NOTES FROM THE FIELD

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Northern Arapaho Language Revitalization with Virtual Reality

Abstract

In cooperation with elders of the Northern Arapaho Language and Culture Commission (NALCC), a language revitalization project using virtual reality is being developed, supported by a National Science Foundation grant. The origins of the project are explored, underlying methodologies examined, as well as the important role that the elders of the Northern Arapaho Language and Culture Commission play in guiding the goals of the grant: (a) exploring the potentials of virtual reality in language revitalization; (b) documenting spoken Arapaho language with an emphasis on hunting and animal migration stories and songs related to place names on the Wind River Indian Reservation and other locations in Wyoming and Colorado; and (c) developing virtual reality curricula units for Wind River Indian reservation K–12 schools. Difficulties in conducting research during the covid19 pandemic, especially with Indigenous communities that have been hit hard by the virus, impacted our methodology and project process. This project seeks to provide a blueprint for other scholars interested in working with tribes and grant agencies in using VR in language revitalization. The project engages the questions if and how VR and subsequent technologies can be used as decolonial tools to help reverse language loss and promote culture.

IN EARLY SEPTEMBER OF 2019, we climbed atop a stone monolith in the southeastern Wyoming region of the United States. The University of Wyoming (UW) archaeologist who brought us to the location named it the “Fortress.” The Fortress holds no Indigenous name within living memory even though it had been heavily inhabited by many Indigenous groups for millennia until the removals of Native Americans from the area in the 1870s and 1880s.
We visited the Fortress at the request of Nii’eihii Neecee, Northern Arapaho culture bearer and leader of the Northern Arapaho Language and Culture Commission (NALCC) to document this land for the tribe. The NALCC is a group of elders (usually eight members with a chair) whose first language is Northern Arapaho.¹ The NALCC was created in the 1980s to promote language and culture revitalization; the Northern Arapaho Tribal Business Council bylaws granted NALCC authority to determine language and culture curricula in reservation schools. The NALCC is seen by the Northern Arapaho tribe as the main cultural authority on the reservation.

The grounds around the Fortress are studded with thousands of rock flakes of all colors chipped off atlatl projectiles and arrow points. Flakes of dark red, yellow, and greenish-blue stand out against the sage and sandstone that dominates the area. Numerous bone flakes (bison, antelope, and deer) and fire-cracked stones from ancient hearths also crowd the area. A human-made earthen ramp runs up to the base of the Fortress, and ancient hand and foot holds carved into the stony sides give access to the top. A hollow area atop the Fortress that could hold several dozen people comfortably provides perfect shelter from the wind. The top and base contain many indentations for fires and thousands of stone and bone chips as well as pottery fragments (prehistoric pottery, the archaeologist tells us). Above the sheltered hollow, on the very top of the Fortress, dozens of human-carved holes pock the surface. The archaeologist tells us these holes may have stored maize as well as water.

The only nearby water source lies one and a half miles from the Fortress: a river named after the ranch family who owns the land.² We hiked there with the archeologist. Like the Fortress, the Indigenous name for this river and surrounding area is not known within living memory though the Northern Arapaho have recently renamed the area leading to the river the “Buffalo Roads.” Going down the small ridge to the river are deep veinlike channels worn through the lithified clay and into the bedrock: evidence of millions of migrating buffalo following one another for thousands of years, each hoof step collecting and carrying away small bits of clay and stone.

No buffalo have been through the area since the 1870s. The Arapaho were removed around the same time, shortly after the 1864 Sand Creek Massacre.³ By 1890, the buffalo were gone and the remaining Northern Arapaho were forced onto the Wind River Reservation in central Wyoming. The entirety of the traditional Arapaho homeland fell into governmental or private nonnative hands. The Fortress sits on a private cattle ranch owned, we were told, by the same family since the 1920s. Hundreds of thousands of bison bones and teeth remain. We found them in exposed cuts three, four, even five feet below the topsoil. Indigenous People hunted and harvested
countless buffalo over the centuries here. The archaeologist told us numerous tipi rings spot the ridges and plateaus beyond the Buffalo Roads. Apparently, large villages once surrounded these roads.

