, "Science: Becoming the Messenger,"[201] (Figure 81) in which they addressed the disconnect between scientists, the public, politicians, and the media. Their observation was that scientists tend to present data with the assumption that it speaks for itself, but that they are essentially speaking a

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[201] "Science: Becoming the Messenger | NSF - National Science Foundation," accessed September 6, 2016, http://www.nsf.gov/events/event_summ.jsp?cntn_id=123444&.

foreign language as far as the general public is concerned. They offered many useful tools, but perhaps primary among them was the importance of knowing your audience and providing contextualization that would permit the audience to make an emotional and personal connection to your topic. This requires the scientist, or the museum, to ascertain what is of value to their audience, then identify how their research intersects with that value, and present that node in clear English, preferably without too many brain-numbing charts.

This is not as straightforward as it might seem. One might reasonably presume a good working basic scientific knowledge among American high school graduates, given decades of federally-mandated education standards. The PRC conducted a study regarding science knowledge. In this case, they compared level of science knowledge and perceptions regarding climate disruption harm between Democrats and Republicans:

> Democrats with high levels of knowledge about science, based on a nine-item index, almost all agree that climate change is mostly due to human activity (93%). By contrast, 49% of Democrats with low science knowledge think this is the case. But among Republicans, there are no significant differences by science knowledge about the causes of climate change. Put another way, Republicans with high levels of science knowledge are no more likely than those with lower levels of knowledge to think climate change is mostly due to human activity.[202]

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[202] Cary Funk23 comments, "How Much Does Science Knowledge Influence People's Views on Climate Change and Energy Issues?," *Pew Research Center* (blog), March 22, 2017, http://www.pewresearch.org/fact-tank/2017/03/22/how-much-does-science-knowledge-influence-peoples-views-on-climate-change-and-energy-issues/.

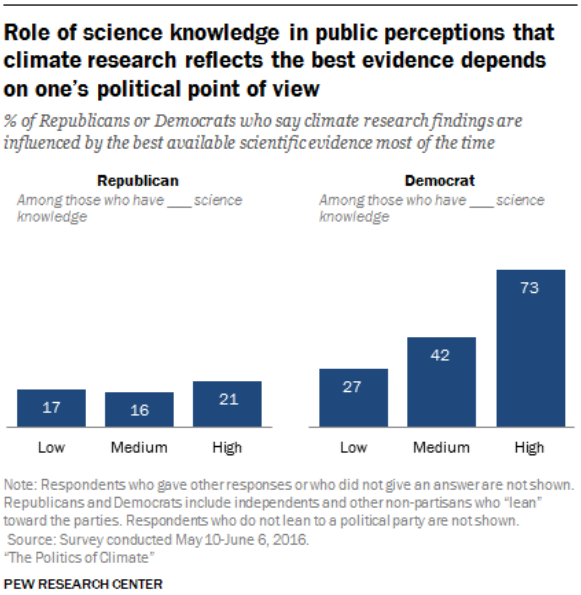

Figure 82. Climate change: Political[203]
IMAGE COURTESY: PEW RESEARCH CENTER

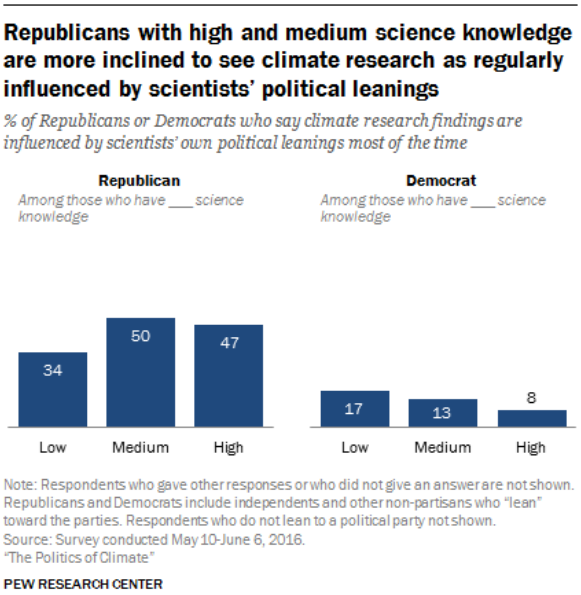

Figure 83. Climate change: Partisan[204]
IMAGE COURTESY: PEW RESEARCH CENTER

Their embedded chart is startling; we find that two individuals, both with an adequate science knowledge, may develop very different conclusions based on political ideology. It would seem that oceanographic data regarding sea level rise would be a politically neutral subject, but it is not—one individual would regard it as anthropogenically caused, the other would assign a natural cause. (Figures 82-84) This suggests that museums must find ways of repositioning information and ideas for the public such that they are not summarily dismissed without consideration. A challenge, indeed.

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[203] comments.
[204] comments.

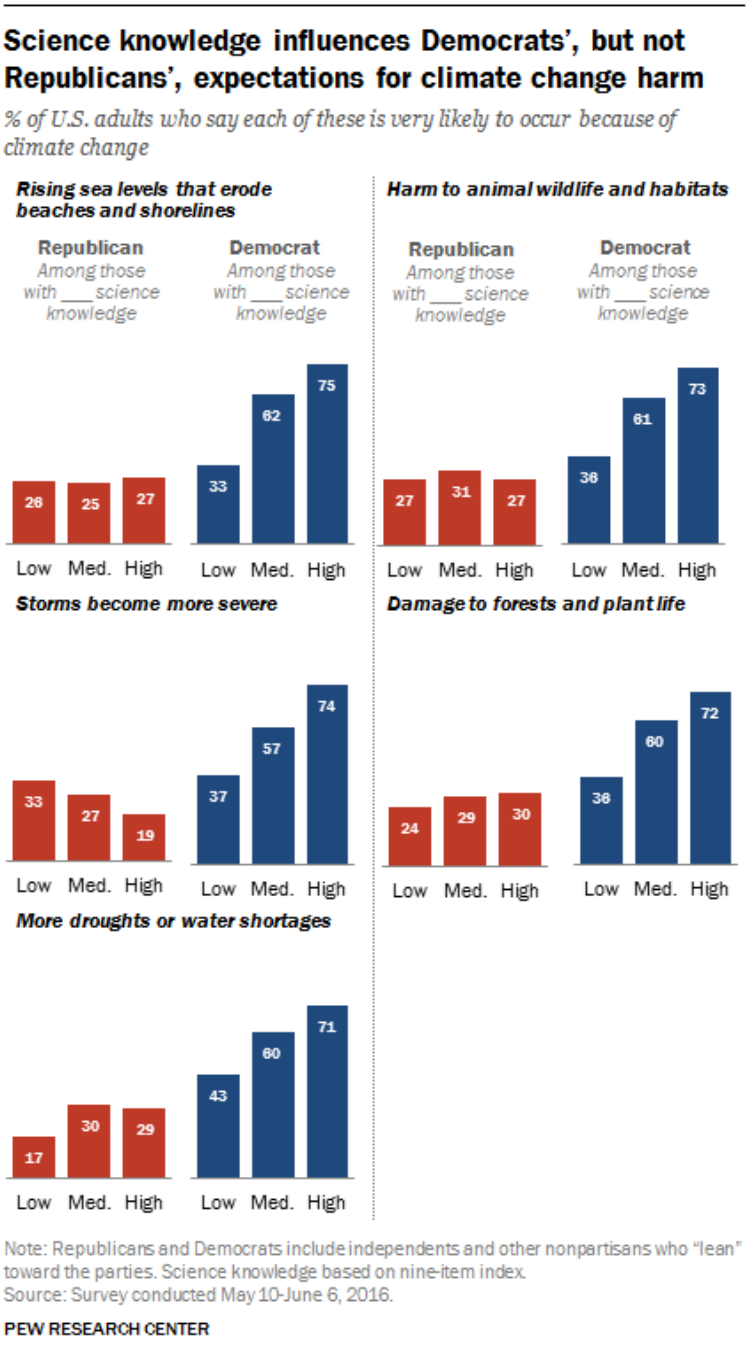

Figure 84. Partisan science knowledge.
IMAGE COURTESY: PEW RESEARCH CENTER

Darren Sherkat, professor of Sociology at Southern Illinois University Carbondale observes:

> Science is a field of culture consisting of mutually sustaining resources and schemas Given this, cultural institutions such as religion will have a potential impact on the development of schemata regarding science, and on cognitive resources pertaining to scientific processes, methods, and knowledge. Indeed, scientific institutions frequently confront challenges from religiously inspired movements like 'creationism' and 'intelligent design' that seek recognition from and influence over scientific resources. Catholic aversion to science is less strident when compared to sectarian and fundamentalist Protestants . . . is agnostic regarding Darwinian evolution, and many devout Catholics find no incompatibility between evolutionary biology and their faith commitments (Deckman, 2002).[205]

Sherkat further notes,

> Religious opposition to . . . climate change research, and even the implication of plate tectonics raises questions about the impact of religious movements on civic scientific literacy in the United States . . . . Climate sciences have also been attacked by sectarian and fundamentalist Christians, and a push to amplify the importance of addressing global warming led to the ouster of a senior staff member of the National Association of Evangelicals. Indeed, the late Reverend Jerry Falwell sermonized about the 'Myth of Global Warming,' opining, 'I am today raising a flag of opposition to this alarmism about global warming, and urging all believers to refuse to be duped by these 'earth worshippers'' . . . . Conservative Catholic Louisiana Governor Bobby Jindal lobbied against funding for volcano monitoring in his rebuttal to President Obama's State of the Union address in 2009, and sectarian Protestant televangelist Pat Robertson argued that the 2010 Haitian earthquake was caused by a pact with Satan. Overall, there is considerable reason to implicate religious factors as potentially important sources of scientific illiteracy in the United States.[206]

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[205] Darren E. Sherkat, "Religion and Scientific Literacy in the United States," *Social Science Quarterly* 92, no. 5 (December 1, 2011): 1134–50, https://doi.org/10.1111/j.1540-6237.2011.00811.x. P. 1136

[206] Sherkat. P. 1137

It is important to note that the increasing rift between the Evangelical right, and Christian faiths such as the Episcopalian or Unitarian churches is not monolithic, and that a significant number of religious organizations have been working diligently on behalf of the environment for a long time. For example, GreenFaith Interfaith Partners for the Environment was started on a local scale in New Jersey in 1992, and now is a national organization with nine programs, and a wide array of affiliated religious groups, including Christian, Jewish, Islamic and Buddhist congregations. They joined the Water Protectors at Standing Rock, they have delivered an interfaith statement to the United Nations; they are environmental activists.[207] Interfaith Power and Light was founded in San Francisco in 1998 as an Episcopal coalition to purchase renewable energy,[208] and is currently an interfaith organization working on renewable energy programs in all fifty states, and 18,000 congregations. Operation Noah, "Faith-motivated. Science-informed. Hope-inspired,"[209] was formed in London in 2004, and primarily works internationally on divestment campaigns, and reaching out to churches that are not eco-aware.

Outstanding and unexpected is the environmental activism of Pope Francis. Elected by the papal enclave on March 13, 2013, at the age of 76, Jorge Mario Bergoglio chose the papal name Francis, honoring Francis of Assisi.

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[207] "Mission and Areas of Focus — GreenFaith," accessed May 14, 2017, http://www.greenfaith.org/about/mission-and-areas-of-focus.

[208] "Mission & History," Interfaith Power & Light, accessed May 14, 2017, http://www.interfaithpowerandlight.org/about/mission-history/.

[209] "Operation Noah | A Christian Response to Climate Change," accessed May 14, 2017, http://operationnoah.org/.

His election was noteworthy in that he is the first Jesuit pope, the first pope from the Americas, the first pope from the Southern hemisphere, and the first non-European pope in almost 1,300 years. His outsider singularity has been especially marked given his dogged focus on climate change. A year and a half after taking office, Pope Francis published his 246-point, 176-page encyclical, *Laudato Si: On Care for Our Common Home*,[210] reaching 1.2 billion Roman Catholics.[211] His detailed encyclical carries a powerful message of personal responsibility for environmental stewardship in response to climate change and fostering community, as he discusses in point 232:

> 232. Not everyone is called to engage directly in political life. Society is also enriched by a countless array of organizations which work to promote the common good and to defend the environment, whether natural or urban. Some, for example, show concern for a public place (a building, a fountain, an abandoned monument, a landscape, a square), and strive to protect, restore, improve or beautify it as something belonging to everyone. Around these community actions, relationships develop or are recovered and a new social fabric emerges. Thus, a community can break out of the indifference induced by consumerism. These actions cultivate a shared identity, with a story which can be remembered and handed on. In this way, the world, and the quality of life of the poorest, are cared for, with a sense of solidarity which is at the same time aware that we live in a common home which God has entrusted to us. These community actions, when they express self-giving love, can also become intense spiritual experiences.[212]

Pope Francis' confrere, His Holiness the Fourteenth Dalai Lama, Nobel

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[210] Pope Francis, "Laudato Si' (24 May 2015) | Francis," May 24, 2015, http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html.

[211] "How Many Roman Catholics Are There in the World? - BBC News," accessed May 14, 2017, http://www.bbc.com/news/world-21443313.

[212] Pope Francis, "Laudato Si' (24 May 2015) | Francis." Point 232.

Laureate and spiritual leader of approximately 488 million Buddhists across the globe,[213] is equally outspoken about the necessity for individuals to take action on climate disruption. Addressing an audience of 1,100 at the Global Environmental Forum for the Next Generation, on April 6, 2015, the Dalai Lama observed,

> The need to take care of nature and the environment is urgent. It's a matter of human survival because this planet is our only home . . . . If we compare changes in the climate and damage to the environment to war and violence, we can see that violence has an immediate impact on us. The trouble is that damage to the environment takes place more stealthily so we don't see it until it is often too late. Trying to restore it at that point is very difficult . . . . One of the important aspects of caring for the environment is taking a sufficiently broad view. A few years ago the results of a summit in Copenhagen were disappointing because too many participants put national interest ahead of the world's interest. They overlooked the obvious fact that if the world is doing well, we all do well… Instead of wasting millions of dollars of weapons we dare never use, the money should be put to more positive ends. And it's no use waiting for our leaders to take action, we the people have to take action to show our disapproval of these instruments of war and violence. This is in our interest, because invariably when things go wrong it's ordinary people who suffer.[214]

In a June 25, 2018, teleconference, the Dalai Lama identifies an underlying cause of climate change to be tied to education:

> Now the concern is the existing modern education. It is very much oriented towards material value. Therefore the generation who

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[213] Pew Research Center, "THE GLOBAL RELIGIOUS LANDSCAPE: Buddhists," Demographic Study (Pew Research Center, n.d.), http://www.pewforum.org/2012/12/18/global-religious-landscape-buddhist/.

[214] Dalai Lama, His Holiness the 14th Dalai Lama of Tibet: News, *Attending the Global Environmental Forum for the Next Generation* (blog), April 6, 2015, https://www.dalailama.com/news/2015/attending-the-global-environmental-forum-for-the-next-generation.

> receives that kind of education eventually goes on to create a materialist life and materialistic culture. When they are faced with mental level problems, they are helpless. My number one commitment is promotion of a sense of oneness of seven billion human beings. Many problems which we are facing are our own creation. The real source of the problem is self-centeredness and divisive attitude.[215]

There are even a few small but beleaguered groups of Evangelicals doing their very best to address what they refer to as *creation care*. The Evangelical Climate Initiative was founded in 2006, with eighty-five senior evangelical leaders, emerging from the 2004 Sandy Cove Covenant. They issued "Climate Change: An Evangelical Call to Action,"[216] as well as developing a detailed web site with a lengthy FAQs page with questions and answers such as:

> Does the Bible have anything to say about taking action to help solve global warming?
>
> Yes. Once we understand the profound impacts climate change will have on people, especially the most vulnerable, then we find plenty in the Bible calling us to take prompt action. Jesus' commands to love our neighbors (Mk. 12:30-31), do unto others as we would have them do unto us (Lk. 6:31), care for 'the least of these' (Mt. 25:40, 45), and be proper stewards of His creation (Lk. 12:42-48; Col. 1:16) all require immediate and sustained action to solve global warming.[217]

Unfortunately, groups such as these have been roundly attacked by the Evangelical right, aggressively personified by Calvin Beisner of the Cornwall

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[215] Tenzin Saldon, "I Am Looking Forward to Another 15, 20 Years Says His Holiness the Dalai Lama," *Central Tibetan Administration: Restoring Freedom for Tibetans* (blog), June 25, 2018, http://www.tibet.net/2018/06/i-am-looking-forward-to-another-15-20-years-says-his-holiness-the-dalai-lama/.

[216] "Christians And Climate | An Evangelical Call To Action," accessed May 14, 2017, http://www.christiansandclimate.org/.

[217] "FAQ - Christiansandclimate.Org | Christians And Climate," accessed May 14, 2017, http://www.christiansandclimate.org/faq/.

Alliance "for the Stewardship of Creation," a group dedicated to promoting free-market materialist capitalism and denying anthropogenic climate change. They have issued a number of policy papers, such as "A Call to Truth, Prudence, and Protection of the Poor 2014: The Case against Harmful Climate Policies Gets Stronger"[218] This blatantly untruthful (or "alternate truth") paper begins:

> On June 2, 2014, the United States Environmental Protection Agency (EPA) proposed a new rule requiring a 30% reduction in carbon dioxide (CO_2) emissions from existing power plants by 2030. Compliance is estimated to cost about $50 billion per year, the loss of about $1,200 per year in income for the average family of four, and the loss of about 600,000 jobs. *Is that a good idea, or a bad one?*[219]

Brilliant *Green Jobs* activist Van Jones provides the answer in an October 2015 interview with GreenBiz correspondent Lauren Hepler:

> **Hepler: What about the green jobs side of the equation. How have you seen the employment market evolve in growing sectors like wind and solar?**
>
> **Jones:** There's only 80,000 coal miners in America. There's more than 100,000 people working in the wind industry and 100,000 working in solar, so we already have more jobs and faster job creation in clean energy than we have in dirty energy. And that's with the federal government having been missing in action for the past five or six years. We've got real promise there.[220]

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[218] Calvin Beisner, "A Call to Truth, Prudence, and Protection of the Poor 2014: The Case against Harmful Climate Policies Gets Stronger," accessed May 14, 2017, http://cornwallalliance.org/landmark-documents/a-call-to-truth-prudence-and-protection-of-the-poor-2014-the-case-against-harmful-climate-policies-gets-stronger/.

[219] Beisner. P.1

[220] Laura Hepler, "Van Jones on the Green Jobs Gap and What's Wrong with Resilience | GreenBiz," GreenBiz, October 19, 2015, https://www.greenbiz.com/article/van-jones-green-jobs-gap-and-whats-wrong-resilience.

In the intervening year and a half, this disparity has increased rapidly. The January 2017 U.S. Department of Energy's Energy and Jobs Report states:

> The electric generation mix in the United States is changing . . . According to the Energy Information Administration, electric generation technologies are expected to add over 26 GW of utility-scale capacity over 2016. The majority of these additions are coming from three main resources: solar (9.5 GW), natural gas (8 GW) and wind (6.8 GW). Together, these three sources make up 93 percent of total additions . . . net generation from coal sources declined by 53 percent between 2006 and September 2016, while electricity generation from natural gas increased by 33 percent and solar by over 5,000 percent from 508,000 MWh to just over 28,000,000 MWh . . . between September 2015 and September 2016 alone . . . estimated total solar—both utility-scale and distributed generation—increased by 52 percent across the country.[221]

The Environmental and Energy Study Institute reports that:

> According to the U.S. Department of Energy (DOE), renewable energy employment alone (excluding efficiency) grew by nearly 18 percent between Q2 2015 and Q1 2016. The agency reports that **3,384,834 Americans were directly employed by the clean energy industry** (which includes the energy efficiency, smart grid, and energy storage industries; electric power generation from renewables; renewable fuels production; and the electric, hybrid, and hydrogen-based vehicle industries) in Q1 2016. Among the leading U.S. employment sectors were energy-efficient appliances, buildings, solar, wind, and bioenergy. The International Renewable Energy Agency (IRENA) estimated there were **8,079,000 direct and indirect jobs in renewable energy worldwide**, with China, Brazil, the United States, and India among the leaders.
>
> By comparison, DOE estimated that **2,989,844 Americans were directly employed by the fossil fuel Industry** (which includes fuels and electric power generation from coal, natural gas, and petroleum; and the manufacturing of gasoline and diesel-powered vehicles and their component parts) in Q1 2016.[222]

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[221] "U.S. Energy and Employment Report" (U.S. Department of Energy, January 2017). P. 22-23

[222] "Fact Sheet: Jobs in Renewable Energy and Energy Efficiency (2017) | White Papers |

A most notable landmark is the recent shift in cost-per-watt between coal and renewable energy. Bloomberg New Energy Finance and the Business Council for Sustainable Energy produce the *Sustainable Energy in America Factbook*, in which they report for 2018 that renewable energy capacity contracted by corporations has risen from a mere .1 gigawatt in 2008, to 2.9 gigawatts in 2017, a meteoric rise in the use of clean energy, supported by the significantly lower price-per-watt of renewable energy compared to coal:

> New solar PV plants can now undercut new coal build on a levelized cost of energy (LCOE) basis in the U.S. The benchmark LCOE for a solar system with tracking was estimated at $54/MWh for 1H 2017, whereas coal came in at $66/MWh. Capex reductions drove a $17/MWh drop in the levelized cost estimate for solar with tracking since 2H 2016 . . . . New onshore wind projects constructed in areas with strong wind resources can achieve LCOEs as low as $33/MWh, beating out even cheap natural gas.[223]

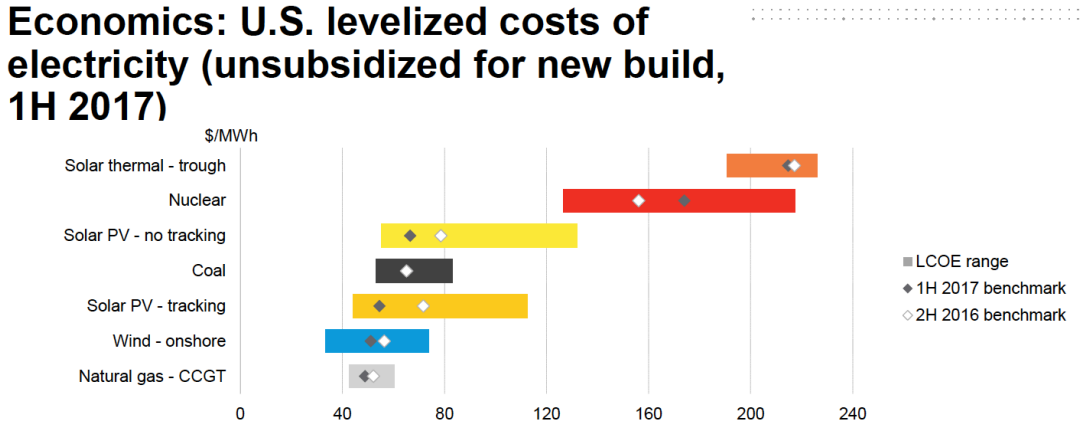

Figure 85. Economics: U.S. levelized costs of electricity.[224]
IMAGE COURTESY: BLOOMBERG NEW ENERGY FINANCE

EESI," accessed May 14, 2017, http://www.eesi.org/papers/view/fact-sheet-jobs-in-renewable-energy-and-energy-efficiency-2017.

[223] Rachel Luo, Colleen Regan, and Ethan Zindler, "2018 Sustainable Energy in America Factbook," Sustainable Energy in America Factbook (Business Council for Sustainable Energy / Bloomberg New Energy Finance, 2018).

[224] Luo, Regan, and Zindler. P. 41-43

The decline of coal-fired power plants brings us full-circle back to the Flintstones. Although we humans have never lived with dinosaurs, we have lived with fossil fuels every day of the Anthropocene, and it has become just as alarming as a scene from Jurassic Park. As Americans, we are ill-prepared to handle the challenges coming at us from climate disruption as well as from other anthropogenic problems, such as oceans full of plastic micro-beads. As the Pew Research Center uncovered, as a country, we are ill-educated in basic science, much less atmospheric science, and our perceptions of and reactions to climate disruption are highly politicized at a time when action, not rhetoric is what is required. (Figure 85)

In addition, a large portion of our American population regards the concept of anthropogenic climate disruption as either ludicrous, or an offense against God, or irrelevant, since they will be lifted away in the Rapture before consequences become too severe. Simultaneously, we are rapidly moving towards a renewable energy economy, primarily for economic reasons. Van Jones eloquently articulates taking a position of courage:

> The future is worth fighting for. The dreams of our forebears are worth defending. The aspirations of our children are worth protecting. And the American Dream itself is worth reinventing—and rebuilding. We have a duty to stand up to the dream-killers in our country. At stake is not just the American Dream, but the Dream that is America. Cowardice and capitulation before the foes of progress is not an option, nor has it ever been. The time has come for the next generation of deep patriots to step forward. We have another century to win.[225]

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[225] Van Jones, *Rebuild the Dream*, 1 edition (New York: Nation Books, 2012). P. 246

His rhetoric is not only inspiring, it is lived, and an ethical message that could be well aimed at museums tempted to step away from clarity in misguided if understandable attempts to protect funding from conservative philanthropists such as the Koch brothers. Despite the protestations of religious fundamentalists, solidly-founded science informs us that we are not merely facing but well into the earth's sixth mass extinction event. The earth has experienced five prior mass extinctions but this is the first induced by human behavior.

Museums' development staff, alarmed at the potential alienation of their conservative philanthropists, might be well-served to stop and consider the potentially catalytic combination of the diplomacy lessons learned from the NSF's 'Science: Becoming the Messenger' workshops, and from Ray Anderson's powerful eco-capitalist experience as a born-again environmental crusader. Anderson turned his corporation, Interface Carpets, from a major polluter into a visionary, financially successful industrial leader, driven by their "Mission Zero"—to completely eliminate any negative impact they may have on the environment by the year 2020.[226] Inspired by eco-economist Paul Hawken's manifesto, *The Ecology of Commerce*,[227] Anderson, in turn, inspired his Interface employee Glenn Thomas by his sustainable vision for their company

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[226] "Mission Zero | About | Interface," Interface FLOR, accessed March 29, 2018, http://www.interface.com/EU/en-GB/about/index/Mission-Zero-en_GB.

[227] *The Ecology of Commerce: A Declaration of Sustainability 1st Edition by Hawken, Paul (1993) Hardcover* (Harpercollins, 1993).

to write the poem "Tomorrow's Child," which Anderson often used to conclude his talks:

> **Tomorrow's Child**
> *Without a name; an unseen face*
> *and knowing not your time nor place*
> *Tomorrow's Child, though yet unborn,*
> *I met you first last Tuesday morn.*
>
> *A wise friend introduced us two,*
> *and through his sobering point of view*
> *I saw a day that you would see;*
> *a day for you, but not for me*
>
> *Knowing you has changed my thinking,*
> *for I never had an inkling*
> *That perhaps the things I do*
> *might someday, somehow, threaten you*
>
> *Tomorrow's Child, my daughter-son*
> *I'm afraid I've just begun*
> *To think of you and of your good,*
> *Though always having known I should.*
>
> *Begin I will to weigh the cost*
> *of what I squander; what is lost*
> *If ever I forget that you*
> *will someday come to live here too.*[228]

This succinct poem also serves as an eloquent reminder to museums of their ethical mission—not to cower before the Koch brothers, but to keep in mind tomorrow's children, and go court the philanthropic Andersons and DiCaprios of this world who are willing to fund visionary endeavors. Funded, and using the bridging/common ground ideas presented by NSF in the Messenger workshops,

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[228] Peter Vidani, "RIP Ray Anderson: Tomorrow's Child," Thought You Should See This, accessed March 29, 2018, http://www.thoughtyoushouldseethis.com/post/8787536187/rip-ray-anderson-tomorrows-child.

it seems quite feasible to create programming about climate disruption that, finding common ground and purpose, neither offends nor prevaricates.

Global Mass Extinction Events: 1-5

The first mass extinction, the Ordovician-Silurian, was approximately 444-439 million years ago; approximately 86% of species went extinct. The earth experienced a short ice age, resulting in glaciation and falling sea levels. The cause is debated, theories include the formation of the Appalachian range causing falling sea levels, and glaciation induced by mass amounts of vegetation extracting CO_2 from the atmosphere, causing global cooling.[229]

The second mass extinction occurred in the Late Devonian, 375-364 million years ago, when 75% of species on earth went extinct, perhaps related to the evolution of land plants releasing nutrients into the oceans, resulting in oxygen depleting algal blooms, amplified by volcanic activity which reduced global temperatures.[230]

The third mass extinction, the Permian-Triassic, 251 million years ago, and is colloquially referred to as "the great dying," as 96% of life on earth perished. This extinction event resulted from a synergistic effect: a massive

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[229] Peter M. Sheehan, "The Late Ordovician Mass Extinction," *Annual Review of Earth and Planetary Sciences* 29, no. 1 (2001): 331–64; Phil Berardelli, "The Mountains That Froze the World," *Science*, November 3, 2009, http://www.sciencemag.org/news/2009/11/mountains-froze-world.

[230] James Castle and John Rodgers, "Hypothesis for the Role of Toxin-Producing Algae in Phanerozoic Mass Extinctions Based on Evidence from the Geologic Record and Modern Environments," *Environmental Geosciences* 16, no. 1 (March 2009): 1–23.

volcanic eruption released a huge amount of CO_2 into the atmosphere, triggering methanogenic bacteria to produce large amounts of greenhouse gas—methane—resulting in global warming, and ocean acidification which resulted in the production of toxic hydrogen sulfide. In short, only 4% of earth species could withstand this level of climate disruption and the ensuing consequences.[231]

The fourth mass extinction, the Triassic-Jurassic, occurred approximately 214-199 million years ago, with a loss of 80% of earth's species. The cause of this extinction event is attributed to asteroid impact, volcanic activity, and resulting climate disruption.[232]

The causes of the fifth mass extinction on earth, the Cretaceous-Tertiary, are also attributed to asteroid impact, volcanic activity, and resulting climate disruption; the result was the loss of 76% of the species on earth. A large comet or asteroid hit the earth 66 million years ago, probably in the Yucatan Peninsula, leaving a 110-mile-wide crater named Chicxulub which has been dated to that time. This impact is thought to have cast an immense amount of debris into the atmosphere, blocking the sun and initiating the extinction event. The second cause, an enormous volcanic event in India, the Deccan Traps, also dated to 66 million years ago, covered approximately a

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[231] Gerta Keller, "Exploring the Causes of Mass Extinction Events," *EOS*, MEETING, 94, no. 22 (May 28, 2013): 200; "The Great Dying | Science Mission Directorate," NASA Science Beta, January 28, 2002, https://science.nasa.gov/science-news/science-at-nasa/2002/28jan_extinction.

[232] Keller, "Exploring the Causes of Mass Extinction Events."

million square miles in lava flows and cast an enormous load of debris and greenhouse gasses into the atmosphere, blocking sunlight and escalating the mass extinction event. One of the particularly interesting facts regarding this fifth mass extinction is that it was quite spotty—dinosaurs went extinct, but crocodiles did not. Tiny dinosaurs died off, but small mammals persisted. Some species of plants succumbed to the challenge of photosynthesis, others survived. However, what is indisputable is that humans were not involved.[233]

The Pleistocene Epoch lasted from approximately 2.6 million years ago to approximately 11,700 years ago, ending with earth's last ice age, (Figures 86-87) and is not counted as a mass extinction, although most mammals over 100 pounds went extinct. Thick glacial ice sheets covered most of the Northern continental landmasses, growing and retreating with natural climate change cycles. Although humans have never lived with dinosaurs, during the Pleistocene we did live with the magnificent charismatic megafauna that thrived on virtually every continent and available island. Africa was only mildly affected by the Pleistocene extinction, compared to the rest of the world, suffering only a sixteen percent extinction of charismatic megafauna—buffered from climate variances during the Pleistocene by its equatorial geography.

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[233] Kevin Pope, Steven D'Hondt, and Charles Marshall, "Meteorite Impact and the Mass Extinction of Species at the Cretaceous/Tertiary Boundary," *Proceedings of the National Academy of Sciences* 95, no. 19 (September 15, 1998): 11028–29, https://doi.org/10.1073/pnas.95.19.11028; G. Keller et al., "Deccan Volcanism Linked to the Cretaceous-Tertiary Boundary Mass Extinction: New Evidence from ONGC Wells in the Krishna-Godavari Basin," *Journal of the Geological Society of India* 78, no. 5 (November 1, 2011): 399–428, https://doi.org/10.1007/s12594-011-0107-3.

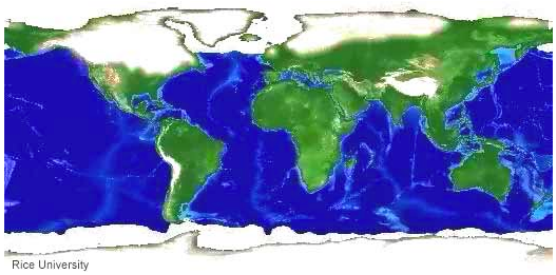

Figure 86. Pleistocene glacial maximum, circa 18,000 BP[234]
IMAGE COURTESY: UNITED STATES GEOLOGICAL SURVEY

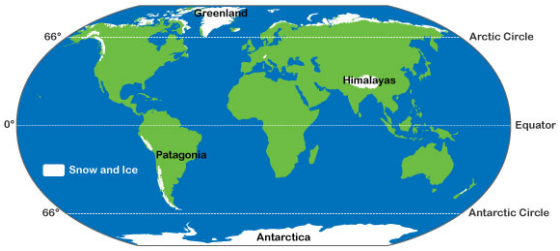

Figure 87. Current glaciation and ice pack[235]
IMAGE COURTESY: BRITISH GEOLOGICAL SURVEY

In Africa there have remained into the Holocene many species of charismatic megafauna such as elephant, rhinoceros and giraffe, although many are on the brink of anthropogenic extinction today.

However, Australia suffered a seventy-one percent extinction loss and South America an eighty-two percent extinction loss; both continents minimally subject to glaciation, but in warmer latitudes, subject to equally devastating drought.[236] Examples of North American continental Pleistocene megafauna, extinct today, include *Smilodon gracilis, S. fatalis and S. populator*—the sabertooth cat, and *Arctodus simus*—the fearsome short-faced bear, especially common in California. These animals became extinct during the Quaternary

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[234] "Ice and Glaciers -The Water Cycle-USGS Water-Science School," accessed July 1, 2018, https://water.usgs.gov/edu/watercycleice.html.

[235] "Ice and Our Landscape | Geology of Britain | British Geological Survey (BGS)," accessed July 1, 2018, http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/iceAge/home.html.

[236] Anthony D. Barnosky et al., "Assessing the Causes of Late Pleistocene Extinctions on the Continents," *Science* 306, no. 5693 (October 1, 2004): 70–75, https://doi.org/10.1126/science.1101476; H.M. Monroe, "Pleistocene Ice Age," Australia: The Land Where Time Began: A biography of the Australian continent, March 27, 2011, http://austhrutime.com/pleistocene_ice_age.htm.

extinction event approximately ten to eleven thousand years ago; the causes for this extinction continue to be fiercely debated, the main hypotheses being a response to natural climate disruption [237] and human predation. [238] A challenging aspect of the climate change hypothesis is that for the most part, the megafauna in question survived the glacial maximum of 18,000 BP, only to go extinct about seven thousand years later, in milder conditions; however, megafauna optimized for glacial conditions could fail to adapt to warmer conditions.

It does seem possible that both could be contributing factors, as humans pursued prey species across shifting territories as glaciation receded and previously uninhabitable regions became accessible.[239] It is well worth noting that *Homo neanderthalensis* thrived across Europe and Western Asia from approximately 350,000BP until about 40,000BP, disappearing just five thousand years after *Homo sapiens* migrated from Africa to Europe into Neandertal homelands. (Figures 88-89) Although popularly depicted as comically dim-witted and hunch-backed, this error originated with the 1857 type specimen found in Germany's Neander Valley—the individual was geriatric and suffered

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[237] Adrian M. Lister and Anthony J. Stuart, "The Impact of Climate Change on Large Mammal Distribution and Extinction: Evidence from the Last Glacial/Interglacial Transition," *Comptes Rendus Geoscience*, Ecosystèmes et événements climatiques extremes Ecosystems and extreme climatic events, 340, no. 9–10 (September 2008): 615–20, https://doi.org/10.1016/j.crte.2008.04.001.

[238] Christopher Sandom et al., "Global Late Quaternary Megafauna Extinctions Linked to Humans, Not Climate Change," *Proc. R. Soc. B* 281, no. 1787 (July 22, 2014): 20133254, https://doi.org/10.1098/rspb.2013.3254.

[239] Richard Gillespie, "Updating Martin's Global Extinction Model," *Quaternary Science Reviews* 27, no. 27–28 (December 2008): 2522–29.

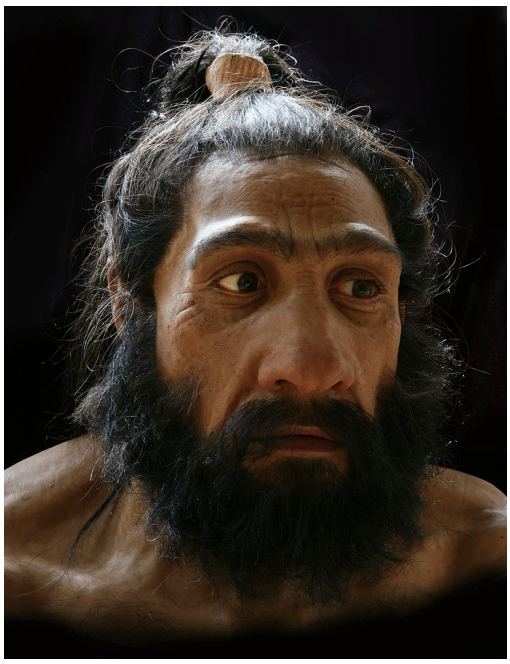

Figure 88. Reconstruction of Neandertal man from Shanidar.[240]
PHOTO COURTESY: UNIVERSITY COLLEGE LONDON

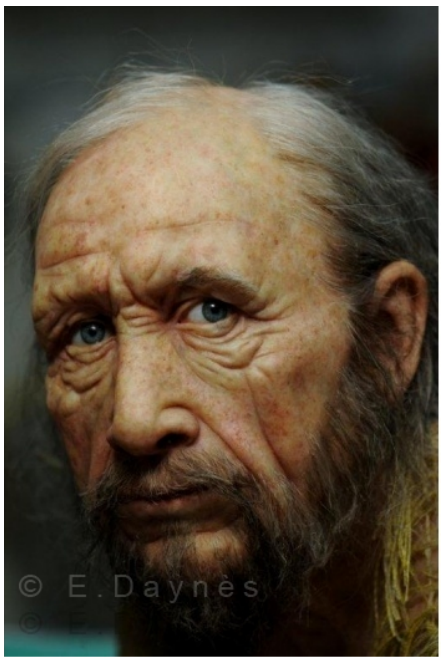

Figure 89. Reconstruction of Homo Sapiens man from Chancelade[241]
PHOTO COURTESY: ELISABETH DAYNÈS

from arthritis.[242] Neandertals were evolutionarily optimized for very cold conditions, stocky of build, with porous, insulating facial sinus bones, large noses to filter cold air, cultural adaptations specific to hunting big game, brains proportionally larger than *Homo sapiens*, although arranged somewhat differently, apparently less migratory than *Homo sapiens*, and had a proportionately longer Achilles tendon and heel, theoretically making them

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[240] Charlotte Houldcroft and Simon Underdown, "Neanderthal Genomics Suggests a Pleistocene Time Frame for the First Epidemiologic Transition," Human Evolution @ University College London, April 11, 2016, http://www.ucl.ac.uk/human-evolution/news/Neanderthal-genomics-april-2016.

[241] Elisabeth Daynes, "DAYNES," Atelier Daynès: Cro Magnon Chancelade, 2012, http://www.daynes.com/en/hominids-reconstructions/homo-sapiens-chancelade-33.html.

[242] Fran Dorey, "Homo Neanderthalensis – The Neanderthals - Australian Museum," October 30, 2015, https://australianmuseum.net.au/homo-neanderthalensis.

slower runners than *Homo sapiens* individuals.[243]

Neandertals thrived for about three hundred thousand years, apparently coexisting with other hominin species[244] until crossing paths with the apex predator, *Homo sapiens*. Although Neandertals were culturally complex, it would appear that Homo sapiens were quicker to culturally adapt to changing circumstances. Although Neandertal and Denisovan DNA appear in modern humans, their species, as such have disappeared from the landscape of modern

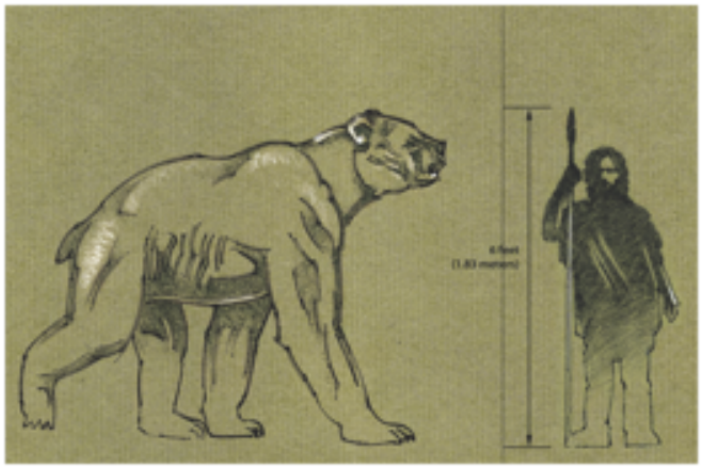

Figure 90. Arctodus compared to Pleistocene human.[245]
IMAGE COURTESY: SAN DIEGO ZOO

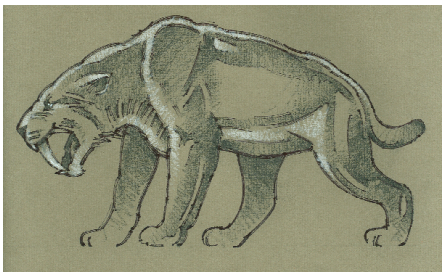

Figure 91. Smilodon, formidable.[246]
IMAGE COURTESY: SAN DIEGO ZOO

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[243] "Homo Neanderthalensis," The Smithsonian Institution's Human Origins Program, January 3, 2017, http://humanorigins.si.edu/evidence/human-fossils/species/homo-neanderthalensis; "Homo Neanderthalensis Essay | Becoming Human," Institute of Human Origins, 2008, http://www.becominghuman.org/node/homo-neanderthalensis-essay; Dorey, "Homo Neanderthalensis – The Neanderthals - Australian Museum."

[244] Sriram Sankararaman et al., "The Combined Landscape of Denisovan and Neanderthal Ancestry in Present-Day Humans," *Current Biology* 26, no. 9 (May 9, 2016): 1241–47, https://doi-org.proxybz.lib.montana.edu:3443/10.1016/j.cub.2016.03.037 |.

[245] "Short-Faced Bear Fact Sheet," accessed March 3, 2017, http://library.sandiegozoo.org/factsheets/_extinct/shortfaced_bear/bear_shortfaced.htm.

[246] "Smilodon," accessed March 3, 2017, http://library.sandiegozoo.org/factsheets/extinct_smilodon/smilodon_factsheet_new.html.

earth. The archaeological record does not provide us with a clear picture of the interactions between these populations, but given the *Homo sapiens* predilection for tactical hunting from earliest times, it seems plausible that they may have not only eliminated their hominin rivals in an early feat of settler colonialism, but engaged in over-kill of the resident megafauna as well.



Figure 92. Hunting mammoth in the Siberian Arctic 45,000 years ago.[247]
IMAGE COURTESY: NATURE / 176 OCEAN/CORBIS

The over-kill hypothesis has been advocated especially strongly in North America, where archaeologists have posited human hunting as the key reason for mammoth and mastodon extinction 10,000 years ago, citing the coincidence

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[247] Ann Gibbons Jan 14, 2016, and 2:00 Pm, "Grisly Find Suggests Humans Inhabited Arctic 45,000 Years Ago," Science | AAAS, January 14, 2016, http://www.sciencemag.org/news/2016/01/grisly-find-suggests-humans-inhabited-arctic-45000-years-ago.

of the arrival of the Clovis peoples with the disappearance of megafauna, and the elephantids in particular.[248] (Figures 90-92) This entire debate, especially in North America, is highly contentious. Archaeologists argue both for and against the human over-kill extinction hypothesis,[249] and, complicating this academic discussion is the fact that archaeologists really have no solid idea of when humans reached the Americas. It used to be thought by archaeologists that people reached the Americas via the Bering Strait about 11,000 years ago. Then it was pointed out that since it was ice pack, maybe there wasn't much of anything to eat, and people migrated along the coastal margins where there would have been abundant food, [250] a hypothesis supported both by archaeology and mitochondrial population genomics.[251] Although the Bering land bridge was available for migration only sporadically, due to the ebb and flow of glaciation episodes, the coasts remained a constantly available route.

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[248] Barnosky et al., "Assessing the Causes of Late Pleistocene Extinctions on the Continents." Marcel Cardillo et al., "Multiple Causes of High Extinction Risk in Large Mammal Species," *Science* 309, no. 5738 (August 19, 2005): 1239–41, https://doi.org/10.1126/science.1116030. Todd A. Surovell et al., "On the Dating of the Folsom Complex and Its Correlation with the Younger Dryas, the End of Clovis, and Megafaunal Extinction," *PaleoAmerica* 2, no. 2 (April 2, 2016): 81–89, https://doi.org/10.1080/20555563.2016.1174559. Cynthia L. Herhahn and Ann F. Ramenofsky, *Exploring Cause and Explanation: Historical Ecology, Demography, and Movement in the American Southwest* (University Press of Colorado, 2016). P. 29.

[249] Christopher Sandom et al., "Global Late Quaternary Megafauna Extinctions Linked to Humans, Not Climate Change," *Proceedings of the Royal Society B: Biological Sciences* 281, no. 1787 (July 22, 2014), https://doi.org/10.1098/rspb.2013.3254.

[250] Bruce Bradley and Dennis Stanford, "The North Atlantic Ice-Edge Corridor: A Possible Palaeolithic Route to the New World," *World Archaeology* 36, no. 4 (December 1, 2004): 459–78, https://doi.org/10.1080/0043824042000303656.

[251] Nelson J. R. Fagundes et al., "Mitochondrial Population Genomics Supports a Single Pre-Clovis Origin with a Coastal Route for the Peopling of the Americas," *The American Journal of Human Genetics* 82, no. 3 (March 3, 2008): 583–92, https://doi.org/10.1016/j.ajhg.2007.11.013.

There are other Western hypotheses as well regarding the population of the Americas. Although discredited by sentient humans today, Erich Von Daniken achieved a brief notoriety with his hypothesis that it was actually extraterrestrial aliens, who had the sophistication to build the Mayan pyramids and lay out the Nazca lines,

> High up in the Bolivian Andes—4,000 meters above sea level—lies Puma punku, an ancient ruined city that *simply could never have been constructed by its Stone Age inhabitants.* 'Something here really stinks to high heaven.'[252]

What offends is von Daniken's scathing dismissal of the abilities of the sophisticated pre-contact cultures of the Americas. As but one example, a thousand years ago the Inca developed a very successful trepanation process, that is, brain surgery, with a ninety percent survival rate; it is speculated that they were treating battle injuries.[253] The Europeans would only develop equivalent surgical techniques a millennium later after they tired of leeches, mercury treatments and other less than salutary medical procedures.

Another contender in the population paradigm hypotheses is Thor Heyerdahl, an independent Norwegian scholar and adventurer who set out to demonstrate that people did not need to walk to the Americas, nor did they arrive from outer space, but that this migration could have been by ocean, and

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[252] Erich von Daniken, *Twilight of the Gods: The Mayan Calendar and the Return of the Extraterrestrials*, trans. Nicholas Quaintmere, 1 edition (Pompton Plains, NJ: New Page Books, 2010).

[253] Valerie A. Andrushko and John W. Verano, "Prehistoric Trepanation in the Cuzco Region of Peru: A View into an Ancient Andean Practice," *American Journal of Physical Anthropology* 137, no. 1 (September 2008): 4–13, https://doi.org/10.1002/ajpa.20836.

it could have been from west to east. He and his team built and sailed the pre-contact design balsa raft, Kon-Tiki, from Lima, Peru across the Pacific to Tuamotu, Polynesia in 1947. Their boat design based on ethnographic information, archaeological evidence, and Spanish historical reports. He and his team then built the papyrus boats Ra, the Ra-II, and the Tigris, sailing from North Africa to the Caribbean after a failed sailing with the Ra.[254] Although Heyerdahl was dismissed by academics at the time as not of the Ivory Tower, and thus an inconsequential dilettante, recent DNA work has supported his hypotheses.[255] It is not surprising that Heyerdahl would find plausible the postulation of sailing as a viable mode of navigating the world—after all, his forebears, the Vikings, proved that it was easily done using the same observational techniques that Pacific Islanders use to this day.[256] Heyerdahl's 800-page tome, *American Indians in the Pacific: The Scientific Theory behind the Kon-Tiki Expedition*,[257] is his academic contribution to the idea that the Polynesian Islands were populated from the Americas, not from Asia, as postulated by Western archaeologists. One cannot help but point out that his Viking ancestors were sailing over the Arctic seas in the 12th century, hunting

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[254] "The Kon-Tiki Museum," accessed April 9, 2017, http://www.kon-tiki.no/.

[255] "New Findings Show More Contact between Prehistoric Humans," The Independent, October 23, 2014, http://www.independent.co.uk/news/science/archaeology/new-discoveries-show-more-contact-between-far-flung-prehistoric-humans-than-had-been-thought-9814377.html.

[256] "How Vikings Navigated the World," sciencenordic.com, accessed April 9, 2017, http://sciencenordic.com/how-vikings-navigated-world.

[257] Thor Heyerdahl, *American Indians in the Pacific: The Theory behind the Kon-Tiki Expedition*, First edition (George Allen & Unwin Ltd., 1952).

narwhals and selling the horns to gullible Europeans as unicorn horns.[258] It is not a far stretch to understand the difficulty of European or Western scholars in understanding the viability of sea travel, since they came to it culturally much later—during the 15th and 16th centuries and their colonial conquests. Unicorns, Vikings and narwhals aside, Heyerdahl is still regarded as a controversial scholar; he is critiqued for being overly-invested in the concept of cultural diffusion and not considering convergent cultural evolution.[259] More importantly, he is critiqued for the racist underpinnings of his theories, his belief that it was light-skinned, fair haired Indians, the Viracocha people of Peru, who travelled to civilize the resident Polynesians.[260] From an Indigenous perspective, these eugenical ideas seriously taint his research.

It would seem reasonable to interrogate the Indigenous peoples of the Americas regarding their origins—and one finds over and over that Indigenous oral history tells us "we have always been here." Over the last fifty years or so, North American archaeologists have adhered to *proven* earliest dates of habitation of the Americas dismissing outlier dates as nonsensical; adhering first to the Bering Straits migration theory, then on to the more logical coastal margins theory of Clovis migration proposed by Stanford and Bradley. There is scientific data such as radiocarbon dating and DNA evidence to support some

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[258] "Arctic Studies Center - Research," accessed April 9, 2017, https://naturalhistory.si.edu/arctic/html/narwhal.htm.

[259] Graham E. L. Holton, "Heyerdahl's Kon Tiki Theory and the Denial of the Indigenous Past," *Anthropological Forum* 14, no. 2 (July 1, 2004): 163–81, https://doi.org/10.1080/0066467042000238976.

[260] Holton.

migration theories, but what they do not do is refute the oral history and cultural knowledge of the First Nations peoples of the Americas. Metis/Cree scholar, Dr. Paulette Steeves has worked to counter and decolonize academic perceptions of Indigenous occupation of the Americas.[261] My undergraduate advisor was prone to remark, "absence of evidence is not evidence of absence," reminding his students that the world is vast, and the number of documented and dated archaeological sites is a tiny fraction of the whole. Dr. Steeves notes in her dissertation, *Decolonizing Indigenous Histories, Pleistocene Archaeology Sites of the Western Hemisphere*:

> Prior to the archaeological story of the Clovis People, American archaeologists…argued that the 'Indians' had only been in America for 3,000 years. Bruce Trigger stated that 'what we believe to be true about modern people influences our understanding of their history.'…. Indigenous peoples and some academic scholars have argued against such oversimplified Eurocentric stories such as the Clovis First hypothesis. Many oral traditions of the Indigenous people of North and South America speak to their origination in the Western Hemisphere telling in vivid detail how the people have been here forever…. Oral traditions tell stories of how the people 'emerged into the world, into their identity, and into history.' In origin stories people were 'given ceremonies and rituals that enabled them to find their place on the continent.' In consideration of a group of first people whose distinct identities, culture, and traditions grew from their relationship to their homelands, it could be said that they have been here forever. For Indigenous people forever may mean from their physical creation, or from the beginning of their cultural identities in a specific place 'an emergence into a precise cultural identity.'[262]

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[261] Paulette F. Steeves, "Decolonizing the Past and Present of the Western Hemisphere (The Americas)," *Archaeologies* 11, no. 1 (April 1, 2015): 42–69, https://doi.org/10.1007/s11759-015-9270-2.

[262] Paulette Steeves, "Decolonizing Indigenous Histories, Pleistocene Archaeology Sites of the Western Hemisphere" (ProQuest Dissertations Publishing, 2015),

Steeves' observations underscore the point that academic researchers are very far from understanding the cultural history and occupation of the North and South American continents.