We came here to record the Buffalo Roads in 3D 360-degree, panoramic photography, video, and spatial audio to incorporate into National Science Foundation (NSF)—funded virtual reality (VR) project we are creating with the 3D Visualization Center (also known as the 3D Cave) at the University of Wyoming. We will add stories of buffalo migration and buffalo hunting in the Northern Arapaho language to the 360-degree photography, video, and spatial audio in order to create a Northern Arapaho language acquisition tool. The tool will be gifted to language teachers on the Wind River Reservation to use in their Northern Arapaho language and culture classes. For this project there were three main goals: to explore the potential of virtual reality in language revitalization; to document spoken Arapaho language with an emphasis on hunting and animal migration stories and songs related to place names on the Wind River Indian Reservation and other locations in Wyoming and Colorado; and to develop virtual reality curricula for Wind River Indian Reservation K–12 schools.

As far as we know, the Northern Arapaho have been back to the Fortress and Buffalo Roads only once since their removal, when more than twenty years ago a small group of elders including Nii’ethii Neecee were allowed on the land to bury human remains that were exposed by erosion from the shifting river. We hope that VR can bring the Buffalo Roads back to the Northern Arapaho people and let them experience, at least virtually and in their own language, this now off-limits area of their traditional homeland.4

There were, without a doubt, ancient Arapaho names for the Buffalo Roads and the Fortress, but none of the remaining Northern Arapaho speakers can recall them. Indigenous languages imbue landscape with meaning and Indigenous place names provide contemporary Indigenous People with connection to their ancestors’ lands. Like the Arapaho themselves, all their names have been removed. The entire area is now blandly called a ranch.

Part I: Finding the Buffalo Roads

The seeds for the Buffalo VR project were planted in the fall of 2016. The University of Wyoming president greenlighted its American Indian Studies program to proceed with a week-long summer high school institute to bring twenty-five high-school-age Indigenous youth to campus in the summer of 2017. The students were housed in dorms, interacted with faculty and administrators in every college, got to know on-campus student resources and activities, and spent a few days in the mountains surrounding the university.
Dr. Phineas Kelly, now a postdoctoral researcher at the University of Wyoming, asked Dr. Christopher Russell, the director of American Indian Studies (AIS) at the University of Wyoming, if the program would be interested in collaborating on a mobile, place-based language application for the Northern Arapaho language—since the university was located on traditional Arapaho territory and the American Indian Studies program had close ties to, and a history of collaborating with, the Northern Arapaho tribe and the NALCC. The mobile app would be a game where users would follow a gamified storyline around the university’s campus, learning Northern Arapaho language and stories as they leveled up in the game. Dr. Russell and Robyn Lopez, the Arapaho language instructor for AIS, advised Phineas to take the idea to the NALCC and introduced Phineas to Wayne C’Hair, Northern Arapaho elder, language instructor, and member of the NALCC. After a year of collaborative development with funding from AIS the Arapaho Vision Quest Augmented Reality Mobile Place-Based Arapaho Language and Culture Learning Application was formally launched on the first day of the summer institute. Two dozen American Indian high school students and a few elders spent hours walking around the university’s campus playing the game on iPhones and iPads. The students often asked the elders for correct pronunciations, or if the elders knew a particular word or story. When it was over, the authors asked an elder Northern Arapaho speaker and member of the NALCC what he thought of the language app. The elder replied, “We must fight fire with fire.” This initial collaboration with members of the NALCC led to a deeper partnership from which the virtual reality elicitation process, methods, and our NSF Documenting Endangered Languages grant grew.

**The Arapaho Language**

The fire the elder was referring to was, of course, the destruction and loss of his Native language. After the discovery of gold near Denver in 1858, white settlers inundated the front range of Colorado, violently displacing the Arapaho tribe. The Sand Creek Massacre of 1864 is perhaps the most infamous (but not the only) example of violence against the Northern Arapaho during this era. After the Sand Creek Massacre, the tribe was split into two groups. One portion headed south to Indian Territory in Oklahoma. The other group, now known as the Northern Arapaho, decided to stay in their traditional territory, which included the southeastern portion of Wyoming and the eastern portion of Colorado from the North Platte River down to the Arkansas River, as well as large swaths of western Kansas and Nebraska. The Northern Arapaho faced constant violence from settlers and soldiers. Northern Arapaho stories from this time recall a never-ending upheaval of their lives in what remained of their traditional lands: battling disease and
starvation, fighting settlers, and fleeing from the U.S. Cavalry. Ultimately, they were forced onto the Wind River Indian Reservation in 1878—a reservation that housed their traditional enemy: the Eastern Shoshone. The U.S. government promised the Northern Arapaho their own reservation, but that promise was never fulfilled.

While removal to the reservation put the Northern Arapaho out of imminent physical danger, it signaled the beginning of the destruction of their language. American Indian boarding schools, the dominance of English as the primary mode of instruction in K—12 education on the reservation, and the seemingly inexorable influence of western media and culture have all contributed to the current state of danger for the Arapaho language.

Like the tribe, the language diverged after the Sand Creek Massacre. The Northern Arapaho dialect of the Arapaho language is now critically endangered and spoken primarily on the Wind River Indian Reservation in the state of Wyoming. The most recent estimates indicate that of the total population of 5,943 fewer than 100 people actively speak the language; none of the fluent speakers are younger than 60. The Southern Arapaho dialect is spoken by a mere handful of elders, all approximately 80 years of age or older in western Oklahoma. Like many Indigenous Peoples worldwide, the Arapaho are in danger of losing all first-language speakers within the next twenty years.

To make the situation more difficult, Arapaho is a polysynthetic and agglutinating language, meaning it condenses a large amount of information into long, complex verbs. These verbs often take a sentence or more to express in other languages, which makes polysynthetic languages like Arapaho particularly difficult and time-consuming as a second language to learn for English speakers. The Northern Arapaho are deeply aware of the challenges faced by their language and have long been engaged in many efforts to maintain it, producing both recorded (audio and visual) and written documentation as well as the development of a variety of language teaching curricula. With the rise of the internet, the Northern Arapaho have also been quite willing to embrace technology such as the Arapaho Vision Quest app as one tool of many to help reverse the loss of their language.

**From Mobile App to VR**

After learning that the Arapaho Vision Quest app was well received by the Northern Arapaho elders and Indigenous students involved in the summer high school institute, we discussed the potential of creating a similar language application using virtual reality with members of the NALCC. The 3D Cave at the University of Wyoming has the ability to create VR programs. We could imagine a fully immersive 3D virtual environment where language
and important landscape could be combined with stories from oral tradition for a fully immersive linguistic experience. We received a seed grant from the University of Wyoming in 2018 to pursue the project and worked with the 3D Cave to create a prototype VR Northern Arapaho language application. We recorded in 360-degree video an Arapaho tipi filled with traditional objects such as a backrest, clothes, bow, arrow holders, hide scrapers, and a buffalo robe. We then recorded in 360-degree video various locations within Vedauwoo, Wyoming, using a drone to navigate between locations. Vedauwoo is a dramatic landscape full of forest and rock formations in the mountains above Laramie. The Arapaho still hold Vedauwoo sacred even though they have been dispossessed of the area, and it is now a state park. The name Vedauwoo itself comes from the Arapaho word bito’o’wu, which means earth or earthborn. With the help of Nii’eihii Neecee, we recorded a song and story in Northern Arapaho from oral tradition about Vedauwoo. We placed the tipi, virtually, in Vedauwoo and combined that scenery with the song and story. With the Vedauwoo VR prototype ready, we were invited to demonstrate the app at an official meeting of the Northern Arapaho Language and Culture Commission (NALCC).6