From the adamant stance of archaeologists that Native North American occupation did not pre-date 3,000BP, we have arrived at the 2014 DNA analysis and dating of a 12,700 year old boy's burial at the Anzick site in Montana. This unusual burial of a one-to-two-year-old child included red ochre and a large cache of Clovis tools. (Figure 93) The DNA analysis, conducted by experts from the University of Copenhagen, suggests that this child was ancestral to both North and South American descendants, implying that Alaska natives are



Figure 93. The Anzick child's skull was found in Montana with Clovis tools.
PHOTO COURTESY: SCIENCE / SAMUEL STOCKTON WHITE

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http://search.proquest.com/docview/1708672505/. 2-3.

descended from North American Indigenous people moving north, and not descended from Asiatic Indigenous people moving south, as had previously been hypothesized.[263] What is clear is that, as with climate change, new discoveries radically alter the perceived knowledge landscape. Complicating both the practice of science on this topic, as well as the relationship of scientists with tribal communities, is the acrid legacy of settler colonialism.

Twentieth-century archaeology was revolutionized by the brilliant and iconoclastic theoretician and archaeologist Lewis Binford, who turned the field upside down in the 1960s with his radical, revisionist *processual archaeology*, which rapidly came to be referred to as the *New Archaeology*. As a doctoral student at the University of Michigan, Binford was underwhelmed by the picayune, aseptic work of fellow archaeologists chronicling artifacts in charts, compared to the expansive work of the cultural anthropologists who inspired his founding of and life-long work in the field of ethnoarchaeology. He stated that archaeology should "explicate and explain the total range of physical and cultural similarities and differences characteristic of the entire spatio-temporal span of man's existence."[264] A bold goal at any time, but especially so in 1962, when the field of archaeology consisted primarily of devising and revising typological schemes.

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[263] Michael Balter, "Native Americans Descend From Ancient Montana Boy," Science | AAAS, February 12, 2014, http://www.sciencemag.org/news/2014/02/native-americans-descend-ancient-montana-boy.

[264] Lewis Binford, "Archaeology as Anthropology," *American Antiquity* 28, no. 2 (1962): 217–25, https://doi.org/10.2307/278380.

Binford's early work, an edited volume of papers presented by *New Archaeologists* at the 1966 annual Society for American Archaeology conference, *New Perspectives in Archaeology*,[265] was followed in 1972 by *An Archaeological Perspective*,[266] which defined and explored the paradigm of processual archaeology. Too radical for his department at the University of Chicago, Binford was let go in 1967. He spent his career at the University of New Mexico, receiving a 2008 Lifetime Achievement Award from the Society for American Archaeology. After successfully launching processual archaeology, Binford turned to his own work, ethnoarchaeology, working closely with Alaska Natives to understand the strategies and culture of caribou hunting, publishing *Nunamiut Ethnoarchaeology* in 1978.[267]

In 1981, Binford, an astute and penetrating scholar who did not suffer fools lightly, turned his prodigious intellect to writing his landmark book, *Bones: Ancient Men and Modern Myths*, in which he presents a state-of-the-field analysis. Binford shines a light on leading edge archaeology; he is scrupulously fair in acknowledging sound work, but woe betide the sloppy thinker. Binford's impeccable logic skewers them for all to appraise. One of these scrutinized, uneven archaeologists is Robson Bonnichsen.[268] As a student

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[265] Sally R. Binford and Lewis R. Binford, eds., *New Perspectives in Archaeology* (Aldine Publishing Company, 1968).

[266] Lewis R. Binford, *Archaeological Perspective*, First Edition (New York: Seminar Press, 1972).

[267] Lewis Roberts Binford, *Nunamiut Ethnoarchaeology*, 1st Edition (New York: Academic Press, 1978).

[268] Lewis R. Binford, *Bones: Ancient Men and Modern Myths*, First Edition (New York:

in Bonnichsen's archaeological field school when *Bones* was published, I was privy to six weeks of outrage regarding the unprofessionalism of the editor who published the book; I was also privy to the editor's analysis of Binford's critique of Bonnichsen.[269] I observed an insecure man, humiliated at having his careless thinking broadcast to his professional community. Leading to his role as lead plaintiff, this pique was to have devastating repercussions as the Kennewick saga unfolded fifteen years later creating a seismic rift between museums and anthropologists, and Native communities.

In the 1980s and 1990s, benefitting from the precepts of New Archaeology, professional archaeologists began to work collaboratively with tribes, developing cultural protocols to ensure that the archaeology proceeded in a manner satisfactory to all parties. Examples of these protocols include maintaining a close working relationship with the tribal cultural committee, and having a tribal elder on-site at all times monitoring the excavation and indicating when excavation should cease in order to evaluate a find. Although some archaeologists felt constricted by having to have a relationship with the descendants of the people whom they were studying, progressive archaeologists immediately discovered both the ineffable value of these working relationships as well as the pragmatic benefit of having an elder

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Academic Press Inc, 1981). 38-58, 79-90, 148-49

[269] Robson Bonnichsen, University of Maine Archaeological Field School- commentary by Robson Bonnichsen regarding the book, Bones, by Lewis Binford., July 1980; William Woodcock III and Lewis Binford, Lewis Binford, Life and Career. Multiple conversations spanning a ten-year period, including conversations with William Woodcock, Dr. Binford's editor at Academic Press from 1972-1989, and with Dr. Binford., 1985 1975.

available to identify mysterious (to the archaeologist) artifacts.

David Hurst Thomas, Curator of North American Archaeology, Division of Anthropology at the American Museum of Natural History, Professor of Archaeology at the Richard Gilder Graduate School (affiliated with the AMNH), and founding board member of the National Museum of the American Indian, is an interdisciplinary scholar whose nearly fifty-year career in North American archaeology is an exemplar of striving toward increasingly collaborative and meaningful scholarly relationships with tribal partners. Thomas discusses the issues involved in decolonizing archaeology in his perceptive and provocative book, *Skull Wars: Kennewick Man, Archaeology, and the Battle for Native American Identity*, graced with a forward by Vine DeLoria Jr. Thomas' book offers an insightful perspective into what became a vitriolic and extremely divisive battle between archaeologists and tribes. Thomas contextualizes the rabidity of the archaeologist plaintiffs, noting,

> With the Kennewick find, archaeologists' worst fears about NAGPRA were realized—that the 1990 legislation would be stretched into deep time, thereby preventing science from studying remains that were not affiliated with any modern tribe. During the years of pre-NAGPRA lobbying, archaeologists and Museum officials had gone to great lengths to argue against universal reburial, trying to ensure that NAGPRA would not close down legitimate research on ancient remains. Yet this is exactly what may happen at Kennewick. In the view of Richard Jantz, 'If we lose Kennewick Man, then every ancient skeleton in the United States could be lost to this law.' [270]

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[270] David Hurst Thomas and Vine DeLoria Jr, *Skull Wars: Kennewick Man, Archaeology, And The Battle For Native American Identity*, First Edition (New York: Basic Books, 2001). 232.

Unfortunately, it would seem to be a truism that the more insecure the scholar, the more belligerent he or she becomes regarding their pet theory or project, however ill-founded. In 1996 a pair of students found the ~90% complete skeletal remains eroding from a Columbia river bank near Kennewick, Washington, that would come to be referred to as "Kennewick Man." James Chatters, a self-employed contract forensic archaeologist for the Benton County coroner's office, was notified regarding the remains. Instead of conducting a proper excavation, Chatters scooped them up in an evening and took them back to the lab, where he conducted a preliminary examination in which he decided that they were those of a historic-period Caucasian man, and definitively not related to Native Americans.[271] Radiocarbon dating would yield an age of ~9,000 years old. Chatters' colleagues, including Robson Bonnichsen, C. Loring Brace, George W. Gill, C. Vance Haynes, Richard L. Jantz, Douglas W. Owsley, Dennis J. Stanford, and D. Gentry Steele, then filed as plaintiffs a lawsuit against the U.S. Army Corps of Engineers, upon whose land the remains had been found, and five local tribes, including the Umatilla, who were requesting that the bones be returned to them under the protection of NAGPRA legislation.

The nine scientists argued for the duration of the nine-year trial that since they had summarily decided that the remains were Caucasian, NAGPRA

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[271] Douglas Preston, "The Kennewick Man Finally Freed to Share His Secrets," Smithsonian, September 2014, https://www.smithsonianmag.com/history/kennewick-man-finally-freed-share-his-secrets-180952462/.

did not apply to them, and they had every right to do whatever research they wished with the remains. During the trial, the remains were held in safekeeping at the University of Washington's Burke Museum.[272]

In February 2004, the United States Court of Appeals for the Ninth Circuit determined that no cultural link with contemporary tribes could be established because of the nine millennia age of the remains. However, the court case lasted so long that DNA testing improved, and in June 2015, the same DNA research team at the University of Copenhagen that had worked on the Anzick case conclusively reported that their research:

> Kennewick Man has ancestry proportions most similar to those of other Northern Native Americans, especially the Colville, Ojibwa, and Algonquin. . . . Analyses show that Kennewick Man, like the Anzick-1 child, shares a high degree of ancestry with Native Americans from Central and South America, and with geographically close tribes . . . . It has been asserted that . . . 'cranial morphology provides as much insight into population structure and affinity as genetic data.' However, although recent and previous craniometric analyses have consistently concluded that Kennewick Man is unlike modern Native Americans, they disagree regarding his closest population affinities, the cause of the apparent differences between Kennewick Man and modern Native Americans, and whether the differences are historically important (for example, represent an earlier, separate migration to the Americas), or simply represent intra-population variation . . . . DNA data are highly statistically significant showing stronger association of the Kennewick man with Native Americans than with any other continental group. We also observe that the autosomal DNA, mitochondrial DNA and Y chromosome data all consistently show that Kennewick Man is directly related to contemporary Native Americans, and thus show genetic continuity within the Americas over at least the past 8,000 years.[273]

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[272] "Kennewick Man, The Ancient One," Burke Museum, February 20, 2017, http://www.burkemuseum.org/blog/kennewick-man-ancient-one.

[273] Morton Rassmussen et al., "The Ancestry and Affiliations of Kennewick Man," *Nature*

US Senator Patty Murray and Congressman Denny Heck successfully sponsored legislation mandating Kennewick Man's repatriation; his remains were finally returned to his descendants on February 17, 2017 who reburied him in a private ceremony.

Kennewick Man was at the epicenter of a bitterly divisive controversy that shattered much of the trust built up through decades of collaborative work by sentient, community-minded archaeologists. Archaeologist such as David Hurst Thomas and Chip Colwell-Chanthaphonh, Senior Curator of Anthropology at the Denver Museum of Nature and Science, and author of *Collaboration in Archaeological Practice: Engaging Descendant Communities*, and *Plundered Skulls and Stolen Spirits: Inside the Fight to Reclaim Native America's Culture*, an account of the DMNS' process of collaboratively working with tribes to repatriate remains and sacred objects, and the ensuing cultural shifts at the DMNS in response.[274]

The egregious behavior of archaeologists in the past left a very poor impression with the legion of Indigenous people who have suffered the consequences; the Kennewick Fiasco brought this history of both institutional and personal disrespect and disregard of Indigenous people and communities into the immediate present. These nine litigious archaeologists perhaps acted

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523 (July 23, 2015): 455–58, https://doi-org.proxybz.lib.montana.edu:3443/10.1038/nature14625.

[274] Chip Colwell-Chanthaphonh and T. J. Ferguson, *Collaboration in Archaeological Practice: Engaging Descendant Communities* (AltaMira Press, 2007); Chip Colwell, *Plundered Skulls and Stolen Spirits: Inside the Fight to Reclaim Native America's Culture* (Chicago ; London: University Of Chicago Press, 2017).

out of some combination of self-aggrandizement, career building, or the defense of scientific access to data. Ironically, these men who spent their lives avidly studying the lives of Indigenous peoples of the past seem to have had nary a concern for the cultural well-being of their descendants, the Indigenous people of today. The hubris of nine men has cost a terrible price in lost trust that museums will have to shoulder, if they are to attempt to heal this reopened cultural wound between anthropologists and Indigenous communities. Without a meaningful reconciliation, museums and their staff members will find that conducting collaborative work with Indigenous communities to address climate disruption will be halting at best. It is a tragedy of archaeology and of diplomacy that such foolish men pursued so stubbornly their colonial agenda, when things might have turned out so very differently with forward thinking, Indigenously aware, culturally competent archaeologists such as Binford or Thomas. Although some of the archaeologists sincerely felt they had a responsibility to steward the remains on behalf of science, many Native elders also feel that they have a spiritual responsibility to steward remains, whether biologically related or not, on behalf of humanity. Colwell relates an early NAGPRA Review Committee meeting in 1992:

> When the seven scientist and Native American representatives comprising the NAGPRA Review Committee met for the first time in 1992, one of the first issues they turned to was resolving the status and disposition of culturally unaffiliated remains. There was deep disagreement. No one could even agree on the scale of the problem. One review committee member, Martin E. Sullivan, a museum director, estimated, on the basis of the Smithsonian's holdings that upward of 95 percent of the human remains could

> ultimately be affiliated. Phillip L. Walker, another committee member and biological anthropologist, more presciently suggested the percentage would be far lower.
> The National Park Service archaeologist overseeing the meeting, Francis McManamon, warned that the hardest cases would be 'where you've got long gaps between a modern group that may have a legitimate claim and an older culture or an older Indian group that is only known archeologically from hundreds or thousands of years ago.' William Tallbull, the Northern Cheyenne leader and committee member, acknowledged that taking unidentified remains was spiritually 'risky.' But he gently suggested it was appropriate to rebury them. Tallbull spoke about discovering in a museum collection the skeleton of an elderly man who had lived 7,000 years ago. 'I talked to that old man for a long time,' Tallbull shared. He told him, 'I'm going to do this to help you, your people, your descendants, your past people, the full tribe.' When Tallbull reburied him, a whirlwind came from the south—a positive sign because that is where the spirits dwell. 'I felt really good,' Tallbull said, 'because apparently I had done the right thing.' None of the committee members reacted to Tallbull's story.[275]

The Anthropocene

The Anthropocene epoch is a concept that, although still viewed with skepticism by some, has gained considerable traction in the twenty-first century and is of particular relevance to this research. Previously a concept and categorization primarily defined by geologists, the term *Anthropocene* and its cognate, *anthropogenic*, are now Used broadly across many scientific, political and social communities.

Technically, *Anthropocene* is a geological term referring to the time period defined by the physical effects of *Homo sapiens* upon the terrestrial

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[275] Colwell, *Plundered Skulls and Stolen Spirits*. 237-238

world and atmosphere. Geologists are currently determining whether Anthropocene is a new *epoch*, in which case it would be subsequent to the Holocene, or whether it is a new *age*, the most recent within the Holocene epoch. At this time, the straw vote seems to be in favor of defining it as a distinct epoch. An extensive, formal review process is required. Nobel laureate Paul Crutzen uses the terms *anthropogenic* and *anthropogenic forcing* several times in his co-authored 1994 *Atmosphere, Climate, and Change*.[276] However, he does not formally propose to the geological academic community the introduction of the term *Anthropocene*, (Figure 94) to describe a new post-Holocene geological epoch, until an article published in the May, 2000 issue of The International Geosphere–Biosphere Programme (IGBP): A Study of Global Change of the International Council for Science (ICSU) Global Change Newsletter:

> Considering these and many other major and still growing impacts of human activities on earth and atmosphere, and at all, including global, scales, it seems to us more than appropriate to emphasize the central role of mankind in geology and ecology by proposing to Use the term **'anthropocene'** for the current geological epoch. The impacts of current human activities will continue over long periods. According to a study by Berger and Loutre, because of the anthropogenic emissions of CO_2, climate may depart significantly from natural behaviour over the next 50,000 years. To assign a more specific date to the onset of the 'anthropocene' seems somewhat arbitrary, but we propose the latter part of the 18th century . . . . This is the period when data retrieved from glacial ice cores show the beginning of a growth in the

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[276] Thomas E. Graedel and Paul J. Crutzen, *Atmosphere, Climate, and Change*, First Edition (New York : New York: Scientific American Library, 1994). 120, 156.

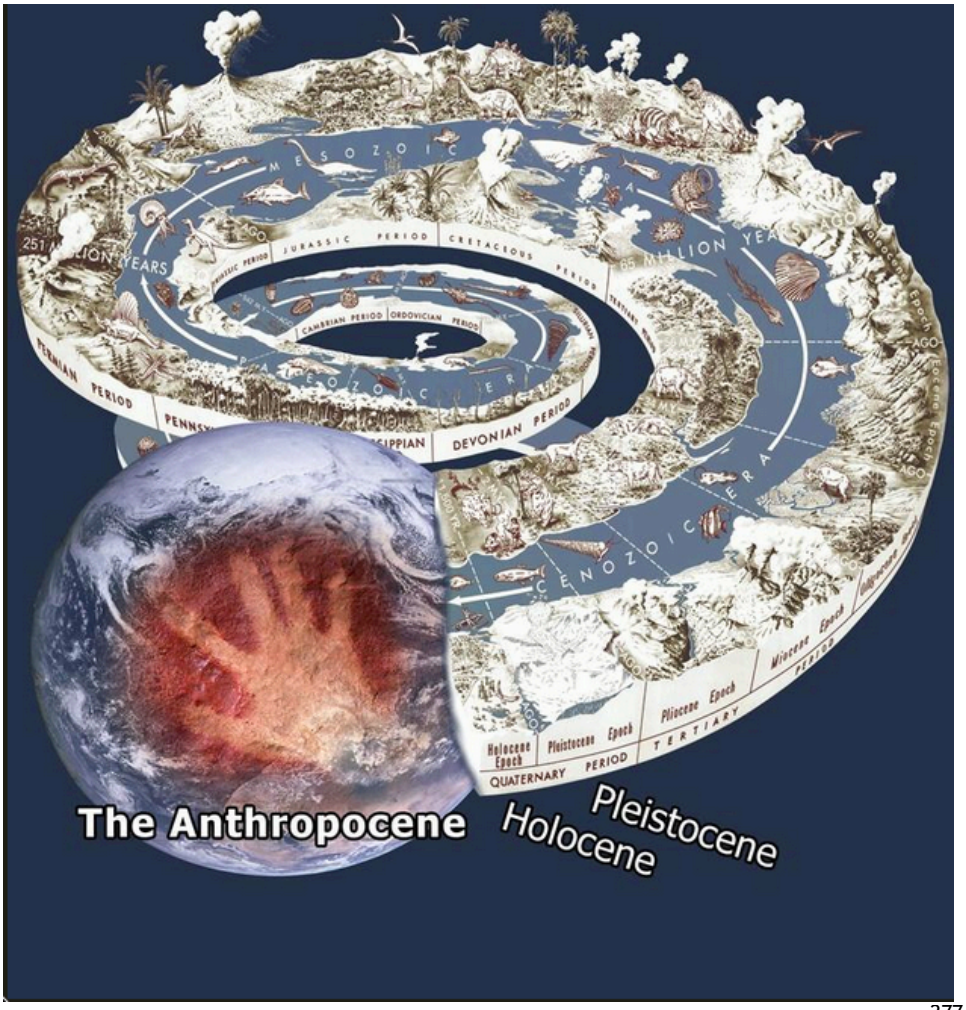

Figure 94. A visual representation of the breakdown of geological time.[277]
IMAGE COURTESY: SMITHSONIAN INSTITUTION

> atmospheric concentrations of several 'green-house gases.' . . . . To develop a world-wide accepted strategy leading to sustainability of ecosystems against human induced stresses will be one of the great future tasks of mankind, requiring intensive research efforts and wise application of the knowledge thus acquired in the noösphere, better known as knowledge or information society.[278]

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[277] "A visual representation of the breakdown of geological time. The Anthropocene would come after the Holocene." "The Age of Humans: Evolutionary Perspectives on the Anthropocene," The Smithsonian Institution's Human Origins Program, December 15, 2014, http://humanorigins.si.edu/research/age-humans-evolutionary-perspectives-anthropocene.

[278] Paul J. Crutzen and Eugene F. Stoermer, "The 'Anthropocene,'" *The International*

Reprinted in Robin, Sorlin and Warde's brilliantly edited volume, *The Future of Nature*, Will Steffen's insightful *Commentary* contextualizes Crutzen's introduction of the term, Anthropocene:

> It is entirely fitting that the first attempt to define the Anthropocene appeared in the newsletter of the global change research program IGBP (International Geosphere-Biosphere Programme) rather than in one of the mainstream scientific journals. . . . This publication was a crystallization of Paul Crutzen's first use of the term Anthropocene during a discussion at a meeting of the IGBP Scientific Committee in Cuernavaca, Mexico, in February 2000. Scientists from IGBP's palaeo-environment project were reporting on their latest research, often referring to the Holocene, the most recent geological epoch of earth history, to set the context for their work. Paul, a vice-chair of IGBP, was becoming visibly agitated at this usage, and after the term Holocene was mentioned yet again, he interrupted them: 'Stop using the word Holocene. We're not in the Holocene anymore. We're in the…the…the…(searching for the right word), the Anthropocene!' . . . . The period from 1950 to 2000 stands out as one the most remarkable in all of human history for its rapidity and pervasiveness of change, and it is now often called 'The Great Acceleration.'[279]

Anthropocene is still a term under cultural construction by academics, the media, and the public. A few scholars have argued for giving it a start date coinciding with the advent of agriculture, circa 8,000-15,000 years ago. William Ruddiman, Emeritus Palaeoclimatologist, University of Virginia, propounds the logic of this relatively unpopular view:

> One possible solution would be to define a two-phase Anthropocene:
> 1. An early phase with anthropogenic effects that began at a very

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Geosphere-Biosphere Programme (IGBP) Global Change Newsletter, May 2000. 17-18.

[279] Paul J. Crutzen, Eugene F. Stoermer, and Will Steffen, "The 'Anthropocene'; Commentary.," in *The Future of Nature*, First Edition (New Haven, CT: Yale University Press, 2013), 483–90.

> small level thousands of years ago but slowly grew to considerable size by the end of preindustrial time
> 2. A later explosive phase of wide-ranging anthropogenic impacts during the industrial era
> . . . . this proposed solution would create a new problem by eliminating much of the Holocene . . . . many scientists think that humans are responsible for the massive megafaunal extinction in the Americas nearly 12,500 years ago. Using that catastrophe to define the start of the Anthropocene would entirely eliminate the Holocene . . . . scientists who want to define the start of the early Anthropocene in a formal way with some kind of globally traceable "golden spike" are requesting the impossible. Agriculture began at different times in different areas and probably at amplitudes too low to be initially detectable. Alternatively, we could choose not to formally impose the simplifying term "Anthropocene" on all the rich complexity of human history: the spread of agriculture, the growth in populations, the creation of civilizations, the onset of the industrial era, and the superinterglacial climate looming ahead. Informal use of the term Anthropocene makes more sense.[280]

In short, it would appear that Ruddiman has essentially argued himself off the table by his conclusion. However, the Anthropocene is popularly construed as beginning with the advent of the Industrial Age, circa late 1700s to mid-1800s. Although the term is in common usage, the process to enshrine it as a global geological epoch writ in stone is lengthy. Currently, an international Anthropocene Working Group is reviewing prodigious amounts of data; when they have completed their review, they will forward their conclusions on to a branch of the International Union of Geological Sciences, the International Committee on Stratigraphy, which will then make a ruling, uncontestable for a period of a decade, to keep the clamor at bay.

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[280] William Ruddiman, "The Anthropocene," *Annual Review of Earth and Planetary Sciences* 41 (May 2013): 45–68, https://doi.org/10.1146/annurev-earth-050212-123944.



Figure 95. Golden Spike located in Guadalupe Mountains NP, Texas
IMAGE COURTESY: ISPS



Figure 96. USGS Benchmark, Death Valley National Park, CA
IMAGE COURTESY: FLICKR / C SHROBA

The term *golden spike* is not wholly apocryphal—not gold, but brass—they pinpoint Global Boundary Stratotype Section and Point (GSSP) locations, identified by the International Committee on Stratigraphy using eleven criteria, and often based on paleontological faunal transition points. They are similar in appearance and purpose to USGS elevation benchmarks, although GSSPs physically mark a conceptual point in time, USGS benchmarks locate a physical elevation. (Figures 95-96)

Our previous geological epoch, the Pleistocene was characterized by being quite cold, and featured charismatic megafauna such as sabertooth tigers, dire wolves, giant sloths and mastodons. The close of the Pleistocene and beginning of the Holocene approximately 11,700BP was triggered by the climatic onset of an *interglacial*, meaning a relatively warm period. It has continued either, arguably, to the present, or terminated with the onset of the

Anthropocene during the Industrial Revolution. Humans and our hominin ancestors had existed for about six million years, (Figure 97) but did not exhibit behavior with climate-changing consequences. However, there is substantial debate regarding the possibility of human causality regarding the coeval Pleistocene extinction, a factor addressed in a small minority of proposed definitions of the Anthropocene including the entirety of the Holocene. *Holocene* refers to the geological epoch following the Pleistocene, continuing to the present or to the Anthropocene, whichever comes first. This post-ice age warmth permitted the human invention of agriculture. However, warm has turned to hot with the onslaught of Anthropogenic mass carbon emissions, prompting the redefinition of the termination point for the Holocene.

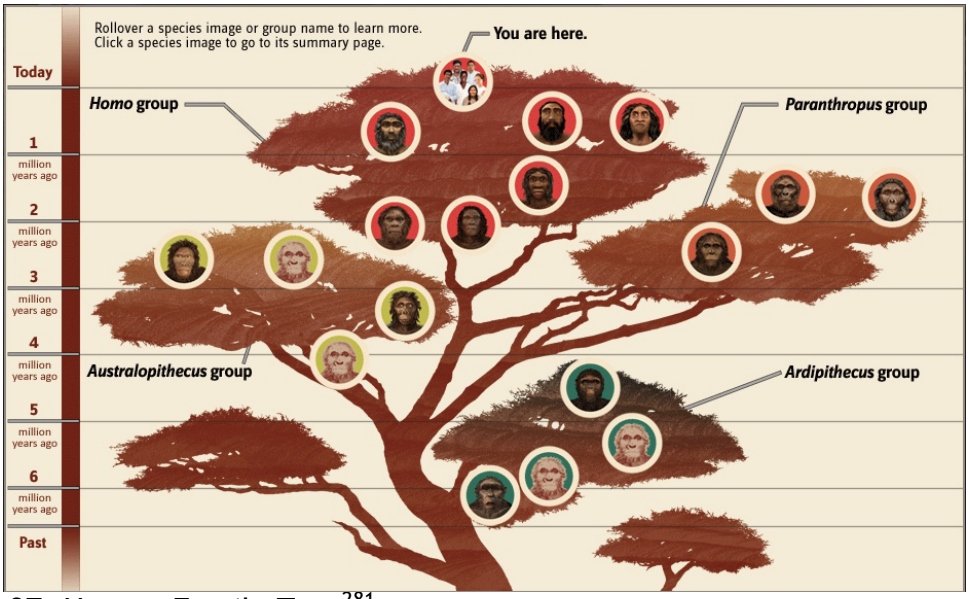

Figure 97. Human Family Tree[281]
PHOTO COURTESY: SMITHSONIAN INSTITUTION, NATIONAL MUSEUM OF NATURAL HISTORY.

[281] "Human Family Tree | The Smithsonian Institution's Human Origins Program," accessed March 27, 2017, http://humanorigins.si.edu/evidence/human-family-tree.

Although a geological term, not usually a fount of culturally explosive terminology, the word and concept, *Anthropocene*, has caught the attention of scholars in a myriad of fields, including Anthropology, Economics, Indigenous Studies and Environmental Studies who have found it meaningful in its succinct encapsulation of human-induced change. In this context I am understanding it as defining a geological and cultural era commencing at approximately 1850, but escalating exponentially at approximately 1950, post-World War II, with a vast increase of worldwide petroleum use and carbon emissions. (Figure 98)

The term *anthropogenic*, coined from *Anthropocene*, is widely used to refer to any human-caused event. Anthropocene is primarily construed within the context of climate. Anthropogenic is used to discuss dysfunctional human maladaptation such as polluting our oceans with toxic micro-beads, causing the extinction of animals by overhunting, inducing epidemiological issues for through the widespread use of biocides and endocrine-disrupting chemicals such as BPA and phthalates. Paul Crutzen notes,

> Human activities are exerting increasing impacts on the environment on all scales, in many ways outcompeting natural processes. This includes the manufacturing of hazardous chemical compounds which are not produced by nature, such as . . .the chlorofluorocarbon gases responsible for the 'ozone hole.' Because human activities have also grown to become significant geological forces . . . through land use changes, deforestation and fossil fuel burning, it is justified to assign the term 'anthropocene' to the current geological epoch. This epoch may be defined to have started about two centuries ago, coinciding with James Watt's design of the steam engine in 1784.[282]

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[282] Paul J. Crutzen, "The 'Anthropocene,'" in *Earth System Science in the Anthropocene*,

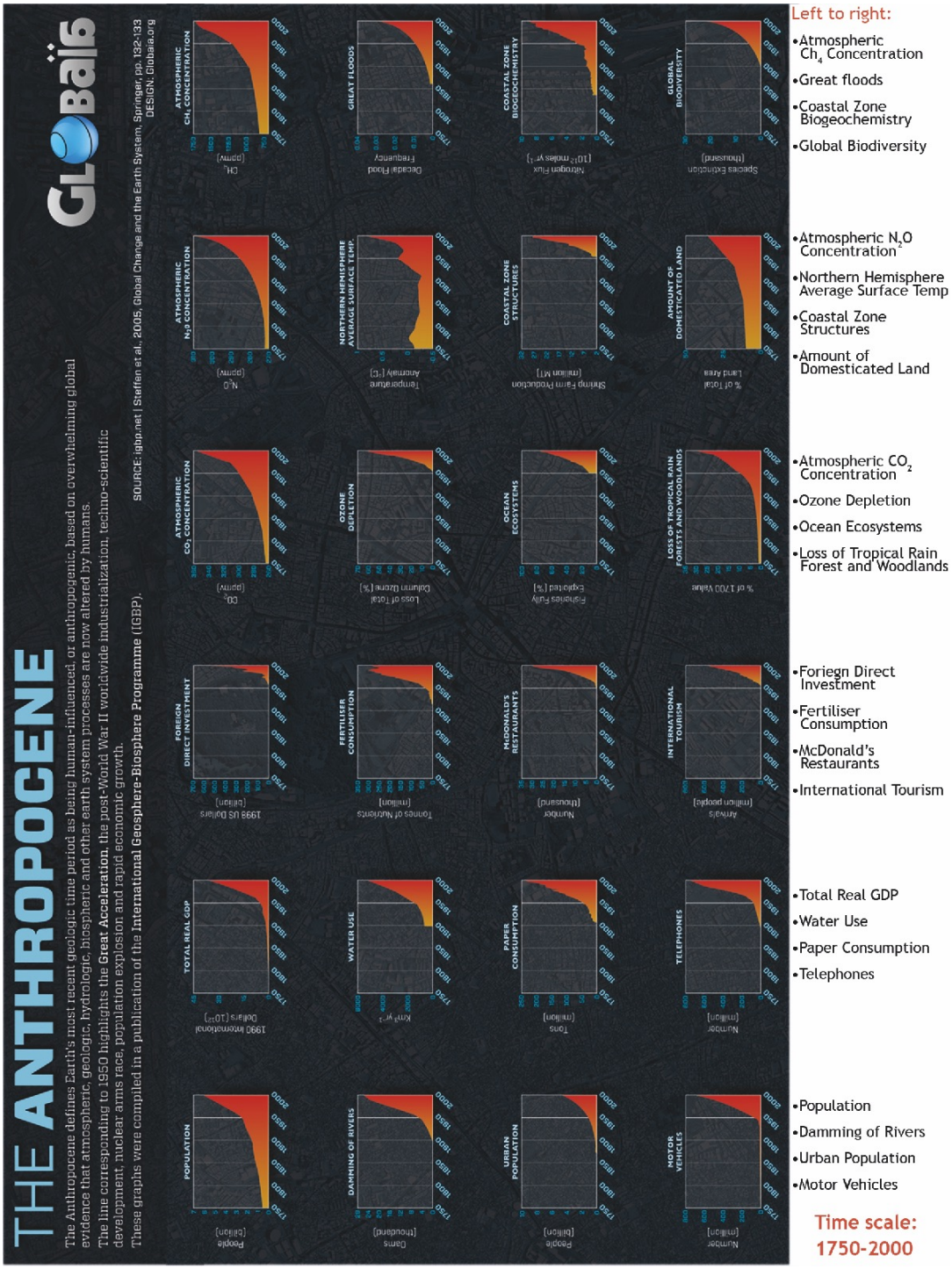

Figure 98. The Anthropocene: 24 markers; 1750-2000.
GRAPHIC COURTESY: GLOBAIA

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ed. Professor Dr. Eckart Ehlers and Dr. Thomas Krafft (Springer Berlin Heidelberg, 2006), 13–18, https://doi.org/10.1007/3-540-26590-2_3.

Catastrophes such as the nuclear meltdown at Chernobyl, the Exxon Valdez and BP Gulf oil spills, and the threatened extinction of mountain gorillas are all topics that have gained a momentary spotlight, yet continue on to this day as unresolved problems. Unfortunately, the public boredom and a sense of tedium attached to *yesterday's news* are highly problematic when it comes to climate disruption. While we can readily ignore the slaughter by poachers of our close cousins the mountain gorillas, or the death by asphyxiation of thousands of oil-soaked shore birds, we cannot ignore the encroachment of climate disruption consequences; they are already affecting us.

The United States is characterized by a widespread willful disregard by the majority of the public for this impending catastrophe, which is interesting from an anthropological viewpoint, but perplexing from either a human or FEMA perspective. In 1989, 35% of Gallup-polled Americans were *very worried* about climate change, dropping to 25% in 2011. In 2011 only 52% of Americans believed that human actions were a primary contributor to climate change, while only 63% believe that climate change even exists.[283] However, notwithstanding these discouraging statistics, climate change has become a household term. According to NASA, the National Air and Space Administration, the overwhelming majority of scientists find converging data on climate

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[283] Lyle Scruggs and Salil Benegal, "Declining Public Concern about Climate Change: Can We Blame the Great Recession?" *Global Environmental Change*, Adding Insult to Injury: Climate Change, Social Stratification, and the Inequities of Intervention, 22, no. 2 (May 2012): 505–15, https://doi.org/10.1016/j.gloenvcha.2012.01.002.

change.[284]

Although our American public has been slow to engage with the anthropogenic issues of the Anthropocene, academic scholars from many disciplines, Indigenous activists, science writers and journalists have bellowed a clarion call to action.

John Kress, Interim Under Secretary of Science at the Smithsonian, and Jeffrey Stine, curator for environmental history at the National Museum of American History have co-edited a very thorough and multifaceted examination of the causes and consequences of the Anthropocene, *Living in the Anthropocene: Earth in the Age of Humans*, published by Smithsonian Books and authored by a host of illustrious colleagues including Edward O. Wilson, Wade Davis, Lonnie Bunch III and Elizabeth Kolbert, to name a few.[285] Among my favorites, a lyrically written chapter by Rob Nixon: "The Unequal Anthropocene." Nixon writes,

> We are witnessing unprecedented efforts to create coalitions of change, however precarious, between . . . 'full-stomach' and 'empty-belly' environmentalists. The odds of achieving anything resembling justice—for themselves or the environments they depend on—remain stacked against Earth's most impoverished billions. We inhabit an era of short-term, shortsighted plunder, as megacorporations of historically unprecedented wealth, size, and mobility destroy environmental safeguard, creating, in society after society, what George Monbiot calls a globalized 'bonfire of regulations.' Unanswerable corporations team up with

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[284] "Climate Change: Vital Signs of the Planet: Scientific Consensus," accessed September 6, 2016, http://climate.nasa.gov/scientific-consensus/.

[285] Edward O. Wilson, Elizabeth Kolbert, and Thomas E. Lovejoy, *Living in the Anthropocene: Earth in the Age of Humans*, ed. John W. Kress and Jeffrey K. Stine (Washington, DC: Smithsonian Books, 2017).

> unspeakable autocrats; even in democracies we witness concerted attacks on public safety nets and the long-term common good. But the fast-moving, deregulated pillage of the most vulnerable ecological and human communities has triggered a pushback, a desperate, determined surge in environmental jUstice activism, not least in frontline communities at heightened risk from climate collapse. Such communities are already experiencing the Anthropocene's accelerated impacts as an ongoing, staggered trauma. Empty-belly . . . . environmentalists are creating transnational networks to expose and oppose . . . . the failure to decentralize, decarbonize, and democratize energy access.[286]

Noteworthy both in content and presentation, the cross-disciplinary, *Arts of Living on a Damaged Planet: Ghosts and Monsters of the Anthropocene*,[287] culled from a 2014 conference and edited by Anna Tsing and colleagues, opens to *Monsters of the Anthropocene* on one side, and flipped upside down, opens to *Ghosts of the Anthropocene* on the other. Included are essays, poems and artwork by twenty-two twenty luminary scholars primarily in the humanities, including among others, Donna Haraway and Ursula K. LeGuin. Rather than the didactic slant often encountered in books explicating the Anthropocene, *Arts of Living on a Damaged Planet* proposes a more edgy and philosophical view of the Anthropocene, exploring issues related to collaborative survival. Haraway's distinctive writing reads like an academic jazz riff, exploring a theme as expertly as Miles Davis with his horn:

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[286] Edward O. Wilson, Elizabeth Kolbert, and Thomas E. Lovejoy, *Living in the Anthropocene: Earth in the Age of Humans*, ed. John W. Kress and Jeffrey K. Stine (Washington, DC: Smithsonian Books, 2017). 149-150.

[287] Anna Lowenhaupt Tsing et al., eds., *Arts of Living on a Damaged Planet: Ghosts and Monsters of the Anthropocene* (Minneapolis: Univ Of Minnesota Press, 2017).

> *Science Art Activisms for Staying with the Trouble*.
> Consider two science art activisms committed to partial healing, modest rehabilitation, and still possible resurgence in the hard times of the Anthropocene and Capitalocene. I think of these science art activisms as stinger-endowed, unfurling tentacles of the ink-spurting, disguise-artist, hunting critters of an ongoing past, present, and future that I call the Chthulucene. The Chthulucene is the time-space of the sym-chthonic ones, the symbiogenetic and sympoietic earthly ones, those now submerged and squashed in the tunnels, caves, remnants, edges, and crevices of damaged waters, airs, and lands. To live and die well as mortal critters in the Chthulucene is to join forces to reconstitute refuges, to make possible partial and robust biological-cultural-political-technological recuperation and recomposition, which must include mourning irreversible losses.[288]

Archaeologist Robert L. Kelly posits that we have embarked upon a *Fifth Beginning* tipping point of human history, commencing at approximately "A.D. 1500—the beginning of European colonization, the Industrial Revolution, capitalism, and globalism;" he suggests, "the fifth beginning might mark an era in which we compete at cooperation."[289] Kelly observes,

> Nomadic hunter-gatherers don't see themselves as owning land . . . but as owning the right to be asked for permission to use a land's resources . . . Hunter-gatherers almost always grant the right to use "their" land because in the near future the tables might be turned, and the host group will need the visitors to return the favor. But this changes once nomadic hunter-gatherers become sedentary. . . the process of becoming sedentary is like the game of musical chairs—everyone grabs a seat, a place on the landscape, and some of those places are better positioned than others, with better wild foods and better potential for agriculture. What happens during the inevitable bad years in those cases? What happens is that those positioned on the poorer places will petition those in the better-endowed places for aid. But those in the well-endowed places will generally not need the

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[288] Tsing et al. M33.

[289] Robert L. Kelly, *The Fifth Beginning: What Six Million Years of Human History Can Tell Us about Our Future* (Oakland, California: University of California Press, 2016). 3.

> assistance of those in poorer places because if a year is bad for the best places, it is probably horrible for the landscape's mediocre venues. On the other hand, if the well-endowed villagers deny the petitioners, they run the risk of retaliation because the potential cost of the violent overthrow of a village, death, doesn't seem too great to someone who might expect to starve anyway.[290]

The pragmatic social mechanism of reciprocity that Kelly describes is true not just of neighboring communities negotiating the resource disparities incumbent in the transition from nomadic camps to sedentary villages, but is equally true scaled up to a national or global level. A signal cultural aspect of the Great Acceleration in the United States has been the consolidation of world wealth into the bank accounts and mansions of the .1%, in concert with the plummeting financial well-being of the 90%. This phenomenon is reflected globally—CNN reports that the world's eight wealthiest billionaires own as much capital as half the world's population.[291]

Warren Buffet, investor and philanthropist, ranks as third wealthiest person in the world, with a personal net wealth of $86 billion dollars. In a January 2018 interview Buffet referred to the Forbes 400, remarking, "Between the first computation in 1982 and today, the wealth of the 400 increased 29-fold—from $93 billion to $2.7 trillion—while many millions of hardworking citizens remained stuck on an economic treadmill. During this period, the

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[290] Kelly. 73-74.

[291] Catherine Clifford, "Warren Buffett Says the Problem with the Economy Is People like Him," June 27, 2017, https://www.cnbc.com/2017/06/27/warren-buffett-says-the-problem-with-the-economy-is-people-like-him.html.

tsunami of wealth didn't trickle down. It surged upward."[292] Buffet has spoken publicly and frequently regarding the utter failure of the "trickle down economy," resulting in the rapidly escalating accumulation of wealth at the top, while the majority of Americans are making the same adjusted salary as they did in 1980, with increasing economic insecurity. His response has been to both speak very publicly about these economic issues, as well as co-establish with Bill Gates a billionaires philanthropic plan—"The Giving Pledge"—to donate at least half of their wealth to those in need, providing an example to others in their financial demographic. (Figure 99)

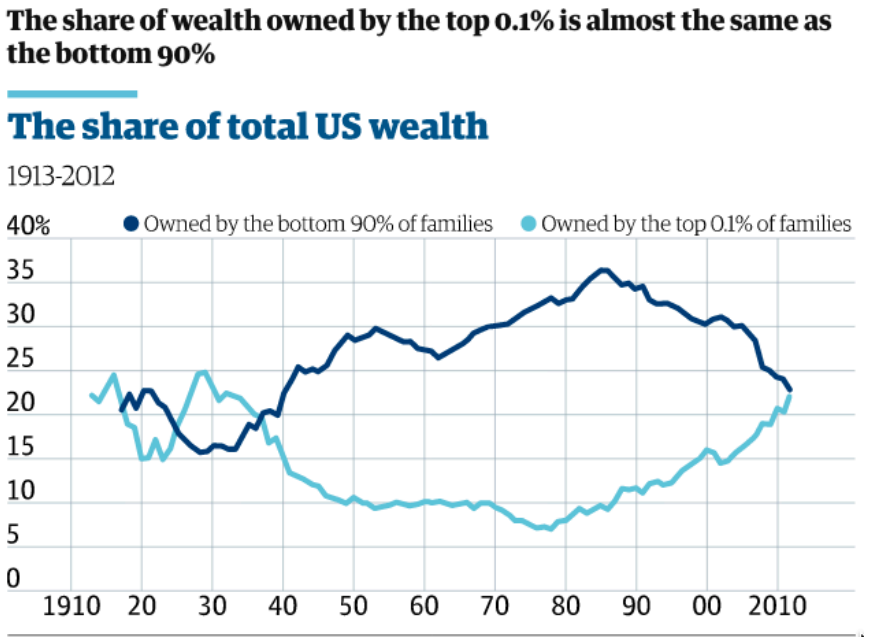

Figure 99. Disparity in U.S. Wealth Distribution
PHOTO COURTESY THE GUARDIAN / WASHINGTON CENTER FOR EQUITABLE GROWTH.

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[292] Catherine Clifford, "Warren Buffett on the Failure of 'trickle down' Economics," January 4, 2018, https://www.cnbc.com/2018/01/04/warren-buffett-on-the-failure-of-trickle-down-economics.html.

The Guardian and the Washington Center for Equitable Growth monitor and research the condition of the U.S. economy, reporting that wealth inequality has reached extreme levels:

> Wealth inequality in the U.S. is at near record levels . . . over the past three decades, the share of household wealth owned by the top 0.1% has increased from 7% to 22%. For the bottom 90% of families, a combination of rising debt, the collapse of the value of their assets during the financial crisis, and stagnant real wages have led to the erosion of wealth. . . . The average wealth of the bottom 90% of families is equal to $80,000 in 2012—the same level as in 1986. In contrast, the average wealth for the top 1% more than tripled between 1980 and 2012.[293]

Not only is wealth disparity increasing astronomically, so too is income instability among the 90%:

> Household income in the United States became significantly more volatile beginning in the 1970s despite relatively stable overall economic growth during the 1980s. Macroeconomists called this period of stable aggregate growth three decades ago 'the Great Moderation,' but the term masked the growing unequal distribution of economic growth. . . . the top 1 percent of adults in 1980 earned 27 times more than the bottom 50 percent of adults on average, but in 2016 the top 1 percent earned 81 times more. . . . savings rates in general have diverged, with the bottom 90 percent losing part of its personal safety net in wealth relative to prior generations and contributing to an inability for the majority of hoseholds to use accumulated wealth to smooth consumption. . . . cash welfare programs are playing a less and less significant role as a countercyclical source of income, though the Supplemental Nutrition Assistance Program plays an increasingly important one. One explanation for this change is that in recent years, policies have weakened the U.S. economy's automatic stabilizers and social insurance programs. One key contributor to household insecurity is rising labor market volatility

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[293] Angela Monaghan, "US Wealth Inequality - Top 0.1% Worth as Much as the Bottom 90%," *The Guardian*, November 13, 2014, sec. Business, http://www.theguardian.com/business/2014/nov/13/us-wealth-inequality-top-01-worth-as-much-as-the-bottom-90.

> . . . The increase in nonstandard work arrangements and nontraditional work schedules creates uncertainty . . . for an increasing share of the U.S. workforce.[294]

Although grim statistics and stark graphs may seem abstract and a challenge to parse, the frightening immediacy of the data behind the graph haunts nine out of ten American homes. The Great Acceleration has left most Americans behind, choking on the dust of the ever more affluent. This Anthropocene asset appropriation by the affluent from middle and lower income families has ramifications far beyond the family home.

- It means that fewer Americans have the opportunity for a higher education, and if they take out loans covering education through an advanced degree, if they can secure a job on graduation, they will work well beyond normal retirement to avoid federal student loan payments being deducted from their social security checks—if there still are social security checks.
- It means that many Americans will make great sacrifices to obtain a college education, only to find themselves working at menial jobs far below their capacity, or at a challenging job with a miniscule salary.
- It means that mere survival requires a double income household, just to make ends meet.
- It means that the children in those homes are probably on the latchkey, without adult mentorship to help them achieve their best.

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[294] Nisha Chikhale, "Household Insecurity Matters for U.S. Economic Growth and Stability," Equitable Growth, May 16, 2018, http://legacy.equitablegrowth.org/research-analysis/household-insecurity-matters-for-u-s-economic-growth-and-stability/.

- It means that the cascading American educational levels in STEM, language and reading can only keep sliding downwards, when schoolteachers are working two jobs to keep up with bills.
- It means that it is no longer an option to send checks to charitable organizations and non-profits doing important work.
- It means thinking twice before taking in a stray cat, dog, friend, foster kid, wondering if that is going to be the expense that breaks the piggy bank.
- It means that any kind of car failure, health disaster, or job loss can spell homelessness in one or two lost paychecks.
- It means slipping credit ratings and higher interest rates than those enjoyed by the wealthy.
- It means trips to the food bank for the middle class, while the wealthy jet in arcane comestibles from remote lands.
- It means that funds that were available thirty years ago to cover music lessons or math tutors are no longer available, subsumed by basic bills; the children of the 90% have to run bake sales for their school art supplies.
- It means that $30 per-person museum entry tickets, with second tickets required for travelling exhibits, are a luxury that fewer and fewer families are able to afford.
- It means that although retaining their position as trusted source of knowledge, museums' visitorship is, for the first time, waning.

In short, it means that the deep American cultural investment in

materialism, coupled with a post-World War II *I've got mine, too bad for you* mentality has led us directly to Robert Kelly's musical chairs scenario, but one in which one person is hogging half the chairs, and the other 90 percent are trying to make do with the other half. It is an untenable position by any measure. It is even untenable for the wealthy—if the 90 percent can no longer participate in a meaningful way in the U.S. market economy, it will collapse as surely as it did during the Great Depression, but without Franklin Delano Roosevelt and his trusty New Deal and Works Progress Administration advisors to save the day. Kelly discusses an Indigenous solution to this cultural conundrum that would ring familiar to Warren Buffett:

> The Kwakwaka'wakh . . . held large feasts. . . known as *potlatches*, a word that . . . means "to give." . . . in Kwakwala, the word used is *pasa*, meaning "to flatten," as beneath a pile of gifts; . . . potlatches were competitive feasts. . . to impress visitors with costumes, dances, magic tricks, and food, food, and more food. The height of the event was the giveaway, when the host, a high-ranking man, would make a very public display of giving away expensive things. . . . These feasts were no different from Gatsby-style parties of the rich and famous . . . 'conspicuous consumption.' The lead visitor at the potlatch was expected to reciprocate, and until he did so, he lost prestige in the eyes of both the host and the members of his own village. The reason has to do with how the host got all the stuff to give away. He did so by holding many small potlatches within his own village. He underwrote these small potlatches himself, and people had to reciprocate with a slightly greater amount of goods or lose prestige. It's similar to investment banking. When that ambitious man held a potlatch for another village, he was communicating to the guests just how many people stood with him. The more goods he had, the more power he possessed. The not-so-subtle message was "Look how much we can give away and it does us no harm. Don't even think about messing with us, because we can crush

you. Now let's be friends.[295]

Although the specific details of a traditional potlatch may not fit exactly the socioeconomic needs of a bewildered, exhausted and economically tattered public, confounded by the expired lottery ticket awarded them for their efforts to conform to the twin Anthropocene cultural expectations of participatory capitalism and consumer materialism, the structural concepts of the potlatch offer a model for redistribution of wealth within communities that could be pretty easily adapted to American hierarchical culture. The potlatch offers a benefit for the affluent that merely paying taxes would not—the opportunity to curry prestige and reputation.

China and the U.S.S.R. proved resounding failures at implementing communism on a vast scale, as George Orwell so bitingly presented in *Animal Farm*. Oppressive treatment of workers and activists was followed in the latter twentieth-century by the dissolution of the U.S.S.R. and the avid pursuit of capitalist endeavors in China and in the Eastern bloc countries formerly of the U.S.S.R. Cuba proved the opposite at a community scale, but it is questionable whether their success is scalable. Scandinavian socialism has proven amenable, but the brand of misery labeled as socialism in Germany, Spain and Italy in the Nazi era has left the term with a toxic aftertaste. The principle of *all for one and one for all* that characterized the Scandinavian socialism of America's pre-World War II Great Plains family farms has an enduring value that runs, soto

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[295] Kelly, *The Fifth Beginning*.

voce, through Kelly's description of *potlatch* mechanics.

American capitalism, the root engine of Anthropogenic climate disruption and a host of contributing phenomena, such as coral-killing sunscreen to name just one, has been irrefutably proven to be a disastrous socioeconomic driver. Its core principle of unrestrained growth is literally a cancer on our world, metastasized beyond repair, poisoning our air, water, atmosphere, and driving the world's biota to extinction. (Figure 100)

Pretty clearly, it is time to try something different, perhaps many different approaches to community and domestic life, searching for a functional equation. Dr. John Kretzmann, author of a number of enlightening books, is the progenitor of *Asset-Based Community Development* (ABCD). ABCD is a kinder, gentler approach to nurturing community projects and needs, especially in Indigenous or economically strapped communities that have probably been labeled as, essentially, pathetic. Kretzmann's method involves designing a project, then inventorying the many personal skills and assets of the community members, matching them up with the requirements to complete the project. Ground-truthed in many communities, Kretzmann's ABCD approach dovetails with the community involvement that Kelly describes in successful potlatches.[296]

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[296] John P. Kretzmann, *A Guide to Capacity Inventories: Mobilizing the Community Skills of Local Residents : A Community Building Workbook from the Asset-Based Community Development Institute, Institute for Policy Research* (ACTA Publications, 1997).

Western Climate Change/Climate Disruption Science

John Brinckerhoff Jackson, in his seminal work, *A Sense of Place, A Sense of Time,* sets the stage for examining cultural relationships with the land that have led us to the current climate precipice, with his interest in the relationship and cultural valuation of roads and homes:

> What do we value more, a sense of place or a sense of freedom? . . . The answer will come when we define or redefine the road as it exists in the contemporary world; when we recognize that roads and streets and alleys and trails can no longer be identified solely with movement from one place to another. Increasingly they are the scene of work and leisure and social intercourse and excitement. Indeed, they have often become for many the last resort for privacy and solitude and contact with nature. Roads no longer merely lead to places; they are places.[297]

This acute observation regarding cultural immersion in roadways made in 1994 has only deepened and ripened over the last two decades with the addition of the global Internet.

The internet adds a sort of holographic parallel universe of pathways; daily our global citizens visually navigate physical pathways while simultaneously frequenting the ephemeral geography of cyberspace—a complicated negotiation of inner/outer geography that mentally collapses physical space/time in a mental wormhole fashion. The irony is that roads used to be an avenue for close scrutiny of new environments; however, close scrutiny is not possible at 80mph—merely peripheral observations are possible,

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[297] John Brinckerhoff Jackson, *A Sense of Place, a Sense of Time* (New Haven: Yale University Press, 1994).

leading to a further disenfranchisement from the subtleties of nature. Jackson's ideas about human valuation of the ideas of road and home therefore are even more germane today, when our global home has become so destabilized. Perhaps this idea, that humans have come to a place where the journey is the destination, can help us to understand the baffling lack of importance placed on our physical earth's crumbling state, despite the pleas of scientists to attend to its repair.

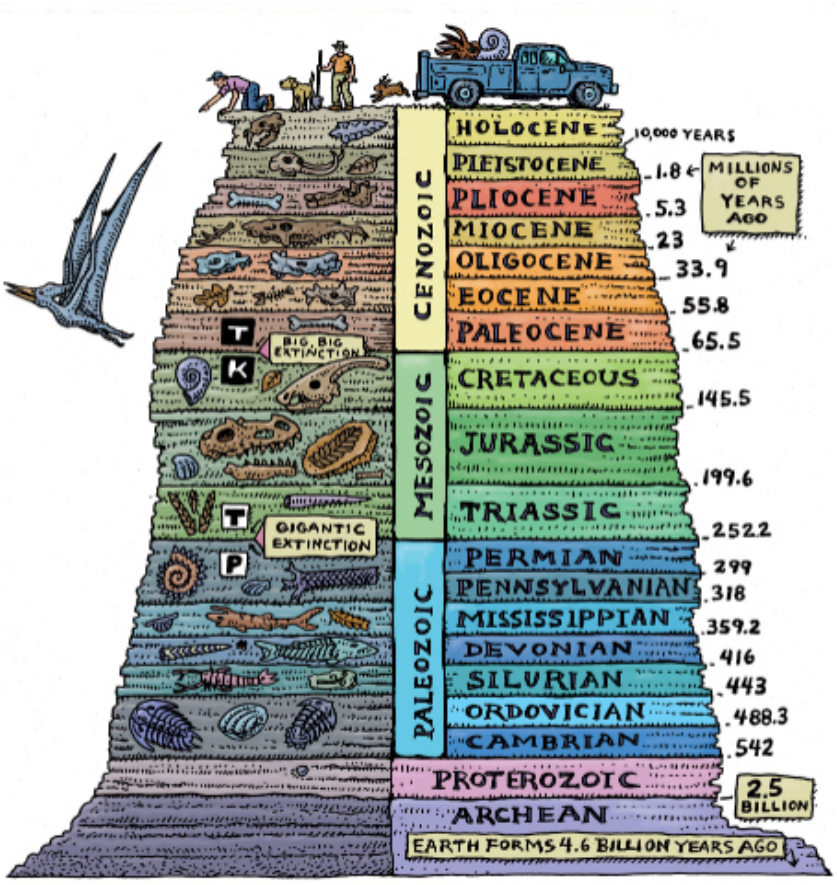

Figure 100. Geologic Time Scale, Anthropocene at the very top.[298]
PHOTO COURTESY: RAY TROLL

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[298] "What Is the Geologic Time Scale? -," *Greenforecast: For a Better World* (blog), April 10, 2013, http://greenforecast.com/what-is-the-geologic-time-scale/.

Key in this research is Dr. James Hansen, currently director of the Climate Science, Awareness and Solutions Program at Columbia University's Earth Institute since 2014, and former Director of the NASA Goddard Institute for Space Studies, from 1981 to 2013. Although he spoke before Congress in 1986 and 1987 regarding climate change, it was his June 23, 1988 testimony before the United States Committee on Energy and Natural Resources, which has become iconic in the cultural climate change timeline. Dr. Richard Besel notes, "Hansen's 1988 success is rooted in his gradual development of a rhetorical sensitivity to his non-scientist audiences: journalists, policymakers, and the general public. In other words, Hansen learned to engage in what rhetorical scholars call the rhetoric of 'accommodating science.'"[299] Hansen's galvanic testimony brought the issue of climate disruption to the American media and public during a summer characterized by record-breaking heat and drought. Hansen has been a leading scientific voice drawing attention to the onset of climate disruption, refining global climate models and speaking out publically leading to several arrests. Hansen eloquently delineates these issues in *Storms of My Grandchildren: The Truth About the Coming Climate Catastrophe and Our Last Chance to Save Humanity*:

> You need to be well informed, to understand these matters, because you cannot count on governments, the people paid to protect the public, to deal properly and promptly with the climate matter. . . . the government's problem is politics, politics

[299] Richard D. Besel, "Accommodating Climate Change Science: James Hansen and the Rhetorical/Political Emergence of Global Warming," *Science in Context* 26, no. 1 (March 2013): 137–52, http://dx.doi.org.proxybz.lib.montana.edu/10.1017/S0269889712000312.

> as usual. U.S. government scientists, at least those at the highest levels, cannot contradict a position taken by the president . . . . The picture has become clear. Our planet, with its remarkable array of life, is in imminent danger of crashing. Yet our politicians are not dashing forward. They hesitate; they hang back. Therefore it is up to you. You will need to be a protector of your children and grandchildren on this matter. I am sorry to say that your job will be difficult – special interests have been able to subvert our democratic system. But we should not give up on the democratic system – quite the contrary. We must fight for the principle of equal jUstice.[300]

Hansen's perspective as a climatologist informs his catastrophic vision of collapsing atmospheric systems, bringing an urgent authority to his pleas for citizens to address politics and the social justice issues embedded in climate disruption.

Tim Flannery, a leading climate disruption scientist from Australia, and Australia's former Chief Commissioner of the Climate Commission, and chairman of the Copenhagen Climate Council, outlines a clear plan of action in his outspoken book, *The Weathermakers*, followed by *Atmosphere of Hope: Searching for Solutions to the Climate Crisis,* [301] and *Sunlight and Seaweed: An Argument for How to Feed, Power and Clean Up the World.*[302] "You can," Flannery says, " in a few months rather than the fifty years allowed by some governments, easily attain the 70 percent reduction in emissions required to

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[300] James E. Hansen, *Storms of My Grandchildren : The Truth about the Coming Climate Catastrophe and Our Last Chance to Save Humanity*, 1st U.S. (New York: Bloomsbury USA, 2009).

[301] Tim Flannery, *Atmosphere Of Hope: Searching for Solutions to the Climate Crisis* (HarperCollins Publishers, 2016).

[302] Tim Flannery, *Sunlight and Seaweed: An Argument for How to Feed, Power and Clean Up the World* (The Text Publishing Company, 2017).

stabilize the earth's climate. All it takes are a few changes to your personal life, none of which requires serious sacrifices."[303] Flannery, a paleontologist, traces the inception of climate disruption from Alfred Russell Wallace's *Man's Place in the Universe*,[304] to the present, clearly presenting the science and analyzing climate disruption politics. He suggests that not only governments but citizens take a strong environmental activist position, starting by taking responsibility at home, and keeping a sharp eye on elected officials and Industry. Flannery is also of interest from the perspective of my research, because he not only packs a tremendous amount of scientific information into 300 pages, but he does so in an engaging page-turning manner. His chapter titles, such as "Digging up the Dead" and "A Warning from the Golden Toad" intrigue the reader, whom he engages with a welcoming storytelling approach. This narrative style of presenting scientific information by telling stories is an example in action of drawing on the attributes of an Indigenous Methodology approach to science.

Mike Hulme, a respected climate geographer from Britain, and the founding editor-in-chief (since 2008) of the review journal *Wiley Interdisciplinary Reviews (WIREs) Climate Change*, contributes *Why We Disagree about Climate Change: Understanding Controversy, Inaction and*

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[303] Tim F. Flannery, *The Weather Makers : How Man Is Changing the Climate and What It Means for Life on Earth*, 1st American (New York: Atlantic Monthly Press, 2005).

[304] Alfred R. Wallace, *Man's Place in the Universe: A Study of the Results of Scientific Research in Relation to the Unity or Plurality of Worlds* (Chapman and Hall Limited, n.d.).

Opportunity [305] to the climate disruption conversation. Hulme's self-identification as an active centrist Evangelical Christian provides an interesting and useful philosophical addition or counterpoint to the secular views of scholars such as Hansen and Flannery. Since approximately a third of the American population is Evangelical Christian, it is quite useful to observe Hulme's approach to communicating his science. In the United States an unfortunate chasm has developed between the Evangelical community and the scholarly one—a disenfranchisement from fact that makes it difficult to contend with addressing climate disruption on a broad scale. Hulme's example is a useful one to study for clues regarding possible ways to bridge this divide in the United States. Hulme is also of particular interest because, in contrast to climate change scholars who observe and suggest behaviors as a corrective tool, Hulme is interested in an anthropological examination of human response to what he refers to as "Capital C" climate change—that of culture and politics. Hulme frames his arguments from a philosophical and Judeo-Christian perspective:

> Science may be solving the mysteries of climate change, but it is not helping us discover the meaning of climate change. We need new ways of looking at the phenomenon – an idea circulating and mutating through our social worlds – and of making sense of what climate change means to us . . . . Coming from a Western European culture with a heritage of Judeo-Christian mythology, I adopt Biblical metaphors for these climate change myths: respectively, lamenting Eden, presaging Apocalypse, constructing

[305] M. Hulme, *Why We Disagree about Climate Change : Understanding Controversy, Inaction and Opportunity* (Cambridge, UK ; New York: Cambridge University Press, 2009), http://www.loc.gov/catdir/enhancements/fy0914/2009004684-t.html.

> Babel, and celebrating Jubilee. Equivalent metaphors attached to the instincts of nostalgia, fear, pride, and jUstice might also be found in other traditions such as Hindu, Norse and Chinese mythologies.[306]

Although as a climatologist, he presents his information scientifically, Hulme is interested in broader questions of perception and avoidance. He posits that the lower 'C' question of climate change is "wicked" complex, and beyond fixing, however, the Capital C Climate Change of cultural perception is rich with opportunity for cultural examination and growth. Whether one agrees with his somewhat cynical viewpoint or Christian framing of the questions, he is nevertheless thought-provoking and one of the relatively few climate disruption scholars really looking at the issue from an anthropological rather than mechanistic perspective. Hulme followed *Why we* Disagree About Climate Change with two volumes, in which he explores the origins of human perceptions of weather in *Weathered: Cultures of Climate*,[307] and decries the insanity of proposals to engage in geoengineering with atmospheric aerosols in *Can Science Fix Climate Change: A Case Against Climate Engineering*.[308]

Collapse, Jared Diamond's treatise on the disintegration of cultures neatly lays out the complexity that Hulme introduces:

> The processes through which past societies have undermined themselves by damaging their environments fall into eight categories, whose relative importance differs from case to case:

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[306] Hulme.

[307] Mike Hulme, *Weathered: Cultures of Climate*, 1st edition (London: SAGE Publications Ltd, 2017).

[308] Mike Hulme, *Can Science Fix Climate Change?: A Case Against Climate Engineering*, 1st edition. (Cambridge: Polity, 2014).

> deforestation and habitat destruction, soil problems (erosion, salinization, and soil fertility losses), water management problems, overhunting, overfishing, effects of introduced species on native species, human population growth, and increased per capita impact of people . . . . Unsustainable practices lead to environmental damage of one or more of the eight types just listed, resulting in agriculturally marginal lands having to be abandoned again. Consequences for society included food shortages, starvation, wars among too many people fighting for too few resources, and overthrow of governing elites by disillusioned masses.[309]

Diamond posits that there is no difference between past Indigenous and other cultures as far as vulnerability to over-use of the environment and suggests a long, hard look at past mistakes. He inquires,

> What are the choices we must make if we are now to succeed, and not to fail? There are many specific choices . . . . that any of us can make as individuals. For our society as a whole, the past societies that we have examined in this book suggest broader lessons. Two types of choices seem to me to be crucial in tipping their outcomes towards success or failure: long term planning, and a willingness to reconsider core values.[310]

These pivotal issues—long-term planning, and a fresh consideration of core values are ideal topics for museums to engage their communities in dialogue.

Kirstin Dow and Thomas Downing's inventively presented, *The Atlas of Climate Change: Mapping the World's Greatest Challenge*, portrays an enormous amount of data through a variety of appealing and well-designed infographics, making the information much more digestible and engaging than is the norm. They suggest, "making fundamental information more widely and

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[309] Jared M. Diamond, *Collapse : How Societies Choose to Fail or Succeed* (New York: Viking, 2005), http://www.loc.gov/catdir/enhancements/fy0719/2004057152-s.html.

[310] Diamond.

easily available is essential. Actors from local communities to global negotiators would benefit. Facing the challenge of climate disruption with such information would be far less daunting."[311] Their goal and approach could be translated well from a two-dimensional book format into a three dimensional museum context. However, they caution that the collection and analysis of the data can be problematic and require a great deal of care to avoid misrepresentation:

> For an issue of such prominence, it is surprising how difficult it is to gather relevant data, assure its quality and usefulness, and make it widely available and easily accessible . . . . Climate change data—across a wide spectrum—come from many different sources. Many of the basic indicators, such as fresh water resources and carbon emissions, are self-reported by countries using agreed upon methods of accounting. But some countries do not have long monitoring records or do not report regularly. Certain information is more reliable than other information. For instance, it is difficult to monitor the many small household investments in renewable energy, so data are more likely to represent a large-scale projects such as hydropower and wind farms. Climate data is sparse in many regions, despite the heavy investment in global climate models.[312]

American climate disruption scientists have faced an uphill battle, eking out research funds from a paltry federal purse and conducting their research while fending off critical politicians, muckraking media and powerful corporate entities. Nevertheless, globally, climate disruption scientists have collected compelling data regarding the onset of anthropogenic climate disruption. Dr. Kristen Intemann's scholarship regarding the drive for an appearance of

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[311] Kirstin Dow and Thomas E. Downing, *The Atlas of Climate Change : Mapping the World's Greatest Challenge* (University of California Press, 2011).

[312] Dow and Downing.

unassailable consensus among climate disruption scientists in the face of harsh media and political attacks suggests a resulting masking of data collection and analysis which predicts climate disruption escalating far more quickly than is being widely communicated to the public.[313]

Scientists have clearly documented that since the onset of the industrial revolution, a precipitous increase in the emission of greenhouse gases has drastically altered the world's atmospheric balance; this science is documented by a wide array of scientists, utilizing extensive data collection from around the world, going back more than a century. In the United States this research is primarily led by the National Oceanic and Atmospheric Administration (NOAA), and the National Air and Space Administration (NASA).[314] NOAA has established the Climate Program Office specifically to track and study anthropogenic climate disruption, and has been monitoring these changes for decades:

> The Climate Program Office (CPO) manages competitive research programs in which NOAA funds high-priority climate science, assessments, decision support research, outreach, education, and capacity-building activities designed to advance our understanding of Earth's climate system, and to foster the application of this knowledge in risk management and adaptation efforts. CPO-supported research is conducted in regions across the United States, at national and international scales, and globally.[315]

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[313] Inmaculada de Melo-Martín and Kristen Intemann, "Who's Afraid of Dissent?: Addressing Concerns about Undermining Scientific Consensus in Public Policy Developments," *Perspectives on Science* 22, no. 4 (2014): 593–615, https://muse.jhu.edu/article/561197.

[314] "Climate Program Office > About CPO > All News," accessed September 4, 2016, http://cpo.noaa.gov/AboutCPO/AllNews/TabId/315/ArtMID/668/ArticleID/593588/New-study-on-anthropogenic-methane-emissions-in-the-US-.aspx; "NASA: Climate Change and Global Warming," accessed September 4, 2016, http://climate.nasa.gov/.

[315] "Climate Program Office > About CPO > All News."

NASA has an excellent web site, “Global Climate Change: Vital Signs of the Planet.”[316] In 1976, Congress authorized NASA to commence research on stratospheric ozone, which led to a new research focus on Earth science, subsequently partnering more closely with NOAA to explore and understand climate disruption.[317]

Dr. Spencer Weart, former director of the Center for History of Physics of the American Institute of Physics, observes,

> For the first time, global warming showed up repeatedly in the most widely read of all American media, the comic strips. In the second half of 1988 the problem got a mention in such highly popular, and normally scarcely topical, strips as "Kathy," "Calvin and Hobbes," "Little Orphan Annie" and even "Dick Tracy." Their creators could take it for granted that readers understood their clever remarks about warming.[318]

In the subsequent three decades, scientists from far-flung disciplines have found their data converging inexorably towards a unified consensus regarding anthropogenic climate change. Cook et al.’s excellent paper, “Consensus on consensus: a synthesis of consensus estimates on human-caused global warming,” reports that,

> The abstracts of 11,944 peer-reviewed papers published between 1991 and 2011 that matched the search terms ‘global climate change’ or ‘global warming’ in the ISI Web of Science search

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[316] NASA Global Climate Change, “Global Surface Temperature | NASA Global Climate Change,” Climate Change: Vital Signs of the Planet, accessed March 29, 2018, https://climate.nasa.gov/vital-signs/global-temperature.

[317] “Climate Change: Vital Signs of the Planet: NASA’s Role,” accessed September 4, 2016, http://climate.nasa.gov/nasa_role/.

[318] Spencer R. Weart, *The Discovery of Global Warming: Revised and Expanded Edition*, Revised edition (Cambridge, Mass: Harvard University Press, 2008).

> engine. Among the 4014 abstracts stating a position on human-caused global warming, 97.1% were judged as having implicitly or explicitly endorsed the consensus. In addition, the study authors were invited to rate their own papers, based on the contents of the full paper, not just the abstract. Amongst 1381 papers self-rated by their authors as stating a position on human-caused global warming, 97.2% endorsed the consensus.[319]

This worldwide scientific consensus regarding our planet's increasing disequilibrium is framed and highlighted by the work of many highly reputable scholars. Although the affluent will always be able to buffer themselves from the grossest affronts of climate disruption, escalating drought will impact every living being on the planet. Fred Pearce noted a decade ago that water is an aspect of climate disruption that disproportionately affects the most stressed global populations, and points out that "more than a billion people in shantytowns and remote villages across the poor world have no access to reliably clean drinking water . . . . but we should not forget that there are hydrologically dispossessed people even in the rich world."[320] In 2015, in the United States, 2.7 million people are without access to clean water.[321]

The World Health Organization reports that currently 1.8 billion people are drinking contaminated water,[322] has set a priority to increase access to

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[319] John Cook et al., "Consensus on Consensus: A Synthesis of Consensus Estimates on Human-Caused Global Warming," *Environmental Research Letters* 11, no. 4 (2016): 048002, https://doi.org/10.1088/1748-9326/11/4/048002.

[320] Fred Pearce, *When the Rivers Run Dry, Fully Revised and Updated Edition: Water-The Defining Crisis of the Twenty-First Century*, Revised, Updated edition (S.l.: Beacon Press, 2018).

[321] "See Where Access to Clean Water Is Getting Better—and Worse," accessed September 5, 2016, http://nationalgeographic.com/clean-water-access-around-the-world.

[322] "WHO | Water Safety and Quality," WHO, accessed September 4, 2016, http://www.who.int/water_sanitation_health/water-quality/en/.

clean drinking water, and has increased access over the last decade, although that access is primarily through ground water wells and aquifers, sources that will literally dry up. Escalating climate-induced drought will bring us to a point in the future where draining aquifers will coincide with surface aridity to create a life-threatening problem.

Drought, easily enough put out of mind if it is not a personal issue, has already become a very pressing problem in many parts of the world. California has entered a rolling drought of six years to date. The 2012-2015 period was the worst California drought on record in 1,200 years, according to NOAA, while the 2016-2017 was the wettest winter ever recorded in Northern California. The La Nina and El Nino weather cycles can create very wet winters, resulting in severe flooding between droughts. Over the last two decades, California has suffered through three multiple-year droughts, each of longer duration and greater severity than the previous. (Figures 101-102) California, already a dry Mediterranean climate, has little natural buffer and the geographical interface between humans and landscape has been a tinderbox. Not only is California the most populous state, it is also a primary source of agricultural products. Some, such as avocados and almonds, are very sensitive to factors such as aridity and intense summer heat, or drenching rains while the plants are in flower.

Many farms, orchards and vineyards in California are family-owned—93

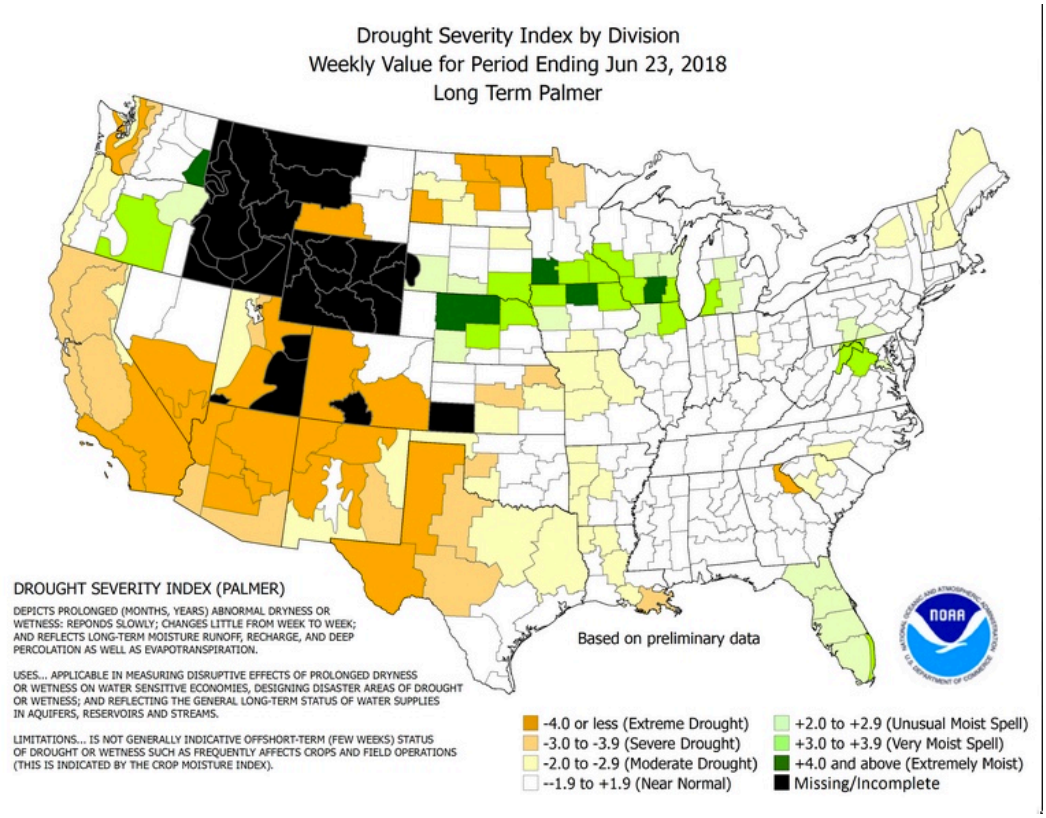

Figure 101. Drought Severity Index. United States. June 23, 2018
IMAGE COURTESY: NOAA

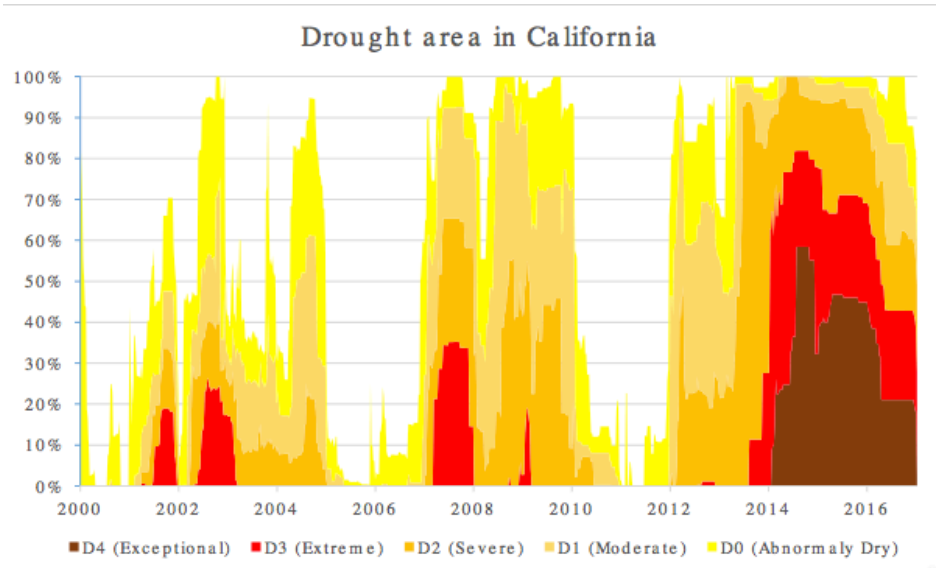

Figure 102. California drought index 2000-2016
IMAGE COURTESY: UNITED STATES DROUGHT MONITOR

percent[323]—without the deep pockets of agribusiness to survive lost crops or fires. California's Napa, Mendocino and Sonoma counties are home to 3,674 primarily family-owned vineyards that take decades to mature; twenty-seven wineries were damaged or burnt to the ground, and many adjacent vineyards suffered smoke damage to their crops. Washington and Oregon are home to 1,255 more wineries, and are predicted to have heavy 2018 fire seasons.

During the summer, fall and winter of 2017-2018, wildfires burned out of control across the state—almost 9,000 wildfires—that burned 1.2 million acres, annihilated nearly 11,000 buildings, killed forty-six people, threatened major cities, and exacted a $3+ billion price tag in damages.[324] The ashes barely swept up, the National Interagency Fire Center's Predictive Outlook for 2018, published on July 1st and forecasting July-October, suggests that the coming fire season will be equally destructive.[325] As of July 1st, 2018, 53,664 acres were burning, requiring evacuations in two counties.

On June 7, 2018, Governor Jerry Brown signed SB 606 and AB 1668 into law, after their approval by the state legislature.[326] The two bills have been

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[323] "2012 Census of Agriculture Highlights" (United States Department of Agriculture National Agricultural Statistics Service, March 2015).

[324] Dave McIntyre, "Weeks after Wildfires, California Wine Country Is 'as Beautiful as Ever' — and Hurting for Visitors - The Washington Post," accessed July 2, 2018, https://www.washingtonpost.com/lifestyle/food/weeks-after-wildfires-california-wine-country-is-as-beautiful-as-ever--and-hurting-for-visitors/2017/11/01/8b8cfbc2-be86-11e7-959c-fe2b598d8c00_story.html?utm_term=.131d9c5af8b2.

[325] Lauren Tierney, "2017 Was California's Largest and Most Destructive Fire Season in a Decade," Washington Post, accessed July 2, 2018, https://www.washingtonpost.com/graphics/2017/national/california-wildfires-comparison/.

[326] "New California Water Law Restricts How Much Water People Can Use," June 8, 2018, https://sacramento.cbslocal.com/2018/06/08/new-california-water-law-restrictions-shower-

universally condemned in the media as Draconian and unreasonable. The legislation mandates permanent rationing of 55 gallons per day, per person, as well as agricultural and industrial limits punishable by $1,000 fines.[327]

Having survived strict water rationing in California as a child, and assessing the disastrous consequences that the California landscape and biota are already suffering from climate disruption, drought, and wildfires, I have no sympathy for the complainers, wailing their perceived entitlement rather than finding a feasible path to water stewardship.[328]

This kind of mandated proactive community sustainability response to a familiar phenomenon, drought, in the process of escalating via climate disruption to a harsher new equilibrium, is a perfect opportunity for museums to provide their public with STEM education, contextualize drought and climate change, and suggest stewardship techniques. Although neither the Oakland Museum nor the Chabot Science Center, also in Oakland, availed themselves of this teaching moment, the Exploratorium created a collaborative exhibit regarding sustainability and water use with the San Francisco Boys and Girls Club, *Ciencia Publica: Agua*[329] while the California Academy of Sciences

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laundry/.

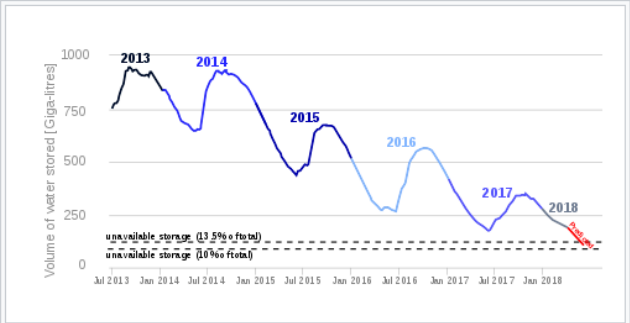
[327] "Drought or No Drought: Jerry Brown Sets Permanent Water Conservation Rules for Californians," *The Mercury News* (blog), May 31, 2018, https://www.mercurynews.com/2018/05/31/california-drought-jerry-brown-sets-permanent-water-conservation-rules-with-new-laws/.

[328] Peter Hartlaub on January 16 and 2014 at 4:19 AM, "Remembering the California Droughts of 1977 and 1991 (Photos)," The Big Event, January 16, 2014, https://blog.sfgate.com/thebigevent/2014/01/16/remembering-the-california-droughts-of-1977-and-1991-photos/.

[329] "Studio for Public Spaces: Projects: Ciencia Pública | Exploratorium," accessed July 2,

created an instructive video, "Water Use: Drought and Beyond."[330]

Similarly geographically situated in a Mediterranean climate, the city of Durban is the seat of eThekwini metropolitan municipality, located in KwaZulu-Natal province on the southeast coast of South Africa. Durban is a terrifying harbinger of times ahead; enduring strict water rationing in response to a severity of drought previously unknown in a major, densely-populated urban metropolis. Unlike the relatively sparsely populated Wine Country of California, home to a few hundred thousand residents, eThekwini has a population of more than four million people, mainly Zulu. Like California, Durban is a locus for vacationers, business conferences, industry, agriculture and citizens. Like



Graph of total reservoir water stored in the Western Cape's largest six dams from 30 June 2013 to 31 March 2018. The graph illustrates the declining water storage levels over the course of the Cape Town water crisis, and the impact of reduced consumption since early 2018. The prediction shows storage levels reaching around 12% by the end of May 2018 based on normal (pre-crisis) consumption. Data obtained from the Climate Systems Analysis Group (CSAG)

Figure 103. Durban, South Africa, reservoir level.[331]
IMAGE COURTESY: CLIMATE SYSTEMS ANALYSIS GROUP

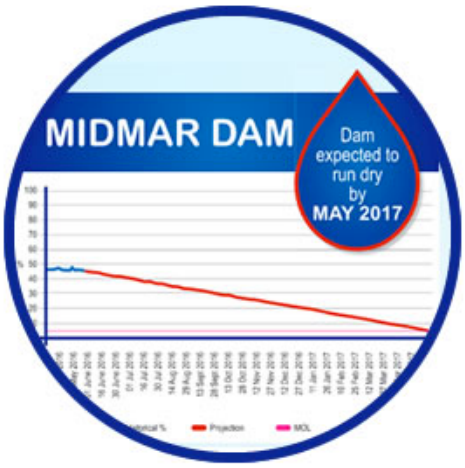


Figure 104. "In the grip of punishing drought"
IMAGE COURTESY: DURBAN.GO.ZA

2018, https://www.exploratorium.edu/publicspaces/projects/ciencia-publica.

[330] California Academy of Sciences, *Water Use: Drought and Beyond*, 2014, https://www.calacademy.org/explore-science/water-use-drought-and-beyond.

[331] Durban, South Africa, reservoir level. June 30, 2013 – March 31, 2018.

California, Durban too has suffered intense drought, accelerated by climate change, requiring rationing and sustainability measures. Unlike California, the South African municipal and federal government monitored the situation closely, creating adaptive initiatives and implementing them in the community. Durban has the largest commercial and tourist shipping port in Africa, as well as banana, sugar cane, and nut agriculture and a thriving industrial economy.[332] Durban is a major tourist destination due to its clement weather and beautiful beaches bounded by emerald Drakensberg Mountains, as well as cultural attractions, golfing and horseracing. Durban is well supplied with hundreds of



Figure 105. Durban, South Africa.
IMAGE COURTESY: INDIA TIMES

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[332] "Demographics of South Africa," *Wikipedia*, June 20, 2018, https://en.wikipedia.org/w/index.php?title=Demographics_of_South_Africa&oldid=846681329.

smaller hotels, 82 conference venues; with 8,000+ guest rooms and about 350,000 square feet of conference meeting rooms.[333] (Figures 103-105)

Unfortunately, although spared the catastrophic fires that have scorched California, Durban, and eThekwini Municipality and the greater KwaZulu-Natal province as a whole have been, as the city water department poster says, "In the grip of a punishing drought."[334] The province was declared a disaster area, as the reservoirs supplying the region, and Durban in particular, plummeted between 2013 and 2018, prompting South Africa's Environmental Affairs Ministry to announce in 2015 that:

> South African farmers must adapt to changing weather patterns brought about by climate change. The minister said extreme heat, uncharacteristic snowfall and cold fronts during the summer months have been caused by climate change, which worsened over the past 15 years. Molewa said in places such as northern KZN, shorelines have already started receding while the western part of southern Africa continues to dry. She said the effects of climate change can already be seen in places like Durban and that the ongoing drought means it's time for farmers to think differently. At the same time, AgriSA says the country is drought-stricken and should brace for lesser rainfall in the coming years.[335]

In June 2015, outer towns in eThekwini imposed water rationing and a basic set of water stewardship rules. By April 2016, water shortages had reached crisis levels; the city announced that it was initiating across-the-board daily water

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[333] "Durban, South Africa Special Event Venues | Cvent Destination Guide," Cvent, accessed July 2, 2018, http://www.cvent.com/rfp/durban-south-africa-special-event-venues-0cd4da62833845d689003a3dd2c84b5f.aspx.

[334] "Drought and Water Crisis Poster," accessed July 2, 2018, http://www.durban.gov.za/City_Services/water_sanitation/Pages/Water.aspx.

[335] Emily Corke, "KZN Facing Worst Drought since 1982," accessed July 2, 2018, http://ewn.co.za/2015/11/04/kzns-drought-worst-since-1982.

shutoffs from 9pm to 4am, and asked residents to, "Play Your Part. Save Water Now!" As the drought stretched on, Durban residents faced the possibility of twice weekly 9-hour water shut-off rationing, and the specter of "Day Zero," the projected total depletion of reservoir water supplies. In July 2017, the municipality announced the implementation of an extensive 10-year water stewardship plan.[336] Six months later, on December 17, 2017, the eThekwini city government announced that the drought was not yet over, and reminded citizens of the water conservation measures expected of every person.[337] In early February, the South African federal government declared a state of emergency and nationalized the drought response; the entire country was facing severe shortages and looming Zero Days. Journalist Brian Browdie interviewed Zachary Donnenfeld, a senior researcher at the Institute for Security Studies in Pretoria:

> 'The [threat of] Day Zero in Cape Town is important and requires immediate attention, but there's a large, more systemic problem going on in the country that rationing and restrictions are not going to address,' . . .For years, South Africa has lacked a culture of water conservation, according to Donnenfeld, who in a recent report notes that South Africans consume, on average, 235 liters (62 gallons) per person daily, compared with a global average of 173 liters (46 gallons)—a figure that Donnenfeld says in all likelihood masks inequality in consumption between wealthy South Africans and those who live in poverty. High-per-capita usage rates also reflect loss of water through leaks, a reliance on

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[336] "10 Year Water Security Plan for City," accessed July 2, 2018, http://www.durban.gov.za/Resource_Centre/Press_Releases/Pages/10-Year-Water-Security-Plan-for-City-.aspx.

[337] "Drought Is Not Over Yet_Albert Falls Dam Critically Low," accessed July 2, 2018, http://www.durban.gov.za/Resource_Centre/Press_Releases/Pages/Drought-Is-Not-Over-Yet_Albert-Falls-Dam-Critically-Low.aspx.

coal-fired power plants that impact water quality and quantity, and inattention to harvesting groundwater, which is less vulnerable to drought than water stored in dams. What's more, South Africa treats only about 60% of wastewater, much of it inadequately, says Donnenfeld, who cites a survey last year by AfriForum that found two-thirds of the country's municipal sewage treatment plants did not meet quality standards.[338] (Figure 106)



Figure 106. People queue to collect water in a Cape Town suburb[339]
PHOTO COURTESY: REUTERS/MIKE HUTCHINGS

This disastrous drought in South Africa is precisely what we can expect in years to come in similar American metropolis communities in California and the desert Southwest—Los Angeles, Phoenix, Albuquerque—and the surrounding urban and rural communities. Museums could play a valuable educational role by creating exhibits or programming drawing attention to the many similarities

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[338] Brian Browdie, "Cape Town Is Just the Beginning of South Africa's Spreading Water Crisis," *Quartz* (blog), accessed July 2, 2018, https://qz.com/1203283/cape-town-water-crisis-day-zero-will-declared-a-national-disaster/.

[339] "People queue to collect water from a spring in the Newlands suburb of Cape Town." Reuters

between Durban and a city like Los Angeles, and sharing with their visitors the steps that South Africa is taking to contend with their long-term drought. A series of city and federal announcements pertaining to the South African drought are included in Appendix 2.

For the purposes of this research, I propose that the 97% scientific consensus regarding anthropogenically-induced climate disruption requires no additional discussion and may be taken as a solid platform upon which to build further research. The politicization of climate disruption in America has drawn valuable attention away from actually addressing the resulting issues that face us, as they do the drought-stricken citizens of South Africa.

Museums, Climate Disruption, the Anthropocene, and Ethics

Although there is a small but growing literature on *Green Museums*, the focus still tends to be primarily on LEED certification, infrastructure, landscaping, and architecture, rather than on the social engineering aspects of creating new, greener social paradigms within the museum community.

Academic scrutiny of museums' approaches to contending with climate disruption institutionally and pedagogically has been sparing. Pragmatic institutional efforts and initiatives for *greening up* have been examined carefully by Sarah Brophy Sutton and Elizabeth Wylie in their first and second

editions of *The Green Museum: A Primer on Environmental Practice*,[340] and Sutton's 2015 volume, *Environmental Sustainability at Historic Sites and Museums*.[341] Sutton's groundbreaking research is focused on the pragmatic issues of *green museums*, providing an excellent model of the kind of handbook much needed in the pedagogical realm of this dissertation research. *The Green Museum* presents a wide array of specific suggestions to improve infrastructure sustainability, illustrated by on-the-ground examples at museums. Sutton has created a website, *Sustainable Museums*, in which she posts monthly blog articles and numerous resources.[342] Rachel Madan's excellent companion piece, *Sustainable Museums : Strategies for the 21st Century*, offers chapter by chapter, the techniques and approaches utilized by museums in initiating green programs.[343]

Richard Hebda and Robert R. Janes, early visionaries, or perhaps *canaries* with their respective works, *Museums, Climate Change and Sustainability*,[344] and *Museums in a Troubled World: Renewal, Irrelevance or Collapse?*[345] were followed several years later in 2012 and 2014 by Australian

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[340] Sarah S. Brophy and Elizabeth Wylie, *The Green Museum : A Primer on Environmental Practice* (Lanham: AltaMira Press, 2008), http://www.loc.gov/catdir/toc/ecip0812/2008008230.html.

[341] Sarah Sutton, *Environmental Sustainability at Historic Sites and Museums* (Lanham, Maryland: Rowman & Littlefield Publishers, 2015).

[342] Sutton, "Sustainable Museums."

[343] Rachel Madan, *Sustainable Museums : Strategies for the 21st Century* (Edinburgh: MuseumsEtc, 2011).

[344] Richard J. Hebda, "Museums, Climate Change and Sustainability," *Museum Management and Curatorship* 22, no. 4 (December 1, 2007): 329–36, https://doi.org/10.1080/09647770701757682.

[345] "Museums in a Troubled World: Renewal, Irrelevance or Collapse? (Museum Meanings):

scholars Dibley and Cameron. Ben Dibley conducts a very thoughtful and insightful examination of pertinent literature focused on the concept of cosmopolitanism in his article, "Museums and a Common World: Climate Change, Cosmopolitics, Museum Practice." Dibley concludes,

> The unfolding crisis of anthropogenic climate change demands that decisions . . . must now be made . . . along with innumerable other human and non-human actors, if we are to work toward the composition of a common world – of a liveable, breathable 'home' on planet Earth. Perhaps, the cosmopolitical museum might come to put forward proposals by which 'we' think of our decisions 'in the presence of' those others once disqualified by the borders of nation, species, and animation, not on the assumption that we nevertheless share a common world, but that we enter into the hard work of its composition. . . . with regard to the climate crisis we find ourselves in networks of relations vastly more complex than the metaphor of 'the crossroad' would allow, here the 'vital role' of museums might lie in cosmopolitical experiments that . . . come to slow down decisions 'about which turn to take' and open up the chance of a common world.[346]

Fiona Cameron explores the role that museums can play in bridging governmental policy and public understanding in her book, *Climate Change and Museum Futures.*[347] Jennifer Newell and Libby Robin compare approaches primarily between the American Museum of Natural History and Australian Museums in their edited volume, *Curating the Future: Museums, Communities and Climate Change*. In the chapter, "An Object in View: The Model of Flooded

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Robert R. Janes: 9780415463010: AmazonSmile: Books," accessed August 11, 2016, https://smile.amazon.com/Museums-Troubled-World-Irrelevance-Collapse/dp/0415463017/ref=sr_1_1?ie=UTF8&qid=1470897908&sr=8-1&keywords=Museums+in+a+Troubled+World%3A+Renewal%2C+Irrelevance+or+Collapse%3F.

[346] Ben Dibley, "Museums and a Common World: Climate Change, Cosmopolitics, Museum Practice," *Museum and Society* 9, no. 2 (July 2011): 154–65. 162.

[347] Fiona Cameron and Brett Neilson, eds., *Climate Change and Museum Futures*, 1 edition (Routledge, 2014).

New York," Edmond Mathez offer an interesting critique regarding a model of Manhattan that was included in the 2008 AMNH exhibit, *Climate Change: The Threat to Life and a New Energy,* an exhibit that travelled worldwide to a dozen museums. This three-dimensional model illustrated Manhattan in 2008, and as it would appear flooded by three-meter and six-meter rises in sea level. Mathez notes several issues regarding the captioning for the model; the time-frame of sea level rise was not immediately obvious, "Indeed, the scales of time and space of planetary processes are among the most challenging concepts to communicate." Mathez makes a second more philosophical observation:

> The caption made another important point that flooding of Manhattan is ultimately unlikely to occur because the city would surely adapt, for example, by building sea walls or other infrastructure to protect itself. . . . Of all places, one of the major financial centers on the planet will surely adapt, but what about the poor parts of the world that are similarly threatened. The model offered an extraordinary opportunity to juxtapose the differing abilities of rich and poor to adapt to climate change, but it did not do so. . . . Only after instillation of the model did we curators, who were ultimately responsible for the exhibit messages, realize our omission. More broadly, this tale is a metaphor for how global society thinks off climate change. We seldom think of it as a threat separating rich and poor, and thus as a threat to all of us.[348]

Diane Barthel-Bouchier's volume, *Cultural Heritage and the Challenge of Sustainability*, although not focused on museums in particular, examines a wide range of situations in which cultural heritage is being impacted, and the

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[348] Jennifer Newell, Libby Robin, and Kirsten Wehner, eds., *Curating the Future: Museums, Communities and Climate Change* (Milton Park, Abingdon, Oxon ; New York, NY: Routledge, 2016). 240-241

efforts to utilize sustainability institutionally and in research.[349] Gregory Chamberlain's slim edited volume, *Greener Museums: Sustainability, Society, and Public Engagement*,[350] contains several germane chapters, in particular, Aaron Pope's chapter on sustainability at the California Academy of Sciences. Chamberlain specifically explores how museums can guide their public towards sustainable perspectives.

Selma Holo and Mari-Tere Alvarez' excellent edited volume, *Beyond the Turnstile : Making the Case for Museums and Sustainable Values*,[351] and Nina Simon's, *The Participatory Museum*, and *The Art of Relevance*,[352] are three of the most pertinent and useful volumes at this time, examining sustainable museum pedagogical practices. Holo and Alvarez evaluate Mexican museums, and present a wide array of essays by museum professionals in Mexico and the United States, advocating best practices. Holo and Alvarez reflect that with increasing costs to stage exhibits, museums need to carefully assess the relevance of their projects. Simon specifically looks at issues of inclusivity, visitor response, and attraction to museum installations and programs. Giving case studies to illustrate her points, she delves into topics such as "co-creation and institutional culture," and methods for handling visitors' inappropriate or

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[349] Diane L. Barthel-Bouchier, *Cultural Heritage and the Challenge of Sustainability* (Walnut Creek, CA: Left Coast Press, Inc, 2013).

[350] Gregory Chamberlain, *Greener Museums: Sustainability, Society, and Public Engagement* (England: Museum Identity Ltd., 2011).

[351] Selma Holo and Mari-Tere Alvarez, *Beyond the Turnstile : Making the Case for Museums and Sustainable Values* (Lanham, Md.: AltaMira Press, 2009).

[352] Nina Simon and Jon Moscone, *The Art of Relevance* (Santa Cruz (California): Museum 2.0, 2016).

offensive comments on participatory installations.[353]

Eric Dorfman's edited volume, *The Future of Natural History Museums*,[354] explores a variety of Anthropocene related topics, focusing on collecting and preservation, visitor experiences and interfaces. Of interest in this context is that although various chapters touch on Indigenous people, there is no chapter devoted to the evolving relationship of natural history museums and Indigenous peoples. Dorfman does note that,

> Authentic partnering between museums and indigenous peoples has often been . . . elusive, particularly since a preponderance of artifacts held in anthropology questions were not acquired, or interpreted, with permission. A notable exception may be found in New Zealand, which, because of the 1840 Treaty of Waitangi, is one of the most progressive countries with respect to indigenous partnerships. Indeed, bicultural museums there may be seen as a model for natural history museums in many other regions . . . . Despite some progress I this direction, these relationships—even in New Zealand—are not thoroughly resolved. Within the sector, there is not even agreement as to whether, and in what circumstances, to display human remains—a subject of great importance in many traditional cultures. A developing spirit of partnership will help provide answers to some of these questions and allow us to ground our impact in social justice.[355]

In contrast, Timothy Luke's *Museum Politics*[356] takes an incisive look at a number of topics, including colonialism in natural history museums, the *hyper real* presentation of desert environments at the Arizona-Sonoran Desert Museum, and, interesting from an American Studies perspective, several

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[353] Nina Simon, *The Participatory Museum* (Museum 2.0, 2010). 222, 274.

[354] Dorfman, Eric, *The Future of Natural History Museums*, 1 edition (Milton Park, Abingdon, Oxon ; New York, NY: Routledge, 2017).

[355] Dorfman, Eric. 205-206.

[356] Timothy W. Luke, *Museum Politics: Power Plays At The Exhibition*, 1 edition (Minneapolis: Univ Of Minnesota Press, 2002).

examinations of cultural concepts and representations of *the West*. Particularly germane to this research manifesto, Luke observes,

> Museum exhibitions are bolted together out of rhetorical fragments taken from specific discourses and practices that have not always been fabricated with objective detachment, passive gazing, and dispassionate consideration. Objects on display in museums are disembedded from their social contexts, and the viewing subjects are kept back from their social sites of origin as they visit and view these objectified museum representations inside a museum's spectacular halls of exhibition. . . . .the positioning of power here cycles through a complex set of simultaneous equations that must interoperate closely and correctly through many intellectual discourses and technical disciplines in order to be effective. . . . Museums help to forge reality, and then they organize the collective rites of this unstable reality's reception that will write authoritative accounts of the past, present, and future in their displays.[357]

Especially relevant to this research is the work of Robert R. Janes, mentioned briefly above. Janes is an intrepid pursuer of a revisionist museum construct based on ethical principles, exploring issues of colonialism, climate disruption, activism, and ethics in *Looking Reality in the Eye: Museums and Social Responsibility*,[358] *Museums in a Troubled World: Renewal, Irrelevance or Collapse?*[359] *Museums Without Borders: Selected Writings of Robert R. Janes*,[360] and *Museums and the Paradox of Change*.[361] Janes provides an inspiring example of facing tough topics head on and taking a long, hard look at

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[357] Luke. 219-220.

[358] Ruth J. Abram et al., *Looking Reality in the Eye: Museums and Social Responsibility*, ed. Robert R. Janes and Gerald T. Conaty (Calgary: University of Calgary Press, 2005).

[359] Robert R. Janes, *Museums in a Troubled World: Renewal, Irrelevance or Collapse?,* 1 edition (Routledge, 2009).

[360] Robert R. Janes, *Museums without Borders: Selected Writings of Robert R. Janes* (London: Routledge, 2015).

[361] Robert R. Janes, *Museums and the Paradox of Change*, 3rd edition (London ; New York, NY: Routledge, 2013).

them. For example, Janes states,

> It is increasingly vital that museums generate the requisite purpose and will to participate more consciously in the world around them, as the warning signs of our collective vulnerability continue to accumulate. . . . . Along with the will-power required to reduce consumption is the greater need to transform the museum's public service persona defined by education and entertainment to one of a locally-embedded problem-solver, in tune with the challenges and aspirations of the community. Is this idealistic? Yes, woefully so, considering the path to irrelevance many museums are seemingly content to tread. The trajectory looks something like this: privileged societal position of trust and respect = assumed authority = group-think by boards and staff, i.e. 'we know what's best for you and us' = museum complacency = isolation from the needs, values and aspirations of local communities = incremental irrelevance at a time of increasing urgency.[362]

Contributing Factors to Public Perceptions of Climate Disruption

Media Influence

The museum world has been, overall, reticent to pick up the issues of climate disruption and anthropogenic factors, reluctant to engage in controversy. In contrast, the media have actively covered the issues, although often divisively, with some notable exceptions. Western science knowledge has proven difficult for the general public to grasp and absorb, a problem compounded because the media have frequently used science as a topic for argumentation rather than enlightenment, leading to challenges in clarifying climate disruption for the public. The National Science Foundation conducted

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[362] Janes, *Museums in a Troubled World*. 173-174.

nation-wide "Science: Becoming the Messenger" workshops to address this problem of miscommunication; one of the key suggestions was that scientists make their findings relevant to their audience.[363] Museums have been presenting climate disruption information to the public primarily through the narrowly-construed lens of Western science, without sufficiently engaging relevancy.

The majority of the American public finds climate disruption education depressing or seemingly irrelevant and avoids it; they trust neither the media nor academics to be unbiased and trustworthy sources of knowledge. To break this impasse of trust, we urgently need to develop new methods of communication between the scientific community and the general public. Twentieth and twenty-first century mainstream media approaches to engaging the public have been founded on a core concept of novelty, as well as frequently over-amplifying the drama of any given situation.

An example of this erosion of media credibility is gleaned from a first-person experience of the 1989 Loma Prieta earthquake. This significant earthquake, occurring at 5:04 pm on September 17, 1989, was epicentered ten miles northeast of Santa Cruz, California, and registered 6.9 on the Richter scale, with mild aftershock activity primarily that evening and the following day.[364] My San Francisco business district 1910 vintage office building had been

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[363] "Science: Becoming the Messenger | NSF - National Science Foundation."

[364] UC Berkeley Seismology Lab, "1989 Loma Prieta Earthquake," accessed March 29, 2018, http://seismo.berkeley.edu/outreach/1989_quake.html.

structurally retrofitted and withstood the quake with a sole toppled monitor, as was the case with most buildings in San Francisco, since building code and common sense dictated seismic retrofitting. Unfortunately, older unreinforced masonry structures, especially on landfill, were damaged as a consequence of geological liquefaction. Forty-one commuters caught on San Francisco's aging Cypress Street viaduct lost their lives when the structure collapsed, and one person died on the San Francisco-Oakland Bay Bridge, when one section of upper deck tipped down to the lower deck. An additional twenty-three people lost their lives across Northern California as a result of the earthquake, 3,757 people sustained injuries, and approximately $6 billion in property damage occurred.[365]

Experiencing this earthquake and aftermath in downtown San Francisco was a notable experience. As it was occurring, every person who had grown up in the California school system dove under desks; the preparedness drills were quite effective. As the earthquake rolled, I snatched my phone from atop my desk and called my parents to let them know I was all right; moments later the phones went dead. We were well aware that this earthquake was "the Big One" we had been planning for—however, it was primarily over in a minute or two, and we all decided to head home. I headed for the BART rapid transit to make my way home across the bay, and found it closed; although the bay tunnel had

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[365] "Historic Earthquakes," accessed September 25, 2016, https://earthquake.usgs.gov/earthquakes/states/events/1989_10_18.php.

not been breached, it was closed as a safety measure. I found the trans-bay bus cancelled as well, due to the bridge damage. I was unable to check into a hotel, as all of their electronic registration systems were down. All telephone and electricity was incapacitated, except for emergency generators.