We traveled to the Wind River Reservation with the Vedauwoo VR language prototype and VR gear; members of the NALCC donned the VR helmets and virtually stepped into the tipi. With the aid of a handheld VR pointer, the elders clicked on icons on the tipi walls and navigated around several landscapes in Vedauwoo while listening to the song and story in Northern Arapaho. They enjoyed the immersive experience and saw the potential for such applications in aiding language and cultural revitalization. We formally asked the NALCC for their support for an NSF grant application dedicated to making similar VR applications for a larger number of traditional landscapes. With their guidance, the creation of interactive VR language applications for use in Northern Arapaho language and culture classes on the reservation and at our university was proposed. NALCC members test out these language applications at all stages of development and have the final say regarding any stories, songs, and translations used.7 At the end of the project, everything—VR applications, computers, VR equipment—will be donated to any school on or around the reservation that is interested; moreover, Northern Arapaho students at our university will be trained to implement a VR curriculum in those schools.

Nearly every elder stated that their children and grandchildren were always playing video games; they loved the idea of using that technology to teach and reconnect young people with their language.8 The NALCC agreed to write a letter of support for an NSF grant application. We submitted the grant in November 2018. After much back and forth with the NSF-DEL
(Documenting Endangered Languages) director, the grant was awarded in August 2019, with three- and one-half years to complete the project. NALCC’s support was and is critical for the project; NSF would not have awarded the grant were it not for the NALCC.

One major concern we shared was that though we are members of Indigenous communities, we are not members of the Northern Arapaho tribe. We did not want to collect stories or songs that are used in ceremony, especially those that are integral to the sun dance, nor did we want to collect stories or songs that are the personal property of bands or clans. The NALCC elders solved this problem. The elders told traditional stories about how the Arapaho hunted the Medicine Bow National Forest and the areas around southeastern Wyoming. The NALCC members described the area from the Snowy Range and Elk Mountain down to Blackhall Mountain in the Sierra Madre as a prime Arapaho hunting area. According to NALCC, the area north of Walden, Colorado, was called “the Door” in Arapaho due to the large concentration of animals that migrated through the corridor between Blackhall Mountain and the Snowy Range. The Arapaho would camp along Elk Mountain, which is called Wind Break or Tipi-liner in their language, and hunt those migrations. The town of Hanna near Elk Mountain means “through here” or “be here” in Arapaho and refers to those vast migrations of animals as well as the meeting of Arapaho bands during hunting season.

The stories clarified the project’s focus: stories of hunting, animal migrations, and traditional subsistence methods surrounding hunting. These stories are relatively safe to collect—the NALCC assured us that such stories do not violate tribal custom. Also, many young Northern Arapaho love to hunt. The NALCC thought these stories would be interesting and inspiring to their youth.

The NALCC dictated the locations we should record. During several meetings on the reservation with the NALCC they selected appropriate locations for our project, five major locations they wanted to record so that they could put stories to them: (1) Thunder Pass, Colorado; (2) Elk Mountain, Wyoming; (3) the Buffalo Roads in southeastern Wyoming; (4) Estes Park, Colorado; and (5) the area around the powwow grounds on Wind River Reservation. The first four locations are part of the traditional Arapaho homeland. Thunder Pass and Estes Park are of special religious importance to the Arapaho and are areas from which the Arapaho were violently removed. The fifth location is part of the current Northern Arapaho homeland on Wind River Indian Reservation.

With the locations of the grant determined, we turned our attention to the technology itself: drones, 360 cameras, and VR. Given the colonial history and colonizing enterprise of technologies such as cameras, audio/video
recorders, and the very fact of research on Indigenous communities, how could we be sure that we were using these technologies in a decolonizing fashion? Were our methodologies based in decolonial strategies?

**Part II: Decolonizing Virtual Reality Technologies**

VR and its attendant technologies are comparatively new tools of practice-based research inquiry and the critical discussions surrounding the use of VR in research are burgeoning. Of particular interest to the field of Indigenous studies is whether or not these technologies can be used as tools of decolonization. Regardless of the intention behind their use, do they represent yet more sophisticated repackaged tools of colonization to extract and appropriate Indigenous knowledge? Do they replicate what Linda Tuhawai Smith noted regarding the dual function of older research tools? “The instruments or technologies of research were also instruments of knowledge and instruments for legitimating various colonial practices.”

We believe the aims and intention motivating the use of VR are of utmost importance. We have been circumspect in our aims and intentions for using VR to aid in Indigenous language revitalization. NALCC controls the subjects of data collection (sites and stories) and the data itself: how it is collected, where it is stored, and ultimately if it is used as part of the VR language revitalization curriculum to be created from the data. As Smith states, “Decolonization . . . does not mean and has not meant a total rejection of all theory or research or Western knowledge. Rather, it is about centering our concerns and world views and then coming to know and understand theory from our own perspectives and our own purposes.”

The directional aspect of our project is important as well: it does not extract data from an Indigenous community and distribute it to the non-Native world. The team collects data from the traditional Northern Arapaho homeland (now no longer part of their territory) and brings it back to the Northern Arapaho on their current homeland—the Wind River Reservation.

One of the aims of the project is to discover if Indigenous ontology and language can be revitalized by reconnecting Indigenous People to their lands with VR applications. Can these technologies be tools to anchor Indigenous knowledge and language to the lands they now call home and—just as importantly—to the lands that have been and continue to be stolen from them? Today everything about land—from directions to and from a place, names, and detailed information—is served up in seconds on a smartphone in non-Indigenous languages. For Indigenous People, finding new ways to connect to their lands is crucial. “American Indians hold their lands—places—as having the highest possible meaning, and all their statements
An Indigenous worldview is indivisible from the natural world; struggles to maintain and regenerate Indigenous languages and culture have been challenged by a separation from the physical places that give context and deeper layers of meaning to Indigenous language and culture. VR and associated technologies may provide a way to bridge the separation between place and language by creating new kinds of place-based reference. A corollary question we will explore in the final year (summer 2022—23) of the grant concerns VR in K–12 language revitalization curriculum: how do we make VR an agent for active learning, as opposed to passive listening, for language learners just beginning their journeys toward language revitalization? The NALCC and language teachers in K–12 schools on Wind River, especially at the Arapaho Immersion School, will be instrumental in helping craft age- and language-level appropriate curricular materials for active VR language learning in the classroom.

In an effort to employ a decolonizing Indigenous methodology, the individual technologies that make up VR elicitation and the unspoken messages they carry must be critically interrogated. VR technology, 8,000-pixel 3D 360-degree panoramas, and aerial drone video used as tools to produce a VR application all leave their imprints. The impact of the technology and communications media we use and ingest on a daily basis is at once massive and often imperceptible. In the same way that we do not think about our legs, arms, hands, and voices per se as we go about our daily lives, we are also often not consciously aware of the tools we use, such as the internet, cellphones, augmented reality, and VR. Media philosopher Marshall McLuhan believed that communications media and technology were equivalent and in effect “extensions of man” and as such they extend the power of humans to become “living vortices of power” that often have unforeseen and negative effects on people as individuals, cultures, and society at large. In the words of McLuhan, “The message of any medium or technology is the change of scale or pace or pattern that it introduces into human affairs” and so the message of our particular use of VR as a technological extension of humans is one of reclaiming ownership of Indigenous lands.

VR has been used as tool in Indigenous language revitalization: for example, the Virtual Atoll Task, the WordsEye Linguistics Tool and the Digital Songlines Project have successfully explored the use of virtual simulations of people, places, and things. The current project uses high-resolution 3D 360 images and video of actual locations and things rendered in VR to provide a highly realistic elicitation experience. Other examples of VR being used in Indigenous language teaching and learning include the VR spaces in Second Life created to teach dialects of Sámi. The use of VR in Sami language
Revitalization is focused on virtually connecting speakers of Sámi who are physically separated from each other to reestablish a sense of community, which has been shown to have a positive effect on the language-learning process.\textsuperscript{16}