The air on this brisk fall night was filled with the distinctive odor of powdered brick; as buildings clapped together during the quake and aftershocks, they puffed out eight decades of brick dust and soot. Although the ambient atmosphere was one of shock and disorientation, and as a small single woman I wanted to get off the darkening evening streets; there was no vandalism, looting, or social threat that I observed. Word passed through the crowds that commuters should go to the ferry building as the city had contracted with ferry operators up and down the coast to converge there to provide transportation for the many thousands of trans-bay commuters. Free emergency ferry service began at 8pm, just three hours after the earthquake, and ran throughout the night and into the next day, providing rides home for more than 20,000 people.[366]

The weary, shaken commuters waited patiently in the nighttime chill, as the ferries large and small came and went, taking people home. What I found notable was the lack of hysteria, drama, or aggression; instead, a sense of camaraderie was maintained. However, it seemed on every corner there was

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[366] Mark Hansen and Sharon Weinstein, "East Bay Ferry Service and the Loma Prieta Earthquake," *University of California Transportation Center*, 1991, https://escholarship.org/uc/item/5dg5n2kb.pdf. 1-12.

someone with a pocket radio—everyone was desperate for news of the extent of the damage, and likelihood of significant aftershocks. Radio and television news reporters used dramatic language such as the inflammatory comments by KGO anchor Cheryl Jennings and reporter Anna Chavez, "A very, very frightening situation," and "Oh my God. …that is one of the scariest things I've ever seen," "we're receiving widespread reports of people smelling gas."[367]



Figure 107. Massive Quake. San Jose Mercury News. *PHOTO COURTESY: SJM NEWS 10/18/89*[368]

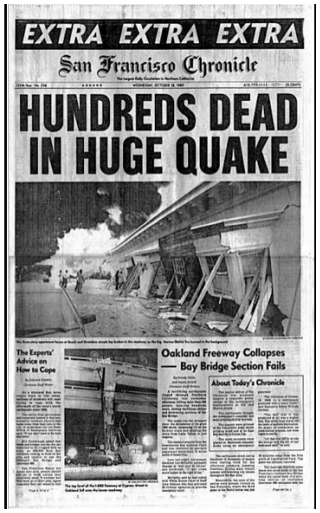

Figure 108. Hundreds Dead. San Francisco Chronicle. *PHOTO COURTESY: SF CHRONICLE 10/18/89*[369]



Figure 109. 250 killed. San Francisco Examiner. October 18, 1989 *PHOTO COURTESY: SF EXAMINER 10/18/89*[370]

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[367] StormSpotterMike, *1989 San Francisco Earthquake - First Minutes (KGO TV)*, accessed July 11, 2018, https://www.youtube.com/watch?v=P5fJdM69pbQ; FreddyKruegerFiles, *Rare Police Footage of San Francisco's Oct 17 1989 Earthquake Aftermath Part 2 of 2*, accessed July 11, 2018, https://www.youtube.com/watch?v=fMVqR5ShdYg.

[368] "Loma Prieta Earthquake: The Mercury News' First-Day Coverage, Morning Paper – The Mercury News," accessed September 25, 2016, http://www.mercurynews.com/2014/10/10/loma-prieta-earthquake-the-mercury-news-first-day-coverage-morning-paper/.

[369] "A Look Back at the 1989 Loma Prieta Earthquake: San Francisco... Photo-2020908.95039," SFGate, accessed September 25, 2016, http://www.sfgate.com/news/slideshow/1989-Loma-Prieta-earthquake-95039/photo-2020908.php.

[370] Dan Brekke, "Loma Prieta: 25 Years Later, the Images Are Still Haunting," KQED News,

The media created an immediate impression that the city of Santa Cruz had been demolished and lay in ruins, and the newspapers followed up the next morning with blaring headlines declaring hundreds dead. (Figures 107-109)

As it turned out, Santa Cruz and San Francisco survived, if battered, and the fatalities numbered sixty-five people, not hundreds. My brother was at that time a student at U.C. Santa Cruz; my father was travelling and phone service was absent or inconsistent, so it was a couple of days before all of my family was able to learn of his safety. Because of the inaccurate media portrayal of the damage and death toll of the earthquake, we were terrified that he had perished. The damaged telephony infrastructure of 1989 did not permit a rapid relay of new. The gap that I, and all of my Greater San Francisco Bay Area cohabitants, experienced between the disorienting shock of this large earthquake with its resulting aftermath of a reconfigured landscape and social patterns, and the surreal fictions displayed across newspaper headlines and television news resulted in a challenging cognitive dissonance and struggle to ascertain fact from dramatization. The end result for me, waiting to hear news from my brother, was a visceral rage at the media for refusing to provide real news, and I have since failed to believe in the veracity of mass media.

I provide this illustrative anecdote for two reasons. First, many Americans have experienced a terrible event of some sort, whether natural

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October 17, 2014, https://ww2.kqed.org/news/2014/10/17/loma-prieta-and-the-images-that-still-haunt/.

catastrophe or act of human aggression, and turned to the news for details, only to encounter hype and hyperbole rather than conscientious reporting on the facts. The public has developed an expectation of encountering topics both earthshattering and mundane covered briefly in the news until the topic is replaced by a newer drama. This iterative process teaches the public to interpret skeptically any media-proffered alleged data, with the supposition that the media is overplaying the importance of any given issue. Russell Frank, folklorist at the University of Pennsylvania notes:

> Though many readers think of journalism as the realm of fact and the newspaper article as a transparent presentation of fact, journalists have always thought of what they do as telling stories . . . . Presenting facts is not enough. Facts will not command our attention or engage our emotions or even make much sense unless we find a way to present them in narrative form . . . . The advent of the twenty-four-hour electronic news cycle has lent new urgency to the storytelling turn.[371]

I would suggest that this kind of individual, personal experience with the media overstating or overdramatizing situations leads many citizens to disregard or underestimate the significance of climate disruption information provided by the mass media. Second, although the Loma Prieta earthquake was not an artifact of climate disruption, it is illustrative in that it was primarily an environmental disaster rather than, say, a terrorist attack such as the September 11th bombings in New York City and Washington D.C. The style of

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[371] Russell Frank, "Folklore in a Hurry: The Community Experience Narrative in Newspaper Coverage of the Loma Prieta Earthquake," *The Journal of American Folklore* 116, no. 460 (2003): 159–75, http://www.jstor.org/stable/4137896.

fictive reporting engaged by the media regarding Loma Prieta presaged the florid and contradictory media coverage regarding climate disruption and anthropogenic problems that we have seen since. When the news is dramatic, the mainstream network media tend to be avid and interested in drawing connections between catastrophic events and precipitative climate disruption. For example, their coverage of the 2006 Hurricane Katrina,[372] 2010 "Snowmageddon,"[373] and 2012 "Frankenstorm" Hurricane Sandy.[374] It is worth presenting in full the contradictory piece by Time Magazine senior editor Bryan Walsh, who, reporting on Hurricane Sandy for Time's column, "Ecocentric," waffles:

> The sheer oddness of Sandy's arrival begs the obvious question: Is climate change involved here? Many environmentalists certainly think so. But scientists are always reluctant to link climate change to any specific weather event, and the impact of warming on hurricanes have proved particularly difficult to untangle. The last Intergovernmental Panel on Climate Change (IPCC) report noted that scientists have 'low confidence' in long-term increases in tropical cyclone activity due to man-made warming. It's true that warming does increase the amount of moisture in the air, which can make storms rainier—just as we saw with Irene last year, and potentially with Sandy now. But don't be fooled by cautious scientists—we can expect that global warming will likely bring about stronger and potentially more destructive storms and other natural disasters like Sandy.
> What we know is that, climate change or not, big storms will

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[372] A. B. C. News, "Category 6 Hurricanes? They've Happened," ABC News, May 23, 2006, http://abcnews.go.com/GMA/Science/story?id=1986862&page=1.

[373] "'Snowmageddon' Slams Mid-Atlantic; Utilities Race to Restore Power - CNN.Com," accessed September 26, 2016, http://www.cnn.com/2010/US/weather/02/06/winter.storm/index.html.

[374] Bryan Walsh, "Frankenstorm: Why Hurricane Sandy Will Be Historic," *Time*, accessed September 26, 2016, http://science.time.com/2012/10/29/frankenstorm-why-hurricane-sandy-will-be-historic/.

> happen—and if they hit populated areas, they will cause damage. The immediate challenge is to prepare for those disasters, and in the future, build societies and infrastructure that can be resilient to the sort of catastrophes that we know will continue to unfold in the future. Sandy killed at least 61 people as it made its way through the Carribbean—53 of them in the desperately poor country of Haiti, which remains consistently unprepared for natural disasters. Sandy will almost certainly cause billions of dollars of damage when it hits the East Coast. We're unlikely to see a severe death toll, thanks to the fact that rich societies like the U.S. have gotten better at predicting and preparing for storms. (The famous 1938 Long Island Express hurricane, another historic storm, killed some 800 people in the U.S.—a death toll that would be impossible to imagine today.) As Sandy looms, let's hope we're ready.
> MORE: Climate Change Equals Hot Summers. Case Closed.[375]

First, Walsh asks if climate change could be indicated. Then he notes that environmentalists say it "certainly" is. Then he hedges by observing that scientists "are always reluctant" to draw that connection. This is a disingenuous conclusion on Walsh's part, since scientists draw careful distinctions between weather and climate, weather being immediate and at times anomalous, climate being composed of long term trends, demonstrated by weather events. Walsh's wording makes it sound as if the scientists are disagreeing with the environmentalists. He then goes on to suggest that the IPCC scientists are dismissing climate change as a factor in Atlantic weather patterns and warns us "don't be fooled by cautious scientists," but to be prepared to "expect that global warming will likely bring about stronger and potentially more destructive storms and other natural disasters." Walsh then

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[375] Walsh.

blithely comments that since we a rich and well prepared nation, we can expect few casualties as a result of the storm. The death toll for Hurricane Katrina is still ambiguous but numbers between 986[376] and 1883 dead, a "severe death toll" by any estimation.

Americans, painted with a broad brush, have always had a taste for the outré, and are eager, it would seem, to be hoodwinked if the story is sufficiently scandalous. Note, for example, P.T. Barnum's American Museum, replete with taxidermied Feejee Mermaid.[377] This taste for the shocking proves easy bait for unscrupulous journalists.

Science Writers and Journalists

Although the credible scientific community has presented a unified front on the topic of anthropogenic climate disruption, the media have been split along political lines, creating a confusing and divisive message for the public. On the one hand are seasoned science writers and journalists steadfastly bringing these issues to the public, and attempting clear explanations of a muddy and swirling topic. In contrast are the ill informed and unhelpful *Yellow Journalists*, doing their best to stir up controversy. The science writer camp is full of excellent steady and informed authors; two include George Monbiot and Elizabeth Kolbert. George Monbiot, author of *Heat: How to stop the planet*

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[376] "Facts for Features: Katrina Impact | The Data Center," accessed September 26, 2016, http://www.datacenterresearch.org/data-resources/katrina/facts-for-impact/.

[377] Peabody Museum of Archaeology & Ethnology, "The Feejee Mermaid," 2010, https://www.youtube.com/watch?v=C1g7QbP4rM4

from burning,[378] and recipient of the 1995 United Nations Global 500 Award for Outstanding Environmental Achievement, argues that it is the responsibility of first world nations, as the primary instigators of climate disruption, to undertake the challenging work of creating sufficient change to avert the worst outcomes predicted by the scientists. *Heat* is a manifesto addressing this proposal by outlining feasible actions to cut carbon emissions by 90% by the year 2030 primarily through addressing transportation, Industry, and renewable energy. Monbiot suggests that personal selfishness cripples larger efforts to contain greenhouse gas emissions, and that "Manmade global warming cannot be restrained unless we persuade the government to force us to change the way we live."[379] Defining the problem in *Heat*, Monbiot explores possible solutions in *Out of the Wreckage: A New Politics for an Age of Crisis*, in which he draws on psychology, neuroscience and evolutionary biology to propose a "politics of belonging" founded in altruism and cooperation.[380]

Elizabeth Kolbert, recipient of the 2006 National Magazine Award for her three-part series reporting on climate disruption for *The New Yorker* magazine expanded this series into *Field Notes from a Catastrophe: Man, Nature and Climate Change*,[381] followed by *The Sixth Extinction: An Unnatural History*,[382]

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[378] George Monbiot, *Heat : How to Stop the Planet from Burning* (Cambridge, Mass.: South End Press, 2007), Table of contents only http://www.loc.gov/catdir/toc/ecip0711/2007006616.html.
[379] Monbiot.
[380] George Monbiot, *Out of the Wreckage: A New Politics for an Age of Crisis* (Brooklyn, NY: Verso, 2017).
[381] Elizabeth Kolbert, *Field Notes from a Catastrophe : Man, Nature, and Climate Change*, 1st

exploring the causes and consequences of anthropogenic extinction and the catastrophic loss of biodiversity on the planet.



Figure 110. "Here is this week's latest in Climate Stupid"[383]
IMAGE COURTESY: BREITBART.COM

U.S. (New York: Bloomsbury Pub. : Distributed to the trade by Holtzbrinck Publishers, 2006), Publisher description http://www.loc.gov/catdir/enhancements/fy0662/2005030972-d.html.

[382] Kolbert, Elizabeth, *The Sixth Extinction: An Unnatural History*, Reprint edition (Picador, 2015).

[383] James Delingpole7 Mar 2018844, "Delingpole: The Shocking True Story of How Global Warming Became the Biggest #FakeNews Scare of All Time (Part 2)," Breitbart, March 7, 2018, http://www.breitbart.com/big-government/2018/03/07/delingpole-the-shocking-true-story-of-how-global-warming-became-the-biggest-fakenews-scare-of-all-time-pt-2/.

Less scrupulous journalists abound, proposing climate disruption conspiracy theories. A notable example is the prolific and widely published English expositor, James Delingpole, self-styled satirist, libertarian conservative, anti-windfarm activist and debunker of climate disruption nonsense. Delingpole currently writes for Breitbart, primarily focused on *debunking* climate change, although his scientific background consists of a claimed degree in English literature.[384] He self-presents as an articulate and educated snappy dresser, but his articles are visually and linguistically styled to be inflammatory. (Figure 110)

In the United States, Sean Adl Tabatabai, a former BBC employee and MTV producer, provides a vivid contrast, conveying what he calls "alternative facts" via his popular website, "YourNewsWire.com." While websites such as "The Onion—America's Finest News Source" are quite clearly presented as satire, "YourNewsWire.com" is ambiguous in nature. "40 New Scientific Papers Say Global Warming Does Not Exist," posted by Adl-Tabatabai on March 27, 2018, claims that

> Hundreds of scientists involved in 40 recent scientific papers say the scare about global warming is based on hysteria and false science . . . Over 40 scientific papers on the global warming hoax have been published in just the first three months of 2018. What their charts show is that 'nothing climatically unusual is happening.'[385]

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[384] "My Moment of Rock-Star Glory at a Climate Change Skeptics' Conference…," archive.fo, July 21, 2016, http://archive.fo/J1IML.

[385] Sean Adl-Tabatabai, "40 New Scientific Papers Say Global Warming Does Not Exist," *Your News Wire* (blog), March 27, 2018, http://yournewswire.com/40-scientific-papers-global-warming/.

A September 2, 2016 article, "Tens of Thousands Of Scientists Declare Climate Change A Hoax," declares "A staggering 30,000 scientists have come forward confirming that man-made climate change is a hoax perpetuated by the elite in order to make money."[386] To borrow Stephen Colbert's coinage, there is a certain *truthiness*[387] that is certain to ensnare the gullible.

In comparison, Fox News presents its so-called journalism as the unvarnished truth, with no ambiguous satire. However, the alternate facts abound. In "Rep. Lamar Smith: Climate Change and the Scientific Method - We Should Welcome New Research, Not Resist It," published online March 29, 2018, Smith claims,

> Climate alarmism has become the chant of the media and liberals who favor more government regulations. As Chairman of the House Science Committee, I have challenged the alarmist rhetoric and pursued the facts about climate change. The Committee follows the scientific method, which welcomes critiques, avoids exaggerated predictions, and relies on unbiased data. Unfortunately, alarmists ignore all these principles… Climate alarmists just won't let the facts get in the way of their science fiction.[388]

Smith, with no academic science background, does serve the congress, but as Chairman of the Committee on Science, Space and Technology, not "Chairman of the House Science Committee." It is not reassuring that he isn't

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[386] Sean Adl-Tabatabai, "Tens of Thousands Of Scientists Declare Climate Change A Hoax," *Your News Wire* (blog), September 2, 2016, http://yournewswire.com/tens-of-thousands-of-scientists-declare-climate-change-a-hoax/.

[387] "Language Log: Truthiness or Trustiness?," accessed March 30, 2018, http://itre.cis.upenn.edu/~myl/languagelog/archives/002586.html.

[388] Lamar Smith, "Rep. Lamar Smith: Climate Change and the Scientific Method - We Should Welcome New Research, Not Resist It," Fox News, March 12, 2018, http://www.foxnews.com/opinion/2018/03/12/rep-lamar-smith-climate-change-and-scientific-method-should-welcome-new-research-not-resist-it.html.

sure of his own title, and posts op-ed pieces packed with “alternate facts” antithetical to every genuine scientific principle. Many Americans choose Fox news as their source for information; as ludicrous as his “climate alarmism” article is to an informed reader, it will seem to be viable to the uninformed. As discussed further in conclusions, the majority of Americans are intimidated by science, and lacking in the critical thinking skills required to decode the alternate facts as pithless. It is little wonder then, that despite the best efforts of stalwarts such as Elizabeth Kolbert, half the U.S. population thinks that climate disruption is a myth, while simultaneously bewailing the catastrophic destruction of the latest hurricane or wildfire burning down their neighborhood.

Cartoonists and Graphic Novelists

In the long run of the daily newspaper, cartoonists had daily access to the majority of the U.S. public, many using that access to project searing political opinions, often couched in wry humor. With the decline in printed newspapers, many newspapers rely on web-based journalism, and cartoonists have experienced a subsequent decline in influence without the daily paper landing on the doorstep. An early leader in articulating environmental issues was the politically astute Walt Kelly, translating American culture one step away to the world of the Okefenokee swamp, and his central character, the endearing Pogo Possum. (Figure 111) Kelly’s daily “Pogo” comic strips often followed politically-based story lines, and were anthologized in numerous



Figure 111. "We Have Met the Enemy and He is us"[389]
IMAGE COURTESY: PUBLISHERS-HALL SYNDICATE

collections, many as funny and germane today as they were decades ago. Kelly created a memorable poster for Earth Day, 1971, in which Pogo and his compatriot Porkypine tramp across garbage strewn in the swamp, commenting, "Yep, son, we have met the enemy and he is us." Because cartoonists have the option to couch their sociopolitical commentary coming from the mouths of opossums, presented as humor or otherwise distanced, they are able to address particularly intractable issues without raising the ire to which conventional journalists are prone. They are, after all, just cracking a joke, kidding around, telling a story.

In the tradition of Kelly, Gary Trudeau has authored the politically acerbic and pointed cartoon "Doonesbury" since 1970, syndicated in a thousand daily and Sunday newspapers, and available online. (Figures 112-113) Trudeau

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[389] Earth Day 1971 "We Have Met the Enemy and He is US" Walt Kelly. Progen, Susan and Brown, Jeffrey, *The World of Pogo: Walt Kelly's Menagerie of Characters from the Okefenokee Swamp in Original Drawings and Animated Films* (Publishers-Hall Syndicate, 1971).

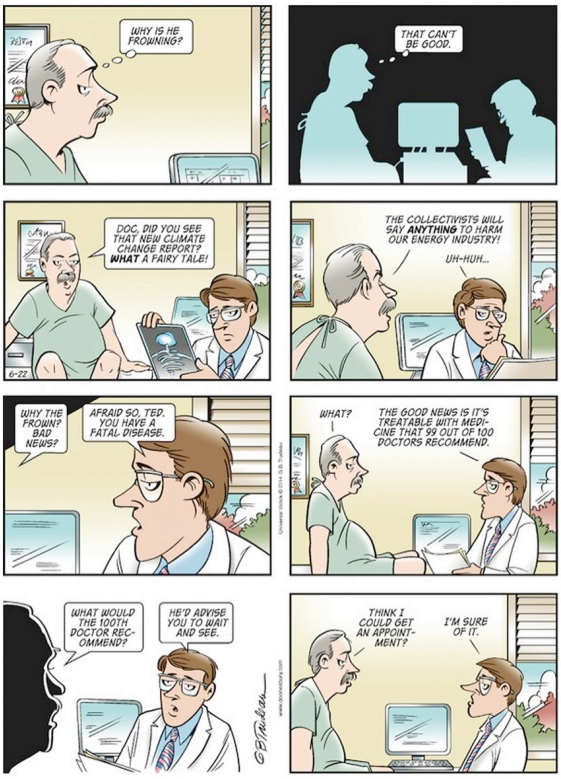

Figure 112. Doonesbury. Gary Trudeau. Wait and see. 2014[390]
IMAGE COURTESY: WASHINGTON POST

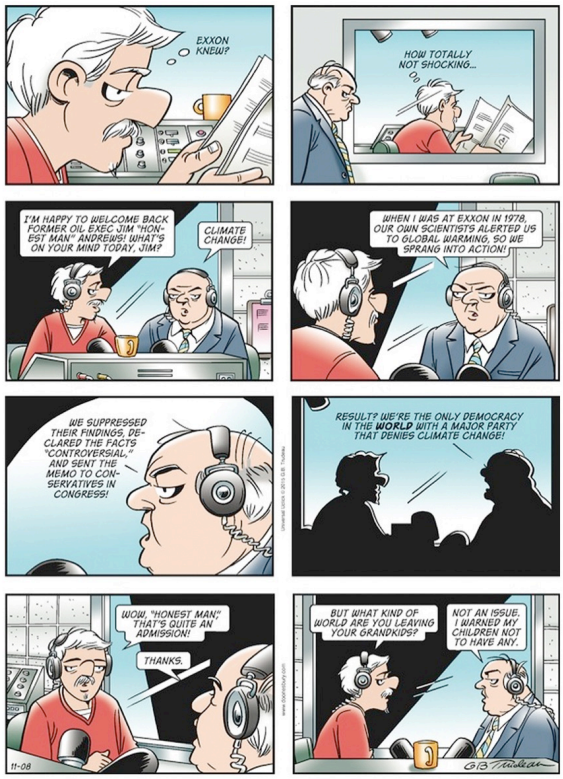

Figure 113. Doonesbury. Gary Trudeau. Suppressed findings. 2015[391]
IMAGE COURTESY: WASHINGTON POST

has taken on the most difficult of social issues, and in 1975 was the first cartoonist to win a Pulitzer Prize. Climate disruption has been a topic frequently explored in Doonesbury, Trudeau taking a sharp poke at denialists.

Two other examples of cartoonists using their platform to draw attention to climate disruption and the surrounding issues include Joel Pett and Adam Zyglis. The irony and visual shorthand of single-cell comics allows a message to catch the readers' eye and be conveyed in one memorable glance, unlike

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[390] Gary Trudeau, *Doonesbury, June 22, 2014. Washington Post.*, 2014, Cartoon, 2014, http://www.gocomics.com/doonesbury/2014/06/22.

[391] Trudeau, Gary, *Doonesbury. November 8, 2015. Washington Post.*, 2015, 2015.

editorials, blogs or books. (Figures 114-117)

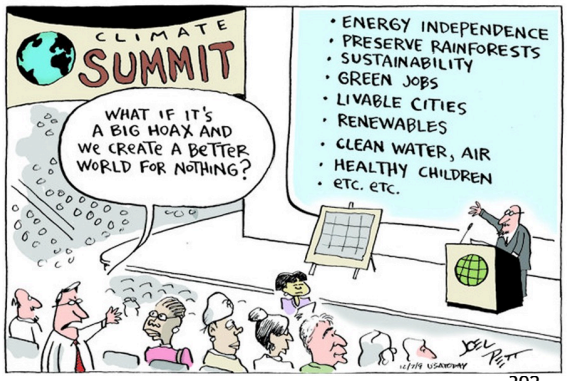

Figure 114. J. Pett. Climate Summit[392]
IMAGES COURTESY: LEXINGTON HERALD LEADER

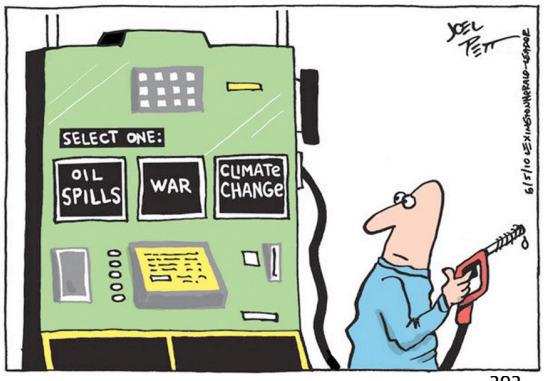

Figure 115. Joel Pett. Select one.[393]
2009-2010



Figure 116. Adam Zyglis. #Je suis desperate. 2015.[394]
IMAGES COURTESY: THE BUFFALO NEWS



Figure 117. Adam Zyglis. The Dodo. 2015.

The comic books of the 1950s, 60s, and 70s, could hardly be called intellectually challenging. *Archie*, *Casper*, *Donald Duck* and *Spiderman* were as predictable and bland as they have become collectable. The outlier in this pack

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[392] "Environmental Cartoons by Joel Pett : Climate Action Reserve," accessed September 23, 2016, http://www.climateactionreserve.org/blog/2012/08/31/environmental-cartoons-by-joel-pett/.

[393] "Environmental Cartoons by Joel Pett : Climate Action Reserve."

[394] Zyglis, Adam, "Weather Coverage," *Adam Zyglis* (blog), January 24, 2016, http://adamzyglis.buffalonews.com/2016/01/24/weather-coverage/.

was *Mad Magazine*, founded in 1952 as a comic book, switching to a magazine format in 1955, peaking in 1974 with two million readers, and still hanging in with 174,000 subscribers in 2017. *Mad* is notable for its utter lack of adherence to good taste, super-hero stereotypes or taboo subjects, treating contemporary subjects with irreverence, parody, and satirical wit. (Figure 118) *Mad Magazine* broke trail for Art Spiegelman's *Maus*. *Maus,* the first graphic novel to win a Pulitzer Prize, was serialized from 1980 to 1991.[395] (Figure 119) Spiegelman Uses *Maus* as a flexible platform, using a mix of genres and styles in which to

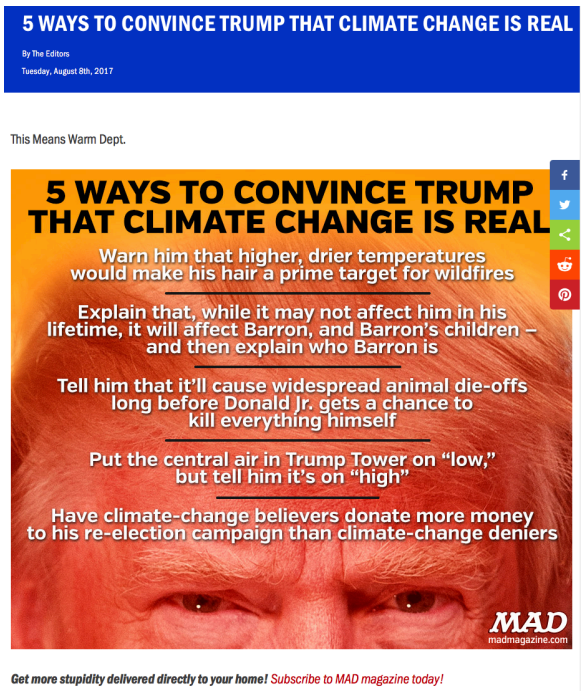

Figure 118. Mad Magazine.[396]
IMAGE COURTESY: MAD MAGAZINE

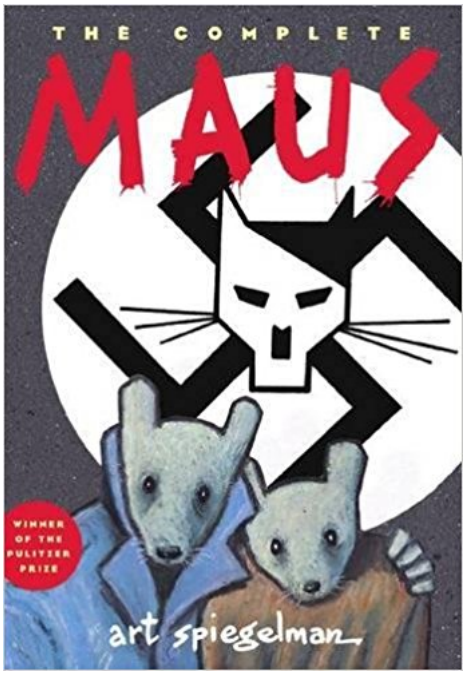

Figure 119. Maus: A Survivor's Tale.
COURTESY: PENGUIN BOOKS

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[395] Art Spiegelman, *Maus: A Survivor's Tale* (London: Penguin Books, Limited, 2003).

[396] "5 WAYS TO CONVINCE TRUMP THAT CLIMATE CHANGE IS REAL," Mad Magazine, August 8, 2017, https://www.madmagazine.com/blog/2017/08/08/5-ways-to-convince-trump-that-climate-change-is-real.

present research and perspectives on the Holocaust, portraying his protagonists as cats and mice. *Maus* took the comic-book land of *Casper* and populated it with real ghosts, much to the chagrin of many. He also opened up an entirely new way of telling a story. Previously, comic books had been regarded solely as the domain of the trivial, thrilling, or farcical. Spiegelman demonstrated the power of using visual storytelling for advancing the grimmest of stories, packed with facts, in a format accessible to all. At a time in American history when literacy is at an ebb, one need but visit the graphic novel section of book stores or libraries to witness the expanding shelf feet being allocated to visual books. Clearly, leveraging *a picture is worth a thousand words* is effective in communicating both amusing tales as well as serious non-fiction topics of all kinds. It is interesting to note that the catch-all term, *graphic novel*, is generally applied to non-fiction as well as to fiction, although the terms *graphic non-fiction* and *non-fiction graphic novel* are in occasional use.

Three striking examples of using this medium to explore climate change, sustainability, and Anthropocene issues are I'm not a plastic bag,[397] World War 3 Illustrated #46 Youth, Activism, and Climate Change,[398] and Climate Changed: A Personal Journey Through the Science.[399] (Figures 120-122) These three books represent, each in their own way, access points into these difficult

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[397] Rachel Hope Allison, *I'm Not a Plastic Bag* (Los Angeles, California: Archaia, 2012).

[398] Various, *World War 3 Illustrated #46: Youth, Activism, and Climate Change*, ed. Hilary Allison, Paula Hewitt Amram, and Sandy Jimenez (Top Shelf Productions, 2015).

[399] Philippe Squarzoni, *Climate Changed: A Personal Journey through the Science*, 1st edition (New York: Harry N. Abrams, 2014).

topics that museum staff could deploy both with children and adults.

Written by Rachel Hope Allison, with a forward by ocean biologist and journalist Jeff Corwin, *I'm not a plastic bag* has a 73-page, six-chapter almost entirely visual narrative. Punctuated by some ironic signage, it introduces the North Pacific Subtropical Gyre and follows the life cycle of a plastic bag as it wends its way from hanging in a tree in San Francisco to the gyre. The imagery is a touch spooky, likely to appeal to a child but be memorably unsettling; the character of the gyre seems friendly, but not perhaps the friend one would seek. Following the narrative is a ten-page section of factual information and suggestions on how to help. This book could be easily understood by a young child with minimal guidance. *I'm not a plastic bag* is printed by Archaia Press, an imprint of Boom!Studios, specializing in graphic novels. An aspect specific to this book is its minimal use of language in the graphic story; the gyre has a shifting series of name tags that surface, the message is primarily conveyed through the images, and potentially through an interpretive docent or other staff member during a museum story hour or educational program. This book could be used in conjunction with, for example, the Anchorage Museum's Gyre exhibit and educational materials.

World War 3 Illustrated #46 Youth, Activism and Climate Change is a 144-page addition to the ongoing activist anthology, "World War 3 Illustrated" (WW3):

> Founded in 1979, by Seth Tobocman and Peter Kuper, *World War 3 Illustrated* was among the first American magazines to

> treat comics as a medium for serious social commentary and journalism. WW3 isn't about a war that might happen. It's about wars ongoing—wars across the globe and in our own neighborhood, the wars we wage against each other and with ourselves . . . . the magazine has been a labor of love, run by a volunteer collective of political activists and artists, both first-timers and established professionals. We're based in New York City and seek to provide a home for comics from around the world.[400]

WW3 issues are primarily black-and-white single-topic thematic volumes with full color covers, and are published by Top Shelf Productions, a specialist publisher of graphic novels. *#46* is their first volume to feature children's work:

> A Foregone Exclusion, Reconsidered: Comics by Kids…
> You hold in your hands or are reading on a screen, the 46th issue of the longest running political comic book in the world, with four decades of publication history (longer than some of us have been alive.) Most comics are created by adults—the participation of children and teens in storytelling a foregone exclusion. Realizing the need for a collection of stories on the future's most pressing topics and challenges, Paula Hewitt Amram suggested that we publish the perspective of world citizens with the most at stake: kids. Children and teenagers, the ultimate inheritors of the future, are finally represented here between these covers, along with long-time and first-time contributing adults . . . . This issue features two overlapping themes: our planet's growing climate crisis, and how young people are confronting the "climates" they have inherited- social, political, cultural, and especially, environmental. For the first time in our comic book anthology's history, works written by, drawn by or with youth are featured, including collaborations between students and teachers, children and parents.[401]

The World War 3 crew held several workshops for children on the topic of climate change, collating their 44 contributions into this volume. The kids ranged in age from first-graders through high schools students; some of the

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[400] "Ww3 | ABOUT," ww3, 3, accessed July 9, 2018, https://www.ww3.nyc/about.
[401] Various, *World War 3 Illustrated #46*, 46.

quality or focus is a little uneven, but some is extraordinary, and one can only imagine the empowerment the participant kids must have derived from having their work published. The process employed by WW3, of conducting topic-focused comic-drawing workshops and welcoming participation by parents or teachers, is one that could be readily duplicated by museums over a series of evenings or weekends. Museums might have an accomplished cartoonist on staff; more likely would be the recruitment of a graphic novelist to guide the workshops. Indigenous graphic novels have become quite popular; among the leading publishers is Native Realities, home of the self-proclaimed *Indiginerds*:

> Featuring the incredible tales of Indigenous icons, First Nations freedom fighters, Aboriginal astronauts, and Native American superheroes whose stories have long been co-opted, unheard or ignored. We strive to give you the most original and authentic representations of Native and Indigenous peoples through stories and texts that educate and entertain children, youth and adults.[402]

Native Realities' volumes include *Tales of the Mighty Code Talkers*, *Deer Woman: an Anthology*, and *Hero Twins*, among numerous others.

> WHAT IS THE INDIGENOUS COMIC CON?
> An amazing, three-day Indigenous pop-culture convention will features the best Indigenous creators, illUstrators, writers, designers, actors, and producers from the worlds of comic books, games, sci-fi, fantasy, film, tv, and graphic novels. The Indigenous Comic Con seeks to highlight the amazing work that brings understanding about the Indigenous experience to the world of popular culture and unlock the Indigenous imagination!
> EVERYONE IS WELCOME![403]

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[402] "Native Realities: About Us," Native Realities, accessed July 9, 2018, https://www.nativerealities.com/pages/about-us.

[403] "What Is the Indigenous Comic Con?," Indigenous Comic Con, accessed July 9, 2018, https://www.indigenouscomiccon.com/.

A museum could recruit workshop leaders from participants at Indigenous Comic Con, or even hold their workshop at the conference. My undergraduate students responded with rabid enthusiasm upon learning of the existence of the Indigenous Comic Con—one can only imagine the elation of K-12 students given the opportunity to participate in a venture such as this. Indigenous Comic Con is now in its third year, with attendance topping 1,200; they have recently announced Indigicon Abroad, being held in Melbourne, Australia in 2019. The seemingly universal aspect of Indigenous cultures, storytelling, is a brilliant fit with graphic novels, and a museum-based workshop like this would probably be both of value and of interest to people of all ages.

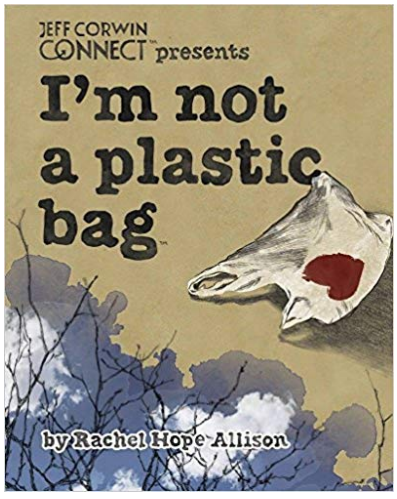

Figure 120. I'm not a…
IMAGE COURTESY: ARCHAIA

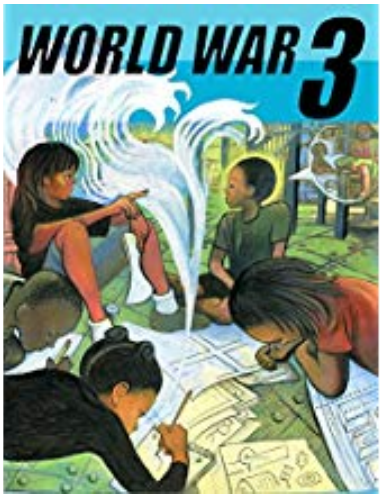

Figure 121. WW3 #46
IMAGE COURTESY: TOP SHELF

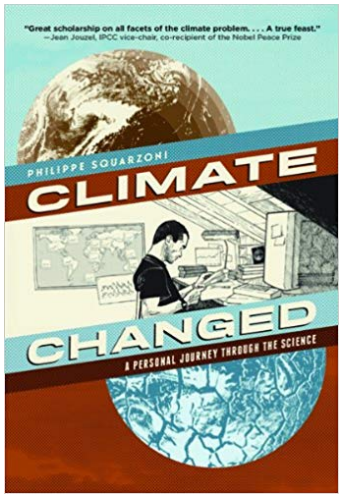

Figure 122. Climate
IMAGE COURTESY: ABRAMS

French cartoonist and investigative journalist, Philippe Squarzoni, faced with developing an understanding of climate change for his work, ended up authoring *Climate Changed: A Personal Journey Through the Science*—a 480

page tome published by Abrams ComicArts, an imprint of fine-art publisher, Harry Abrams. *Climate Changed* addresses "the causes, controversies, and consequences of climate change—and what we can do about it."[404] Squarzoni leads us through his research process, providing a great deal of factual information, punctuated by life experiences, contextualization, and many interviews with specialists. Significantly different from the previous two works mentioned, his book is eminently readable for adults, and some children. This book would make an ideal selection for a museum's book club, in that it takes some time to read, is engaging, and offers many topics for discussion.

Politicians

The role of politicians in curbing or promoting climate disruption is worthy of a dissertation in itself. In the United States, a key relationship has been formed between many elected officials and corporate leaders, such that the elected leaders appear to be actually representing a corporate constituency rather than the public. While most corporations follow a fairly linear track through time regarding their relationship to anthropogenic climate disruption and the surrounding issues, politicians are transitory, serving until their term is done or they are voted out and replaced.

The consequence is that the politicization of climate disruption in the United States creates a highly unstable relationship between museums

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[404] Squarzoni, *Climate Changed*. Interior jacket text.

dependent on government funding, scientists studying climate change, and the senate and congress, empowered to fund or not fund, as they so choose. Federal funding for museums is primarily distributed through the federal agency, the Institute of Museum and Library Services (IMLS.) The IMLS received a 2018 federal funding allocation of $240 million, an increase of $9 million over the 2017 budget; funding that supports six programs and serves 120,000 libraries and 35,000 museums.[405] The IMLS and the Federal Office of Museum Services are among many federal arts and education programs targeted by the Trump Administration for elimination in 2019.[406]

The science world and concerned members of the American public were disconcerted to find, in the first few days of the Trump administration, that the Center for Disease Control office of *Climate Change and Occupational Safety and Health* was renamed *Occupational Safety and Health and Climate* with references to climate change removed from the Center for Disease Control website.[407] This was not an isolated instance. The Environmental Data and Governance Initiative (EDGI) reports key findings regarding changes to federal websites under the Trump administration:

- The Environmental Protection Agency's (EPA) removal and

[405] Giuliana Bullard, "IMLS Receives Funding Increase for Remainder of FY 2018," Institute of Museum and Library Services, March 23, 2018, https://www.imls.gov/news-events/news-releases/imls-receives-funding-increase-remainder-fy-2018.

[406] Eileen Kinsella, "Trump Budget Proposes to Eliminate the NEA," Artnet News, May 23, 2017, https://news.artnet.com/art-world/trump-budget-proposes-steep-cuts-to-arts-funding-969641.

[407] Chris Mooney, "The Phrase 'Climate Change' Mysteriously Vanishes From a CDC Website," SEJ, July 5, 2018, https://www.sej.org/headlines/phrase-%E2%80%98climate-change%E2%80%99-mysteriously-vanishes-cdc-website.

> subsequent ongoing overhaul of its climate change website raises strong concerns about loss of access to valuable information for state, local, and tribal governments, and for educators, policymakers, and the general public.
> ● Several agencies removed or significantly reduced the prominence of climate change Web content, such as webpages, documents, and entire websites, and the White House omitted climate change as an issue highlighted on its website.
> ● The Department of State, Department of Energy (DOE), and the EPA removed information about the federal government's international obligations regarding climate change, downplaying U.S. involvement.
> ● Descriptions of agency priorities shifted to emphasize job creation and downplay renewable fuels as replacements for fossil fuels. At the DOE, mentions of 'clean energy' and explanations of harmful environmental impacts of fossil fuels were also removed.
> ● Language about climate change has been systematically changed across multiple agency and program websites. In many cases, explicit mentions of 'climate change' and 'greenhouse gases' have been replaced by vaguer terms such as 'sustainability' and 'emissions.'[408]

In addition to the systematic purging of the phrase *climate change* from federal government websites, EDGI identifies a leadership problem, in that:

> The Office of Science, Technology, and Policy (OSTP), responsible for providing analysis of scientific and technological federal policies and programs to the President, has yet to rebuild its portion of the White House website, which under President Obama included an 'Initiatives' section on 'Combating Climate Change.' The lack of a prominent OSTP Web presence may be explained by the fact that President Trump has yet to appoint a White House science advisor, who, among other duties, leads the Office. On November 16, 2017, seven senators sent a letter to President Trump urging him to appoint a science advisor and fill other key open OSTP positions.[409]

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[408] "Changing the Digital Climate: How Climate Change Web Content Is Being Censored Under the Trump Administration," The First 100 Days and Counting (The Environmental Data and Governance Initiative, January 2018). 3.

[409] "Changing the Digital Climate: How Climate Change Web Content Is Being Censored Under the Trump Administration." 15.

These core mission changes to federal agencies, including the Department of the Interior, the Environmental Protection Agency, the United States Geological Survey, and the Bureau of Land Management, to name a few, reflected policy changes at an international level. Trump's elimination of U.S. participation in all global climate change agreements and accords, such as the Paris climate accord, is accompanied by the U.S. withdrawal from the United Nations Educational, Scientific and Cultural Organization (UNESCO) in October 2017, and from the United Nations Human Rights Council (UNHRC) in July 2018, coincident with the separation of families and mass incarceration of immigrant children by U.S. immigration officers, and the reclassification of requests for political asylum as a crime punishable by deportation. EDGI notes that both federally mandated censorship, as well as proactive self-censorship in reaction to the science-phobic atmosphere of the current administration, are involved in the elimination of access to climate change information on federal websites:

> Without additional information, it is often impossible to tell whether changes were made by career agency employees, agency political appointees, members of the Trump administration, or anyone else. The distinction between self-censorship, in which career staff attempt to make their offices appear less at odds with the administration's stated policy goals, and changes that were ordered by political appointees at an agency or the White House, is not trivial. . . . . "Energy spokeswoman Lindsey Geisler said these changes were not ordered by the Trump administration but were made by career staff to 'better reflect the broader focus of the project, which includes all traditional and nontraditional energy sources.'"[410]

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[410] "Changing the Digital Climate: How Climate Change Web Content Is Being Censored Under the Trump Administration." 39-40.

Politicians at city and state levels as well as citizens have responded by taking action in response to this widespread federal censorship regarding climate disruption, the work to understand it, and the work to ameliorate its effects. President Trump's withdrawal from the Paris climate accord spurred Governors Andrew Cuomo of New York, Jay Inslee of Washington, and Jerry Brown of California to form the bipartisan U.S. Climate Alliance, including seventeen member states, in June 2017. The purpose of the alliance is to fulfill the reduction of greenhouse gas emission specified by the Paris accord,[411] despite federal opposition. The U.S. Climate Alliance notes that it "now represents 40 percent of the U.S. population and a $9 trillion economy, greater than the third largest country in the world, and U.S. Climate Alliance states are on track to meet their share of the Paris Agreement emissions target by 2025."[412]

Academic institutions have also stepped in to fill the federal gap; Georgetown Law University houses the Georgetown Climate Center which provides the extensive online resource, Adaptation Clearinghouse, "An online database and networking site that serves policymakers and others who are working to help communities adapt to climate change."[413] The Adaptation Clearinghouse website is very well organized, making it simple to navigate

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[411] "ALLIANCE PRINCIPLES," U.S. Climate Alliance, accessed July 9, 2018, https://www.usclimatealliance.org/alliance-principles/.

[412] "About the Initiatives," U.S. Climate Alliance, accessed July 9, 2018, https://www.usclimatealliance.org/about-initiatives/.

[413] "Adaptation Clearinghouse," accessed July 9, 2018, http://www.adaptationclearinghouse.org/.

through an enormous amount of information and opportunities for participating in various networks.



Figure 123. President Barack Obama. Tweets, 5/16/13; 1/27/16; 9/22/16[414]
IMAGE COURTESY: TWITTER, BARACK OBAMA

If one stands on the top floor patio of the National Museum of the American Indian, one looks directly at the House of Congress—not an uplifting sight when congress is threatening to eliminate museum funding, and intimidating in that the fear of losing necessary funding creates an atmosphere in which it is truly risky for museums and scientists to explore issues such as climate disruption when to do so could mean the possibility of catastrophic budget cuts. This relationship can change in a day. The president of the United

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[414] Barack Obama Verified account, "Ninety-Seven Percent of Scientists Agree: #climate Change Is Real, Man-Made and Dangerous." microblog, *@barackobama* (blog), May 16, 2013, https://twitter.com/barackobama/status/335089477296988160; Barack Obama Verified account, "We Can't Sit Idly by. Climate Change Is Likely to Threaten Our National Security—We Must Act Now. #ActOnClimatepic.Twitter.Com/CCFZdEYc8T," microblog, *@BarackObama* (blog), September 22, 2016, https://twitter.com/BarackObama/status/779068216018468864; Barack Obama Verified account, "Scientists Agree Climate Change Is Man-Made—and We Can Do Something about It. Http://Ofa.Bo/J9fm #ActOnClimate," microblog, *@BarackObama* (blog), January 27, 2016, https://twitter.com/BarackObama/status/692409273263869952.

States has legally limited powers, but unshackled influence. It is illuminating to compare the tweets of Presidents Obama and Trump: on climate disruption, they are diametrically opposed. (Figures 123-125)



Figure 124. Trump Twittering: Climate Change.[415]
IMAGE COURTESY: @REALDONALDTRUMP



Figure 125. Newsweek[416]
IMAGE COURTESY: @NEWSWEEK

Economists' Perspectives: Consumer Society

George Monbiot observes in Heat: How to Stop the Planet from Burning:

> Governments will pursue this course of inaction—irrespective of the human impacts—while it remains politically less costly than the alternative. The task of climate-change campaigners is to make it as expensive as possible. This means abandoning the habit of mind into which almost all of us have somehow slumped over the past ten years or so: the belief that somehow someone else will do it for us . . . . This is partly, I think, because of the sustained global economic growth between then and now. We are simply too comfortable, and we have too much to lose. It is partly also because, accompanying this growth (indeed to some extent driving it) has been a surge in indebtedness, especially among the young, who used to be on the front line. Debt induces a bright

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[415] "Donald J. Trump (@realDonaldTrump) | Twitter," accessed April 4, 2017, https://twitter.com/realDonaldTrump?ref_src=twsrc%5Etfw&ref_url=http%3A%2F%2Fwww.latimes.com%2Fpolitics%2Fla-na-pol-trump-climate-tweets-20170328-story.html.

[416] "Newsweek on Twitter: 'A Timeline of Every Ridiculous Thing Trump Has Said about Climate Change Https://T.Co/V17zQcIctD Https://T.Co/Nh2zmpmB0k,'" accessed April 4, 2017, https://twitter.com/Newsweek/statUS/849120870341775361.

> panic, which ensures that those burdened with it can seldom see beyond the next few weeks.[417]

However, the American public holds highly divided views on the subject. According to Yale scholar Dan Kahan,

> Every individual . . . . employs her reasoning powers to apprehend what is known to science from two parallel perspectives simultaneously: a collective-knowledge-acquisition one, and a cultural-identity-protective one . . . . The failure of widely accessible, compelling science to quiet persistent cultural controversy over the basic facts of climate change is the most spectacular science-communication failure of our day. We will neither understand nor remedy this failure . . . . unless we take account of its source in the conflict that our own knowledge assessment practices create between the use of reason to know what is known and the Use of reason to be who we are.[418]

In other words, the problem is not that half the U.S. public is too dim to understand climate science education, as much as it is that the cognitive dissonance produced by thinking about the anthropogenic causal factors of climate disruption is too cacophonous for half our public to endure. Since the 1950s, we have been bombarded with corporate advertising, relentless messaging to increase consumption of every possible commodity, a practice that has led us directly to the environmental problems besieging us today.

Pre-World War II America prided itself on a cultural identity framed in helping ones neighbor, family values, and thriftiness. In post-World War II America, radical consumerism has transmogrified our deep culture in a shockingly brief period of time. If a person is diagnosed with uncontrolled cell

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[417] Monbiot, *Heat : How to Stop the Planet from Burning*.

[418] Dan M. Kahan, "Climate-Science Communication and the Measurement Problem," *Political Psychology* 36 (February 1, 2015): 1–43, https://doi.org/10.1111/pops.12244.

growth, they are perceived as risking death, and are only pronounced healthy when growth is at a harmonious norm. If a corporation is diagnosed with uncontrolled growth, they are lauded as successful, and near death if they are operating at an even rate. We have allowed our cancerous economy to outstrip our basic common sense, and nature is levying the price. Our viable solution is to back out of this extreme dead end, and reconnect with seasoned values. The traditional values held by most indigenous communities, expressed succinctly in the idea of the *seventh generation*, are very similar cultural paradigms to those held widely in pre-World War II America. It stands to reason that if the aggregate public is presented with sustainability ideas filtered through the lens of indigenous culture, it should spark some corresponding memories of the social value of altruism encapsulated in familial oral history. Partnering with local Indigenous communities can help museums find fresh ways of presenting functional cultural paradigms to their publics.

Thus, the need is urgent to find methods of communicating these ideas to the public in ways that they will find engaging and compelling. Economists and social commentators such as Juliet Schor, Bill McKibben and Paul Hawken and their colleagues have each contributed valuable insights regarding ways to live and conduct business not only sustainably, but profitably, as well. Bill McKibben first drew critical acclaim for his work, *Deep Economy: The Wealth*

of Communities and the Durable Future,[419] and subsequently has become very influential through his organization, 350.org, focused on environmental actions, awareness, and community building.

Paul Hawken's' influential *The Ecology of Commerce: A Declaration of Sustainability*[420] was epiphanal in 1994 for Ray Anderson, then CEO of Interface Carpets, the largest carpet company in the world, inspiring him to rapidly convert his company to 100% sustainability—a goal thought to be both unachievable and financially disastrous. To the contrary, he did achieve his goal, positioning Interface Carpets as an example that the environmentally dirtiest of companies can clean up, and make a substantial profit doing so. Anderson described this adventure in his bestselling *Confessions of a Radical Industrialist: Profits, People, Purpose—Doing Business by Respecting the Earth*, and *Mid-Course Correction: Toward a Sustainable Enterprise: The Interface Model.*[421] Anderson was a very strong proponent of redesigning industry by "dematerialization through conscious design, a concept with far-reaching implications for a voracious industrial system."[422] Although Anderson was not an economist per se, his business acumen and experience in large-scale

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[419] Bill McKibben, *Deep Economy : The Wealth of Communities and the Durable Future*, 1st ed. (New York: Times Books, 2007), http://www.loc.gov/catdir/enhancements/fy1001/2006051100-s.html.

[420] *The Ecology of Commerce*.

[421] Ray C. Anderson, *Mid-Course Correction : Toward a Sustainable Enterprise : The Interface Model* (Atlanta White River Junction, VT: Peregrinzilla Press ; Distributed by Chelsea Green Pub., 1998).

[422] Ray C. Anderson and Robin A. White, *Confessions of a Radical Industrialist : Profits, People, Purpose : Doing Business by Respecting the Earth*, 1st ed. (New York: St. Martin's Press, 2009). 263.

industrial conversion were highly regarded and led to a seat on the Clinton administration *President's Council on Sustainable Development*.[423]

Juliet Schor and her colleagues at the Center for a New American Dream study consumer economics, seeking sustainable ways of living in contemporary America. Schor has authored or co-authored nine books investigating what she denotes as a *critical politics of consumption*, including *Plenitude: New Economics of True Wealth*,[424] and *Sustainable Planet: Solutions for the Twenty-First Century*.[425] She draws awareness to the commercialization of childhood, and discusses the viable possibility of reducing consumer behavior without experiencing feelings of deprivation. Schor calls for "independent organizations of consumers to pressure companies, influence the political agenda, provide objective product information, and articulate a vision of an appealing and human consumer sphere."[426] The positive impact and potential social influence and leverage of these visionary economists cannot be overstated. Post World War II, America has been ruled by capitalist values embedded in a petro-privileged paradigm. Money, profits and comfort are concepts that most Americans, including business people and elected officials,

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[423] Jim Witkin, "A Magnate's Green Epiphany," *Green Blog* (blog), August 11, 2011, https://green.blogs.nytimes.com/2011/08/11/a-magnates-green-epiphany/; Cornelia Dean, "Ray Anderson: Executive on a Mission: Saving the Planet," *The New York Times*, May 22, 2007, sec. Environment, https://www.nytimes.com/2007/05/22/science/earth/22ander.html.

[424] Schor, *Plenitude New Economics of True Wealth (10) by Schor, Juliet B [Hardcover (2010)]* (Penguin HC The, Hardcover, n.d.).

[425] Juliet Schor and Betsy Taylor, *Sustainable Planet: Solutions for the Twenty-First Century* (Boston: Beacon Press, 2003).

[426] Juliet Schor and Douglas B Holt, *The Consumer Society Reader* (New York, NY: New Press, 2000). 460.

find more compelling than virtue and restraint. The positive messages that these economists and commentators convey, grounded in personal experience and attesting to the viability of wealth and comfort in the Anthropocene, creates an atmosphere of comfort in which the skeptical may be more willing to listen.

CHAPTER FOUR:

WE ARE ALL RELATED: INDIGENOUS PERSPECTIVES

Indigenous Museums—Tribal, Regional, and Hemispheric

Tribal, regional and hemispheric perspectives are well represented by these three museums—the Makah Cultural Research Center and Museum, the Alaska Native Heritage Center, and the National Museum of the American Indian. However, this is essentially a snapshot in time and space—although each of the three museums well represents their category, they are not therefore definitively representative of their category of museum as a whole. I have found a wide spectrum of tribally specific museums through informal visits during my travels. Many are small, and appear to operate on a small budget, but are clearly integral to their communities in a substantial way. Since the founding in 1996 of the IMLS, availability of grant funding has permitted many of these museums to design and conduct projects. A survey of these museums and their work would be of great interest. A survey and comparison of regional museums would also be invaluable to the field. The American Indian Cultural Center and Museum, representing forty tribes in Oklahoma, will be an important addition to this group.[427] The NMAI is unique in the Americas in its role as a hemispherically-focussed museum.

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[427] "The Center," The American Indian Center, accessed July 16, 2018, http://www.theamericanindiancenter.org/the-center.

A Tribal Perspective: Makah Cultural Research Center and Museum[428]



Figure 126. The Makah Museum and Cultural Research Center
PHOTO COURTESY: J WOODCOCK-MH

The Makah Museum/Makah Cultural Research Center is an extraordinary example of a culturally relevant, sovereign museum and cultural center, representing the culture of the community, and working responsively to meet Makah tribal members' needs. The museum itself was built to house the

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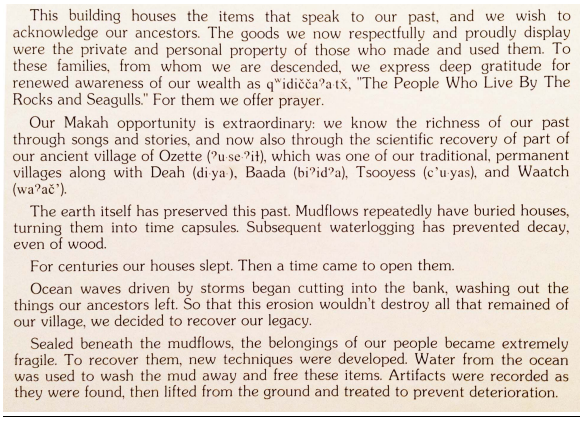
[428] "Makah Cultural and Research Center and Museum (Neah Bay, Washington)," accessed July 16, 2018, http://makahmuseum.com/about/. Makah Cultural and Research Center Mission Statement: To protect and preserve the linguistic, cultural and archaeological resources of the Makah Indian Nation; To provide policy direction in the area of archaeological, linguistic, and cultural management to the Makah Tribal Council, Makah Tribal Departments and other interested organizations; To educate Tribal members and the public in the culture, heritage, and language of the Makah Indian Nation; To stimulate, support and carry out research which will benefit the Makah Nation and the academic community, providing a comprehensive center for Makah oriented research.

artifacts from their pre-contact village, Ozette. As the coast eroded, the artifacts began to emerge, and the Makah sought assistance from a known archaeologist in excavating their ancient village. They trained Makah tribal members in archaeology, to work on the site. They hired an architect, and had



Figure 127. Makah canoes and whale
PHOTO COURTESY: J WOODCOCK-MH



This building houses the items that speak to our past, and we wish to acknowledge our ancestors. The goods we now respectfully and proudly display were the private and personal property of those who made and used them. To these families, from whom we are descended, we express deep gratitude for renewed awareness of our wealth as qʷidiččaʔatx̌, "The People Who Live By The Rocks and Seagulls." For them we offer prayer.

Our Makah opportunity is extraordinary: we know the richness of our past through songs and stories, and now also through the scientific recovery of part of our ancient village of Ozette (ʔuːseːʔiɬ), which was one of our traditional, permanent villages along with Deah (diːyaː), Baada (biʔidʔa), Tsooyess (cʼuːyas), and Waatch (waʔačʼ).

The earth itself has preserved this past. Mudflows repeatedly have buried houses, turning them into time capsules. Subsequent waterlogging has prevented decay, even of wood.

For centuries our houses slept. Then a time came to open them.

Ocean waves driven by storms began cutting into the bank, washing out the things our ancestors left. So that this erosion wouldn't destroy all that remained of our village, we decided to recover our legacy.

Sealed beneath the mudflows, the belongings of our people became extremely fragile. To recover them, new techniques were developed. Water from the ocean was used to wash the mud away and free these items. Artifacts were recorded as they were found, then lifted from the ground and treated to prevent deterioration.

Figure 128. Makah exhibit labels
PHOTO COURTESY: J WOODCOCK-MH

him design their museum in terms of seasons, rather than chronology. (Figure 128) They revived ancient crafts and replicated some of their artifacts that were too fragile to put on display. They designed their collections storage in terms of Makah language group designators, rather than English language/Western museum collections categories. The exhibit signage is phrased in the first person—*we Makah*, rather than *the Makah*, as one almost invariably encounters, even in tribal museums. (Figure 127) The Makah, like the ANHC, are also primarily focused internally, on language and cultural retention efforts. Although they are affected by climate disruption, it is of secondary concern to the museum staff, who are primarily concerned with language

retention and other cultural work.

I had some prior knowledge of the Makah Museum from watching the documentary, *A Gift from the Pas*t, regarding the Ozette excavation and establishment of the museum, as well as a reading a few of the many books about the Makah, such as *Singing the Songs of my Ancestors: The Life and Music of Helma Swan, Makah Elder*,[429] and *Voices of a Thousand People: The Makah Cultural and Research Center*.[430] In addition, I had heard a talk by MCRC director, Janine Ledford, given at the ATALM conference. I was quite eager to visit this museum, and was appreciative to be given permission to conduct interviews with MCRC staff.

The Makah Museum itself is composed primarily of the original exhibit of 498 objects, created to showcase their pre-contact Ozette culture and 55,000 excavated artifacts. The museum contains two canoes made for hands-on exhibit, and a full-size replica longhouse lies at the heart of the museum. In addition, there is a portrait gallery, and a lovely gift shop full of Makah-made jewelry and carvings, items from Native-owned company Native Northwest, as well as a well-stocked book section. What might seem in a casual visit to be a sleepy little museum is actually behind-the-scenes a very busy educational hub.

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[429] Linda Goodman, *Singing the Songs of My Ancestors : The Life and Music of Helma Swan, Makah Elder*, The Civilization of the American Indian Series (Norman: University of Oklahoma Press, 2003), Table of contents http://www.loc.gov/catdir/toc/fy037/2002020270.html.

[430] Patricia Pierce Erikson, *Voices of a Thousand People: The Makah Cultural and Research Center* (University of Nebraska Press, 2002), http://www.amazon.com/Voices-Thousand-People-Cultural-Research/dp/0803218249/ref=tmm_hrd_title_0?ie=UTF8&qid=1385854370&sr=8-1.

The museum is a subset of the MCRC, which also includes archives, library collections, Makah language program and other classes, providing cultural education for the Makah people, as well as providing collections and archive access to scholars.

It is interesting to note that of all of my visits, in a sense, the visit to the Makah was most formal. If I had been requesting permission to work in the archives or collections, or with non-museum Makah persons, I would have had to submit a formal application to be reviewed by the Makah cultural IRB. However, because I was solely interviewing MCRC staff about the museum itself, Director Ledford permitted my research on her authority without a full board review; this diversion from normal protocol was noted in subsequent staff interviews. Although the MSU IRB rules are designed for anonymized social science research and stipulate the destruction of interview materials upon completion of the analysis, Director Ledford had a differing request: “when we work with researchers and when we do interviews that may have interest to our descendants or to other people, we would rather have them available here.” Which made sense to me; however, this was the only museum that requested final interview transcripts for their archives, which I found interesting.

The Makah interviews were also unique because of cultural congruity. All of the formal interviews, as well as informal conversations with staff were with Makah tribal members. In addition, the Makah museum, the MCRC, and the

Makah reservation is within their homeland. I was told:

> We're fortunate because we are in the same area where we've always been. We weren't removed by any Executive Order or any treaty provisions. We're really in just a reduced area of our traditional territory, and when we did negotiations in 1855, we had tribal representatives who were very clear that we needed to have continued access to the ocean.
>
> So we're right here on the Pacific Ocean, we're looking west out to the Pacific and then when we look north we look across the Strait of Juan de Fuca to Vancouver Island. So we're located at the very northwest tip of course of what is now Washington state.
>
> And our people have always understood again the importance of the ocean for our, our well-being, for our wealth, you know, for sustaining our way of life. And so they said we just need a little bit of land for where houses are, but we need, we need the ocean. And so in that treaty—and our treaty is unique because we're the only tribe in the state who has a one-on-one treaty with the federal government—we didn't, we didn't collaborate. We didn't work with any other tribes, and we entered into that treaty.
>
> And then we are the only tribe in the country that actually reserved the right to take whales. So there's a lot of the language in the treaty that is kind of boilerplate, and ours is very specific that we reserve the right to take whales, seals and fish at usual and accustomed fishing stations. And, and so . . . there's a lot of things about our history that are really unique and then of course we are the oceangoing tribe in this region. Other tribes to the south of us have really productive river systems and we don't have productive river systems. We have a couple of smaller rivers and we utilize them of course, but we, we've developed really sophisticated ways to take resources from the ocean. So we have a history of our seal hunters, and whale hunters, and fishermen went way, way out in the ocean. We're talking dozens and dozens of miles you know—up to 100 miles out for some expeditions—it is just a real amazing, you know, situation when you think of, of how in these canoes people could travel so far—way, way out of the sight of land. So of course it's science—it means knowing how to navigate. And so you know we—again we're fortunate because we've always been here, and we reserved really kind of the most important parts of our land for our reservation.
>
> (Makah Museum interview #97)

The Makah museum opened in 1979. Climate disruption and sustainability were not contextualizing topics at that time, and the museum exhibit, well-done in the first place, requires no revision for cultural accuracy. In succeeding decades, the Makah, as with all coastal people, are contending with the effects of climate disruption. As with the Alaska Native Heritage Center, the focus is on cultural sustainability, and community classes rather than on exhibits about environmental sustainability.

A notable cultural sustainability moment was achieved when traditional net fishing rights were upheld in court by the introduction into evidence of pre-contact fishing net from the Ozette excavation. Unlike other major archaeological excavations, the Ozette excavations were conducted collaboratively with tribal members, elders were on-hand to identify artifacts, and the resulting excavated materials remained with the Makah, forming the basis of their museum collections and exhibit.

When I asked in an interview whether the Ozette excavation had sparked a cultural renaissance, a misperception I had gleaned, I was told that the Makah had never been seriously culturally disenfranchised, so although it was certainly bolstering, and interesting, the Ozette experience contributed to their cultural continuity, rather than restored it.

The MCRC received IMLS funding through the Conservation Assessment Program (CAP), which involves a thorough assessment with a conservator. The funding will allow infrastructure sustainability improvements in the 39 year old

building, including a new roof, revised lighting, and possibly the installation of a solar array. Staff also discussed with me their interest in a National Endowment for the Humanities (NEH) "Sustaining Cultural Collections" grant that allows for infrastructure improvements in relation to historic preservation. Recycling has a cultural flare at the Makah Museum; near the main door there is a trash bin that is adorned with a sign, "Think before you toss!" featuring a stick figure wearing a traditional woven conical hat.

A Regional Perspective: Alaska Native Heritage Center



Figure 129. The Alaska Native Heritage Center
PHOTO COURTESY: J WOODCOCK-MH

My first research visit to a Native museum was at the Alaska Native Heritage Center. I had called ahead to make appointments, but wasn't quite

sure what to expect, as their website provides primarily information regarding a dense schedule of activities. [431] The one thing that I was sure of was that since this center serves all Alaska Natives, that the ANHC would have exhibits exploring pressing issues of climate disruption, such as those facing the residents of Shishmaref—literally losing ground—and the Gwich'in efforts to protect the calving grounds of the Porcupine Caribou herd, upon which they depend. As I explored the museum area of the cultural center, to my consternation, I found nothing about climate disruption or melting permafrost. What I did find was a woman painting extraordinary, larger than life portraits of elders, (Figure 129) and in the *Hall of Cultures*, displays representing the different cultural areas of Alaska. (Figure 130) These displays clearly indicated the cultural group, and their home area, with quotations such as, "Keeping alive the culture of the Inupiat people does not mean we have to live as I did as a boy," attributed to Edward Hopson, Sr., Inupiat, Barrow, Alaska. Adjacent to cases featuring a cultural elder, and cases with artifacts, the cultural displays

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[431] "ANHC Mission | About Us | Alaska Native," Alaska Native Heritage Center: Mission and Vision, accessed July 16, 2018, http://www.alaskanative.net/en/main-nav/about-us/anhc-mission-new/. AHNC MISSION AND VISION: Alaska Natives represent many languages, creeds, and philosophies, but we share common goals, values, and the challenge to embrace modern changes in such a way that we can be full participants in this new era. We build on the traditional cycle of knowledge that has helped to perpetuate Native societies for hundreds of generations. Vision: Thriving Alaska Native people and cultures respected and valued. Mission: Preserves and strengthens the traditions, languages, and art of Alaska's Native People through statewide collaboration, celebration, and education. Ten Universal Alaska Native Values: **SHOW RESPECT TO OTHERS**, *Each Person Has a Special Gift;* **SHARE WHAT YOU HAVE,** *Giving Makes You Richer;* **KNOW WHO YOU ARE,** *You are a Reflection on Your Family;* **ACCEPT WHAT LIFE BRINGS,** *You Cannot Control Many Things;* **HAVE PATIENCE,** *Some Things Cannot Be Rushed;* **LIVE CAREFULLY,** *What You Do Will Come Back to You;* **TAKE CARE OF OTHERS,** *You Cannot Live Without Them;* **HONOR YOUR ELDERS,** *They Show You the Way in Life;* **PRAY FOR GUIDANCE,** *Many Things Are Not Known;* **SEE CONNECTIONS,** *All Things Are Related.*

also featured photographs of kids—the message clearly conveyed was that these are living cultures—here are the children, today. Another point of interest in this *Hall of Cultures* is that the people, including children, were identified by name; this is in sharp contrast to most exhibits of Native people in museums of natural history, where they usually remain anonymous.

My interviews were spread out over two days, and I was given the opportunity to talk with all available staff, despite it being a very busy time for them, although it seemed that perhaps it was always a very busy time for them.

ANHC Interviewee #23 remarked on activities at the ANHC: "We've not been heavily involved in the topic of climate change here at the heritage center. . . focus on cultural sustainability, on the youth. We try to bring their roots here—bring seals in for butchering," "Making Kayaks, butchering seals," "We're a living culture center," "Museums are houses of the dead," "making of the five-foot frog bowl that summer that will get dedicated later this month," "the Aleutian Pribiloff Islands have their culture camp, and then do their big culminating day (there at the ANHC) with dancing and kayak blessings and all kinds of presentations, and skin sewing stuff . . . " – "making Kayaks is an awesome project," "It's all authentic cultural activities, is what I'm trying to get at,"- and "tourists are coming through, watching this and observing that, and when we do that, our comment cards skyrocket out of the roof, they're like, "awesome stuff, awesome stuff!" "I don't want to teach kids to be little

puppets and put them onstage . . . there has to be some of that, but I want our young people to be learning."

When I asked staff about the lack of climate change information in the *Hall of Cultures*, I was told "Tourists only want to hear happy stories about Eskimos and polar bears, so that's what we give them," also, Northern Alaskan cultural centers are focused on climate change issues. When I then asked about their work with the tribes, they explained that cultural sustainability was even more pressing than environmental sustainability, so that is where they focused the bulk of their energies. Approximately half of the Native people of Alaska live in Anchorage, and the majority of Native high school students in Anchorage were dropping out of high school for a variety of reasons. The ANHC addresses this problem through intensive after school programs, educating these young people regarding their traditional cultural knowledge, instilling dignity and hope, and radically improving their high school graduation rate. ANHC provides *Walking in Two Worlds* for 6th-9th graders, and the *Career Counseling and Community Interconnectedness* program for 14-25 year-olds, providing paid internships and immersive cultural education.

The ANHC staff members articulated their premise that until there was a solid base of culturally knowledgeable, engaged, empowered young Native Alaskans, there would not be the pool of stalwart people required to fight climate disruption and protect the interests of Native Alaskans in an increasingly challenging environmental, economic and political climate.

Therefore the ANHC has prioritized cultural sustainability education before that of environmental sustainability, and created a highly effective intensive after school program focusing on cultural knowledge and skills specific to each child's tribal background. The students participating in these programs have a 70-80% high school graduation rate, according to ANHC staff.

This program beautifully demonstrates the importance of relationships noted by many proponents of Indigenous Methodology. The mentoring relationships that these marginalized children have with their cultural elders at the ANHC literally re-ground them, giving them the personal stability to re-enter their Indigenous communities as effective agents to address the stress of climate disruption and relocation that many of them are facing.



Figure 132. ANHC-outdoor architecture
PHOTO COURTESY: J WOODCOCK-MH



Figure 133. ANHC Docenting in snow
PHOTO COURTESY: J WOODCOCK-MH

An additional issue contended with by the ANHC is an unusual curatorial situation—they have model buildings for each of the Alaska Native cultural

areas, used for teaching and for events. However, not all of these buildings are designed for arctic conditions, and they must be examined for frost and snow damage; I accompanied staff as they conducted inspections, concerned about blowing snow drifting into buildings and damaging painted carvings. (Figures 132-133)

A Hemispheric Perspective: National Museum of the American Indian[432]



Figure 134. The Smithsonian National Museum of the American Indian.
PHOTO COURTESY: J WOODCOCK-MH

I was very fortunate to be the recipient of an NMAI fellowship; this

[432] "Mission Statement | National Museum of the American Indian," accessed July 16, 2018, http://nmai.si.edu/about/mission/. Mission Statement: The National Museum of the American Indian (NMAI) is committed to advancing knowledge and understanding of the Native cultures of the Western Hemisphere—past, present, and future—through partnership with Native people and others. The museum works to support the continuance of culture, traditional values, and transitions in contemporary Native life.

allowed me a luxury of time in which to conduct interviews and make connections, the ability to access the Smithsonian computer intranet, and to have a desk to work from, so I did not have to portage my gear from place to place. Also, the fellowship bestowed a level of credibility on my venture that saved considerable time and explanations when I was asking for interviews. In all, I was able to conduct twenty-seven interviews at the NMAI with staff from a wide array of positions, including the director, the janitor for my office floor, education, curatorial, repatriation, media, film, exhibits, security, Mitsitam chef, various NMAI-based facilities staff, NMAI-based Anthropocene Initiative staff, to name but a few.

While I was disconcerted to find so little on climate disruption at the tribal and regional Native museums, I came to fully understand their logic of placing emphasis on cultural sustainability rather than environmental sustainability, given limited staff and resources. I knew that it was a different situation at the NMAI, given a comparatively generous budget, staff, and the greater resources of the Smithsonian Institution. I spent time speaking with staff both about pragmatic infrastructure sustainability initiatives and issues, as well as pedagogical and programming approaches to furthering sustainability awareness. The NMAI holds on an annual event, the Living Earth Festival, held in July, as its main sustainability focus with the public. Masterminded by Carolyn McClellan, this complex three-day event consists of a conference with invited speakers, guest artists, eco-friendly artisan wares, information tables

for organizations such as the InterTribal Buffalo Council, Native dance performances, musical entertainment and food. Initiated in 2008 with 8,000 people attending, the festival is geared primarily toward families, and draws thousands of visitors to the NMAI. In 2015, during my time at the NMAI, the Living Earth festival featured the musician Quetzal Guerrero, had a ladybug release, Mayan chocolatiers, and a Native chef cooking competition, among many other activities. The conference included a keynote talk by Robin Wall Kimmerer, and focused on issues of sustainable farming, GMO crops, conservation of indigenous seeds and other issues related to sustainable Indigenous farming. The festival is live webcast, and then archived online for those not able to attend in person. (Figure 136)

The landscaping surrounding the museum is carefully designed to include hardwood, wetland, meadow and farm habitats, including a beautiful water feature and forty huge *grandfather rocks*; the farm area is used to grow traditional food and spice plants that are used in the Mitsitam café. One of the pedagogical features that I kept an eye out for at all the museums was signage—the NMAI consistently provided signage to draw visitors to the teachable moment. The garden areas each had signage explaining the significance of the plants. (Figure 135)

Now retired, Tim Johnson was the NMAI's associate director of Programs, and the primary connection to the Smithsonian's Living in the Anthropocene Initiative. Johnson was particularly interested in tribal elder's knowledge

regarding climate change and finding ways to impart that cultural knowledge to the public in such a way as to motivate behavioral change.



Figure 135. NMAI Gardens.
PHOTO COURTESY: J WOODCOCK-MH



Figure 136. NMAI Living Earth Festival.
PHOTO COURTESY: J WOODCOCK-MH

The NMAI has developed a website geared towards teachers, *American Indian Responses to Environmental Challenges,*[433] that investigates four tribes' contemporary sustainability initiatives, with lessons and interactives for teachers to use with their students. In the nexus of pragmatic and pedagogical attention to sustainability, the NMAI places sustainability as a core value in exhibit development, targeting LEED specifications.

I visited the NMAI at a cusp point. Director Gover had assessed that the goal of the NMAI, to communicate Native culture and history to the public, was being insufficiently met in that people were walking out of the museum holding on to the same misconceptions with which they had entered. He discussed how

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[433] "American Indian Responses to Environmental Challenges," accessed July 16, 2018, http://nmai.si.edu/environment/.

to contend with this problem, and felt that taking a step back and creating programming of a didactic nature, demythologizing Native culture would be the most effective course of action. He had launched this path with the exhibit, *Treaties*, and while I was there his team was preparing *Americans*, an exhibit exploring the actual story five of famous Native Americans. The NMAI, while being a museum about Native people, primarily by Native people, is also an entity of the Smithsonian, and thus charged with serving the public—it holds dual roles in what seems to be at times an uneasy balance. Certainly staff seemed uneasy with this shift in direction somewhat away from tribal relationships and toward the public; I noted some institutional sustainability issues in this regard.

Much more straightforward, if challenging were the day-to-day infrastructure initiatives being worked on. Many of these overlapped those of the Smithsonian as a whole. For example, bathrooms used electric eye automatic flush toilets. However, they often would flush too many times, so this was a point of concern. On the other hand, aerated faucets were effective, and saved a lot of water. Lighting was tied to motion sensors, to eliminate the problem of people forgetting to turn lights out at night. Recycling bins were placed at convenient intervals, to encourage use, as were bins in the employee lounge, where people ate lunch. Composting was in issue at the NMAI as it was elsewhere, I will discuss that further in the next chapter. One of the more important aspects of incorporating sustainability initiatives was the factor of

reducing hierarchical exclusion of facilities staff. The janitor for my floor was very involved in sustainability, really cared about it, and was included in NMAI sustainability meetings, which he reported made him feel like his work was important, as were his observations and opinions. This inclusivity was something that I saw repeatedly at the Smithsonian, especially at the NMAI, and I believe that it helped people to stay motivated in tackling intransigent problems.

Indigenous Cultures versus Industrialized Cultures

The term *Indigenous cultures* refers to cultural groups of people who have resided in, or if forcibly removed, identify with their landscape region since time immemorial. The term references Native American sovereign tribes of North and South America, Aboriginal peoples of Australia, First Nations sovereign tribes of Canada, Pacific Island communities, and African tribal communities, amongst many others. *Indigenous* is an umbrella term referring to thousands of vastly different cultural groups around the globe, but who tend to share cultural traits emphasizing sustainable environmental practices, an emphasis on community well-being valued before personal profit, and a prizing of traditional language, knowledge, and land relationships. *Indigenous cultures* are frequently contrasted against *Industrial cultures*.

Industrial cultures are commonly equated with colonial, settler colonial, or empire building nations. Industrial cultures currently are primarily

conceptualized within academia as being European or descended from European colonists, and economically supported by mechanized, petroleum dependent, industrial manufacturing. I would argue that this predominant concept is incomplete, racialized, and an antiquated remnant of the colonial concept of the "three stages of civilization" popularized in the 1800s by anthropologist Lewis Henry Morgan in his book *Ancient Society: Or Researches*



2010 RANK		Country
1		United States
2		China
3		Japan
4		Germany
5		France
6		United Kingdom
7		Italy
8		Brazil
9		India
10		Canada

2020 RANK (Predicted)		Country
1		China
2		United States
3		Japan
4		India
5		Germany
6		Brazil
7		Russia
8		United Kingdom
9		France
10		Canada

2040 RANK (Predicted)		Country
1		China
2		India
3		United States
4		Indonesia
5		Brazil
6		Nigeria
7		Russia
8		Japan
9		Germany
10		United Kingdom

Figure 137. The Top 10 Largest by GDP Economies in the World[434]
FIGURE COURTESY: PACER ADVISORS

in the Lines of Human Progress from Savagery Through Barbarism to Civilization.[435] Under his classification, China, India and Japan would all be

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[434] "The Top 10 Largest by GDP Economies in the World (in Billion Current USD)," Pacer Advisors, 2017, https://www.paceradvisors.com/solutions/why-global/.

[435] Lewis Henry Morgan, *Ancient Society; Or, Researches in the Lines of Human Progress From Savagery, Through Barbarism to Civilization* (Andesite Press, 2015).

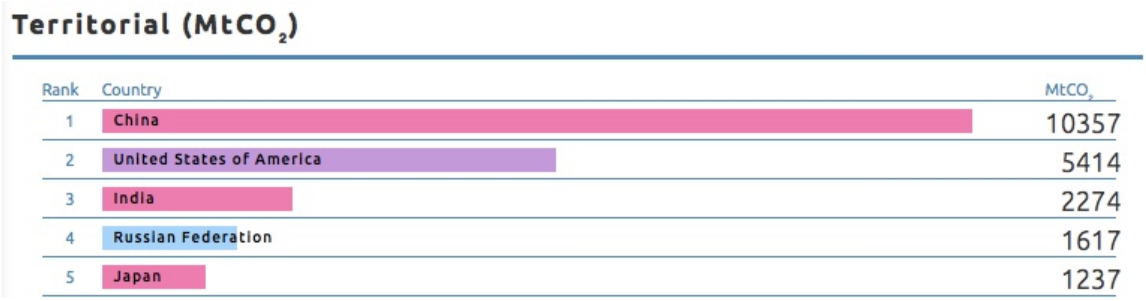

Figure 138. Top Five CO_2 Emitting Nations[436]
FIGURE COURTESY: GLOBAL CARBON ATLAS

countries or cultures falling under the 'Barbarous' or 'Semi-Civilized' classes. In other words, not to be taken seriously as 'civilized' world powers. According to the IWGIA (International Work Group for Indigenous Affairs), China recognizes 55 ethnic minorities, does not acknowledge the term Indigenous, but did report in the 2000 census approximately 735,000 "unrecognized ethnic groups"; Japan is home to the Indigenous Ainu and Okinawan peoples; and India recognizes 461 "Scheduled Tribes", their term for Indigenous peoples. I suggest that although these nations include Indigenous communities, as post-World War II world forces, China, India and Japan are demonstrably in the lead as industrial cultures. The World Monetary Fund reports their current estimate for global GDP by country, the top four including China, USA, India and Japan, in that order. The subcontinent of India originally consisted of many individual nation states until European colonization and the eventual domination by the British Raj. India was finally partitioned from Great Britain in 1947, however it

[436] "CO2 Emissions | Global Carbon Atlas," Global Carbon Atlas: Territorial (MtC02), 2017, http://globalcarbonatlas.org/en/CO2-emissions.

demonstrates its colonial legacy by remaining a unified country rather than reverting to its original multi-national states. China and Japan, however, have their own long histories of empire building and colonial domination of their neighbors. Japan's aspirations were crushed by U.S. nuclear holocaust in World War II, but China's imperialism remains undaunted to the current day, with their domination of Tibet, Inner Mongolia and Taiwan. To not classify these countries as *Industrial Cultures* is racist and does not reflect their true role in either the global economy or as environmental protagonists. (Figures 137-138)

The Global Carbon Atlas lists the top CO_2 emitters of 2015—China, India and Japan among them.[437] The key point is that although colonization and industrialization have been characterized as *Western* and *White* or *European*, the actual situation is more complicated and should rather be regarded as a dichotomy between commercialized materialism-focused industrialized societies, and Indigenous societies.

Many Indigenous cultures carry important cultural and scientific perspectives about living harmoniously on our planet—ideas which have traditionally been communicated through stories, and which have value for aggregate culture in imagining more functional ways of living on the planet.

Two critical differences between most Indigenous cultures and aggregate cultures are that many Indigenous languages are verb-based rather than noun-based, and Indigenous cultures are primarily place-based. Dr. Gregory Cajete,

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[437] "CO2 Emissions | Global Carbon Atlas."

in *Native Science*, gives a very clear explanation regarding verb-based language, and how it can be misperceived:

> Native Science continually relates to and speaks of the world as full of *active* entities with which people engage. To our sensing bodies, all things are active. Therefore, Native languages are verb based, and the words that describe the world emerge directly from actively perceived experience. In a sense, language "choreographs" and/or facilitates the continual orientation of Native thought and perception toward active participation, active imagination, and active engagement with all that makes up natural reality. This active perceptual engagement with the animate world was termed the "participation mystique" by French anthropologist Lucien Levy-Bruhl to describe "the animistic logic of Indigenous, oral peoples for whom ostensibly 'inanimate' objects like stones or mountains are often thought to be alive and from whom certain names, spoken out loud, may be felt to influence the things or beings that they name, for whom particular plants, particular animals, particular places, persons and powers may all be felt to 'participate' in one another's existence, influencing each other and being influenced in return." While this definition of animism is descriptive of its observable traits, it is also a term that has become steeped in Western scientific and cultural bias. [438]

Drawing on, but not clinging to, the linguistic hypotheses of Sapir, Orwell, and Chomsky, summed in Sapir's proposal that, "Language and our thought-grooves are inextricably inter-related, are, in a sense, one and the same,"[439] the philosophical repercussions of framing the world from a verb-based versus noun-based language are profound. Cajete's choice of "choreographed" to describe verb-based language is apt—the relationship between a mind and a verb-based language can be seen as a dance,

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[438] Gregory Cajete, *Native Science : Natural Laws of Interdependence*, 1st ed. (Santa Fe, N.M.: Clear Light Publishers, 2000). 27.

[439] John E. Joseph, *From Whitney to Chomsky: Essays in the History of American Linguistics* (Amsterdam ; Philadelphia, PA: John Benjamins Publishing Company, 2002). 74.

performance art, a fluid passage. In contrast, a noun-based language such as English is akin to a set of Legos—it is architectural in nature, and has a tendency, like Legos, to inspire constructed thought that is linear of nature and binary in application.

Professor Anne Slater, emerita linguist at the University of Wyoming, observed in class that native speakers of a language are most blind to it. If one speaks a noun-based language, linear in aspect and grammar, it is an easy thing for Sapir's 'thought-grooves' to gently mold a mathematical weltanschauung, a mental house of Legos, internally consistent, and engendering a cultural perspective that rejects the fluidity of verb-based thought and culture as essentially sloppy and literally without foundation.

I suggest that this cognitive divergence is what has impelled the most well-meaning of anthropologists, publishers, teachers of literature, and librarians to consistently categorize Indigenous oral history and story-conveyed instruction as "myth", when it is, in fact, analogous to a software zip file—it is information compressed symbolically in such a way that when unpacked, it expands with nuance and application. This instinctive misconstruction possibly originates, at least in part from the kind of early stories given to little noun-based children. There are precious few deeper meanings to be teased out of *Harold and his Purple Crayon*, or *The Poky Little Puppy*; until very recently, if a child was given a book of Native American instructive stories, it came labeled as myth or legend—something to be dismissed as fanciful and archaic. This

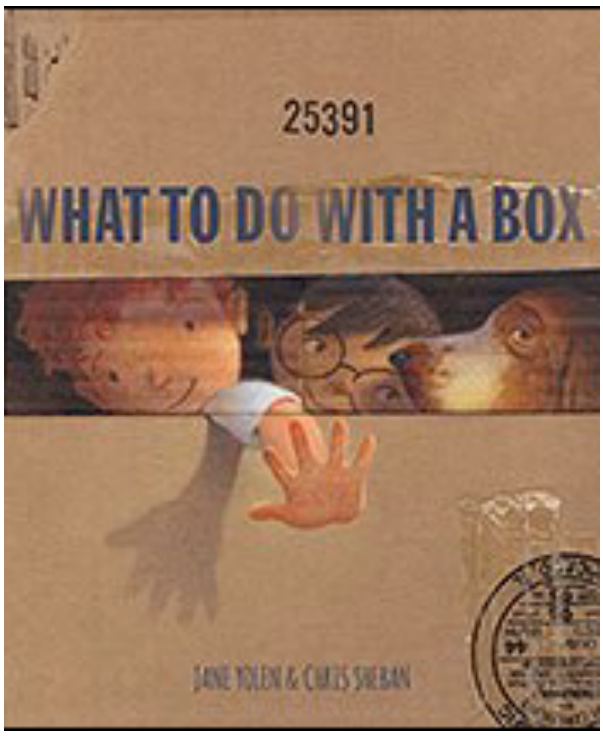

Figure 139. *What To Do With a Box*, Jane Yolen
FIGURE COURTESY: CREATIVE EDITIONS

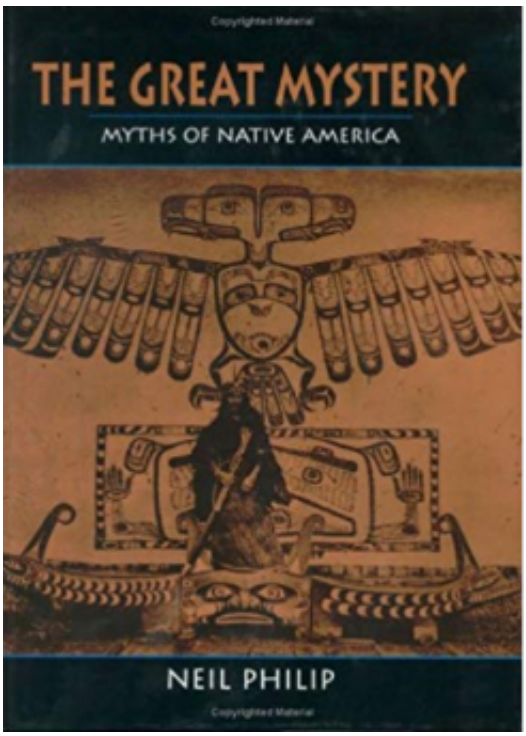

Figure 140. The Great Mystery: Myths of Native America, Neil Philip
FIGURE COURTESY: CLARION BOOKS

routine early childhood instruction is literally the difference between teaching a child to think inside the box, or outside the box. Any first-grader can report back about the consequences for straying outside of the box; it is generally considered pathological, unruly, or unduly distracted. (Figures 139-140)

I hasten to point out that is not a de facto binary equation of cognitive dissonance, although these clashing paradigms do fuel the dynamics of settler colonialism and the pursuit of manifest destiny. At the pathological far end of these askew worldviews, only by dismissing an 'other' as somehow less than human, mentally and culturally inferior, can the exploitation and abuse required for imperialism be sufficiently rationalized. At the near end, adhering

head-down to the narrow path of linear thinking is an efficient way of obliviously missing the big picture. There are a number of means for providing the mental landscape in which to reframe this cultural disconnect:

As any bilingual or polyglot person knows, there are concepts that may be easily expressed in one language, but hard pressed to find an accurate expression in another. Fluency in more than one language creates a synaptic option of synchronously devising an idea across multiple language platforms, triangulating in on the most authentic version; especially true if the languages are disparate, such as American Sign Language, a visual language, or Basque, unrelated to any other language, for example.

Dr. Temple Grandin, in her autobiography, *Thinking in Pictures*, lyrically describes her innate visual thought processes; her mind's eye navigating in 3D, drawing on a vast repertoire of mental images, editing her creative mental processes as one would a film, and visualizes verbs as they call a mental image to mind. Grandin observes, "Mine is a world of thinking that many language-based thinkers do not comprehend. I have observed that the people who are most likely to deny animals thought are often highly verbal thinkers who have poor visualization skills."[440] In a world that conceptualizes autism as a handicap, it is illuminating to read her perceptions of people who think in gawkish words and are incapable of the complex mental visualization that is

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[440] Temple Grandin and Oliver Sacks, *Thinking in Pictures, Expanded Edition: My Life with Autism*, Expanded ed. edition (New York: Vintage, 2006). 4-5, 14, 23, 28, 185-186.

intrinsic to her thought—she thought that they were oafishly stupid until she discovered their visualization disability. Although Grandin is a dazzling virtuoso of visualization, autism is certainly not a prerequisite factor. Complex visualization is a commonly employed training strategy among competitive athletes,[441] as an acute pain management technique,[442] and as a widely used meditation practice.[443] Visualization, thinking in pictures, effectively replaces the concretizing tendency of English with the fluidity of verb-based languages by opting into imagery.

A third road out of linearity spirals right back in again to the English language. The editors of that bastion of the English language, *The Oxford English Dictionary*, report that the second edition of the twenty-volume dictionary includes full entries for 171,476 words in contemporary use, entries for 47,156 archaic words, and about 9,500 subentries for derivative words. The OED editors conclude that:

> there are, at the very least, a quarter of a million distinct English words, excluding inflections, and words from technical and regional vocabulary not covered by the *OED*, or words not yet added to the published dictionary, of which perhaps 20 per cent are no longer in current use. If distinct senses were counted, the

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[441] Wendy Rodgers, Craig Hall, and Eric Buckolz, "The Effect of an Imagery Training Program on Imagery Ability, Imagery Use, and Figure Skating Performance," *Journal of Applied Sport Psychology* 3, no. 2 (September 1, 1991): 109–25, https://doi.org/10.1080/10413209108406438.

[442] Kate Seers and Dawn Carroll, "Relaxation Techniques for Acute Pain Management: A Systematic Review," *Journal of Advanced Nursing* 27, no. 3: 466–75, accessed July 3, 2018, https://doi.org/10.1046/j.1365-2648.1998.00538.x.

[443] "A Perception Theory in Mind–Body Medicine: Guided Imagery and Mindful Meditation as Cross-Modal Adaptation | SpringerLink," accessed July 3, 2018, https://link-springer-com.proxybz.lib.montana.edu:3443/article/10.3758/s13423-011-0166-x.

total would probably approach three quarters of a million.[444]

Journalists at *The Economist* have been monitoring *TestYourVocab.com*; when the two millionth vocabulary assessment test was completed, researchers compiled and released data. Relevant to this discussion is their dismaying result for adult speakers of English as their first and/or only language—a vocabulary of 20,000-35,000 words.[445] If one generously assumes a vocabulary of 35,000 words, and subtracts that from the *Oxford English Dictionary's* available pool of 228,132 words, one is left with a fecund bounty of 193,132 lexical opportunities for improving verbal precision. We live in a country where the flagrant illiteracy of several United States presidents is regarded with hilarity in the media and TweetWorld, and the Oxford education of another is regarded askance as denoting an unattractive surfeit of education, apparently rendering him an unsatisfactory figurehead for the U.S., too likely to use a baffling three syllable word. If one figuratively moves from the five-Crayola vocabulary set up to the deluxe 152 set, there is a corollary ability not only to express oneself much more clearly, but more meaningfully, empowering oneself with an agentic vocabulary creates the possibility of thinking much more complex and nuanced thoughts. I offer the hypothesis that having the capacity to exactly capture a thought or observation with precise language

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[444] "How Many Words Are There in the English Language?" Oxford Dictionaries," Oxford Dictionaries | English, accessed July 3, 2018, https://en.oxforddictionaries.com/explore/how-many-words-are-there-in-the-english-language/.

[445] R.L.G. Johnson, "Lexical Facts: Vocabulary Size," *The Economist*, May 29, 2013, https://www.economist.com/johnson/2013/05/29/lexical-facts.

extracted from a vast mental dictionary in turn subtly promotes a keener observation of life and its complexity, as well as keen interest in collecting words like baseball cards. Educators refer to *decoding* and *literacy* to distinguish between the mundane ability to decipher written data, and the ‘”window on the world”’ offered by that wild ride, literacy. These terms are equally applicable to verbal proficiency or mere functionality in language. I offer the idea that just as our world has reached a dismal climatic tipping point, an opposite mental tipping point can be reached by saturating one’s mental ocean with melting ice bergs of words, slipping one by one out of frozen torpor into a sea of inspiration, and that when the tipping point is reached, and a trick of synesthesia turns words as sweet as Belgian chocolate language even noun-based language shape-shifts into an exhilarating performative state.

Why, one might ask, would one want to put such a significant effort into becoming a polyglot visual thinker with a stupendous vocabulary? All three of these skills can be augmented. It is true that acquiring languages is a greater challenge as an adult, and that some people are simply not wired for *3D* visualization, however, a daily visual meditation practice can greatly strengthen that aspect of imagination. These three skills, singly or together create the possibility for building a sturdy cognitive bridge from the linear world of a noun-based language denizen to the agile world of verb-based thinkers. Although Americans are pragmatically trained from birth to identify and respond to the symbolism encoded in widely recognized semiotic markers

such as ‘the Golden Arches,’ road signs, or the power on/off symbol, we are no longer taught in grade-school to mentally extend a recognition of semiotic markers into the dense cognitive shorthand of symbolic thinking exemplified in poetry or Native American cautionary stories.

As I conducted my doctoral research interviews, talking with non-Native museum staff about their efforts and experiences in working cross-culturally with tribal communities in collaborative endeavors, I heard repeatedly, at many institutions, that despite their very best intentions, they felt a cultural disconnect that impeded them from working successfully. In some cases this was gap was socially brokered, often by Dr. Nancy Maryboy, but in others the opportunity for collaboration slipped away into the noun-verb cultural chasm. We are not encouraged to expand our minds in America, but it can be accomplished and does seem like the obvious answer to making a genuine effort to grasp other cultural perspectives and reach a functional level of communication. *Getting on the same page* in this way can’t magically fix serious cross-cultural communication blocks, but it should create enough common ground to at least have a viable starting point from which to build a collaborative tribal/museum alliance.

The second defining feature of Indigenous peoples, place-based culture, is an immersive knowledge acquired and handed down through millennia of iterative experiences, navigating every square foot of the landscape in every season, and in every kind of weather, memorizing who lives where, and when

and under what circumstances; what is good to eat, what will kill you, and what will cure your headache, what clay from what exposure will fire without exploding, what plants will yield colorful dyes, and which will give rashes instead, where all the sources of fresh water can be found, which ones are seasonal, and which ones are erratic, where all the berry patches are, and where the bears hibernate, and where the best landscape points are for enjoying the view. They may inadvertently hunt to extinction a seemingly inexhaustible food source. They might learn to shape biodiversity through the judicious application of fire. After ten or twenty or thirty thousand years of observing the ebbs and flows of biogeographical data regarding these and many other points of interest, comparing and analyzing these observations as a community and ensuring that the knowledge is passed down through generations, a community will have an encyclopedic knowledge of their environment, its natural cycles, and the red flags of unprecedented changes.

This also means that the people, as a people, are molded to the curve of the land. The mass physical displacements used as a destabilizing tool of oppression by settler colonial regimes is deeply jarring and culturally disruptive to the descendants adrift on unfamiliar earth, excised from the bone deep call and response of their home. The experience of culturally navigating the disenfranchisement from landscape woven deep into culture, and the beginning of establishing a new relationship with a new landscape is exquisitely expressed in *Braiding Sweetgrass*, penned by Dr. Robin Wall Kimmerer, Potawatomi

botanist and SUNY Syracuse Distinguished Teaching Professor of Environmental Biology. Kimmerer writes:

> The guidelines for of the Honorable Harvest are not written down, or even consistently spoken of as a whole—they are reinforced in small acts of daily life. But if you were to list them, they might look something like this:
>
> Know the ways of the ones who take care of you, so that you may take care of them.
> Introduce yourself. Be accountable as the one who comes asking for life.
> Ask permission before taking. Abide by the answer.
> Never take the first. Never take the last.
> Take only what you need.
> Take only that which is given.
> Never take more than half. Leave some for others.
> Harvest in a way that minimizes harm.
> Use it respectfully. Never waste what you have taken.
> Share.
> Give thanks for what you have been given.
> Give a gift, in reciprocity for what you have taken.
> Sustain the ones who sustain you and the earth will last forever.[446]

In Potawatomi terms, this is a honed recipe for inter-species etiquette; in Western scientific terms it is a precise analysis of how to avoid the extinction of plant sources through overharvesting. It is also a splendid example of urgently needed Native Science, applicable across landscapes, and how Native Science can benefit everyone as we try to find our way through the bewildering changes of the Anthropocene.

Or, one could attempt the extraction of overlapping information from Liu et al's, earnest "The Conservation Value of Germplasm Stored at the

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[446] Robin Wall Kimmerer, *Braiding Sweetgrass : Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants*, First edition. (Minneapolis, Minnesota: Milkweed Editions, 2013). 183.

Millennium Seed Bank, Royal Botanic Gardens, Kew, UK":

> Vulnerability to extinction
> The representativeness of taxa in the MSB that are extinct, rare or vulnerable to extinction and taxa with a lower risk of extinction at global and/or national scales are given in Tables 5 and 6. When compared with IUCN (2016) global assessments, MSB conserved at least 5.31% of taxa, representing nearly 1600 collections, which are declared as extinct or vulnerable to extinction (EW, CR, EN and VU). This includes seven of 36 taxa which are declared as extinct in the wild (Table 7). For those taxa declared as having a lower risk of extinction, MSB collections include 23.19% taxa, represented by over 7400 collections.[447]

Although Liu and colleagues' work and summation in the *Journal of Biodiversity and Conservation* appears to be impeccable science, and very useful within their field, neither this paragraph, nor any of its kin in the article is inspirational. I could easily use Kimmerer's text as a memorable and accessible didactic tool on a berry picking venture with my six-year old niece Astrid; I can only imagine her perplexed chagrin if I were to read her the Liu paragraph.

These two key cultural differences, language and place-based identity, can lead to challenges in authentically and accurately presenting Indigenous cultural ideas to an aggregate public audience. Very careful collaborative work with a culturally fluent Indigenous consultant is necessary to avoid inaccuracies or inadvertent cultural faux pas. Recognizing and acknowledging the appropriative settler colonial history tainting many Indigenous/museum

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[447] Udayangani Liu et al., "The Conservation Value of Germplasm Stored at the Millennium Seed Bank, Royal Botanic Gardens, Kew, UK," *Biodiversity and Conservation* 27, no. 6 (May 1, 2018): 1347–86, https://doi.org/10.1007/s10531-018-1497-y.

relationships, is of critical importance in establishing a point of credibility from which to launch initial discussions of collaboration from the very beginning stage of contemplating an initiative. Otherwise, contemporary efforts may simply perpetuate historical grievances rather than serve as a reconciliatory starting point. During my research interview conversations, it was repeatedly mentioned that successful collaborations were begun together, on an equal footing, rather than approaching a potential tribal partner after the project was already in draft form.

An additional serious concern is regarding the security of intellectual property; in the digital age it can be very advantageous to scan archival materials and access them remotely, especially for use by elders at home, or in communities spread over large distances. However, it is crucial to use a system like Mukurtu,[448] which is heavily firewalled, and has custom access log-on profiles designated by tribal culture committee elders. For example, a tribe may want to map seasonal food sources, but not want this information available to the public, or make public or hidden specific plant locations. Mukurtu and the Sustainable Heritage Network, based at Washington State University, work extensively with tribes to create custom designed digital repositories for their museum or cultural center, either housing the archive with the tribe, or behind Washington State University's firewalls. This is particularly important for tribes that may have archaeological or burial site

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[448] "Learn," Mukurtu CMS, accessed March 21, 2018, http://mukurtu.org/learn/.

location information; pothunters relentlessly take advantage of known localities.

Indigenous Theory and Methodology

Indigenous theory and methodology is a key emerging academic field, although derived from ancient cultural knowledge. Core components of Indigenous theory and methodology include a focus on Traditional Ecological Knowledge (TEK), the utility and value of interpersonal relationships, a respect for and responsibility to others, humility, reciprocity, a concept of global interrelatedness, and especially, the concept of Seven Generations, and relational accountability. Indigenous theory and methodology preferences experiential knowledge, thus complementing closely a qualitative ethnographic approach with a subtle shift toward a greater emphasis on collaboration.

My research incorporates these aspects of Indigenous Methodology for two reasons: First, conducting research with this approach proved to be far more productive with both Indigenous and non-Indigenous interview subjects because of its inclusive humanity, and secondly, much needed efforts to "Indigenize the Academy," creating opportunities for catalyzing non-Western perspectives to surface in academia, require exercise in fields beyond Native American Studies. A decolonizing research approach offers possibilities of weaving together Indigenous and academic knowledges into a salutary synthesis. This work is well suited for an innovative approach to data collection and analysis.

Scholars such as Dr. Daniel Wildcat, Dr. Shawn Wilson, Dr. Margaret Kovach, and Dr. Robin Wall Kimmerer have all written extensively on the topic of Indigenous theory and methodology, and collectively offer a rich and fresh way of conducting academic research, although perhaps somewhat alien from a Western perspective. Yuchi/Muskogee scholar Wildcat introduces in *Red Alert: Saving the Planet with Indigenous Knowledge* the concept of "Indigenous Realism," that incorporates "respect for the relationships and relatives that constitute the complex web of life" relationships that carry inalienable rights and responsibilities. Wildcat suggests that in creating climate disruption policy, "the way in which issues are defined will pose a difficult challenge for scientists, policy makers and entrepreneurs. . . . a necessary radical reframing of environmental justice issues will have to occur if humankind is to substantially mitigate the consequences of our behavior already set in motion." He suggests that we find hopefulness in peoples who find their cultural identity in a nature/culture nexus, demonstrating a symbiotic connectedness with the natural world. Wildcat presents four main points:

> 1—The truth is not inconvenient, it is deadly.
> 2—This Red Alert is a continuation of long-standing Native American and Alaska Native traditions of issuing calls for action.
> 3—To respond to this Red Alert, we must situate our thinking and acting to the environments we did not design and build. . . . As modern industrial civilizations developed, so, too, has a major error, possibly a fatal one. Humankind immersed in industrial and postindustrial societies tend to look at themselves, or more accurately through their human relations in order to see the world. Not surprisingly, our view of the world has been distorted.
> 4—The 4th point is hopeful, for this Red Alert recognizes the resilience of Mother Earth and the peoples whose lives are deeply

related to her landscapes and seascapes.[449]

Wildcat's call for action delineates clear questions with which museums could engage their medial public, and invite their Indigenous community to participate in crafting more sustainable strategies in their area. Wildcat makes a cogent point regarding collaboration:

> The Native insight that Indigenous knowledges should not be strictly understood as human constructions, but rather as collaborations, is worth emphasizing. Indigenous knowledges in this sense are emergent from the nature-culture nexus. Consequently, Indigenous knowledges are a set of relations and relationships situated in our life experiences which vary as we move through what physicists would call space-time.
> The increasing impoverishment of life on earth is overwhelmingly a cultural product. After a five-centuries-old imposition of Eurocentric institutions around the globe, the world might benefit from a serious examination and discussion of Indigenous ideas found among the First Peoples of North America. It is ironic that American Indian lifeways and worldviews, exceptional for their practicality, are inevitably cast by modern societies as full of myth and romanticized recollections. Indigenous ingenuity (indigenuity) can help us deal with the fundamental cultural crisis that threatens much of Mother Earth's life system, for the global burning we are immersed in is ultimately about how a great number of humankind currently lives—it is about the lifestyles that have been sold to us.[450]

Wilson's foundational text, *Research is Ceremony: Indigenous Research Methods*, draws on his Opaskwayak Cree cultural knowledge to discuss the importance of relationships, relationality, and relational accountability. He emphasizes that in conducting cross-cultural research, finding common ground

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[449] Daniel R. Wildcat, *Red Alert! : Saving the Planet with Indigenous Knowledge*, Speaker's Corner (Golden, Colo.: Fulcrum, 2009). 9, 24-33, 67-71.

[450] Daniel R. Wildcat, *Red Alert! : Saving the Planet with Indigenous Knowledge*, Speaker's Corner (Golden, Colo.: Fulcrum, 2009). 73-76.

is both crucial, and one of the most difficult tasks, forged through developing relationships. Wilson concludes that research well done is essentially reflexive, and that research without reflexivity is missing a solid point of perspective from which to launch inquiry. Wilson manifests the method that he describes by juxtaposing formal academic narrative with informal relational narrative, as he uses the platform of the book to gift his knowledge to his young sons.[451] I personally found Wilson's work, including this book and talks and workshops which he presented annually at the American Indian Research Association conferences between 2013-2016, to be of great value as I reassessed my interview style.

Kovach, Plains Cree/Salteaux, offers in *Indigenous Methodologies: Characteristics, Conversations, and Contexts* that non-Western methodologies incorporate experiential knowledge, cognition derived from dreams, or from "cultural knowledges coming from a non-rational, non-time sort of place." She notes, "The gift of Indigenous research frameworks is that it allows our story to be a part of our research. Research stories teach us much, they give us much. They tell us who we are as researchers."[452] Kovach presents the experience of six Indigenous researchers, as well as her own observations, weaving a picture of decolonizing research strategies from a variety of perspectives.

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[451] Wilson, *Research Is Ceremony : Indigenous Research Methods*. 1-144.

[452] Kovach, *Indigenous Methodologies : Characteristics, Conversations and Contexts*. 44-45, 181, 94-96.

"Generosity is simultaneously a moral and a material imperative, especially among people who live close to the land and know its waves of plenty and scarcity. Where the well-being of one is linked to the well-being of all . . . . In a culture of gratitude, everyone knows that gifts will follow the circle of reciprocity and flow back to you again."[453] Kimmerer, in her lyrical volume, *Braiding Sweetgrass,* presents a dual perspective, as a Potowatomi citizen displaced from her ancestral lands, and as an academic biologist. She delineates the importance of plants in grounding us to both place and culture, key concepts for museums to communicate to children, for whom the idea may be quite alien in our paved-over country.[454]

The insights of these four scholars were critical in the rethinking and reconstructing of my initial interview process from a formal and standardized Western approach to a more community-focused and malleable way of interacting with my interview subjects. The contribution of Indigenous theory to my research has been both fine and broad. At a personal level, I forsook the icy formality of a traditional academic approach, which I believe was not only a relief to myself, but to most of my interview respondents as well. This led to more candid, and I believe, more forthcoming interviews, for the most part. On a broader scale, from mulling the deeper principles of arranging one's life around the needs of one's community, and the need to think ahead to the

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[453] Robin Wall Kimmerer, *Braiding Sweetgrass : Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants*, First edition. (Minneapolis, Minnesota: Milkweed Editions, 2013).

[454] TEDx Talks, *Reclaiming the Honorable Harvest: Robin Kimmerer at TEDxSitka*, 2012, https://www.youtube.com/watch?v=Lz1vgfZ3etE.

future, I viewed my research trajectory more clearly.

From a self-contained research project to generate data for a dissertation, I revised my project terminus to be not merely a published dissertation, but a set of knowledge and experiences that could be of significant value and practical use to small and medium-sized museums across the country. Efforts to Indigenize the academy and implement these approaches in research contexts can be met with confusion or hostility by people unfamiliar with these concepts, or plagued by racism. Since academia is an inherently hierarchical cultural system, from freshman to professor emerita to university president, efforts to initiate a community-based alternative, in which the rules are new and unknown, may be quite challenging and require explanations regarding academic rigor and research success under this methodology.

Storytelling as a methodology within the academy is still finding its feet, although it has been a recognized heuristic methodology practiced by Indigenous knowledge keepers into time immemorial. Bessarab and Ng'andu discuss Nyoongah and Setswana approaches to 'yarning' as an effective research methodology, differentiated from oral history:

> Yarning in a semi-structured interview is an informal and relaxed discussion through which both the researcher and participant journey together visiting places and topics of interest relevant to the research study. Yarning is a process that requires the researcher to develop and build a relationship that is accountable to Indigenous people participating in the research. In different cultures there are different rules, language and protocols for conducting conversations. In Western AUstralia, Nyoongahi people

> Use the term "yarning" when they want to talk with someone. . . . When an Aboriginal person says 'let's have a yarn, what they are saying is, let's have a talk or conversation. This talk/conversation/yarn can entail the sharing and exchange of information between two or more people socially or more formally. To have a yarn is not a one way process but a dialogical process that is reciprocal and mutual. Oral histories are another research genre where the information that is gathered and recorded relies heavily on conversation and story telling to elicit the information. One of the challenges for qualitative researchers when listening to stories of lived experience is that the teller decides what parts of their story to tell and which parts to leave out, the researchers' role is to draw out the parts they are interested in which may not be told and which relate to the research topic. Although supported by her supervisor, Bessarab's attempts to apply yarning as a research tool in her doctoral thesis in 2000 was challenged by other academics who argued it was not a "bona fide" research method and was not recognized as a legitimate tool for gathering data by Western academia. . . . Unlike other more formal methods yarning enables the unfolding of information through the process of story telling (narrative) in a relaxed and informal manner that is culturally safe for Indigenous people. Through the social yarn certain conventions and rules are established which sets the boundaries of how the yarn will take place and demands from the researcher an accounting of who they are in the research process.[455]

My experience paralleled that of Bessarab and Ng'andu, in that on any number of occasions, I felt that my interviews were wandering in irrelevant directions, only to find later that I had been told something quite interesting. I made a decision early on to treat each interviewee as I would a respected elder, so I specifically chose not to interrupt or redirect conversations. My interview technique was quite similar to theirs, and like them, I found it to be both enjoyable as well as an inviting conversational space for the interviewee;

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[455] Dawn Bessarab and Bridget Ng'andu, "Yarning About Yarning as a Legitimate Method in Indigenous Research," *International Journal of Critical Indigenous Studies* 3, no. 1 (2010): 37–50.

more so than my first few formal interviews.

Indigenous methodologists, practitioners and scholars of research approaches based in Indigenous cultural knowledge, such as Shawn Wilson[456] and Margaret Kovach,[457] teach us that storytelling and relationship building are key methods of conveying cultural knowledge successfully. Advertisers have practiced this for a long time, building stories that equate materialism with happiness. Museums are well placed to wield their unique position as cultural community anchors to Use storytelling to discuss anthropogenic climate disruption with their visitors, turning the marketing message of materialism upside down and connecting their community in meaningful ways with the environment.

Indigenous Climate Disruption Science

Indigenous communities have, through knowledge hard won over the millennia, developed functional and philosophical approaches to living successfully in their particular environments. Often dismissed erroneously as 'primitive' these adaptive strategies serve to educate industrial cultures in re-conceptualizing their agency on the planet. Observations of Indigenous museums reveal how these cultural paradigms may be presented accurately and respectfully, information that is of great value to mainstream museums seeking more effective methods of engaging their public.

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[456] Wilson, *Research Is Ceremony : Indigenous Research Methods*.
[457] Kovach, *Indigenous Methodologies : Characteristics, Conversations and Contexts*.

Western culture is characterized by teaching primarily through the transmission of written documents; most Indigenous cultures share sophisticated concepts, moral lessons, environmental data and cultural information through parables and symbolism communicated through stories. In the past, this was accomplished through strict encoding of information in oral traditions accurately transmitted over many, many generations, with the utilization of some visual cues such as petroglyphs and winter count robes. In the contemporary U.S., this oral history tradition continues, incorporating modern tools such as YouTube, Facebook and graphic novels to blend visual and oral storytelling, both to transmit traditional knowledge and as a pro-activist tool for breaking news and building networks. For example, Portland State University's Department of Indigenous Nations Studies uses YouTube to make available a talk by Dr. Greg Cajete, discussing traditional cultural knowledge and its application in rebuilding sustainable Indigenous communities,[458] while First Nations advisory council ICE/Indigenous Circle of Elders, uses YouTube to present their ICE Summary and Recommendations report regarding reconciliation and cultural sustainability to Federal Environment Minister Catherine McKenna.[459]

Unfortunately, the Western world has tended to misconstrue the elegance of ideas honed over millennia for simplistic folk stories. Enduring

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[458] Portland Community College, "YouTube," Dr. Greg Cajete: Rebuilding Sustainable Indigenous Communities, July 21, 2011, https://www.youtube.com/watch?v=wg5h7Fd0Bio.

[459] River Voices, "YouTube," ICE / Indigenous Circle of Experts summary and recommendations, March 27, 2018, https://www.youtube.com/watch?v=THFAJS-XgVM.

Indigenous concepts such as *we are all related*, *seventh generation*, and the *honorable harvest*, beautifully elucidated by Potawatomi botanist Robin Wall Kimmerer, are concepts that have functioned for millennia, ensuring survival whether resources are slim or abundant.[460]

Indigenous scientists, holders of traditional ecological knowledge or TEK, provide a vital collaborative counterpoint to Western scientists. While Western scientists provide invaluable quantitative data regarding climate disruption, Indigenous scientists such as Caitlyn Baikie, an Inuk geography student from Nunatsiavut, draw on the equally invaluable millennia of qualitative citizen science observations, encoded culturally through the oral traditions of place-based peoples.[461] While Western scientists collect raw data, Indigenous scientists are able to contextualize changes on the landscape over deep time via transmission of cultural knowledge. Indigenous people worldwide have organized to share knowledge through a variety of entities, including the United Nations International Indigenous Peoples Forum on Climate Change, formed in 2008.[462] A greater level of collaboration between Western and Indigenous scholars can only benefit the world as a whole.

Native Science is a commonly used term, it is the title of Tewa scholar

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[460] TEDx Talks, *Reclaiming the Honorable Harvest*; Kimmerer, *Braiding Sweetgrass : Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants*, 2013.

[461] Rebecca M. Bratspies, "Sustainability Is the Answer, Now What Was the Question?," SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, April 3, 2015), http://papers.ssrn.com/abstract=2655845.

[462] " International Indigenous Peoples' Forum on Climate Change Home," *IIPFCC*, accessed September 6, 2016, http://www.iipfcc.org/.

Dr. Gregory Cajete's excellent book, and it is a frequently employed term academically. However, it refers to a concept that should be thought through carefully and contextually before being used. While the intent to recognize the legitimacy of Native scientists is commendable, and a long time coming, the potential problem is in not a clashing of world-views, but of world-views that don't quite overlap. The definitional or semantic issue is that in aggregate culture science and scientists are regarded and specifically defined as distinct and apart from nonscientists and their observations; in other words, there is life and there is science. In most Indigenous cultures, science and scientific observations are part of the daily life of culturally place-based people. In short, a wheat farmer in Jordan, Montana, and an Arctic seal hunter are arguably closer in their scientific paradigm than they both are with a NOAA meteorologist although they are all deeply interested in the weather. The issue is not so much that the term "Native Science" is misplaced, so much as that it can be narrowly construed.

Native Science in Museums

Although there have been a handful of exemplary Native Science initiatives or collaborations, such as NSF's The Cosmic Serpent: Bridging Native and Western Learning in Museum Settings, NOAA's Worldviews Network, the NMAI's many events and the Denver Museum of Nature and Science's Native American Science Initiative, in most museums Native Science is notable by its absence. It is the finding of this research that most Indigenous museums and

cultural centers are more focused on cultural material than on what could be categorized as scientifically focused exhibits. In medial museums, if Indigenous contributions are featured at all, it is usually as cultural and historical exhibits in natural history museums, rather than being presented as contemporary science of value. It is the intent of this research to illustrate the agency of and advocate for the inclusion of Native Science in medial museums. As Citizen Science has become an increasingly popular method for engaging the public in meaningful ways with their museums, so too can Native Science serve a vital role in museums by presenting a paradigm of a more engaged relationship with the world around us than that experienced by the average American today. Native Science can be viewed as Citizen Science with a global network, and several millennia of culturally transmitted data collections—certainly not a resource to be dismissed lightly, in the face of anthropogenic climate disruption, and a time when we need to deploy all the tools at our disposal.

Collaborative Initiatives

Although the focus of this research has primarily been on the relationship between tribal communities and medial museums, it is important to point out that there is much collaborative work that goes on between tribal museums and communities. For example, many have made good use of IMLS project grants, such as this $300,000 IMLS National Leadership Grant obtained by the Tamaktslikt Cultural Institute, enabling them to work collaboratively on

immersive language initiatives:

> The Tamaktslikt Cultural Institute in partnership with the People's Center of the Confederated Salish, Kootenai, Pend o'Oreille Tribal Nations, the Ponca of Nebraska Tribal Museum and Cultural Affairs Department, and the National Council of the Lewis and Clark Bicentennial Circle of Tribal Advisors will create a model for tribal museums to promote language preservation through the teaching of traditional arts and cultural technologies such as bead and leather work, basketry, music, dance, oral history and story telling. This immersion method will engage tribal elders, linguists, and other language professionals to teach apprentices language in the context of culture. The process will be documented through audio and video media in order to develop curricula, teaching skills, and materials so that the apprentices can pass on their artistic and linguistic skills by mentoring others in the tribe.[463]

The Cosmic Serpent Project



Figure 141. Indigenous Education Institute – Cosmic Serpent Project
PHOTO COURTESY: J WOODCOCK-MH

The Indigenous Education Institute (IEI) and the U.C. Berkeley Space

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[463] "LG-21-02-0132-02," Institute of Museum and Library Services, July 8, 2015, https://www.imls.gov/grants/awarded/lg-21-02-0132-02.

Sciences Laboratory (UCB) developed the National Science Foundation funded project, *Cosmic Serpent: Bridging Native Ways of Knowing and Western Science in Museum Settings*, to explore the "cultural disconnect between Western scientists and educators and the native community in terms of scientific worldviews and Indigenous ways of knowing," and how museums could serve to bridge this gap. [464] This was accomplished by holding "professional development workshops from three regions and peer mentoring; creating museum programs featuring native/western commonalities as entry points to STEM; forming regional partnerships among museums and Native communities; creating multimedia resources; writing a legacy document to inform the ISE field on ways to improve STEM programming for Native Americans; and a culminating conference jointly hosted by the National Museum of the American Indian (NMAI) and the Association of Science-Technology Centers (ASTC)."[465]

The *Cosmic Serpent* project involved well over a hundred Native and non-Native museums, surveying the state of Native Science in museums. It was a ground-breaking project; no-one had attempted anything like it before, it was viewed as visionary and highly successful in that it brought a previously invisible subject to a place of lively discussion, revealed many issues of cultural disconnection that were hampering efforts to collaborate, and networked many

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[464] Peticolas et al., "Lessons Learned from Cosmic Serpent, a Professional Development Project for Informal Educators on Science and Native Ways of Knowing."

[465] Nancy C. Maryboy, David Begay, and Laura Peticolas, *The Cosmic Serpent: Collaboration with Integrity. Bridging Native Ways of Knowing and Western Science in Museums Settings.*, ed. Christopher S. Teren et al. (Indigenous Education Institute, 2012).

like-minded museum personnel interested in long-term work in this are. The *Cosmic Serpent* was the first NSF grant awarded to a Native research facility, the Indigenous Education Institute. (Figure 141)

The Native Universe Project

Cosmic Serpent was followed by a second NSF project, *Native Universe: Indigenous Voice in Science Museums*, which incorporated the *Cosmic Serpent* findings into a working group of the Indigenous Education Institute, the Imiloa Astronomy Center, and the Center for Science Education at U.C. Berkeley's Space Sciences Laboratory, working with the Arizona Sonora Desert Museum, the Oregon Museum of Science and Industry, and the Durango Powerhouse Science Center, to "explore commonalities between Native and Western Science and enable participants from both perspectives to Use science, technology, engineering and math (STEM) as an entry point for museum programs and exhibits that also highlight longstanding Indigenous knowledge."[466] *Roots of Wisdom*, OMSI's exhibition developed for *Native Universe*, regarding traditional plant use, exemplifies the potential for this kind of exciting collaboration between museums and Indigenous communities.

IWISE: Indigenous Worldviews on
Informal Science Education

The third phase of the IEI NSF-funded projects, *I-WISE, Indigenous*

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[466] "Cosmic Serpent - About Us," accessed September 6, 2016, http://cosmicserpent.org/about-us.html.

Worldviews on Informal Science Education, has focused on worldwide relationship building, developing networks, and identifying and mentoring youth leaders. It has been moved forward through a series of in-person and online workshops.

Housed within the Indigenous Education Institute, the groundbreaking work of the *Cosmic Serpent/Native Universe* working group provides an exemplary, tested model demonstrating how medial museums can work hand in hand with Indigenous scientists and communities to bring enduring knowledge about environmental and cultural sustainability to the general public in culturally respectful and appropriate ways. This kind of knowledge sharing is predicated on a foundation of relationship building, good will, and conversations about mutual goals between the museum, its Indigenous community partner, and government agencies such as NSF, NASA, NOAA, and IMLS that have proven inclined to fund these kinds of collaborative initiatives. Dr. Nancy Maryboy, the principal investigator or co-principal investigator of these initiatives is responsible for facilitating many collaborative relationships between native communities and museums, talking them through the difficult initial stages of building cultural understandings and project goals.

Collaborating and Partnering with Indigenous Communities

Many museums have tried and failed in efforts to work collaboratively with tribal communities because they failed to grasp and understand cultural

differences. First among these is a sensitivity among many Indigenous peoples regarding being the object of study. Anthropologists have a history of invasive, appropriative research work among tribal people. To avoid being mistaken for one of these people, it is crucial to have early conversations regarding the nature of the potential collaborative partnership, what goals are being contemplated and what the tribe might get out of it— the museum presumably gets an exhibit or some kind of program. There also needs to be crystal clear comprehension on both sides regarding intellectual rights over information, data, and objects. There may be cultural differences regarding expectations. Many Indigenous people are juggling many responsibilities, and the likelihood is that the museum may come last, which may incorrectly be misinterpreted as disinterest. Many Indigenous communities may have been taken advantage of previously by researchers, and be skeptical or hostile about participating in a project with a non-native museum, in which case having the assistance of someone like Dr. Maryboy is invaluable to act as a kind of guide and mentor through the initiation of the collaboration process.

Approaches to Conveying Traditional Ecological and Cultural Knowledge

One might assume that since Indigenous peoples are differentially impacted by climate disruption, tribally controlled museums would display a strong emphasis in exploring these issues. In the preliminary stages of my research, I was quite certain of what I would find, and was primarily concerned

with how to engage museum staff and understand cultural protocols. This was a natural assumption for me to draw, since I had spent a number of years in various academic settings witnessing rigorous efforts by Native scholars and allies to 'Indigenize the academy" including persistent efforts to draw attention to climate change and environmental justice issues. However, currently, cultural sustainability is often trumping environmental sustainability as an even more urgent focus, and thus museums or cultural centers are focusing their efforts on instilling traditional knowledge and values in their community members. This leads to an interesting dichotomy between academia and the museum community, for the most part. The very lively academic discussion of TEK/Traditional Ecological Knowledge/Native Science and how it relates and interrelates with Western Science has been a topic of great interest and focus, with many conferences, working groups, and support for Indigenous students from groups such as AISES and SACNAS. Tribal colleges, such as Salish Kootenai College, for example, have been key bridges in this endeavor.

However, it is not a phenomenon that translates broadly if at all into the museum field at this time. I attended five sequential meetings of ATALM (Association for Tribal Archives, Libraries and Museums) during my doctoral studies and research, watching closely for sessions or individuals referencing climate change activism or environmental justice. I was disconcerted to find none, until Dr. Nancy Maryboy and Dr. David Begay, directors of the Indigenous Education institute, began attending the conference in 2016 and presenting

their work. The task that I thought would be easy—selecting a roster of climate activist museums—proved elusive. Isolated in Bozeman, Montana, I felt stymied regarding making choices and optimistically assumed that the climate change focus that I was not seeing at the conference would undoubtedly be physically manifested in the museums themselves. I decided to adjust my selection criteria for the Indigenous museums to reflect a span of engagement levels, from hemispheric to tribal, and a high degree of sovereignty, leaving myself the option to add a climate-focused museum to my list if possible.

In selecting the Indigenous museums that I would include in my research pool, I decided to include a large, hemispheric museum—the National Museum of the American Indian; a regional museum—the Alaska Native Heritage Center, serving the entire state of Alaska; and a culturally specific museum—the Makah Museum, representing and working with solely their own tribe. I was very interested to interview staff at the ANHC and Makah Museum because each institution exemplifies Indigenous sovereignty manifested by Indigenous people, for Indigenous people. The NMAI was a very interesting museum in which to conduct interviews because it is simultaneously a huge museum primarily conceptualized and staffed by Indigenous people, and, it is an arm of the Smithsonian, our country's largest public museum, with a mission to serve the general public, as do all entities of the Smithsonian.

My actual visits were scheduled according to pragmatic issues, rather than their location on my orderly list. My first stop was Anchorage, Alaska, in

Late October and early November 2012; I conducted interviews at the Anchorage Museum and at the Alaska Native heritage Center.

Issues of Language

The issue of language in the context of discussing Native Science in English is complex and nuanced, and without any easy answers. The core problem is that while English is a noun-based language, many Indigenous languages are verb-based, creating a significantly different tone. Native speakers of Indigenous languages report that there are many concepts that simply cannot be accurately translated into English. Since much of scientific observation is processual, verb-based languages are actually ideal for conveying the subtleties of close observations. Unfortunately, there are a dwindling number of fluent native speakers of Indigenous languages in the United States, making it even more difficult to assess the accuracy of an interpretive exhibit on Native Science. With the collaboration of a fluent native speaker, an exhibit designer could creatively incorporate elements such as imagery or sound to complement text that was lacking the nuance of the Indigenous language. It is a challenging problem, and one that should not be dismissed without careful collaborative consideration.

Issues of Place Based Cultural Paradigms

Potowatomi botanist Dr. Robin Wall Kimmerer succinctly notes,

> The evolutionary advantage for cultures of gratitude is compelling. This human emotion has adaptive value, because it

> engenders practical outcomes for sustainability. The practice of gratitude can, in a very real way, lead to the practice of self-restraint, of taking only what we need . . . . Reciprocity—returning the gift—is not just good manners; it is how the biophysical world works. Balance in ecological systems arises from negative feedback loops, from cycles of giving and taking. Reciprocity among parts of the living Earth produces equilibrium, in which life as we know it can flourish.[467]

This key cultural principle of living reciprocally in one's environment is in sharp contrast to the consumptive market economy of the American world, that defines growth as success, and equilibrium as failure. A century of experiment has proven the market economy approach unviable in the long term. It is judicious to explore alternative paradigms, such as the reciprocity paradigm sketched by Dr. Kimmerer. A cautionary note is required, however. Inattentive sentimentality resulting in inadvertent propagation of stereotyping is a pitfall for non-Native scholars looking for a quick Indigenous fix to their problems. The signal feature of place-based cultures, and their strength, is a deep knowledge of particular environments, and how to successfully adapt human life-ways to that particular landscape and biota. This means that a museum in Phoenix or a museum in Maine might exhibit a program on Arctic life, as they might exhibit a program on Swiss life, but if they want to authentically explore Indigenous solutions to life in their landscape, they need to turn to the tribal members living in their neighborhood, inviting them in to create meaningful collaborative exhibits.

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[467] Kimmerer, Robin Wall. http://www.humansandnature.org/earth-ethic---robin-kimmerer-response-80.php

Issues of Cultural Appropriation

Cultural appropriation is a concept that can be opaque or seem trivial when viewed through a lens of White privilege. It is, however, a rampant, widespread and enduring problem that Indigenous people have been contending with since the first imperialists set sail from Europe. An instantly recognizable and reprehensible example of cultural appropriation is the life of the woman Matoaka, popularly called Pocahontas or Rebecca Rolfe.



Figure 142. Disney's popularization[468]
IMAGE COURTESY: DISNEY



Figure 143. Painted from life in London, 1616[469]
IMAGE COURTESY: THOUGHTCO

The Powhatans, on their tribal website, explicitly denounce the cultural

[468] "Pocahontas (Character)," Disney Wiki, accessed March 23, 2018, http://disney.wikia.com/wiki/Pocahontas_(character).

[469] Jone Johnson Lewis, "Pocahontas Image Gallery," ThoughtCo, accessed March 23, 2018, https://www.thoughtco.com/pocahontas-image-gallery-4123082.

appropriation of the life of Matoaka, observing that it "distorts history beyond recognition" and that "not only is the 'good Indian/bad Indian theme' inevitably given new life by Disney, but the history, as recorded by the English themselves, is badly falsified in the name of 'entertainment.'"[470] This is but one instantly recognizable instance of thoughtless cultural appropriation that not only offends, but also misses the opportunity for a genuinely interesting story. (Figure 142-143)

As a result of this kind of cultural theft, many Indigenous people are understandably leery of sharing their cultural knowledge with outsiders. As well, Indigenous knowledge can be privileged in tiers of access levels. While Western Science is either available publicly, a trade secret, or a national security secret, Indigenous knowledge may be available only seasonally, only by a gender, only by a member of an age group, only by a tribal member, only by an initiate, or it may be common knowledge. The difference between cultural appropriation and cultural appreciation must be of paramount importance to museums, and thoroughly worked out in each specific instance with tribal members authorized by their communities to discern appropriate levels of information disclosure.

Indigenous Methodology in Museums

Indigenous Methodology is characterized by narrative approaches,

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[470] http://www.powhatan.org/pocc.html

relationships, ethics, iterative observations, and a respect for nature and its components; these concepts, taken together, suggest a far different research strategy than is commonly found in Western academia. Traditionally, Western Science has prized above all things an objective, morally neutral, personally distanced approach to research that has brought us DDT saturated food, nuclear weaponry, and endocrine disrupting BPAs in our baby bottles. This level of ethical detachment and distancing regarding the end results and implementation of research might readily be perceived as psychopathic. Although it is a very far stretch from typical amoral Western Science to the cooperative and reflective, relational values espoused by the Indigenous Methodologists, the drastic times of encroaching climate disaster call for a radical rethinking of the scientific methods that have launched us into this predicament. Indigenous Methodology offers great hope for new ways of working cooperatively and cross-culturally in a global manner.

CHAPTER FIVE:

IN MUSEUMS WE TRUST: GROUNDING A GREEN PEDAGOGY

Medial Museums—Addressing the Anthropocene

The California Academy of Sciences



Figure 144. California Academy of Sciences. Building Blocks for Sustainability. *PHOTO COURTESY: J WOODCOCK-MH*

Institutions such as California Academy of Sciences belie the premise that funding from Big Oil or the Koch Brothers is unavoidable. The California Academy's mission statement declares "In our day-to-day work and overarching goals, we're guided by a mission statement as profound as it is simple: to Explore, Explain, and Sustain life on Earth."[471] They built their LEED Platinum

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[471] "About Us | California Academy of Sciences," accessed September 6, 2016, http://www.calacademy.org/about-us.

building, funding their museum and its biodiversity grounded research, while declining to accept oil and gas funding. Their donor list is available for review on their website. California Academy of Sciences Executive Director Jonathan Foley announced on August 21, 2015, that in the preceding January the Academy had implemented a new institutional gift policy ensuring "that contributions are consistent with the Academy's stated mission, purposes, and priorities," [472] and had now gone a step further. Effective summer 2015, they held no "direct investments in fossil fuel companies and have begun to phase out all oil, gas, and mineral leases on lands with historic mineral rights given by donors,"[473] and currently are working with financial advisors and their Board of

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[472] "About Us | California Academy of Sciences." The mission of the California Academy of Sciences is to explore, explain, and sustain life. Core Values: Scientific Excellence: We ask bold questions about the nature and future of life on Earth, and we bring both integrity and innovation to answer them. Sustainability: We are passionate about securing a healthy future for life on Earth, and we work to shape that future through a combination of applied research and public engagement efforts. Environmental Literacy: We believe that giving global citizens a strong foundation in basic ecological principles is a necessary step toward a sustainable future. Courage: We don't shy away from tough challenges. Science is more important to our daily lives than ever before, and we unapologetically advocate for using scientific data to solve problems and make informed decisions about our collective future. Professional Integrity: We feel a deep responsibility to our supporters, our community, and one another to uphold the highest standards of ethical and financial integrity in our work. Trust, respect, and transparency are core to our culture. Inspiration: We are inspired daily by our planet, our mission, our staff, and our guests, and we seek to inspire the same appreciation for nature and human ingenuity in audiences around the world. Collaboration: We recognize that we can't solve our planet's vast environmental challenges alone, so we partner with world-leading environmental, scientific, and community organizations to strengthen and amplify our work. Accessibility: We believe that science is for everyone, and that every child should have the transformative experience of a visit to our museum or exposure to our digital learning resources. Diversity: Diverse communities are stronger and more resilient, both in nature and in human society. We are committed to cultivating a culturally inclusive and equitable environment in which diversity of thought and expression are valued, respected, and celebrated. Fun: While exploring, explaining, and sustaining life is a serious undertaking, we strive to create a fun environment for guests, volunteers, trustees, and employees alike.

[473] "From Our Executive Director | California Academy of Sciences," accessed September 6, 2016, https://www.calacademy.org/executive-director-thoughts-on-divestment.

Trustees to implement a fully divested investment portfolio. This freedom from petroleum funding endows the liberty to research and report widely and at will on climate disruption and other anthropogenic impacts on the biosphere.



Figure 145. Cal Academy Docent.
PHOTO COURTESY: J WOODCOCK-MH



Figure 146. Cal Academy Amazon tunnel.
PHOTO COURTESY: J WOODCOCK-MH

Teacher training workshops offer a means for museums to disperse environmental information to a large number of children by intensively educating their teachers. The California Academy of Sciences offers a two-year institute, The Teacher Institute on Science and Sustainability (TISS), for 3rd-5th grade teachers, preparing them to successfully teach the Next Generation Science Standards.

> In each year of the program . . . . teachers participate in a 2-week summer session and over 25 hours of school year professional development. . . . TISS participants receive a $2,000 stipend, a free membership to the Academy, and a class set of science notebooks for each year of the program. Teachers are supported with school site coaching, access to Academy educational resources, and continuing education credits (fee-based) for their participation.[474]

[474] http://www.calacademy.org/teachers/tiss/

California Academy of Sciences also offers many other training workshops for both classroom teachers and for informal educators, such as the two-month, ten-session Conservation and Sustainability Education workshop that utilizes a rapid prototype/iterative design process. This level of investment in teacher and informal educator training is extremely costly and out of the reach of most museums; however, on a more limited scale, this kind of outreach could positively impact many classrooms in a museum's community.

After school programs can be one of the most effective ways of educating and mentoring young people; highly effective at keeping at-risk children on an academic track and providing them with sophisticated skills and knowledge, and kindling future careers for high potential students. As our public schools struggle to teach the most rudimentary skills, museums are a location of opportunity for bright children to experience exhilarating academic challenge, and be inspired to pursue their education. It is the personal experience of this researcher that a two-year, ten-hour a week museum internship in high school provided invaluable scientific experience otherwise unattainable. The purpose of these internships can vary. The California Academy of Sciences has a variety of after-school programs for middle and high school students. Their twenty-two year old *Careers in Science Internship Program* offers very competitive year-round multi-year paid internships that bridge minority and female students into college, with the intent of addressing lack of diversity in science by increasing the pool of women and minority

scientists.[475] Staff reported that this program has had a very high retention rate, despite the challenges that students encountered in fulfilling the requirements. he mission of the California Academy of Sciences is "to explore, explain and sustain life," so these young students are being mentored at an epicenter of climate disruption research. The goal of the program, to increase diversity in the sciences has been fulfilled, in that most of the participants not only go on to college, but complete advanced degrees in the sciences.

The Denver Museum of Nature and Science



Figure 147. The Denver Museum of Nature and Science. DMNS Recycles!
PHOTO COURTESY: J WOODCOCK-MH
[476]

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[475] https://www.calacademy.org/youthprograms/careers-in-science/

[476] "Denver Museum of Nature and Science: Mission and Vision," accessed July 16, 2018, http://www.dmns.org/about-us/mission-and-vision/. Mission: Be a catalyst! Ignite our

The Denver Museum of Nature and Science is a robust community museum, serving Denver and the state of Colorado since 1900. While some museums that I encountered during this research journey felt difficult to access, buffered from bother by institutional elitism, the DMNS was refreshingly exceptional, and exceptionally friendly to me as a visiting researcher. James Calder, the director of Building Services and a busy man, carved out about six hours to talk to me and show me the facility in person over two separate visits to the museum. I was able to conduct ten interviews



Figure 148. DMNS. Water. Photo Courtesy: J Woodcock-MH



Figure 149. DMNS Gift shop Photo Courtesy: J Woodcock-MH

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community's passion for nature and science. Vision: The Denver Museum of Nature & Science envisions an empowered community that loves, understands, and protects our natural world. Core Values: We love science. We are curious, creative, and playful. We cultivate relationships with each other, diverse communities, the environment, and for our future. We think critically and act with empathy.

of a wide range of staff holding positions in curatorial, planetarium, facilities, museum café, zoology to name a few. The DMNS is notable in that as an institution it is working hard on many fronts to move its 118-year-old self smoothly into the twenty-first century. The Building Services director actually had half a dozen hours of sustainability initiatives and experiments that he is working on. The planetarium department is a partner in the groundbreaking Worldviews Network program. There are examples of educational signage, such as *Recycled Water Makes a Big Splash.* (Figure 148) The anthropology staff work collaboratively with Colorado's tribal community, and they sponsor Native American Science scholarships, Native American Science Career Day, and their Indigenous Fellowship Program. The gift shop, although it has its share of made-in-China items, also had a large table at the front of the store with a display and discussion of fair trade items. (Figure 149) A slightly less tangible aspect of the DMNS, but noteworthy, nonetheless is its city, county, state and federal networking. Almost everyone with whom I talked mentioned working connections with another institution or community of some kind; they are just the opposite of a siloed institution. Because I was asking about environmental sustainability, and this was early in my interview process, it took me a little while to realize that what they were describing to me was a very solidly developed institutional sustainability. They are an excellent role model for other institutions in that regard.

The Anchorage Museum at Rasmuson Center[477]



Figure 150. The Anchorage Museum at Rasmuson Center
PHOTO COURTESY: J WOODCOCK-MH

My interview process at the Anchorage Museum was effortless, but unfortunately I did not realize that I should have added the café and bookstore managers to the ten interviews that I did complete. The Anchorage Museum serves the wider community of Alaska, and provides exhibits and programming in science, art and history. It has a planetarium, which was showing a Native

[477] "Museum Mission," Anchorage Museum, accessed July 16, 2018, https://www.anchoragemuseum.org/about-us/museum-info/museum-mission/. Mission: The Anchorage Museum connects people, expands perspectives, and encourages global dialogue about the North and its distinct environment. Vision: The Anchorage Museum is recognized as a leading center for scholarship, engagement, and investigation of Alaska and the North.

astronomy program during my visit. There was very little material explicitly about climate change when I was there, however, the staff were working on the Gyre exhibit, which I was able to view later when it was travelling to the CDC Museum. The Smithsonian has its Arctic Studies Center lodged in the top floor of the Anchorage Museum, housing a very nicely done set of exhibits, as well as a viewing area with documentaries about arctic cultures. The Arctic Studies Center and the Anchorage Museum collaborate with the Alaska Native Heritage Center to share materials with students or community members as needed. The gift shop at the museum is very nicely done with little made-in-China junk, a very well-curated selection of books, and a large assortment of very nice Alaska Native-made jewelry and artwork for sale.

I thoroughly enjoyed speaking with curator Julie Decker, who oversaw both the *True North/Next North* event, as well as the exceptionally well-done and successful *Gyre* exhibit. The innovative Anchorage Museum 2012 True North exhibit, paired with the three-day Next North Symposium, featured "an in-depth discussion of the primary issues facing the circumpolar North today. Participants include(d) prominent scientists, architects, anthropologists, artists and Indigenous culture bearers from around the globe."[478] Dr. Julie Decker, curator and organizer of the project, observed that the art exhibit, which included eighty photographs, films and multi-media installations by thirty-nine artists from Iceland, Scandinavia, Canada and the United States, paired with

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[478] https://www.anchoragemuseum.org/galleries/true_north/next.aspx

the symposium was a very well attended and successful method of reaching out to a broad swathe of the Arctic community to discuss the current issues, primarily around climate disruption. This effective exhibit/symposium model is an excellent way of bringing diverse voices together to discuss climate disruption in an interdisciplinary way, and is a useful model for other museums to explore in their own communities.

Gyre: the Plastic Ocean – An Exhibit that Works

For the transient museum visitor, the answer to catching their interest seems to reside in engaging people in a very personal way, touching more on their emotions than in taxing their minds with dense data. Art is key in bringing about this sort of successful interaction. An exemplary model for this is the Anchorage Museum's exhibit, now travelling, *Gyre: The Plastic Ocean*.[479] This



Figure 151. Gyre: the Plastic Ocean, scientists and artists in collaboration.[480]
IMAGE COURTESY: ELIZABETH LEADER / ANCHORAGE MUSEUM

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[479] "Gyre: The Plastic Ocean - Anchorage Museum at Rasmuson Center."
[480] "Gyre: The Plastic Ocean - Anchorage Museum at Rasmuson Center." Exhibit image is an excerpt from a pencil drawing, "Tires underwater." by Elizabeth Leader, Buffalo, New York.

landmark exhibit examines the environmental effect of humans on the ocean as manifested by ubiquitous plastic refuse. The Anchorage Museum invited NOAA, the Smithsonian, Blue Ocean Institute, Alaska SeaLife Center, Alaska Marine Stewardship Foundation, Ocean Conservancy, National Geographic and Anchorage Museum scientists, educators, and twenty-six artists from around the globe to study marine debris, collect data, and create evocative artworks. (Figures 151-153) In June 2013, this interdisciplinary team sailed north along the Alaskan coast, collecting data, impressions, and trash. Their culminative



Figure 152. Cornucopia by Pam Longobardi.[481]

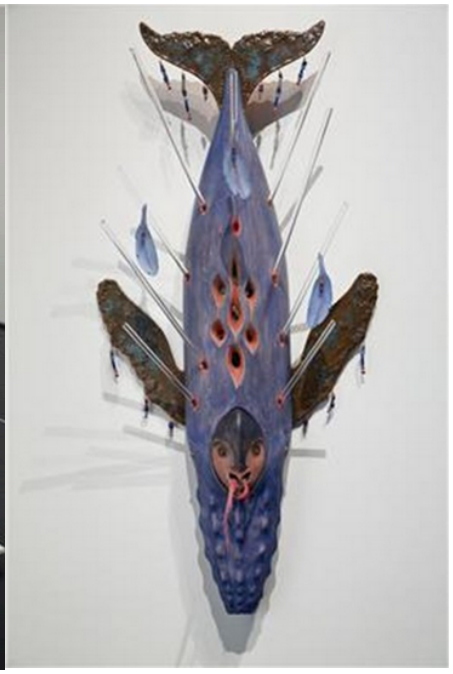

Figure 153. Mixed media piece by Rebecca Lyon.[482]

IMAGES COURTESY: CHRIS AREND/ANCHORAGE MUSEUM

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[481] Cornucopia by Pam Longobardi; composed of plastics, steel armature, drift nets and floats. "Image Gallery," Anchorage Museum, accessed March 13, 2018, https://www.anchoragemuseum.org/exhibits/gyre-the-plastic-ocean/image-gallery/.

[482] Mixed media piece created by Rebecca Lyon, an Athabascan/Alutiiq artist. "Image Gallery."

event was a visit to Hallo Bay, a site in Katmai National Park significantly impacted by the 2011 Japanese tsunami, where the team collected four tons of debris from a four-mile stretch of coastline.[483]The result is a captivating 7,500 square foot, 80+ piece exhibition composed of a diverse array of painting, sculpture, collage, assemblage art, film, developed collaboratively with scientists and artists, and curated by Julie Decker of the Anchorage Museum. In addition to the primary exhibit, "*Gyre*" has been recreated in a condensed version and is currently on tour. The Anchorage Museum has made many tools for teachers available on their web site to expand *Gyre's* utility in the classroom. These include a list and descriptions of four "*Gyre* Field trips" available at the Museum, a description of the Education Standards that they address, Activity Guides, Educator Guides, and Field trip Sheets. They also provide seven detailed *Gyre* themed lesson plans:

- Currents: Lesson 1: Plastics in Motion
- Plastics then and now: Lesson 2: Plastics in Society
- Effects on animals: Lesson 3: Effects of Marine Debris on Ecosystems
- How to be a citizen scientist: Lesson 4: Coastal Cleanup, Data Entry and Exploration
- Reduce, reuse, reinvent: Lesson 5: Top of the Ocean Mat
- Plastic gyre dangles: Lesson 6: Plastic Gyre Dangles

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[483] "Expedition," Anchorage Museum, accessed March 13, 2018, https://www.anchoragemuseum.org/exhibits/gyre-the-plastic-ocean/expedition/.

- Marine debris masks: Lesson 7: Marine Debris Masks

Lesson One can be viewed in full in Appendix 3. These lessons are notable in that they are designed for a range of ages, as one might expect, but rather than sticking to a STEM format, they include both art and science, and bring the larger picture concepts to a local level. This exhibit, with its well-designed companion educational materials, sets an excellent model for other museums to emulate.

The Gyre exhibit, with its companion education piece, is exemplary in its genre of exhibit plus educational materials. It is beautifully designed, the lessons are intelligent and engaging, and I find no criticism to levy whatsoever. My criticism is of the overarching genre as being too ephemeral, and reliant on the availability of teacher and classroom time to employ the lessons, an impossibility in many schools.

Smithsonian National Museum of Natural History[484]



Figure 154. Smithsonian National Museum of Natural History
PHOTO COURTESY: J WOODCOCK-MH

The National Museum of Natural History has a secret of which I was unaware until I came in through the back door one day. The front of the museum has NMNH signage, the website has NMNH wording. The back door has

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[484] "Mission, Vision, and Values: Smithsonian National Museum of Natural History," accessed July 16, 2018, https://naturalhistory.si.edu/about/mission.htm. Our Mission: Understanding the natural world and our place in it. Our Values: Excellence. We strive to deliver the highest quality in everything we do. Integrity. We achieve our goals with responsibility and accountability. Respect. We believe that every member of the Museum community has an equally important role, and that the natural world is intrinsically valuable. Diversity. We capitalize on the richness inherent in differences.

a sign that reads:

Smithsonian Institution
National Museum of Natural History
and
National Museum of Man

This sign was installed in 1968, at the direction of Smithsonian Secretary Ripley, who ordered the "change made due to concerns of exhibiting non-Western cultures in a natural history museum."[485] (Figure 155) The NMNH parallels the NMAI in some regards in that they both have human collections and repatriation archaeologists and staff to see them home. They both have exhibits about Native people—of course at the NMAI, that's the point. At the NMNH, even though it would seem that Secretary Ripley's concerns have remained addressed by one elusive plaque, all the same, the presentation of



Figure 155. NMNH. Museum of Man
Photo Courtesy: J Woodcock-MH



Figure 156. NMNH. Banner bags
Photo Courtesy: J Woodcock-MH

[485] Smithsonian Institution Archives, "Museum of Man Added to Museum of Natural History," Smithsonian Institution Archives, August 12, 1968, https://siarchives.si.edu/collections/siris_sic_2321.

people is widely construed, and the place of people nested within the natural world and acting upon it is made repeatedly. For example, in the oceans exhibit, *Habitat Destruction* is adjacent to *Where Salmon live, People Thrive*. (Figure 154) There was not a great deal of material specifically about climate disruption, however. One does wonder if the climate-change skeptic David Koch, and his $35 million gift to the NMNH could have anything to do with such a major lapse. On the other hand, as far as *boots-on-the-ground* sustainability work goes, the NMNH is home to the irrepressible Eric Hollinger. Although Hollinger has a busy job as a repatriation archaeologist, he also finds the time to explore and contend with many aspects of sustainability at the Smithsonian as a whole, not just at the NMNH. For example, he took the time to mentor me and answer my many questions, he personally saw to checking for cross-contamination in recycling and composting, (Figure 157) as well as work on more tidy sustainability initiatives such as recycling exhibit banners into sturdy bags, for sale in the gift shop. And he attended sustainability work meeting in addition to his normal workload. Hollinger is the answer to "What can one person do?" The answer is—a lot, if one has that much drive and purpose. He serves as a role model to many people regarding the importance of sticking to sustainability initiatives, even if they are challenging. While I was there, the Smithsonian was having quite a bit of trouble with composting but they were doggedly pursuing solutions.

Smithsonian Facilities and Enterprise



Figure 157. Smithsonian Facilities
PHOTO COURTESY: J WOODCOCK-MH

Across the Smithsonian's twenty-nine constituent museums, zoo, and research facilities, institutional measures are being enacted to adhere to the goal of sustaining a biodiverse planet. For example, the 2015 Folklife Festival diverted 94% of trash away from landfill to composting and recycling. Participating food vendors used compostable containers and cutlery. Smithsonian restaurants use either washable china and cutlery, or compostable ones, and compost their kitchen scraps. (Figure 157-158) The Smithsonian encourages the purchase of recycled office paper products, and increased by 70% the ordering of recycled copy paper by making it the first choice on their

internal supply ordering drop down list. Janitorial staff use green cleaning compounds, benefitting the environment, employees and visitors. The Smithsonian gardens showcase issues surrounding invasive species and ways visitors can use their home gardens to provide inviting habitat for birds and bees. A key point with these initiatives among many others, some visible to the



Figure 158. Smithsonian Facilities
Photo Courtesy: J Woodcock-MH



Figure 159. Smithsonian Enterprise
Photo Courtesy: NMAI

public, some only to the Smithsonian's 6,300 employees, is signage: if initiatives are conducted without signage, they are functionally invisible. With signage, they are a didactic illustration of how our nation's museum is conserving the public's resources; a lesson to take home. Social engineering is needed to make sure that initiatives such as these are actually implemented; anthropological perspectives have a great deal to offer museums in identifying the human behaviors that facilitate or hinder the best-laid plans of engineers.

Smithsonian Enterprises oversee the stocking of many of the SI museum

stores. Because of the many made-in-China trinkets I the gift shops, I approached my interview with a senior level Enterprise employee with a certain level of cynicism. It turned out to be quite an interesting interview because I found that they were quite aware of the issues and trying hard to make a difference. It's a challenge to *buy local* when it's on the scale of a Smithsonian gift shop. However, there is quite a lot of purchasing of hand made items that is accomplished, the NMAI store is a good example of stocking hand made items at various price points. (Figure 159) My interviewee was particularly concerned that day because they were intrepidly trying to locate organic cotton t-shirts at an affordable price point.

American Museum of Natural History[486]

My interviews at the NMAI were partial, for the reasons stated in the Methodology section. I was very appreciative of the individuals who made time to talk to me. As discussed above, Dr. Jennifer Newell, now of the Australian Museum, was particularly interesting to talk to, as was her post-doc researcher. Because of the circumstances, I did get quite a bit of time to make museum observations, which was quite interesting, especially when I was able to follow up with inquiries during interviews. Founded in 1869 during the heyday of dioramas, and exhibiting folks in natural history museums, the AMNH

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[486] "Mission Statement," AMNH, accessed July 16, 2018, https://www.amnh.org/about-the-museum/mission-statement. To discover, interpret, and disseminate—through scientific research and education—knowledge about human cultures, the natural world, and the universe.

still has the same dioramas (Figure 161) and people in glass cases since 1899. (Figure 162) The Pacific Northwest Culture Hall is nearly identical to when it was opened almost 120 years ago.

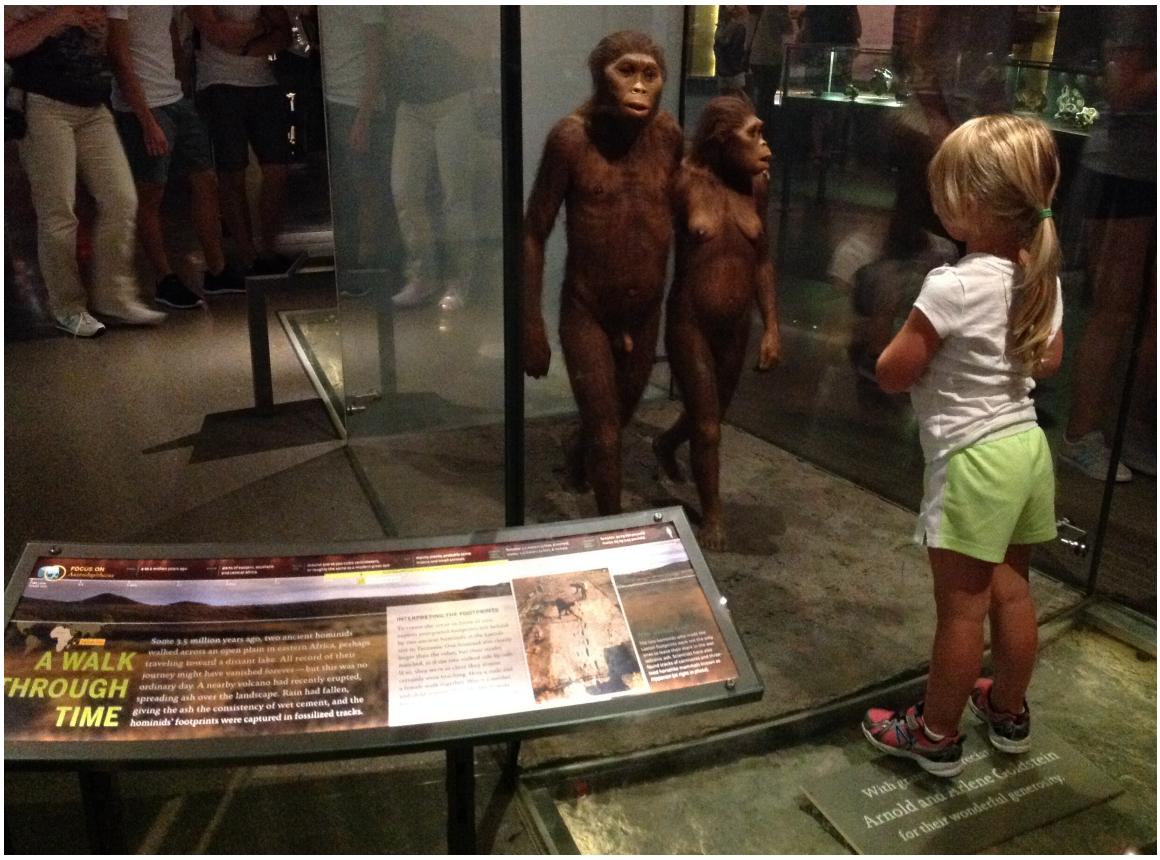

Figure 160. American Museum of Natural History
PHOTO COURTESY: J WOODCOCK-MH

I found this bemusing, but more bemusing was the response I received when I asked about these two sets of exhibits. When I asked the DMNS curator about their dioramas, we had a long chat about multigenerational attachment to displays, not wasting the critters, and how to update them and make them relevant today. At the AMNS the curt reply was that they were just fine as is.

The same answer held for the Northwest Coast Hall, except that the answer was elaborated to include the comment that the exhibits themselves were artifacts now, and so they would always be exactly the same. The AMNH does have a vast array of elderly exhibits of ethnic peoples, they are only missing affluent White people. It is quite possible that there were staff with more nuanced views, but I did not meet them.



Figure 161. AMNH. Dioramas.
PHOTO COURTESY: J WOODCOCK-MH



Figure 162. AMNH. NW Coast Hall.
PHOTO COURTESY: J WOODCOCK-MH

I was unable to meet with any facilities staff, so was not able to make an informed observation in that regard. The AMNH does post their sustainability guidelines online:

> The guiding principles of the Museum's sustainability efforts are:
> • Manage the Museum's operations and facilities in a manner that reduces the Museum's negative impact on the environment.
> • Encourage environmentally responsible practices in projects that call for the design, renovation, and/or restoration of the Museum's facilities.
> • Develop opportunities for the Museum to inform and encourage its staff and visitors about sustainable practices and the Museum's

> efforts to lessen its own impact.
> • As appropriate, collaborate with external entities such as governments, businesses, citizens groups, schools, and peer institutions to advance awareness of environmental issues and the impact of personal and industrial behavior.
> • Continue to monitor the sustainability of the Museum's operations: by assessing the impact of existing and newly initiated practices; by establishing and evaluating sustainability goals; and by looking for new opportunities to improve the Museum's "green" practices.[487]

There is evidence that there individuals who are interested in sustainability and climate disruption based on several of the exhibits which touched on these topics. The AMNH is home to astronomer and philosopher Neil de Grasse Tyson, who has greatly served science in America with his razor sharp intelligence and witty presentation.

When I was making observations, the most recent climate change exhibition was 2009;[488] the Rose Center for Earth and Space was climate change free. However, AMNH has opened a new climate change exhibit, *Our Changing Climate*, in July 2018.[489]

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[487] "Sustainability Principles," AMNH, accessed July 16, 2018, https://www.amnh.org/about-the-museum/sustainability-principles.

[488] "Climate Change," AMNH, accessed July 17, 2018, https://www.amnh.org/explore/science-topics/climate-change.

[489] "Explore Updated Exhibits in the Hall of Planet Earth This Weekend at the Museum," AMNH, accessed July 17, 2018, https://www.amnh.org/explore/news-blogs/news-posts/explore-updated-exhibits-in-the-hall-of-planet-earth-this-weekend-at-the-museum.

The Oregon Museum of Science and Industry[490]



Figure 163. The Oregon Museum of Science and Industry. Site visit.
PHOTO COURTESY: J WOODCOCK-MH

Roots of Wisdom: A Model to Follow

An exemplar of this work is *Roots of Wisdom: Native Knowledge. Shared Science*. Created as one of the Native Universe projects, *Roots of Wisdom* is a 2,000-square-foot exhibit, developed with NSF grant funding, and in

[490] "History and Mission," OMSI, accessed July 16, 2018, https://omsi.edu/history-and-mission. Mission: What we stand for: Inspire curiosity through engaging science learning experiences, foster experimentation and the exchange of ideas, and stimulate informed action. Vision: Where we are going: OMSI, collaborating with partners, will ignite an education transformation at the intersection of science, technology and design, and weave a thriving innovation district into the fabric of Portland, that spreads opportunities across the Northwest

partnership with the Oregon Museum of Science and Industry (OMSI), The Indigenous Education Institute, and four culturally diverse Indigenous communities from Hawaii, the Pacific Northwest, and North Carolina. "*Roots of Wisdom* is an interactive, science museum exhibition about contemporary ecological and cultural restoration."[491] *Roots of Wisdom* is very engaging to walk through, with many interactive games, puzzles or activities with which to learn the material. The exhibit is currently travelling, and is designed to be tailored to local Indigenous plant knowledge. (Figure 164)

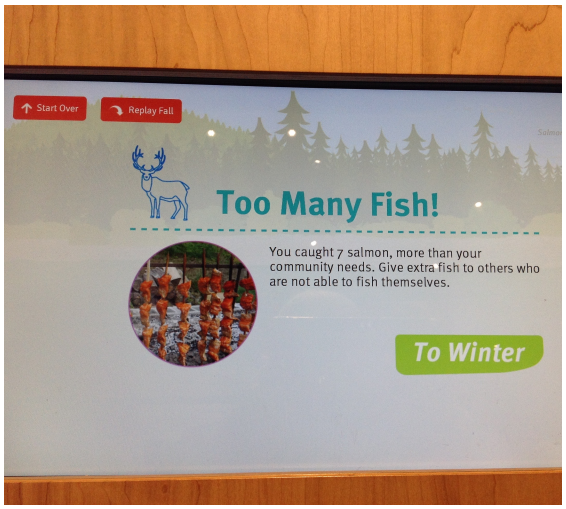

Figure 164. OMSI. RoW-Fish!
PHOTO COURTESY: J WOODCOCK-MH



Figure 165. OMSI. Recycling
PHOTO COURTESY: J WOODCOCK-MH

My trip to OMSI was brief, and overlapped a site visit that staff were making to an old factory site. (Figure 163) I was able to clearly ascertain that OMSI shares qualities of community embeddedness with the DMNS, and that

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[491] "Roots of Wisdom."

sustainability and climate disruption awareness are not news there. For example, their recycling bins, clearly labeled, have been there long enough to begin to get a little scruffy. (Figure 165) Clearly, people know what they are for and how to use them. When I volunteered at the recycling booth at the Smithsonian FolkLife Festival I was interested to find how few people actually knew how to recycle fairly simple items. Portland, home of OMSI, is well-known for being a progressive city. I did learn something entertaining from the OMSI Facilities Manager. He told me about how they has installed water saving automatic flush toilets in the bathroom adjacent to the children's wing—but the whooshing water scared the tots, and they had to replace the toilets with standard flush toilets.

OMSI has excellent signage for their visitors, including a kiosk with detailed information regarding their sustainability initiatives.

> Another factor in maintaining balance involves the element of time. As we peer into society's future, we—you and I, and our government—must avoid the impulse to live only for today, plundering for our own ease and convenience, the precious resources of tomorrow. We cannot mortgage the material assets of our grandchildren without asking the loss also of their political and spiritual heritage. We want democracy to survive for all generations to come, not to become the insolvent phantom of tomorrow.
> Eisenhower's "Farewell Address to the Nation," January 17, 1961[492]

How, one might ask, could the anthropogenic climate disruption wreaking havoc upon our world today find its roots in the 1925 Paris Exposition Internationale des Arts Decoratifs et Industriels Moderne, the 1933 Chicago Century of Progress Exposition, and America's great museums? The answer to this proves not to be a wild leap into preposterousness, but a modest stroll through the annals of American exceptionalism. This economic and social engine was generated with the first clacking of the industrial revolution in the latter 1800's, coming to a crescendo in the mid twentieth century, and is found stuttering on the sidelines at the dawn of the twenty-first, running out of oil. The consequences of ignoring Eisenhower's prescient mid-century warning to refrain from plundering our precious resources, and his admonition that "Together we must learn how to compose differences, not with arms, but with

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[492] "Eisenhower's Farewell Address to the Nation," accessed September 14, 2016, http://mcadams.posc.mu.edu/ike.htm; Philip Nute, *Eisenhower's Farewell Address Jan 17, 1961 Part 1 Www.Philipnute.Com*, 2010, https://www.youtube.com/watch?v=jnaM8TqAzzo; Philip Nute, *Eisenhower's Farewell Address Jan 17, 1961 Part 2 Www.Philipnute.Com*, 2010, https://www.youtube.com/watch?v=KCRDp4OF5Ig.

intellect and decent purpose" have come to fruition with a vengeance.

The 1925 Paris exposition attracted approximately 5,853,000 visitors to its modernism agenda—an agenda found unsettling enough by the Americans that they declined participation.[493] In response, United States fair organizers commented that Americans were willing to consider modernity, as long as it had one foot in the past, thus, at the critical juncture of mass industrialization, the United States defined modernity as being essentially a timid creep into the future, anchored to the comforting and familiar past, while Europeans defined modernity with no such hampering restrictions, producing the likes of Picasso and Aalto. The United States Commission on International exposition of modern decorative and industrial art observed:

> In this Exposition all the nations of the world were invited to participate. …The invitation to the United States was declined on the ground that American manufactureres and craftsmen had almost nothing to exhibit conceived in the modern spirit and in harmony with the spirit of the offical specifications. …For in a new creation it is entirely unnecessary, and even unsafe, that every element be novel. To blend the old with the new, to embody some element that has already been accepted by the public is to start that creation with a very fair chance of life. Creation that departs too radically from the past; that throws into the discard all that has gone before, is apt to be short-lived. The continuity of nature, the natural law that creates new forms step by step, by an evolutionary process in contradistinction to a revolutionary one, may well be followed in the industrial field. Very few understand this principle, but those few are achieving really worthwhile things and are doing constructive work.
> US Commission on International Exposition of Modern Decorative and Industrial Art, 1925[494]

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[493] Erik Mattie, *World's Fairs* (New York City, NY: Princeton Architectural Press, 1998), http://www.loc.gov/catdir/enhancements/fy0722/98034047-d.html.

[494] United States Commission on International exposition of modern decorative and Charles

This apparently academic distinction between dissonant definitions of modernity has proven to have significant long-term ramifications. Europeans, unhampered by restrictive definitions of modernity, have been culturally free to pursue the rethinking and creative engineering needed to combat climate disruption and achieve social sustainability goals. The U.S. has pursued a much more modestly paced exploration of technology, primarily in consumer goods and the military industrial complex. Americans approached the social construction of cognitive and geographical exposition landscapes based in a methodical and scientific paradigm consisting of government, corporate and museum partners.

The museum partners, such as the American Museum of Natural History, the Field Museum, and the Smithsonian, provided guidance regarding how to navigate the ethnographic presentation of human beings at the expositions, presented to the public for erudition and shock value. In return, the museums gleaned substantial additions to their ethnographic and natural history collections at the close of the exhibitions, shaping their holdings and displays to the current day.

Because of this established focus on individual consumption rather than

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Russell Richards industrial art, Paris, 1925, *Report of Commission Appointed by the Secretary of Commerce to Visit and Report upon the International Exposition of Modern Decorative and Industrial Art in Paris, 1925* (United States Dept. of Commerce, 1925), http://books.google.com/books?id=ecFNAAAAYAAJ&q=Report+of+Commission+appointed+by+the+secretary+of+commerce+to+visit+and+report+upon+the+International+exposition+of+modern+decorative+and+industrial+art+in+Paris,+1925&dq=Report+of+Commission+appointed+by+the+secretary+of+commerce+to+visit+and+report+upon+the+International+exposition+of+modern+decorative+and+industrial+art+in+Paris,+1925&hl=en&sa=X&ei=hpDjT7jsF4SE8AT5vvmGCA&ved=0CDUQ6AEwAA.25, 27.

communally beneficial and advanced technology, the United States has become a world leader in consumption of goods and production of green house gases, while Europe, the *old country*, has flown past the United States into a more efficient twenty-first century approach to technology that focuses on products that are energy efficient, stylish, and good for the world. Europe, although appreciative of its past, holds it in a loose grip and has developed a cultural approach to technology that requires no past referent in order to achieve social acceptance, nor a thumbs up from the oil Industry, thereby freeing up innovators to create remarkably efficient goods and services. These two widely diverging world views, old fashioned from the new world, and forward thinking from the old world, are reflected in their respective museums. European and Australian museums are far ahead of most American museums in addressing issues of sustainability as institutions and in their educational programming.

The concretization of economic and social values expressed by the U.S. Commission on International Exposition is exemplified by Portland's 1905 Lewis and Clark Centennial and American Pacific Exposition and Oriental Fair motto "to celebrate the past and to exploit the future;" Carey notes,

> The exposition promoters held stock, both literally and figuratively, in the region's industrial economy and the exposition was financed with capital from Portland's leading bUSinessmen and its largest corporations. As if to leave no doubt about the origins and impetus for the exposition, the board made an Oregonian newspaper reporter, Henry Reed, the fair's 'Director of Exploitation.' Early on, the exposition motto was 'to celebrate the past and to exploit the future.' Reed and the promoters, seemingly immune to or unaware of the irony, crafted a nuanced vision of the history and landscape of the Pacific Northwest that

itself helped shape the nation's image of the region.[495]

Unfortunately, the U.S. took the Portland motto quite to heart, and proceeded to encode it as a quintessential American value.

Robert Rydell's observations regarding American reactions to the 1925 Paris Exposition Internationale des Arts Decoratifs et Industriels Moderne are illuminating, casting a spotlight on an under-examined catalyst of climate disruption, the early twentieth century divergence between the America and Europe in cultural conceptualizations of modernity, and the concomitant commercial dynamic for creating and dispersing goods and services.[496] The Paris Exposition required entries to forego "reproductions, imitations and counterfeits of ancient styles," prompting President Hoover to decline our invitation to the party, since he felt that modernism was un-American; he did, however appoint the U.S. Commission on International exposition of modern decorative and industrial art to attend the Exposition and report back.[497] Their report includes a startling invocation of Darwinism as a theoretical endorsement of their 'blending the old with the new' approach to modernity. However, this referent to evolution is in line with the social Darwinism promoted heavily by anthropologists and governments in fairs and expositions of the nineteenth and early twentieth centuries. The fairmakers of the 1933

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[495] decorative and industrial art, Paris, 1925.

[496] Robert W. Rydell et al., *Designing Tomorrow : America's World's Fairs of the 1930s* (New Haven: Yale University Press, 2010). 6.

[497] Rydell et al., 5.

Chicago Century of Progress Exposition defined their vision of modernity for the U.S. with the clairvoyant motto, “Science finds, Industry applies, man conforms,” a motto applicable to American life today, in part as a result of the rampant commercial industrialization successfully sold to the American public at venues such as the 1933 Chicago Exposition.



Figure 166. 1925 ‘Pavilion de L'Esprit Nouveau’ Le Corbusier[498]
PHOTO COURTESY:



Figure 167. 1933 ‘House of Tomorrow’. Keck and Keck.[499]
PHOTO COURTESY:

It is instructive to compare the 1933 Chicago Exposition organizers’ reductivist Darwinism approach with that of André Delieux, organizer of the 500-member Collectivité Delieux of designers and craftsmen, and sponsor of the Pavilion Delieux that exhibited their work at the 1908 Exposition Franco Brittanique. Delieux declared,

I believe, sirs, that it is a fault to think in too traditionalist a way

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[498] “L’Esprit Nouveau Pavilion - Architecture of the World - WikiArquitectura,” accessed September 15, 2016, https://en.wikiarquitectura.com/index.php/L’Esprit_Nouveau_Pavilion.

[499] “80 Years: The House of Tomorrow,” Solar House History, accessed September 15, 2016, http://solarhousehistory.com/blog/2013/4/21/80-years.

> that science and art have said their last word, and that for us it is best to copy the masterpieces of our predecessors. What! Everything changes, progresses, and you, in powerlessness, reduce your role to copyists! No sirs, this is against history, against the laws that rule the destiny of humanity.[500]

Delieux takes what could be seen as an expansive view of evolutionary theory in social practice. These two approaches to modernity are exemplified in a pair of pavilions demonstrating homes of the future: the French Corbusier home is impressively modern for 1925, it could easily pass for a design of the 1960s. (Figures 166-167) The Chicago Keck house on the other hand looks like a widow's walk scooped off a 19th century Victorian; it is highly referential, and achieves the goal of being modern, but not too modern. The structure has an apocryphal story associated with it; due to the large glass windows, apparently Keck noted that it was warm inside, and it has become positioned as a forerunner of solar heating.[501] This would seem disingenuous at best, since in common parlance, this would be called a greenhouse, or more formally, a conservatory. Greenhouses were built to achieve this warming effect in Italy in the 13th century, so not a particularly notable observation in the twentieth century.[502]

Rydell notes, "Ironically, in their effort to show that American culture had come of age, fair planners before World War I tended to insist on buildings

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[500] Paul Greenhalgh, *Fair World : A History of World's Fairs and Expositions, from London to Shanghai, 1851-2010* (Winterbourne: Papadakis, 2011).

[501] "80 Years."

[502] "History of Conservatories and Glasshouses | Garden & Nature," accessed September 15, 2016, http://www.gardenandnature.com/conservatory/history.

designed in conservative, beaux-arts forms that drew heavily on European precedent. European fair planners, on the other hand, were more willing to display new building technologies."[503] It would seem that little changed between the wars. Although Corbusier's pavilion was so dramatically modern as to generate a great deal of heated controversy, nevertheless, it was taken seriously, and included in the French exposition, helping to open a cultural dialogue about the meaning and nature of cutting edge modern aesthetic and technical exploration. This critical split between the two visions, reductive and expansive, has defined the diverging paths of the United States and Europe to the current day.

If Some is Good, More is Better

The modernity precedents established at the 1925 Paris Exposition and 1933 Chicago Exposition continued, and continued to inform public opinion. In 1939, the New York World's Fair promoted the theme of *Building the World of Tomorrow*, exemplified by the *Futurama* exhibit, a model city, *Democracity*, housed in the *Perisphere* dome, and the debut of television to the American public. (Figures 168-169) Although financially the 1939 Exposition concluded at a loss, it successfully introduced two monumentally formative aspects of everyday American life. Television and its influence on citizens has come to permeate American culture in a way virtually inconceivable fifty years prior,

[503] Robert W. Rydell, "The Literature of International Expositions," in *The Books of the Fairs: Materials about World's Fairs, 1834-1916, in the Smithsonian Institution Libraries*, ed. Smithsonian Institution (American Library Association, 1992). 6.

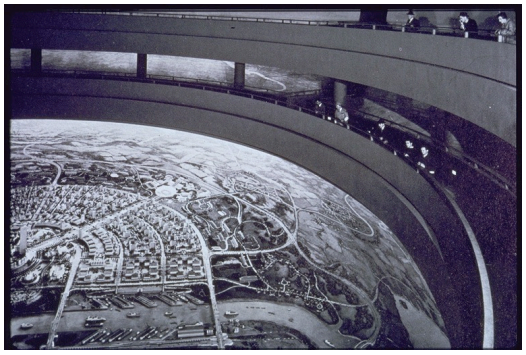

Figure 168. Democracity. 1939 New York Exposition.
PHOTO COURTESY:

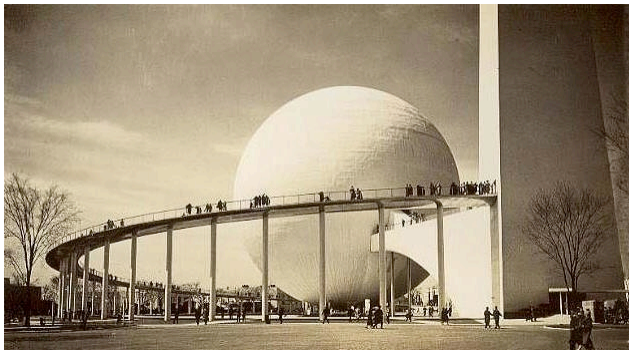

Figure 169. Perisphere. 1939 New York Exposition.
PHOTO COURTESY:

and Democracity introduced the U.S. to the idea of the modern suburb,[504] a concept that would spread like wildfire, and destroy the functional American cityscape in half a century. (Figures 170-171)

These ideas, television and the suburban life, worked together in the minds of the American people to create a vision of a successful life, one that was based on the mass consumption of a seemingly endless supply of consumer goods. Although introduced in 1939, when the U.S. was recuperating from the Great Depression and tooling up for World War II, this vision of consumer exuberance came to full flower when the military industrial complex needed to retool after the big business of World War II came to an end. The 1950s marked an explosion of advertising, print and television, and a move from cities to suburbs, requiring a major shift to personal ownership of automobiles. Instead

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[504] Democracity. Accessed 21 June 2012
1939-40 World's Fair Democracity Re-Creation. New York Public Library. http://www.youtube.com/watch?v=kulk7IPTL10 Accessed 21 June 2012

of being viewed as profligate and morally bankrupt, shopping sprees for



Figure 170. 1959 Dodge convertible ad
PHOTO COURTESY: DODGE



Figure 171. This is the Life…
PHOTO COURTESY: RICH PLAN CORPORATION

consumer goods were presented as essentially patriotic, and supporting American business. It was during this era, in 1961, during his farewell speech that President Eisenhower issued his famous remonstrance:

> In the councils of government we mUst guard against the acquisition of unwarranted influence, whether sought or unsought by the military industrial complex. The potential for the disastrous rise of misplaced power exists and will persist. We must never let the weight of this combination endanger our liberties or democratic processes. We should take nothing for granted. Only an alert and knowledgeable citizenry can compel the proper meshing of the huge industrial and military machinery of defense

> with our peaceful methods and goals, so that security and liberty may prosper together."[505]

Unfortunately, Americans paid no heed whatsoever to Eisenhower's warning, and instead pursued a headlong fall into consumer hedonism wrapped in an impermeable self righteous assumption of superiority, that has been virtually unassailably clothed as Christian virtue. The outcome of the rampant consumerism promoted in the forties, fifties, and sixties is that American cultural values of thriftiness, previously voiced in many of Benjamin Franklin's aphorisms, were discarded as un-American, in that they did not promote a growing economy. Trained through advertising to acquire a taste for constant and instantaneous novelty, and fed a stream of consumables designed with planned obsolescence as a key feature, Americans lost touch with the functionally conservative values of pre-World War II daily life.

Unfortunately, this heedless lifestyle of constant frivolous consumption of transitory material goods comes at an egregious cost in social justice, environmental degradation, and global warming. Museums are not exempt from this dynamic. In his class, "Museum History," Robert Rydell emphasizes that there are no neutral spaces in museums, including the hallways, bathrooms and gift shops. Messaging is everywhere, either specifically articulated or invoked inductively. It is instructive to visit museum gift shops with a critical eye—

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[505] Eisenhower, Dwight D. January 17, 1961. Farewell address to the nation. Text transcription: http://mcadams.posc.mu.edu/ike.htm. Film recording, Part 1, Part 2: http://www.youtube.com/watch?v=jnaM8TqAzzo http://www.youtube.com/watch?v=KCRDp4OF5Ig

although most do not specifically Use the gift shop as an instructional locus, the message is clear—buy a souvenir for your self, your child, and to take home. In the course of conducting interviews, some back-to-back at unrelated museums, it became clear that museum managers were purchasing inventory from the same merchants, imprinting identical Chinese-made plastic trinkets with their museum's logo.

A Trajectory Towards Travesty

Rydell, referencing Pred, notes, "expos have always been hyperspaces and metaphors where power relations, played out in the arena of representational spaces, have advanced the economic and political forces associated with modernization."[506] One could say the same of museums, and it is more likely that museums rather than world's fairs will be able to act as an heuristic mechanism for Americans in the twenty-first century, because of cost, availability and education level. Although recent international fairs such as the 2010 Shanghai Exposition seem ideal for communicating modern and futuristic ideas to Europeans and Asians, it is unlikely in our economy that we would be able to successfully fund an inspirational exposition, and, it is unlikely that the American people would absorb much from one at this point—after all, America is still eating GMO *food*, driving 8 mpg cars, and slurping down megafrosties. It seems likely that the finer points of comparing wind turbines wouldn't be

[506] Robert W. Rydell, "'New Directions for Scholarship about World Expos,'" in *Seize the Day: Exhibitions, Australia and the World*, ed. Kate Darian-Smith et al. (Melbourne: Monash University ePress, 2008), 21.1-21.13.

engaging or meaningful at this time.

Museums, however, are well situated to gently introduce ideas to the public in non-confrontational ways that might be more palatable and effective. Perhaps in the second quarter of the twenty-first century, Americans will be more receptive. The 2016 presidential election was remarkable in showcasing the progressive thinking of many Millennials compared to many Americans of preceding generations. These young people will be adults in 2025, and as such, in decision making capacities. This is well worth noting, because the topics which many museums currently find of little interest or too politically charged to actively engage, are precisely the topics that are of great interest to this rising generation in their twenties and thirties. The American penchant for all things modern, as exemplified by the popularity of the iconic and prescient films '*2001: A Space Odyssey*' (1968), and *Blade Runner* (1982). (Figure 172) Museums can use *edutainment* approaches to inform the public about aspects of the science we must learn to survive this coming century. Film, media, and planetaria are comfortable social norms for young Americans, offering many possibilities for introducing challenging subjects in a non-threatening manner.

The U.S. is teetering at a pivotal point in the early decades of the twenty-first century. On the one hand, authors and commentators such as Michael Pollan have become increasingly popular, drawing attention to the critical issues of food and health, and the critical role of a locavore approach to healing our economy. On the other hand, Americans have become

increasingly dismissive and disinterested in science, to the point where we have lost our manned space program, an eventuality inconceivable to the world



Figure 172. Still image from *2001: A Space Odyssey*[507]
PHOTO COURTESY: OPENCULTURE.COM

of the 1960s, when we put a man on the moon.

The paradigmatic dilemma between factual history, and America's far different cherished memories, often derived from Hollywood or sitcoms, romanticizing the consumption era of the 1950s and 1960s, is a problem that has led us into an unbelievable squandering of not only our own share, but also much of the world's share of resources. America's view of modernity, keeping a foot solidly planted in the past, has kept us from things that Europeans take

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[507] "Did Stanley Kubrick Invent the IPad in 2001: A Space Odyssey?," *Open Culture* (blog), accessed March 23, 2018, http://www.openculture.com/2015/06/did-stanley-kubrick-invent-the-ipad-in-2001-a-space-odyssey.html.

for granted, such as bullet trains, high mileage cars, and pesticide and GMO free food. It is time to rethink this approach to visualizing the future, before we are completely out of options. Although we live in a globalized world, our imperialistic relationship to the rest of the planet has left us a thin conduit of communication, which we must expand.

Worlds Fairs and expositions can be thought of as the vanguard of entitlement consumerism. The singular presentation style of the world's fairs—presenting as many spectacular purchasable items in one location—more than could be appreciated in a long day—introduced the concept of endless opportunities for consumerism, leading to an expectation of a constantly available plethora of consumer choice. This paradigm was readily adopted by the American public, leading to the highly consumer oriented culture that blossomed in the 1950s, becoming the predominant cultural paradigm and replacing the thrifty paradigm that had reigned for several centuries prior. Not only has this lifestyle led to extreme use of resources, but it has also become harder and harder for Americans to maintain in the failing economy of the post-peak oil twenty-first century.

Europeans, who never adopted the novelty based consumer economy to the extent that Americans have, have been socially freer to distance themselves from this lifestyle and actively pursue social and engineered approaches to sustainability in an effort to combat climate disruption. This divergence needs to be bridged between the United States, clinging to the

past, losing its hard-won space program, and Europe, embracing modernism, forging forthwith into the grim realities and exuberant possibilities of the post-peak oil twenty-first century.

Museums, as trusted purveyors of information, are ideally situated to assess successful sustainability strategies and present them to a public direly in need of solutions.[508]

Museums hold a cherished and trusted place in American communities; almost every community has at least one museum, and museums are ideally located, both physically and socially, to convey ideas and information to their communities. As previously noted, the term *museum* is construed here to include entities named and understood to be museums, but also including entities such as cultural and heritage centers. In many Indigenous communities, anthropologists and museums have behaved reprehensibly, perpetuating "Othering" in offensive ways.

An iconic example of this problematic relationship is the commonly recognized but oversimplified relationship of the Yahi man, Ishi, and anthropologist Alfred Kroeber and linguist, Edward Sapir, with whom he worked to document Yahi culture. It would appear that Ishi and Kroeber maintained a cordial and mutual friendship. Kroeber, despite his training as an anthropologist, failed to recognize Ishi's susceptibility to illnesses in the urban

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[508] Jennifer Woodcock-Medicine Horse, "Addicted to Consumption: A Fair Proposal" (June 22, 2012).

environment; it is possible that in that pre-antibiotic era, awareness of illness vectors was less prevalent. Ishi contracted tuberculosis, and was very concerned that if he died, his body be buried intact, as was the way of the Yahi. Unfortunately, Kroeber left on a trip, and Ishi was left with Edward Sapir. Sapir worked intensively with Ishi to document the Yahi language, until Ishi's death in 1916 from advanced tuberculosis. Sapir had Ishi autopsied, directly countermanding his expressed wishes. Kroeber returned after the fact, and sent his brain to the Smithsonian Museum. Ishi's brain was not repatriated to his Yahi tribal descendants until August 10, 2000.[509] This story, widely told in books for adults, books for children, academic tomes, and documentary films, strikes right to the heart of cross-cultural disconnects between well-meaning people, resulting in the furthering of colonial behavior. Museums have not, as a whole, either stepped away from this objectification of the non-White Other, nor have they stepped toward the non-White Other intending the initiation of a relationship predicated on inclusion and collaboration.

Othering has also taken the form of alienating museums from their environmental responsibilities as public museums, facing declining revenues and unpredictable allocation of federal tax dollars, have turned to oil and gas companies for financial underwriting. With the increase in public awareness regarding global warming, increasing green house gasses, and the role of

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[509] "NMNH - Repatriation Office - The Repatriation of Ishi, the Last Yahi India," accessed March 30, 2018, https://anthropology.si.edu/repatriation/projects/ishi.htm.

petroleum products in perpetuating climate disruption, carbon energy companies have stepped forward with generous funding for museums. Declining levels of federal support has inclined some museums to accept readily proffered or oil and gas money, however, accepting it comes packaged with the fear of losing it. When conducting research interviews, museum staff at institutions accepting funding from entities such as the Koch brothers or Exxon reported that they did not feel constrained by accepting these funds, however, in each of these museums I observed a signal lack of overt climate disruption education, exhibits or programming.

Large publicly funded institutions, such as the Smithsonian Institution, are to a degree at the mercy of our elected officials who control the purse strings,[510] however, they also have a direct mission to serve the public, and are finding ways to facilitate this. Most American museums have neglected to substantially explore sustainability with their community, but are in the catbird seat to do some really interesting work in this area. If museums were to collaborate with their local Indigenous communities to develop programming that incorporated art, story telling, and citizen science to engage children in learning about their changing environment and ways of responding positively to these challenges, they could address burning issues of social and environmental injustice without alienating half their visitors and donors.

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[510] Peggy McGlone, "Smithsonian Institution Asks Congress for $922.2 Million for 2017," *The Washington Post*, March 23, 2016, https://www.washingtonpost.com/news/arts-and-entertainment/wp/2016/03/23/smithsonian-institution-asks-congress-for-922-2-million-for-2017/.

The Smithsonian's National Museum of the American Indian is doing exactly that, with their annual Living Earth Festival. The 2015 Living Earth Festival attracted thousands of visitors, featuring a butterfly release, a cook-off, Mayan food preparation, a concert by Quetzal Guerrero, a Navajo youth summit discussing efforts to improve health education and access to healthy foods, and a symposium titled *On the Table: Creating a Healthy Food Future*, among many other activities centered around climate disruption and sustainability, such as the *Anthropocene initiative*, supporting their Four Grand Challenges:

- Unlocking the Mysteries of the Universe,
- Understanding and Sustaining a Biodiverse Planet,
- Valuing World Cultures, and
- Understanding the American Experience.[511]

Climate Disruption and Sustainability Education: The Role of Museums

As *most trusted* information source, and carriers of cultural messaging, museums have a key role to play in climate disruption and sustainability education. As natural history institutions, they have a responsibility to stay out of the political or religious fray, and present the climate disruption facts in as clear and comprehensible a manner as possible. As cultural institutions, they can find in their archives and institutional memories the heirloom bits and

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[511] "Mission," Smithsonian Institution, accessed March 23, 2018, https://www.si.edu/about/mission.

pieces of American culture that we can weave back into a patchwork quilt of cultural sustainability approaches. We truly require the new or revived models of social integration that museums will be able to present and demonstrate to us through such examples as community gardens associated with their cafés, or portable planetariums going out to schools too poor for field trips.

Early efforts at creating successful climate disruption exhibits in museums have been discouraging; visitors tend to be annoyed by and ignore bar graphs and charts, and are sensitive to perceptions of dark, impenetrable, apocalyptic visions of the future. Presented with this kind of information, they tend to leave and not return until the exhibit has been taken down and replaced with something more upbeat. Although Americans seem to have a taste for the scandalous and outré, we are not in general a people, post-world war II, to roll up our sleeves and set forth to tackle problems; we would rather gripe about them on Facebook and leave large issues to politicians and billionaires. This widespread abdication of personal agency presents museums with quite a challenge – how to interest and engage citizens in thinking about Anthropocene issues in a truly meaningful and epiphanal way.

Museums and Social Justice: Responsibilities and Outreach

Responsibilities

Medial museums carry a history marred by the hegemonic repercussions of a colonialist past, seizing the relics of conquered peoples, and presenting

both the objects and the people as either wonderful and extinct, or alive and primitive, or, perhaps, extinct and primitive. Rarely, however, until more recent times, have museums celebrated the authenticity and currency of non-White people. It would seem only just that while we are addressing the sour outcome of White imperialist exploitation—the industrialization and poisoning of our planet—which we also take the opportunity simultaneously to contemplate social justice issues, and how museums can reach out in a meaningful and useful way to the *Third World*. Some of these children are in the global third world, and some are from our own U.S. tribal reservations and inner cities, financially restricted from traveling across the country to visit a museum. Technology makes access possible, if children have computers and satellite Internet access. In our current world economy dominated by a diminishing number of ever wealthier individuals, and suffering from shrinking federal research funds, it is increasingly economically difficult for individuals to travel for pleasure or academic research—for this reason as well, the digitization of museum collections democratizes them in a way that is highly advantageous not only for children, but for the autodidact and academic scholar as well.

Outreach

For a variety of very legitimate reasons, many museums have become prohibitively expensive for all but the affluent. Technology can be used to connect that gap; the Internet enables programming of either a formal nature

such as specific lessons or online exhibits, or of an informal nature such as webcams with blogs, to reach visitors far away. The concept of sister-cities could be used to reach out specifically to remote communities and invite them to join the visitor community, and to engage in reciprocal and interesting citizen science activities. Since the twenty-first century world is characterized by globalization, we ought to make it not simply an economic interconnectedness, but of value to citizens as well as corporate stockholders. The World Bank modeled an engaging approach with their MOOC/Massively Open Online Course, “Turn Down the Heat: Why a 4°C Warmer World Must be Avoided,” enrolling thousands of participants through Coursera. Coursera currently offers several dozen courses on climate disruption and sustainability—a model that would be fairly easy for most museums to adopt and put together, showcasing the research of its staff. The National Museum of the American Indian is an exemplar of creative online exhibits on a variety of topics.

One could suppose that only natural history museums have reason to address climate disruption with their visitors. However, a brief exercise on April 5, 2014, in Googling potential museum exhibit topics, demonstrates quite otherwise:

- The Cartoon Art Museum, San Francisco, CA: Google Search "Climate Change cartoons" yields "About 36,900,000 results"—surely enough material to contemplate an exhibit. The search yields the news story, "Cartoons make climate change a laughing matter"; The Guardian

observes that 150 cartoonists from 50 countries entered the Ken Sprague Fund cartoon competition -- easily an engaging museum exhibit.

- The American Computer Museum, Bozeman, MT: Google Search "Climate Change computers" yields "About 103,000,000 results." The search yields the news story, "Welcome to climate*prediction*.net, the world's largest climate modeling experiment," utilizing citizen scientists and networking their computers, climateprediction.net leverages data collection. This would make a very engaging topic for an exhibit, inviting young computer whizzes into the world of citizen science.
- The Walt Disney Family Museum, San Francisco, CA: Google Search "climate change Disney" yields "About 35,100,000 results," and the news story, "Warming to "Earth"—Disney's cinematic lesson about climate change," an opportunity for Disney to capitalize on their bow to climate change awareness.
- The Museum at the Fashion Institute of Technology, New York City, NY: Google Search "climate change fashion" yields "About 284,000,000 results," and the news story, "How Will Climate Change Affect What We Wear? Surprise! It Already Has," the Huffington Post explores the impact of climate change on the fashion world. This could make a very interesting and thought provoking exhibit, highlighting the hidden costs of our highly consumptive clothing habits in the U.S.

This brief exercise in randomly Googling topics not normally immediately

associated with climate change demonstrates that many museums might find innovative exhibits to engage their public in a dialogue regarding these issues. Stanley Kubrick's 1968 visionary film, *2001: A Space Odyssey*, Alvin Toffler's bestselling 1970 *Future Shock*, and Christopher Nolan's 2014 film, *Interstellar* present us with prescient, bookended perceptions of our rapidly evolving technological present and future. The fantastical technology presented in Kubrick's radical vision, such as skyping and the International Space Station, has indeed become manifested as part of our daily lives in the twenty-first century. Much has been written about the pros and cons of the immersive aspects of technology in the lives of children today, and much attention is focused on the costs. The end result is a rapid progression towards the near-future toxic earth depicted by Nolan. These concepts bear inspection, as both technology and nature are under-utilized in museums today.

Museums' Role in Inspiring the Cyber Generation to Action

Connecting/Reconnecting with Nature

At the 2013 American Alliance of Museums conference, during a session on the future of natural history museums, an audience member noted, "Children who love nature grow up to be the stewards of our planet." He went on to mention that he had been a director of a museum and currently worked as a consultant on children's nature education. He observed that museums can spend a great deal of money on constructed playground equipment that does

little to connect kids to the outdoors, or the museum can spend a thousand dollars to rehabilitate a vacant lot—removing hazards, fencing the exterior, making sure it has a pond with some frogs, rocks, trees, and letting the kids loose to mess around in the dirt, scrape their knees on tree bark, delight in beautiful bugs, and actually have an unsanitized outdoor experience. After a number of years spent working on both models, this speaker spoke strongly for the low-cost, grubby model that truly engages children, noting that even a relatively small area can seem large and magical to a small child.

Peace activist and educator Maria Montessori was also a strong advocate for educating the very smallest of children about nature and their interconnectedness with the natural world. She encouraged the permanent incorporation of animals, plants and aquaria in classrooms, as well as plenty of outdoor nature time with children. Her premise was that inculcating this knowledge of interconnectedness with their world in very small children led them to develop into empathic adults who would live cooperatively in the world. Her educational model has proven successful worldwide. Her educational models and theories regarding children's developmental stages would be valuable translated into a museum context; in that it would provide a different rubric for calculating and projecting ideal challenge levels in pedagogical materials.

American children are media recipients of a wide-ranging array of animal protagonists—from Ranger Rick and Smokey the Bear, to Bugs Bunny, Wilbur the

Pig and Winnie the Pooh. Children are eager to form attachments to both real and fictitious animals, and this is a prime opportunity for museums to create educational characters through which to convey environmental information to children. California Academy of Sciences has done exactly that with two of its



Figure 173. Claude the albino alligator
PHOTOS COURTESY: CAL ACADEMY OF SCIENCES

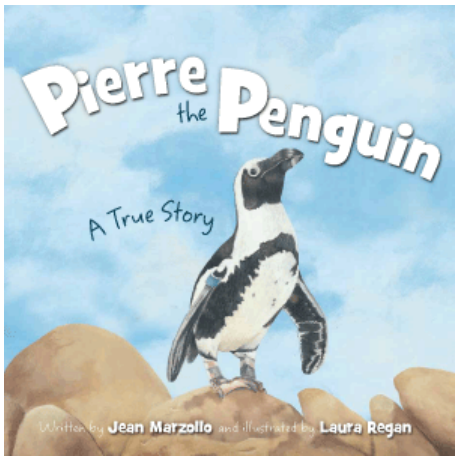

Figure 174. Pierre the Penguin's book

most popular inhabitants, the beloved Albino Alligator, Claude, and Pierre the Penguin. (Figures 173-174) Claude is very popular at California Academy of Sciences, and has his own Facebook page and Youtube videos.[512] Pierre developed an illness that caused him to molt and lose his feathers—which could have been fatal. However, a wetsuit was made for him, and he thrived. He has his own book, Kindle book and Youtube video. This synergy between personal visits by children to encounter these two favorite animal friends, and the ability to reconnect with them at home on their own iPads watching videos and

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[512] https://www.facebook.com/pages/Claude-the-Albino-Alligator/113022098755056

webcams,[513] or reading a book with pictures of their animal friends is an excellent way for museums to draw children in, then educate them about the lives of these animals, and the circumstances facing their kin in the wild. Museums that don't have an aquarium could get creative—if they have landscaping, they probably have birds or squirrels that could be drawn to the attention of child visitors, effectively creating an awareness of urban wildlife and the stressors they face from habitat and toxins in the environment. Today's environmentally educated and sensitized children can revolutionize tomorrow's cultural and material world, and the way we live in it.

Wilderness and Urban Nature Experiences

Counter-intuitively, despite the fact that youngsters typically spend eight hours a day with their electronic media, summer camp attendance is on the rise, increasing one-to-three percent a year for American youngsters, according to the American Camp Association.[514] This slowly growing rediscovery of the outdoors, in an educational setting, is an ideal way for museums to bring the issues of climate disruption to life in a hands-on way that could take this highly abstract science and give it an immediacy otherwise difficult to create within four walls. It could also be a great way for institutions to work collaboratively, sharing staff and kids from around the country, able to share diverse observations about the environmental change in their

[513] https://www.calacademy.org/webcams/penguins/

[514] http://blog.childrenandnature.org/2010/03/18/summer-camp-is-more-popular-than-ever/

communities. Summer camps are certainly not accessible to all children, especially those from lower income strata. However, that does not mean that these marginalized children need to be disenfranchised from their environment. The environmental movement can be perceived as exclusively the realm of affluent whites, and can, at times come into direct conflict with social justice organizations.

This is quite unfortunate, and overlooks the contributions of activists such as Majora Carter and Van Jones. A particularly impressive example is that of the Earth Angels. Founded by Neil Andre in 1981, this group of inner city children in St. Louis conducted a wide array of environmental actions, raising funds and donating their proceeds to the Nature Conservancy's Amazon rainforest protection program. Their example is stereotype shattering and evidence that children from all walks of life, and in the most bleak of urban environments can not only find interest in the natural environment, but a great deal of meaning and agency as well. This is the sort of low-cost program that a museum could easily launch in their community, working in collaboration with neighborhood groups and after school programs.

Human-to-Human Experiences

Research interviews subjects reported that the human-to-human approach can be particularly effective in communicating climate disruption information to museum visitors because the complexity level in discussing the science can be tailored to the individual visitor. Several interview subjects

reported the almost universal dislike by visitors of charts and graphs describing climate disruption; they preferred individual interactions if they were available.

Docents are the often the first, and possibly the only human educators whom visitors may encounter personally within a museum. Although audio-tours are pragmatic, they are static and one-size-fits-all. Docents can personalize each visitor encounter, either broadly introducing the topic or going into a great deal of depth as asked for by the visitor. Although not in the field of climate disruption, an excellent example of the use of docents is at the Head-Smashed-In Buffalo Jump UNESCO World Heritage Site. All of the docents at Head-Smashed-In are local Blackfeet and Pikuni people, whose ancestral Use of the site goes back many millennia. These docents are able to provide an unparalleled depth and meaning to the site because of their unique perspective and enthusiasm for sharing their heritage.

Media: Technology, Computer Games Videography, and Social Media

Technology

The use of technology has become ubiquitous, although not necessarily done well. Often its use in museums seems more like an afterthought—a sop to the twenty-first century rather than a brilliant way of communicating information. The technological interactive exhibit *Connected Worlds* was discussed earlier, and is a brilliant use of whimsical technology to communicate

basic environmental principles. The Center for Civil and Human Rights, in Atlanta, Georgia, has used simple technology to connect directly with visitors at an emotional level. It is, I believe, the most effective use of technology that



Figure 176. Center for Civil and Human Rights. *Stories*.
PHOTO COURTESY: J WOODCOCK-MH



Figure 177. Center for Civil and Human Rights. *Lunch Counter*[515]
PHOTO COURTESY: J WOODCOCK-MH

have ever encountered in a museum. In their *Stories* room, life size touch screen panels activate, at a touch—however, if you move back into American safe space, they stop—you have to stay in close conversational distance or be made aware that you are trying to distance. Their award-winning *Lunch Counter* uses a simple digital counter and headphones to put visitors into the terrifying space occupied by activists in the civil rights era. (Figures 176-177) Used intelligently and for a good reason, technology can be very useful and

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[515] "The American Civil Rights Movement," *Center for Civil and Human Rights* (blog), accessed July 16, 2018, https://www.civilandhumanrights.org/exhibit/american-civil-rights/.

effective, used as an after thought, it tends to get tedious quickly.

Videography: Guerrilla Film

The DLSR camera has revolutionized the creation of media in the twenty-first century. Technology has become widely affordable, making it feasible for museums to make relevant, locally focused media productions for their public, utilizing staff, citizen scientists, and a digital video camera. Video and media saturate the planet and are easily assimilated methods for communicating ideas to a broad public. They can bring nature to children who physically cannot come to nature or do not recognize the nature around themselves. In the twentieth century, the cost and technical expertise required to create a film were often prohibitive, especially for a smaller institution. It is now possible to purchase equipment for creating a film of broadcast quality for under $2,000—a price easily covered by a small grant, and videography and digital editing skills are certainly within the capabilities of most museum employees, and are a way to really captivate high school interns. With the increase in common platform technology, this also creates a viable opportunity to engage citizen scientists into museum media creation. The term 'guerrilla film,' used and popularized in a museum context by Dr. Kachun Yu of the Denver Museum of Nature and Science, refers to the ability to very spontaneously capture digital footage in an impromptu fashion—even iPhones can now capture serviceable footage—allowing a creativity and timeliness previously impossible.

For the Millennials, tasked in their lifetimes with addressing the consequences of anthropogenic climate disruption, film and media are a daily part of life, streaming at them from their iPads and iPhones on an hourly basis. Media has become an expected form of information gathering. Therefore, using media in museums to authentically present information in a manner that young people will find absorbing seems prudent. Film is especially useful in documenting and teaching about climate disruption, since environmental data can be subtle and ephemeral; it is much more powerful to show visually that a hillside that is now covered in blighted pine trees Used to be thriving, than it is to mention it in a placard. Guerrilla film projects also offer an opportunity to make low investment preliminary experiments in citizen science data collection efforts.

Planetaria: Immersed in Science

Planetaria are a barely tapped resource to literally immerse the public in an environmental story—touching them in a more impactful way. Museums can create their own short dome pieces, and take them out to schools in portable domes. The videographic technology for creating dome films is evolving very, very rapidly, becoming more accessible and affordable even at a smaller museum's budget. Larger museums with planetaria, such as the California Academy of Sciences, the Denver Museum of Nature and Science, and the American Museum of Natural History have begun making excellent dome programs that are about more than just star shows. Digital planetaria are a

tremendous, underutilized resource of many museums in the United States. As 3-D immersive environments, they provide an opportunity for a much more absorbing method of learning than is generally the case with traditional theaters that place the viewer both at a physical and conceptual distance from the screened material. Planetaria are now capable of very sophisticated spontaneous performance teaching, using the UniView[516] system (Figures 178-179) which allows the planetarium program manager to create programming on the fly, tailored to individual audiences, by downloading specific data from the UniView program and uploading it in real-time to the dome. This could be



Figure 178. Elumenati showcase, AAM Conference 2012
PHOTO COURTESY: J WOODCOCK-MH

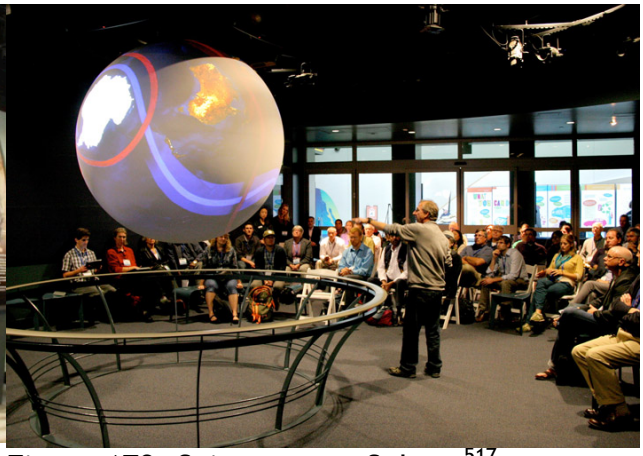

Figure 179. Science on a Sphere[517]
PHOTO COURTESY: NOAA

spectacularly useful in teaching school kids and answering their questions in an immediate, visual way. NOAA's phenomenal Science on a Sphere can

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[516] http://www.scalingtheuniverse.com/products.php
[517] "What Is Science On a Sphere," accessed March 23, 2018, https://sos.noaa.gov/What_is_SOS/.

complement this kind of planetarium programming. [518] Science on a Sphere Uses a six-foot sphere in combination with three ceiling mounted projectors to display an almost endless array of science topics on what appears to be a spinning globe. It is a very engaging way to learn that is being Used by the Science Museum of Minnesota to teach about climate disruption.

StoryKiosk[519] or a similar podium can also be used to work interactively with kids, inserting their input from the kiosk into the planetarium program and thereby involving them at a more personal and creative level. As well, it can keep them actively involved while they wait, a time when interest would generally lag, but can instead be refocused on the educational goal of the museum visit.

Social Media

Social media form a rapidly evolving arena of platforms interfacing with the public, especially with Millennials. It is probably advisable for museum staff to work with an experienced consultant to avoid investing time and resources on a waning venue, such as MySpace. However, it is prudent to monitor and utilize social media in ways that are efficient and attractive to tech-savvy visitors. It's hard to wrong with a Facebook page for museum schedules and updates, but there is also a shifting array of Reddit, Pinterest, Twitter, YouTube, Instagram, LinkedIn, Tumblr, Google+, Flickr, MeetUp, Care2,

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[518] http://sos.noaa.gov/
[519] http://www.bradlarson.com/storykiosk/

Academia.edu, ResearchGate, Foursquare, LibraryThing, Quora, ScienceStage, SoundCloud, to name some that might be relevant. Casting the net too widely and trying to keep up on too many sites is a recipe for failure, but knowing which sites on which to maintain a consistent presence requires some insider knowledge, perhaps that of a teenage intern.

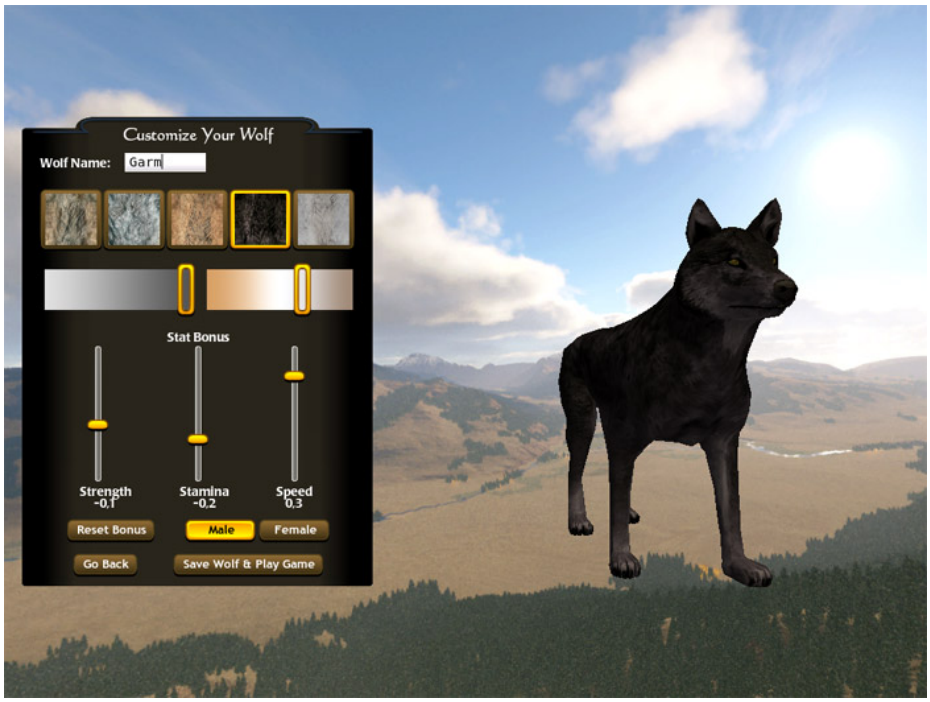

Figure 180. WolfQuest: Customize your wolf
IMAGE COURTESY: WOLFQUEST

Computer Games

Video games, a favorite preoccupation of young people, may be effectively and engagingly used to teach behavioral concepts regarding sustainability. A good example of how this can be accomplished is the game

WolfQuest. WolfQuest[520] is a highly successful, award-winning game about wolf ecology, collaboratively developed by EduWeb with a $508,253 grant from NSF. (Figure 180) With about half a million players, it is a prime example of a multi-level, single or multiplayer game that does a very good job of teaching complicated sustainability education, and provides a good model for future experiments.

Exhibits and Travel Trunks

Exhibits, both within the museum, as well as portable travel trunks are traditional methods for educating the public. Experiences by members of the California Academy of Science staff suggest that traditional exhibits on climate disruption fail to engage the public in a meaningful way, and need to be re-examined. This kind of format often includes graphs and charts that fail to convey the facts in a way that touches visitors emotionally, so the message eludes them. Because children learn well in tactile situations, travel trunks, commonly lent to schools, offer a rich opportunity for educating children regarding climate disruption and sustainability, if they can be created inventively.

Citizen Science Partnerships

Probably the most effective, affective, productive and fun approach available to museums for engaging their public are participatory citizen science

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[520] http://www.wolfquest.org/

projects. They can be engaged in by museum visitors from wide demographic categories. For example, a museum could work with mobility challenged members to take temperature readings and observe seasonality indicators in their neighborhoods. Small children could be taught bird identification, and do bird counts in their yards. Older children could have more complex projects, such as monitoring local bird habitat areas. Schools could create projects that address science education standards. Many institutions have very successfully engaged their public in projects such as these, to good ends. These sorts of projects can yield substantial amounts of useful data for museums to use in research projects or exhibits. Citizen science is, by another name, just what Indigenous people and agriculturalists have been doing for millennia; however in this era of popular disenfranchisement from nature, it serves to reintroduce the idea, forging real bonds between museums and the public.

CHAPTER SIX:

CONCLUSION: *TERRA PUNKS*—A PLAN FOR ACTION

It is a world challenged by a panoply of Anthropogenic problems that we face today, and that will become ever more pressing during the ensuing decades of the twenty-first century. Museums offer the possibility of a social oasis, an arena where children can learn without fear of life-shattering grading, where adults can be inspired by innovative programming, and pithy information can be shared that helps, rather than terrifies or alienates the museum visitor. Museums can relocate themselves as the educational pivot points of their communities, drawing in their local universities, schools, senior centers, city administration, and Indigenous or other cultural communities to form a robust and inclusive collaborative home for learning and innovation.

This research has found that early efforts at creating successful climate disruption exhibits in museums have been discouraging; visitors tend to be annoyed by and ignore bar graphs and charts, and are sensitive to perceptions of dark, impenetrable, apocalyptic visions of the future. Presented with this kind of information, they tend to leave and not return until the exhibit has been taken down and replaced with something more upbeat. Americans are increasingly disengaged with nature, and experiencing a decline in educational scores, particularly in STEM fields, leaving young people ill-prepared to solve the complex scientific issues with which they will be faced in adulthood. This

complex array of deficits presents museums with an exhilarating challenge—how to interest and engage young people in thinking about Anthropocene issues in a truly meaningful and epiphanal way, helping them to develop knowledge, discover joy in nature, and equipping them with knowledge and skills that will give them agency to actively work for a habitable planet. I suggest that this is not the impossible task that it might at first appear. It requires an alternative route to youth engagement than the ephemeral experiences normally prepared for young visitors.

K-12 Citizen Scientist/Artist Community-Based TEK-Inclusive Mentoring

That alternative route to creating a path to science for children can be taken via citizen science/citizen art. *Citizen science* is defined by the Oxford English Dictionary as, "scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions."[521] Not a new practice, the term has been in Use for almost thirty years, in the United States and abroad. Coined in 1989 by the Audubon Society to describe their inclusion of 225 data collection volunteers in an acid-rain project, 'Citizen Science', as a practice took hold in the United States and United Kingdom in the early 1990s. Although people have been practicing citizen science for millennia, collecting and sharing

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[521] "Citizen Science, N.," *OED Online* (Oxford University Press), accessed March 21, 2018, http://www.oed.com.proxybz.lib.montana.edu/view/Entry/33513.

environmental data, citizen science as an academic practice has flourished with ready access to technology for data acquisition and delivery. As an established field worldwide, citizen science is represented by several large professional organizations, including among others, the Citizen Science Association,[522] based in the United States; the European Science Association,[523] based in Berlin, Germany; and the Australian Citizen Science Association[524] based in Sydney, Australia.

An early proponent and advocate regarding the utility of citizen science is the Cornell Lab of Ornithology. Beginning in 1997, Cornell began using citizen science volunteers to collect data; by 2018, their six citizen science programs include eBird, Project FeederWatch, NestWatch, Celebrate Urban Birds, Great Backyard Bird Count, and Habitat Network. Project eBird alone collects an average of 7.5 million bird observations monthly.[525] Cornell addresses numerous ornithological research questions, but they find citizen science data collection specifically useful in tracking climate disruption data:

> Climate has an enormous influence on where birds survive and reproduce. In the short term, weather can influence the timing of migration, territory establishment, breeding, and egg laying. Over the long term, species have adapted to seasonal weather trends. We combine data from citizen-science projects with long-term

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[522] "Citizen Science: Partnering the Public and Professional Scientists.," CitizenScience.org, accessed March 21, 2018, http://citizenscience.org/.

[523] "European Citizen Science Association (ECSA)," European Citizen Science Association (ECSA), accessed March 21, 2018, https://ecsa.citizen-science.net/.

[524] "Australian Citizen Science Association – Citizen Science Is Redefining How We Do Science," accessed March 21, 2018, https://www.citizenscience.org.au/.

[525] "What We Do Citizen Science," accessed March 21, 2018, http://www.birds.cornell.edu/page.aspx?pid=1664.

> weather data to examine climate's role in the changes we are seeing in the ranges of some bird species, as well as the timing and outcomes of breeding.[526]

As a Carnegie Tier-One research university, Cornell's thirty-plus year utilization of citizen science participation as a core data acquisition strategy has served to legitimize citizen science as a viable scientific protocol. Their procedural development of citizen science incorporation, data collection, and technology serves as a successful model for other institutions, both informally through social media, their web site, and word of mouth, as well as through academic publications. Wesley Hochachka et al provide valuable insights regarding the development of this process in their paper, "Data-intensive science applied to broad-scale citizen science" for example, they note:

> Similar to all studies based on observational data, analysis of broad-scale citizen-science data has two basic requirements. First, the observations mUst adequately represent the inferential population (e.g. the data need to represent the spatial region and time interval of interest or the group of species under consideration). Second, the data mUst contain sufficient information to estimate the quantity of interest while controlling for important confounding sources of variation, whether these confounding sources arise from other biological processes or from variation in the observation process itself. Because most observational data (i.e. data gathered through sensor networks, remote-sensing techniques, or citizen-science projects) are collected prior to analysis, achieving these goals will often constrain the range of research questions possible. For this reason, extra care is necessary for developing specific research questions and selecting the analytic methods. Similarly, the retrospective nature of this data-driven analysis paradigm places a greater burden on analytic methods to control confounding

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[526] "What We Do Citizen Science," accessed March 21, 2018, http://www.birds.cornell.edu/page.aspx?pid=1664#citsciThemeHighlights=1.

> sources of variation, and many of the existing methods of analysis are not always appropriate. [527]

This kind of informed, peer-reviewed analysis and publication regarding the challenges of developing a rigorous inclusion of citizen science, with specific observations about feasible data collection and analysis is invaluable for organizations contemplating their own project. Citizen science participation demographics, although less so, more recently, have tended to lean towards retired White males, people with more leisure time in which to engage in this kind of activity. Dr. Muki Haklay, co-director of the University College London Extreme Citizen Science group observes that,

> In many projects there is unequal participation in terms of gender, ethnicity, age, and socioeconomic backgrounds. In some cases, this is the result of the multiple prerequisites that are needed from participants – access to advanced smartphones and the Web, technical knowledge, and domain knowledge, as well as leisure time and the self-motivation to learn about the project and participate in it. Because citizen science can serve multiple goals (STEM education, awareness of scientific or environmental issues, provision of new information to scientists, monitoring, etc.), there is a need to carefully consider the trade-offs and to decide which of those will be addressed in a given activity. Local and city projects can be more inclusive, since the barrier to participation is USually low. As the project grows in scale, there is a need to carefully consider the target audience and the reach. A common misconception is that social media and the Web are enough to ensure wide participation, since there is no obstacle for anyone to be able to participate in the project. There is, therefore, a need to differentiate between ***potential participation***, which any website can be for any person with web connection (assumed to be over 3 billon people), and ***actual participation*** which is limited by skills, time, connectivity costs,

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[527] Wesley M. Hochachka et al., "Data-Intensive Science Applied to Broad-Scale Citizen Science," *Trends in Ecology & Evolution*, Ecological and evolutionary informatics, 27, no. 2 (February 1, 2012): 130–37, https://doi.org/10.1016/j.tree.2011.11.006. P. 132.

> and coverage, along with other aspects discussed above. *If the aims of the funder are to increase participation of disadvantaged groups, or to achieve improvement in STEM education to a specific group, then a purposeful activity must be designed to reach the target group and engage them in an effective way*.[528]

It is important to note that although as previously observed, the majority of Americans are intimidated by STEM fields, or find them boring, if children are introduced to science early, they can overcome this mental block through their own positive experiences. Citizen Science does not have to be *dumbed down* for kids to understand. Loree Griffin Burns demonstrates this in her book *Citizen Scientists: Be a Part of Discovery from Your Own Backyard,*[529] which is classified as juvenile literature, but gives an easily readable account of Monarch butterfly tagging, bird counts, frog identification, and ladybug mapping. Her book has good pictures, checklists of what is needed, an overview of the scientific relevance, and additional resources. A sharp five-year old could read this book themselves, or an adult could read it to them and help undertake one of the activities. This book would probably be engaging for a kid up to ten or so, and is a useful how-to guide for amateur or mentoring adults.

Science writer Akiko Busch observes, in The Incidental Steward: Reflections on Citizen Science,

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[528] Haklay, Muki, "Citizen Science and Policy: A European Perspective," Commons Lab Science and Technology Innovation Program (Washington, DC: Woodrow Wilson International Center for Scholars, 2015). P. 48.

[529] Loree Griffin Burns and Ellen Harasimowicz, *Citizen Scientists: Be a Part of Scientific Discovery from Your Own Backyard* (New York: Square Fish, 2012). P. 5-77.

> Routine and revelation have always been steadfast allies, and it is my suspicion that such an imagination arrives most frequently through measured work, and that local epiphanies are a common product of rote discipline. At a time when apocalyptic rhetoric so often colors the conversation around changing global ecologies, it may be useful to consider what are sometimes called repetitive motion tasks. My guess is that whatever degree of wildness happens to be required, it is likely to come through the conjugations of ordinary action, through that impeccable eye and certain hand that come from the repetition of familiar gestures—whether it is weeding the river of water chestnuts every July, counting the eels coming into the tributary every Monday in the spring of your sophomore year in high school, or taking the temperature at the same time and same place every morning of your adult life.[530]

Although Busch is referring to the experience of an adult, she echoes closely Montessori's observations regarding optimal learning strategies for children.

A Plan for Action: Terra Punks Education Collaborative

I propose the creation of an ambitious, nation-wide K-12 citizen science/citizen artist pilot program, with the working name of Terra Punks Educational Collaborative (TPEC). Terra Punks would be composed of regional collaborative component programs, each focused on the land, people, and biotic history of their particular landscape. For example, in the Pacific Northwest/Columbia River region—the Salmon Punks Collaborative; in the Great Plains—the Buffalo Punks Collaborative. TPEC would be a collaborative, interdisciplinary, cross-institutional citizen science and citizen art program,

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[530] *The Incidental Steward by Busch, Akiko Published by Yale University Press 1st (First) Edition (2013) Hardcover*, First (Yale University Press, 2013). P. 208.

educating and inspiring Indigenous and non-Indigenous youth about climate disruption and proactivism, literally grounding children in science and their world. Children in Indigenous, coastal, and island communities are disproportionately impacted by climate disruption; *TPEC* would empower children to create social and technical solutions to global climate disruption by educating, mentoring, and supporting their environmental scholarship. This program could feasibly address the multiple problems discussed previously, most specifically, the poor science skills in American children, lack of teacher time to undertake this task, and declining educational funding.

The TPEC pilot program would most viably be funded and launched as a scalable Citizen Science/Citizen Art project focused on the pollinators—bees, bats, butterflies, birds—that are critically import to our food supply, sensitive to climate disruption, found in most localities, and familiar to children. The collected data could be of real value to agricultural scientists and others, and grants could potentially be found not only from the National Science Foundation, but also possibly through other granting agencies such as the U.S. Department of the Interior, or the United States Department of Agriculture. Although government funding agencies have become politically leery of supporting climate change initiatives, TPEC is primarily providing much-needed STEM support to American children, and as such, grant proposals could be written focusing on the low cost/high impact per-served-child in increased acquired science, language and art skills, rather than the underlying contextual

issues of their data collection and cross-cultural education. Although federal funding has become increasingly slim under the current administration, administrations do change. Less changeable are the motives of large corporations; although accepting corporate support might be a faster route to funding, it would also potentially damage the credibility of TPEC beyond repair. The emerging field of environmental philanthropists, such as the Leonardo DiCaprio Foundation, or the Ray C. Anderson Foundation, offers a growing opportunity for funding separate from either federal or corporate funders.

TPEC will create K-12 pollinator data collection and analysis exercises, teaching increasingly complex academic skills and environmental awareness over the duration of students' participation. Students will be mentored by environmentally knowledgeable seniors; First Nations/Indigenous youth will be supported in appropriately sharing traditional ecological knowledge as vetted by elder knowledge holders of their community. *TPEC* will bring Citizen Science and Citizen Artist students together with university faculty and museum staff to conceptualize and create scientifically sound, emotionally evocative exhibits and programs. Following a successful pilot phase, *TPEC* could expand to include sister communities, and eventually to interconnect globally with compatible programs.

The key to successfully constructing this TPEC program is to cast a net across the participant community, drawing on many constituent entities, so

none is too taxed. These entities would include:

1. Local museum; curators, exhibits, education and programs staff
2. Local university or college; faculty and graduate students
3. Students and their families
4. K-12 School district; teachers and administration
5. Local Indigenous community, and
6. Elder mentors

These community entities may have no history of connectivity, or one of periodic or occasional interactions. However, if they are all included as weight-bearing partners in TPEC, they will generate a synergistic support of the community children's education. John Kretzmann's work on *Asset Based Community Developmen*t cannot be over-estimated in its value. Summed up in his volume, *Building Communities from the Inside Out: A Path Toward Finding and Mobilizing a Community's Assets*, Kretzmann introduces the idea that communities are rich in untapped and unrecognized resources.[531] He observes that when one approaches a community project from the stance that the community is bedraggled, downtrodden, and in need of saving, said project is likely to flounder from lack of interest, since the constituent base has been implicitly defined as incompetent. However, if one creates an inventory of skills possessed by community members, the project perception is transformed

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[531] John P. Kretzmann and John L. McNight, *Building Communities from the Inside Out: A Path Toward Finding and Mobilizing a Community's Assets* (ACTA Publications, 1997).

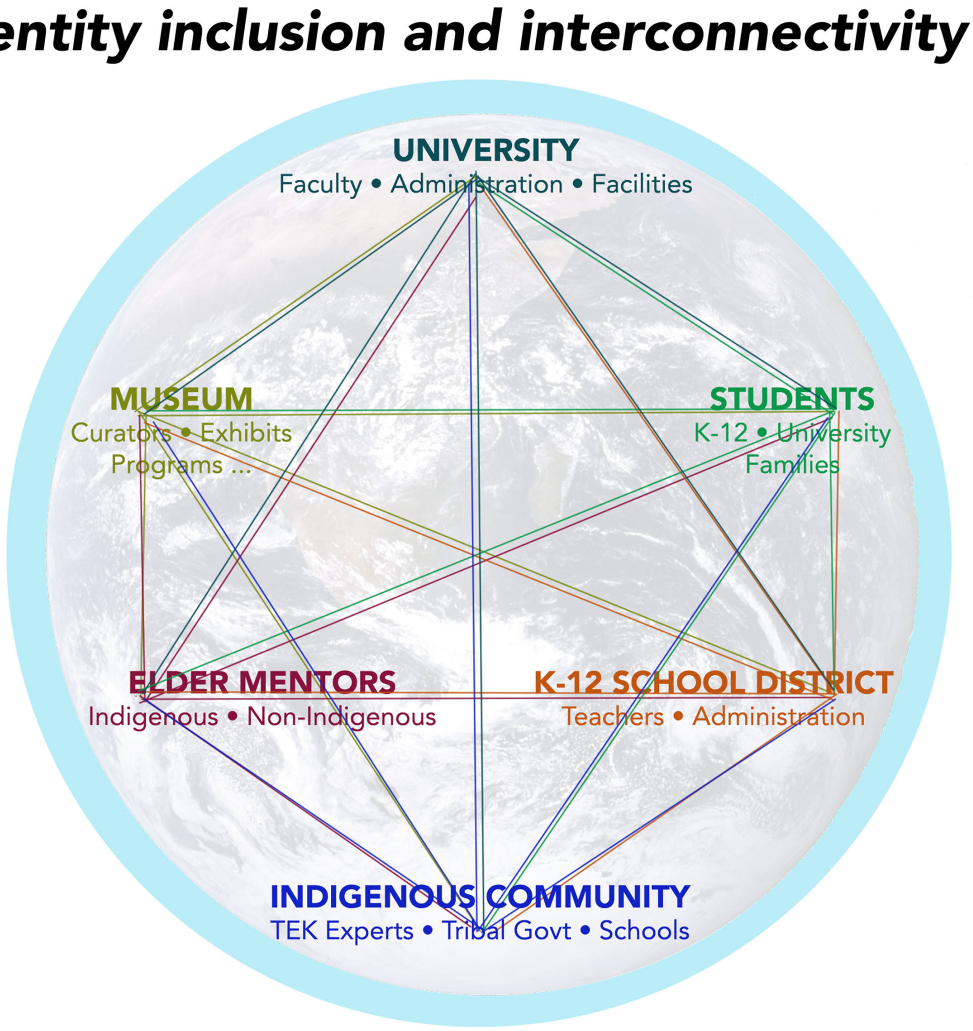

Figure 181. Terra Punks Entity Inclusion and Interconnectivity
IMAGE COURTESY: J WOODCOCK-MH

from one of humiliating charity to empowered agency. Kretzmann specifically discusses how important it is to Use this agentic technique in Native American communities, which are so often viewed by government agencies and the public as disempowered, as well as with youth and seniors, also generally

regarded as demographic groups without agentic value.[532] Kretzmann provides very specific instructions on how to go about creating a community inventory with the goal of completing a community-based project.

His premise may be summed up in the idea that the greater part of most projects lies in the human resources needed to imagine and complete them—including the finding of financing. This premise is in contradiction to current American perceptions that ordinary humans are at the mercy of an uncaring state, and without the ability to do much about it in a country where votes are bought and sold. We see headlines everyday about Medicare and children's food security programs sitting on our elected official's chopping block. This reality means that if progressive programs are to be created, they probably need to be created primarily from the human resources at hand, rather than relying on the generous government funding enjoyed in the late 1900s by social, scientific and environmental programs and agencies. Ironically, in the twenty-first century, faced with Anthropogenic catastrophe, the solutions are least likely to be funded. A conundrum, until one considers the implications of Kretzmann's successful work in diverse communities, over decades.

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[532] Kretzmann, *A Guide to Capacity Inventories: Mobilizing the Community Skills of Local Residents : A Community Building Workbook from the Asset-Based Community Development Institute, Institute for Policy Research*. P. 29-68

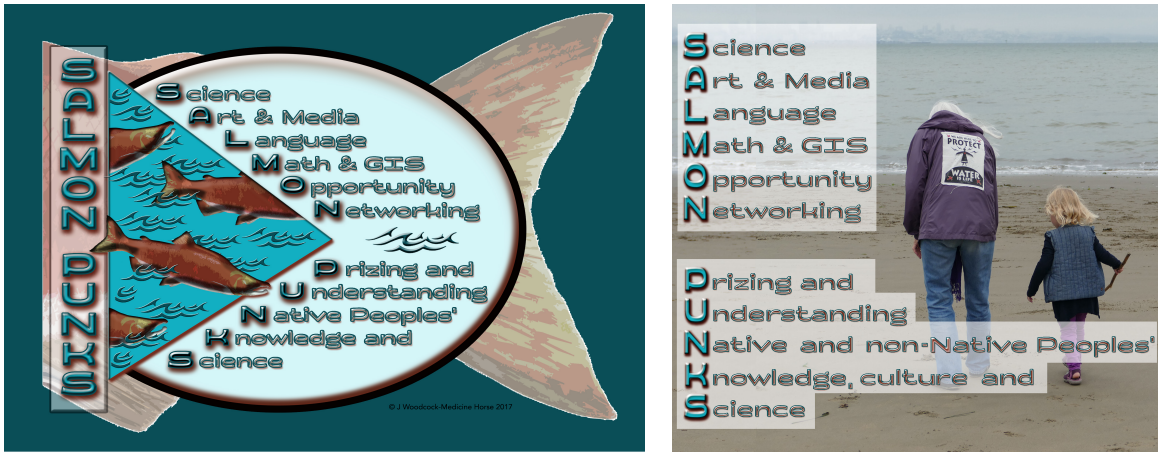

Figure 182. Salmon Punks acronym and concept, NW Coast & Plateau.
IMAGES COURTESY: J WOODCOCK-MH



Figure 183. Buffalo Punks acronym and concept, Great Plains.
IMAGES COURTESY: J WOODCOCK-MH

1. Local Museum; curators, exhibits, education and programs staff

Although a number of museums, including for example, the Anchorage Museum's *Gyre* lessons, and California Academy of Sciences' extensive teacher

resources, including their Science Pedagogy Workshops,[533] the problem remains that teachers may well not have the time to avail themselves and their students of these resources, as much as they might wish to. The solution that TPEC offers is to essentially outsource this education, allowing teachers a respite, knowing that the education being offered to their students is both pedagogically sturdy, and of direct assistance in addressing math, science, art, and language arts standards.

Museums are an ideal host for this collaborative project, as they are usually located at the heart of their community, children are usually familiar with their museum from field trips or family visits, and they have a wide range of staff to work with the Citizen Artist students to conceptualize ways in which their TPEC pollinator data can be transmogrified into meaningful exhibits or programs for the public. STEM learning is necessary, but equally important is the role of Citizen Artists in interpreting this data for the public.

TPEC will bring Citizen Science and Citizen Artist students together with museum staff to conceptualize and create scientifically sound, emotionally evocative exhibits and programs to be presented at the host museum, then sent travelling to other museums and schools, and housed digitally. The ready familiarity that many children have from relatively brief interactions with their museum can be deepened into meaningful and epiphanal educational

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[533] CA and 94118 United States379-8000, "Professional Development," California Academy of Sciences, accessed March 21, 2018, https://www.calacademy.org/educators/teacher-professional-development.

experiences when these interactions happen regularly over years of mentorship. Many museums have as part of their mandate, an obligation to serve their community; this is an excellent manner to discharge that responsibility.

It would be ideal if the museum could set aside a dedicated space for students' initiatives. Although the very youngest students would be less likely to be concocting ideas for exhibits, they would be delighted to be able to participate in one. The Tohono O'odham Museum has a hallway dedicated to students' artwork, and staff report that it is very meaningful for students and their families to be able to visit their art in the museum. After years of mentorship, and a growing understanding of the exacting standards and creativity required for a museum exhibit or program, high school art students could certainly be able to co-create exhibits, films, performance art, community workshops or other museum events, providing them with an invaluable portfolio as they move on to college or a career.

2. Local university or college; faculty and graduate students *TPEC* program staff, in collaboration with university faculty and graduate students, can create a set of K-12 age-appropriate, meaningful pollinator data collection exercises feasible in the community, and of genuine scientific value. Pollinators are an excellent choice because children and adults can all find a way to care about the peril of pollinators being affected by global climate disruption and other anthropogenic factors, such as biocides. The primary pollinators are bats,

bees, birds, and butterflies. For the dinosaur-loving crowd, a project with bats or bees would probably be endearing. For those more entranced by fairies and

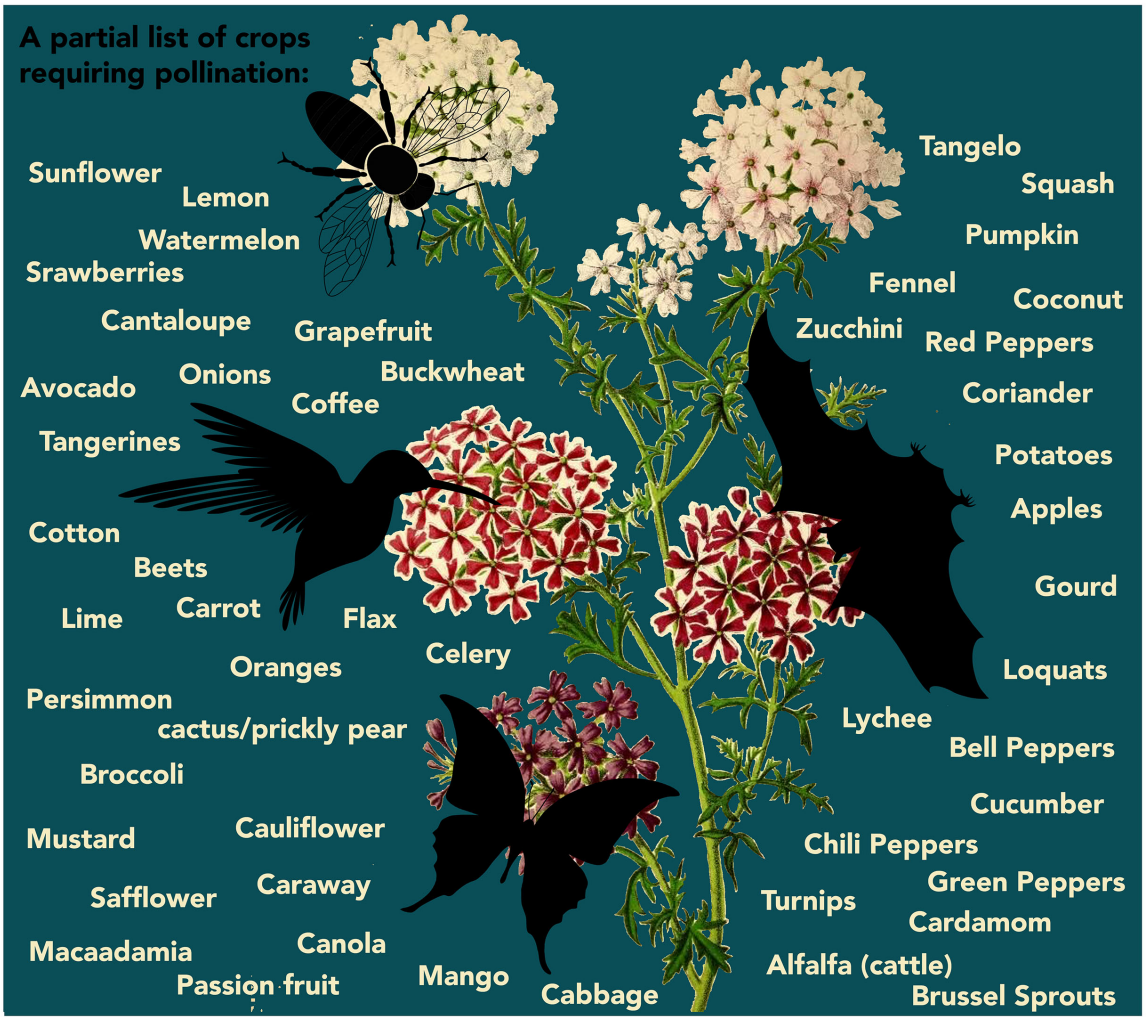

Figure 184. A Partial list of pollinated crops.
IMAGES COURTESY: J WOODCOCK-MH

elves, the butterflies and birds would probably suit better. All of these organisms are currently suffering from critical issues—bees are affected by colony collapse disorder, bats, fruit pollinators, are suffering population decimation from nose fungus disease. The list of crops requiring pollination

includes something that every child and adult will care about will care about—it is an easy way in to a scientific project, and also one that lends itself to starting simply, and moving into more complex territory as children mature as scholars through the years.

As discussed by Hochachka et al, there can be analytical constrictions with using citizen science collected data, if the research plan is not thought out carefully in advance. Entomology and other university faculty would be invaluable in collaborating on a pollinator research data collection plan that would provide scientifically viable data. This could also be a very interesting project to engage graduate students; the research plan as a whole would need to be coherent and useful; within the pollinator data collection plan, it would need to be stepped up in complexity each year, through high school.

Although the role of the university personnel would probably be more directly with TPEC program staff, it is probable that there would be excellent opportunities for mentorship of engaged students, either by faculty, or graduate students. This kind of mentorship and role models is truly inspiring for children, and would be helpful in making their participation cohere for them. University faculty and graduate students would also be excellent advisors regarding the most pertinent scientific skills to teach at each grade level, becoming increasingly complex.

For example, Esri provides K-12 age-appropriate GIS software; the Esri Education Outreach Team provides extensive support in explaining best

practices, solving problems, and training instruction.[534] Introducing kindergartners or first-graders to the concept of visually recognizing and mapping their world, then constructing interactive data layers to explore interactivity of elements over time and space may sound unrealistic, yet it is precisely what Montessori would remind us that they are capable of at that age. School children are often given faux projects to explain concepts, but how much more meaningful to start one's education with real projects, rather than trivial exercises. A key early experience for this pilot cohort would be to take them on a campus visit to meet their faculty, and see their data at work. As the students progress through the thirteen years of the program, advanced students could realistically be expected to be able to co-author papers on TPEC pollinator data, which would be an enormous advantage to them as they apply for college.

3. Students and their families Climate disruption, already affecting every human on the planet, will effect dramatic impacts and disruptions in the adult lives of these students. Unprepared, they would grow to maturity in a world crushed by the unchecked consequences of global climate disruption. *TPEC* is intended to address this seemingly insurmountable problem by recruiting the optimism and unbridled creativity of children, educating them, mentoring them, and empowering and supporting their intelligent ingenuity in

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[534] "GIS for Schools | Esri Education," accessed March 21, 2018, http://www.esri.com/industries/education/schools#%20.

understanding their environment and creating social and technical solutions to global climate disruption. Museums cannot singlehandedly solve entrenched social issues, but they can provide an opportunity for new perspectives and knowledge to gain a footing.

TPEC offers museums exactly that kind of opportunity to connect with children and find safe ways to engage them with nature. TPEC is conceptualized as being regionally grounded in the local environment. Salmon Punks Collaborative would be housed in the North West Coast/Plateau salmon country; Buffalo Punks Collaborative would be housed in the Great Plains region, buffalo country. These would be very easy areas to get children out into nature. However, it would also be quite possible to design an urban version, forming connections for children with the activist urban farmer movements that are building in major metropolitan areas, such as San Francisco and Oakland California. An excellent example of a potential partner is the Acta Non Verba Youth Urban Farm Project, which has an after school program, and summer camp.[535] Of their fifteen community partners, none is a museum. Most American children live in either single parent families, or families where both parents work, possibly more than one job. TPEC provides these families with an opportunity to give their children fascinating, intellectually challenging experiences after school or on the weekends,

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[535] "Acta Non Verba - Youth Urban Farm Project - Oakland, CA," Acta Non Verba, accessed March 21, 2018, https://anvfarm.org/.



Figure 185. Acta Non Verba Youth Urban Farm Project
PHOTO COURTESY: ACTA NON VERBA YOUTH URBAN FARM PROJECT

supervised by safe, invested adult mentors, without fear that their children will come to harm. In the longer view, not only would TPEC provide children with an interesting weekly outing and advanced academic skills, participation through high school would give the students a strong advantage in applying for college, in that they would have not only the technical skills, but also the earned personal confidence that comes from working alongside adults, as a young person.

4. K-12 School district; teachers and administration K-12 school districts, from the superintendent to the classroom teacher must all toe the federal Standards line. TPEC is intended to alleviate some of that pressure by providing

an intensive, long-term, solution to addressing STEM, art and language arts standards. During the curriculum development phase, TPEC staff would work closely with school district staff to ensure that the research curriculum was closely aligned with the requirements of the grade level standards. This would allow the teachers to focus on other content areas, secure in the knowledge that their students would be learning required content outside the classroom in a structured and accountable manner. It would be advisable, if FERPA restrictions allowed it, to monitor the testing success of TPEC participant students, looking for patterns of success or areas that could be adjusted for improvement.

5. Local Indigenous community The intent of TPEC is to locate an Indigenous/First Nations community that would be interested in participating, and collaborating in developing the curriculum and program design. The nexus of Indigenous and Western Science offers tremendous opportunities for TPEC participant children to gain an entirely new perspective about living life on this planet. Non-Indigenous TPEC children would learn by exposure that the mass marketed mainstream cultural values in which they had been immersed from birth have a viable alternative, the strong community values shared by many Indigenous communities. Dr. Muki Haklay discusses the complexity of conducting citizen science with Indigenous people:

> Another challenging area is the opening up of local and Indigenous knowledge across the world, through its integration in citizen science. The increase in recordingof information can lead, inadvertently, to the release of sensitive information suchas the

> location of an endangered species. At the personal level, there are privacy considerations and reduction of risk to the participant in cases where they have recorded information at their home. With the growth in citizen science and the engagement of Indigenous groups, there is a need to ensure that mechanisms for consent to participate, protection of information, ensuring intellectual property rights, and other aspects are in place, in accordance with international best practices, such as the International Labour Organization (ILO) Indigenous and Tribal Peoples Convention from 1989, or the ethics guidelines of the International Society of Ethnobiology. Importantly, many of the guidelines and the need to ensure ownership and control over local knowledge are also relevant for other situations of community-based participatory research.[536]

Indigenous people have experienced intellectual property robbery since the point of contact with Europeans; close collaboration with an understanding that the Indigenous community might have data that they are interested in collecting, but do not wish to share. In such case, it would be very useful to employ a tool such as Mukurtu,[537] allowing tribally determined access to information.

Because TPEC would be incorporating students from different communities and schools, collecting different data in different environments, an important part of the program would be regular mini-conferences, perhaps seasonally, to compare data, create and refresh acquaintances. It is a crucial part of developing TPEC that Indigenous participant youth would be supported in appropriately sharing traditional ecological knowledge, with the understanding that this would require close monitoring from culturally

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[536] Haklay, Muki, "Citizen Science and Policy: A European Perspective." P. 58.
[537] "Learn."

knowledgeable tribal elders. It is a subtext, but an important one, that the mixing of participant children from Native and non-Native backgrounds would allow cultural differences to be demystified and appreciated. It is important that the youngest children be included in the seasonal workshops, in part because of this social goal. Racism can become impenetrably entrenched in older children, so to provide an alternative as early as possible would be useful. Including the elder mentors in the seasonal conferences would be valuable as well, in providing traditional ecological knowledge that may be illuminating for all. In addition to working collaboratively between tribal elders, scientific curriculum developers and TPEC staff, it is equally important for the tribal knowledge keepers to be part of the collaborative process with the museum participants from the very beginning.

As discussed previously, many museums have, or have had, very tense and potentially abusive relationships with tribal communities; this is an opportunity to work collaboratively and get an initiative right, from the beginning. For the collaboration to be productive and positive for all, the Indigenous participants must be core participants, and in now way be made to feel like an after thought or less intellectually rigorous than other participants. This may require some cultural education of non-Native collaborators.

6. Elder mentors Students will be matched with environmentally knowledgeable seniors to accompany them on their data collection trips, providing for both their safety and increased knowledge. These adults would be

screened with thorough background checks, and licensed and bonded as appropriate. Some children may have a ready and able mentor of their own; others would be matched, using a model such as Big Brothers, Big Sisters, in an effort to get a good match. The mentors would be thoroughly trained regarding the science and data collection protocols, and would accompany the children on their data collection trips after school or on the weekend. Seniors in America all have either a conscious or latent knowledge of climate disruption and are thus well suited to accompany the child on these data collection trips,



Figure 186. Bill Woodcock discussing a dead seal with Astrid Woodcock.
IMAGE COURTESY: BILL WOODCOCK IV

because they can contextualize the environment for the child.

An additional consideration is that, to recall Tennyson, “Nature, red in tooth and claw,” can be startling when encountered by a young child. Although young children can have quite an affinity for the gruesome, having an adult

along to discuss unanticipated surprises is cautious. While many other cultures revere their elders, in America, seniors are generally shuttled out of site as soon as possible after retirement. To be so summarily dismissed after accruing a lifetime of experience is not only extremely rude, but a shocking waste of cultural capital. It also would seem to be a rewarding and entertaining experience for the senior mentors, to be able to share their knowledge and enjoy accompanying the children.

After a successful pilot phase, TPEC could be expanded to include sister communities around the United States, and to interconnect globally with similar programs such as FrogID at the Australian Museum in Sydney, Australia. For young people growing up in an increasingly globalized world, forming environmentally-based connections with their counterparts around the world could be eye-opening both culturally as well as academically.

TPEC offers museums a politically neutral way to introduce students to their environment, and the changes that they will observe over the duration of their participation. It gives museums an opportunity to form bonds with their Indigenous community, creating a forum for dialogue and building new alliances. It creates an enduring bridge with community schools, relieving them of pressure to teach science, while encouraging mentorships with adult scientists and museum professionals. It brings seniors back into the active community in a new participatory role. It creates many opportunities for community children to grow and thrive academically and creatively, preparing

them to thrive in their future academic or work endeavors.

TPEC offers museums an opportunity to reposition themselves not as a static provider of information, but as a pivotal community asset, building networks between many community entities for the betterment of the youth. The common phrase, "it takes a village to raise a child," is embodied in the Salmon Punks/Buffalo Punks Collaborative.

In Conclusion

Each of the ten museums in the research pool collectively exhibited a unique set of knowledge and practices only minimally overlapping the other museums. The greatest point of similarity was the degree of siloing, or isolation, experienced both by individual museum employees, and by their institutions relative to other institutions. All of the museums participated in a wide array of sustainability practices, however, there was a spectrum regarding whether practices were adhered to out of principle, or because they were cost effective. No museums were satisfied with the success of their climate disruption exhibits, if they had attempted to create one. The Anchorage Museum was in the initial stages of creating their *Gyre* exhibit when I was on location conducting interviews; *Gyre*, an interdisciplinary art/science approach was the most successful and popular approach to addressing climate disruption or Anthropocene issues of any initiative that I observed.

Although Indigenous peoples worldwide are most susceptible to climate

disruption consequences, the three Indigenous museums were most focused on cultural sustainability rather than on environmental sustainability. Political divisiveness in America has put museums in a difficult position regarding exploring climate disruption with the public. However, creating a community-based environmental education after-school program, inviting collaborative participation from their local Indigenous community, would allow a museum to redefine its position in the community, building bridges and enhancing children's successful learning of environmental and scientific knowledge, presented in the museum through programs and exhibits.

According to a 2008 study by Reach Advisors, a strategy and research firm specializing in museums, 84% of science museum patrons found information presented by museums to be *very trustworthy*, 8% found it *somewhat trustworthy*, 7% *hadn't thought about it*, and only 1% found it *untrustworthy*.[538] *The IMLS National Study on the Use of Libraries, Museums and the Internet* report by the Institute of Museum and Library Services similarly reports that, "Libraries and museums are the most trusted sources of information according to a survey of over 1,700 adults."[539] According to the American Association of Museums, there are at least 33,000 museums in the United States, or an average of 660 museums per state.[540] This figure may not include institutions such as tribal cultural centers that serve and function as

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[538] http://reachadvisors.typepad.com/mUSeum_audience_insight/2008/11/trust-are-we-trusted.html

[539] http://interconnectionsreport.org/reports/ConclUSionsSummaryFinalB.pdf

[540] http://www.aam-US.org/aboutmUSeums/abc.cfm

community museums but may not be self-classifying as such, bringing the total count of museums, libraries and cultural centers even higher.

This impressive statistic leads one to ask further questions, such as:

- Is this public trust in museums well placed?
- Where do museums get their information from regarding climate disruption and sustainability, and are their sources credible?
- Do the museums present this information about climate disruption and sustainability to the public in a factual or biased way?
- Is there an effective way to tell the difference at this point? and,
- How do they convey their credibility in this hotly contested field?
- If the museum chooses not to present this information, why do they make that choice?

It has been the intent of this research to delve into these questions and attempt to reach some conclusions, by posing both factual and open-ended interview questions to the museum staff interview subjects addressing the Green infrastructure practices and sustainability or climate disruption pedagogy of the museums included in the study group. Because each museum is unique, not all questions were germane to all museums, and because the interviews were conducted eliciting a story-telling response, in some cases, the respondent did not answer the question asked, but answered a question I didn't know to ask. Employing the social and academic tools of Indigenous Methodology was very advantageous in conducting fruitful interviews; the

interviews were less formal and more forthcoming than most of those conducted with amore formal approach and a standard list of questions for each interviewee.

It was a surprising but definitive finding that the Indigenous museums are significantly less focused on climate disruption and environmental sustainability than the medial museums, although there is a much stronger rally in Indigenous communities at large on this topic, as demonstrated by the numerous Indigenous conferences on climate disruption. Untangling this conundrum was key, since Indigenous communities are disproportionately impacted by climate disruption consequences. Further research more broadly among Indigenous museums, as well as at an international scale would be enlightening.

It is technically true that I could have completed a skeletal version of my work with one or two museums, but the purpose of creating a snapshot of sustainability across a wide spread of museums would not have been achieved. Clearly, a book is the next right step in moving from the theory-driven paradigm of a dissertation to a concrete manifestation of the hundreds of useful and interesting ideas shared with me in interviews for distribution to the museum community. I very much look forward to that next step.

APPENDICES

APPENDIX A

GYRE: THE PLASTIC OCEAN



Plastics in Motion

Created by Center for Alaskan Coastal Studies

Essential Questions:

How do people affect coasts and the ocean?
How do physical processes influence human effects on marine ecosystems?

Enduring Understandings

- Watersheds, rivers, wetlands, and the one big ocean of the world are an interconnected system.
- Climate patterns cause physical changes in the environment.
- Physical changes in the environment can challenge the conditions for life.
- Marine ecosystems are dynamic, with physical changes occurring on a daily, seasonal, and long-term basis.
- Weather systems and ocean systems have major influences on each other and the transport of solids and liquids in the ocean.

Objectives

Students will understand that air and water have different densities at different temperatures and that these density differences drive global and local patterns of air and water movement in wind and currents. They will recognize how the Coriolis effect influences wind and current patterns, and how this can create ocean gyres. They will create a flowchart of plastic movement to the ocean, detailing how physical factors power this movement and how people can stop it.

Concept

Temperature-dependent gradients of density drive the movement of air and water in winds and currents. As hot air or water rises, cool air moves in to fill the space left behind. This movement is deflected by the rotation of the earth, called the Coriolis effect. Marine debris is transported by both winds and currents. Debris large and small tends to accumulate in ocean gyres, such as the North Pacific and North Atlantic gyres.

Materials

- Science notebooks
- Pencils
- Tape
- Small strips of paper
- 2 or more thermometers
- Clear density tube or graduated cylinder
- Food coloring (blue and red)
- Hot water
- Cold water
- Computer/laptop and projector or SmartBoard
- Internet connection
- Globe or map of Earth
- Sphere or cylinder that can be drawn on
- Dry-erase markers

Background

This lesson focuses on winds and currents that move marine debris around the world. The lesson is mainly based on global rather than local systems, but can include local components. The first subject in the lesson is the movement of heat and cold on earth and to see how they interact when they meet. The second step is to look at the different densities of hot and cold water and air. The third step is to look at the Coriolis effect on global wind and current systems. Finally, applying these concepts to local wind and current factors helps connect students to surroundings.

Preparation

Identify a door or window to the outside that can be opened, and move furniture for easy access to this spot. Prepare insulated containers of hot and cold water. If you have not done a density experiment before, practice pouring the cold and hot water before demonstrating it to the class. Set up a computer and projector or SmartBoard to show the Majestic Plastic Bag mockumentary (http://www.youtube.com/watch?v=GLgh9h2ePYw). Also load the NOAA Global Science Investigator for marine debris in the North Pacific Gyre (http://www.csc.noaa.gov/psc/dataviewer/#view=mdebris). Research to find out if there is local drift card information available for your area.

Introduction

Begin by showing the "Majestic Plastic Bag" mockumentary on YouTube (http://www.youtube.com/watch?v=GLgh9h2ePYw). At the conclusion of the video, ask students to write their reaction in their science journal. As a group, brainstorm different pathways plastics follow to the ocean. Have students sketch a quick flowchart of a piece of plastic's journey to the ocean.

Procedures & Activities

Explain to students that marine debris are transported by winds and currents, which are driven by temperature differences in water and air masses. Choose one or more of the following activities to explore this concept:

Hot Air/Cold Air Demonstration

Conduct a temperature demonstration by asking for two volunteers. Crack open a door or large window that leads outside. Have one volunteer hold a thermometer at the top and another person hold one at the bottom. Read and record the temperatures. The top temperature should be higher than the lower temperature, demonstrating that heat rises and cold air fills in below it. Explain to students that hot and cold air have different densities. Because molecules in cold air are less energetic and move more slowly, it is denser than warm air, where molecules are more energetic. The more dense cold air sinks as less dense hot air rises.

Water Density Tube

Next, reiterate this concept by creating a density tube with water. Add a drop of red food coloring to hot water and a drop of blue food coloring to cold water. Ask students to make a prediction in their science notebooks about what will happen when the cold and warm water are put in the same density tube. Pour hot water into the density tube or graduated cylinder. Holding the density tube at an angle, carefully and slowly pour the cold water into a density tube so that the water runs along the side of the container before mixing with the cold water. Observe as a class what happens to the less dense hot water and denser cold water.

Classroom Draftometer Observations

Explain that as water or air warms, it rises. This creates a sort of vacuum below, which is filled by cool air or water. Build simple “draftometers” with students by having them tape a small strip of paper hanging vertically from a pencil. Have students hold the pencil horizontally with the paper hanging down. Any movement of the paper will identify areas of air movement in the classroom. Allow students a few minutes to measure drafts around the classroom and see for themselves how small air masses are flowing throughout the classroom based on differences in temperature and thus density. If you have extra thermometers, have them measure the temperature in low-lying drafty areas and compare it to the temperature above these drafty areas.

Current Predictions and the Coriolis Effect

Introduce a globe or map of the Earth. Ask the class to consider which areas of the earth are warm and cold and what would happen to the air and water in those areas. Ask students to sketch a basic map of the Earth in their science journals and predict the direction of winds and currents based on areas of the Earth that are hot and cool.

Once all students have made their predictions, explain that the warm equatorial water/air rises and moves the north and the cool polar air/water flows along the surface toward the equator. The zones where warm and cold converge are the areas that create the main currents and winds on earth. The currents and winds interact with each other, which changes their direction from what you might predict. The winds and currents are also deflected by the rotation of the Earth. This is called the Coriolis effect, and deflects winds

and currents to the right in the northern hemisphere and to the left in the southern hemisphere.

For more advanced classes, you may choose to demonstrate the Coriolis effect by using a cylinder or sphere that can be drawn on with a dry erase marker. Spin the object and have a student draw a line from the center to the top and then from the center to the bottom. The lines should be curved-pointing the same direction. This shows how objects moving across the rotating earth are pushed.

Effect of Real Currents and Winds on Marine Debris

Show an actual global current and global wind model. Use the Global Science Investigator to demonstrate the path of drifter buoys into the North Pacific Gyre (http://www.csc.noaa.gov/psc/dataviewer/#view=mdebris). Discuss the transport of plastic and floating debris across the globe's ocean. Explain that there is really only one ocean, and water moves around it in surface and deep ocean currents. As currents are deflected to the right (or to the left in the southern hemisphere), this creates a circular pattern. Water tends to "pile up" within these circular currents, called gyres. Currents concentrate marine debris in these gyres, creating what are sometimes referred to as "ocean garbage patches." A good supplemental activity that illustrates the movement of marine debris by ocean currents can be found in the Alaska Seas and Rivers Curriculum, Grade 7, Investigation 1 – Where Did the Rubber Bath Toys Go? (http://seagrant.uaf.edu/marine-ed/curriculum/grade-7/investigation-1.html)

Finally, bring the concepts of wind and current to a local level. If you are located near the ocean, discuss whether your area experiences a day breeze on hot days. This is caused when the sun heats the land, causes warm air to rise from it. This space is then filled by cool air off the ocean. The reason the winds don't come straight off the ocean? Coriolis effect! Talk about the factors that drive heat and cold in your area and how they might affect local transport of debris. Ask students to write in their science notebooks to explain a local weather or current pattern based on the information presented in this lesson. Discuss some of the areas local bodies of water are likely to "receive" debris from, and where local debris may end up. Use local drift card models to confirm predictions if available.

Wrap-Up & Extensions

Ask students to revisit the flowchart they created at the beginning of the lesson. Have them identify the different physical factors that affected the transport of their plastic piece to the ocean. These physical factors will include the movement of air and water due to density gradients and the Coriolis effect, but students should also consider such factors as tides and gravity. Ask them also to identify three ways that they could interrupt this flow of plastic to the ocean (i.e., proper disposal of plastic, recycling, reusable bags, cleaning up litter, filtering technology, etc.)

This activity pairs well with Gyre Lesson 6: Plastic Gyre Dangles.

Evaluation

The initial flow charts serve as a pre-assessment, while the revised flow charts should illustrate student understanding of how weather systems and ocean systems affect each other and the transport of solids and liquids in the ocean, as well as the connection of watersheds to the ocean. Review the science journals for understanding of basic concepts of density-based movement of water and air and how this concept can be applied to understanding of currents, wind and local weather patterns.

Sponsors

Gyre: The Plastic Ocean educational programming is supported by the William Randolph Hearst Foundation and the Atwood Foundation.

APPENDIX B

SOUTH AFRICAN DROUGHT INTERVENTION MEASURES

In June 2015, outer towns in eThekwini imposed water rationing and a basic set of water stewardship rules:

To save water consumers should:

a) Avoid washing cars.
b) Avoid filling swimming pools.
c) Avoid filling water in the bath tub, Use a shower instead but keep it brief.
d) Avoid watering gardens with a hose pipe. Use a watering-can.
e) Avoid washing paving and roofs.
f) Report leaks and bursts to 080 13 13 013 or eservices@durban.gov.za as soon as you can.
g) Reduce the unnecessary flUShing of toilets.

By April 2016, water shortages had reached crisis levels; the city announced that it was initiating across-the-board daily water shutoffs from 9pm to 4am:

22 APRIL 2016
City's New Drought Intervention Plan
For immediate release;

EThekwini Municipality is severely affected by the current drought situation. Residents and businesses will experience on-going interrupted water supply until there is sufficient rainfall. Weather predictions indicate that there will be minimal rainfall in the next few months; therefore the available storage will be further depleted if we don't continue to save more water.

The Municipality is committed to working with residents and businesses to prevent areas going without water for a long period of time. However, it is necessary to reduce water supply and demand in areas that are supplied from the Midmar and Albert Falls Dam Systems.

This will be achieved by limiting water supply at night between 21h00 and 04h00 in the morning to allow the reservoirs to fill up for the next day. This intervention commences on Friday, 22 April 2016.

This dire situation requires all of us to change our daily water usage patterns.

Midmar Dam supplies water to areas such as Pinetown, Cato Ridge, KwaXimba, Umbumbulu, Georgedale, Hammarsdale, Shongweni, Salem, Umlazi and parts of Folweni.

Albert Falls Dam supplies areas such as Durban North, Umhlanga, Verulam, KwaMashu, Ntuzuma, Newlands, Westville, Reservoir Hills, KwaDabeka, Clermont, Pinetown, Queensburgh, Chatsworth, Umlazi and parts of Folweni.

The water level at Midmar Dam has dropped to 46% while Albert Falls Dam has reached a low of 34%.

Umgeni Water, which supplies water to eThekwini Municipality, has already started to reduce water supply in order to control the demand and usage patterns. This is very important because it will provide us with continued water supply.

In this way we can ensure that water is available to consumers during the day. The Municipality will engage businesses and public facilities to ensure their operational plans are in line with the current water management plan.

We are confident that this intervention will achieve the required water saving. However, if we are not able to achieve this, an option of limiting water supply during the day will be considered.

Other initiatives by the Municipality to achieve the saving of water include pressure reduction, installation of water meter restrictors, fines and penalties for those with high water usage.

The drought is a reality. However, together we can successfully reduce the impact of the drought by changing our behaviour every day. It is possible to reduce the amount of water we Use. We can all do it.

Play Your Part. Save Water Now!

In July 2017, the municipality announced the implementation of an

extensive 10-year water stewardship plan:

- Financial Sustainability
- Water quality
- Management capacity (Talent Management, Operational Resilience, Sound Governance)
- Water resources (ground water, effluent reUse, dams, sea water and rainwater harvesting)
- Water conservation and water demand management and;
- Infrastructure stability

Mashoko said the strategic objectives were to improve financial sustainability of the business by protecting and enhancing revenue streams, to optimise the usage of available water resources thereby ensuring security of water supply and to improve on accountability and governance. During his presentation, he said broad objectives of the plan include:

- Reduce Non-Revenue Water to <20% by 2025/26;
- Reduce System Input Volume (annual water demand) growth to <1%;
- To reduce unrestricted average domestic water consumption (wastage) by 25% by 2026;
- To increase water reUse to 100M/day by 2022;
- To install meters on all water connections (100%) by 2022 and,
- To ensure clean audit of the water bUSiness on a yearly basis.

Mashoko said the City's strategic approach would be to use the International Water Association water balance to ascertain the components and size of the Non-Revenue Water and to ascertain the geographical zonal distribution of the Non-Revenue Water in the Metro and prioritise the zones with the highest percentage and high return on investment. Further, the City will select the appropriate mix of synergistic interventions that will yield maximum gains such as pressure management and pipe replacement which must be married. "We will use the lessons learnt in the last ten years and avoid the mistakes made while maximizing on the interventions and methodology that yielded good results," he said. A two pronged approach to water conservation will be pursued namely; demand reduction from the consumer side and demand reduction from the utility side, Mashoko added. He outlined new targets by loss type for Non-Revenue Water:

- Real which comprises of bursts, leaks, high pressure and reservoir is currently at 30%. The target is 25% in the next five years and 17% in the next 10 years.
- For apparent losses which include inaccurate meters, billing errors and illegal connections, the current loss is 10%. The target is 5% in the next five years and 3% by 2027.
- Finally for authorised unbilled consumption which includes unmetered rural areas, unmetered informal, RDP, fire fighting and tanker services, the target is 5% in the next five years and 3% in the next 10 years, an improvement from the current loss of 10%. This plan will ensure benefits for the City. In financial terms, based on the cost of water at R5.33/kl, an average selling price of water R16.64 (9-25kl tariff) and an average sewer charge of R5/kl, the benefits are as follows:
- R229m annual savings from real loss reduction (implemented over 10 years);
- R1 260m annual increase in billed revenue from metered consumption (implemented over 10 years);
- R38m from the increase in sewer charges (implemented over 10 years).
- The combined annual benefit for the Water Conservation Water Demand Management Plan, is R1 489 000 000 per annum.

Mashoko provided an action status update on some projects including:

- Pipe replacement which is ongoing. The approach will be reviewed based on performance, criticality, vulnerability and network analysis,
- Leak detection and reservoir refurbishment will commence,
- Efforts underway in quick response to bursts and leaks. This will be intensified and resourced and a first level rapid response team will be created,
- Education and awareness campaigns, while ongoing, will be refocused and intensified,
- The installation of smart meters, valve control training and resizing of meters is still to commence while the replacement of aged meters to be intensified under the programme,
- The metering of informal settlements is very slow and a programme will be commence soon while the metering of rural properties will also be intensified,
- Pilots of treated effluent reUse are underway and,
- By-laws review will commence.

Mashoko said 68,000 water flow restrictors have been installed in the City to deal with the drought in the past year.

> "There are many issues we will be looking at. Water conservation has not previously been looked at gauging how we conserve water, education and awareness around this as well as by-law enforcement. Targets will be monitored," he added.[541]

Six months later, on December 17, 2017, the eThekwini city government announced that the drought was not yet over, and reminded citizens of the water conservation measures expected of every person:

> Drought Is Not Over Yet: Albert Falls Dam Critically Low
> Despite the recent welcomed rain, it was insufficient to end the drought with water levels in some dams still critically low. The current drought situation has worsened resulting in the level of Albert Falls Dam dropping further to 19.31%. The current demand of water from this system is exceeding the supply. The City is appealing to residents to reduce water demand by 15%. Various outer lying reservoirs are being shut at night to build up storage for the following day to meet the targeted savings. Mostly affected areas are those which are supplied by the Durban heights system which includes areas in the North, South, Central and Western regions. EThekwini Municipality further urges holiday resorts and holiday makers to Use water sparingly. Play your part in saving water this festive season by following these suggestions:
>
> - Fix leaking taps or report them to local authorities immediately. A dripping tap (one drop per second) wastes up to 30 litres of water an hour.
> - Do not fill up the bath tub or alternatively take a five minute shower.
> - Close the tap when brushing your teeth or use water from a cup.
> - Close the tap when shaving.
> - Do not rinse dishes under running water. Rather fill a basin to rinse dishes.
> - Avoid washing vegetables under running water; rather Use a bowl to do this. The water can be reUsed in the garden.
> - To check if you have a toilet leak, put a few drops of food dye in the cistern. If the colour slips into your bowl, you have a leak. A leaking toilet can waste up to 30 litres of water per hour.

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[541] "10 Year Water Security Plan for City."

- Hosepipe usage is prohibited during this period. Wash your car using two buckets of water. This can save up to 300 litres of water each time you wash your car.
- Wash your car on grass as this will water your lawn at the same time.
- Teach children not to waste water and engage them in water saving exercises.
- Only water your garden with grey water before 10am and after 4pm. Watering your garden while the sun is high wastes water as most of it gets evaporated into the air with the heat of the sun.
- Avoid watering on windy days as the water easily evaporates.
- Collect rain-water for irrigation purposes.[542]

In early February, the South African federal government declared a state of emergency and nationalized the drought response; the entire country was facing severe shortages and looming Zero Days.

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[542] "Drought Is Not Over Yet_Albert Falls Dam Critically Low."

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