Technology itself is often far from benign or unintentionally exploitative, as the Indigenous Data Sovereignty and Data for Black Lives Matter movements have demonstrated. The very programs and algorithms that drive our digital culture are racially and culturally biased. Algorithms and data are never neutral; examples of bias in criminal risk assessment and predictive policing policies are only a few of the most recent examples of bias in consumer technology and the data that drives and informs it.\textsuperscript{17} Pivotal, the effect of media and technology is often much greater than the content it carries and so, as McLuhan noted long ago, the medium is (or becomes) the message. McLuhan's assertions are even more relevant today than when they sprung into public and academic consciousness in 1965. However, a medium would be useless without a message and vice versa; Robert Logan's update of McLuhan's maxim is more apt in this current digital age: “The medium is the message and content is king!”\textsuperscript{18} In sum, the use of any Western technology owned by institutions or individuals from a group that has historically dominated an Indigenous group has connotations in terms of the unequal access to capital to purchase technology and the underlying reasons for that inequality.

**Virtual Reality**

The history and majority of mainstream use of VR is dominated by the creation of virtual fantasy worlds where the user is transported to places that have or could not in fact exist—as seen in the gaming and entertainment industries. VR elicitation employs immersive VR using goggles with spatial audio and is distinct from “3D” VR as employed in Hollywood movies; immersive VR envelops people in a full 360-degree optical and auditory surround. Until recently, VR has been used only by researchers in computer technology and relatively small groups of technophiles with the money to buy or make expensive headsets. From 2015 to 2020 VR has become available in relatively inexpensive toys and headsets for computer games. More recently, due to improvements in mobile phone video processing and improved mobile data speeds, VR experiences are now available on any smartphone with the addition of gogglelike blinders into which the phone is placed. In our estimation, VR elicitation does not only take users to fantasy worlds: it can provide Indigenous consultants access to locations in their traditional lands from which their families and ancestors were removed by force and genocide and that they now may not have the means or physical ability to visit.
A pivotal aspect of the message of VR is how much it privileges sight, “subordination to the visual really points toward the coordination (and domination) by the visual of our other bodily faculties and senses. VR privileges sight, and other senses play a subordinate role to it.” The message of VR is also bound up in the specific means by which VR privileges sight. Once you put VR goggles on, you are completely blocked out of where you physically are and given an experience of being somewhere else that is so compelling and powerful your body responds as if you were actually in that place.

The ways that human beings have over time told stories, painted pictures, staged ceremonies and plays, shown photographs and movies, and recently viewed 360 panoramic photos and entered VR simulations can be viewed as a continuum. The continuum reaches from experiences that took place in an intimate social setting where we were physically close to one another, listening to a person who was likely a family member a few feet away tell a story, to VR simulations that disconnect people completely from everyone and everything in their physical surroundings. This continuum places the intimate, social, unmediated experience on one end and the solitary, technology-mediated experience on the other. The message of VR could then easily be said to be one of isolation and technological dependency, and it surely is in many of its current applications. However, examples of VR are being used to connect people to one another and to places, for example VR productions by charities and nongovernmental organizations to tell and show the stories of the world’s most vulnerable people. The United Nations Clouds Over Sidra simulation allows people to experience life in a Jordanian refugee camp.

Currently more uses of VR lean toward isolation than toward social connection, and yet the affordances of the medium itself make VR a powerful tool to promote empathy and connectedness. Importantly, VR elicitation improves on older VR technology that surrounded users with artificial models of an environment that were compelling only because they appeared to be real. VR elicitation is compelling because it uses high resolution 8K 3D panoramic photographs and video of real physical environments. The VR elicitation prototype immerses people in 8K 3D 360 panoramic video and photography of real places with hyper-realistic three-dimensional detail down to the individual hairs on a buffalo robe. Simulations created from older VR technology are flat and artificial in comparison.

360 Panoramic Photography and Video
The history and practice of photography as a medium cannot be separated from the reality of its colonial gaze, appropriating power and othering the exotic. In colonial Africa, the process of taking pictures of colonized people and lands and then distributing them back to colonial centers of power was
a key part of the historic and ongoing processes of colonialism. The camera was and arguably still is a triumph of Euro-American technology; controlled by whites; able to capture—and at the same time to rearrange the appearance of exotic environments and peoples: the camera played many roles. It created “landscapes”; it constructed the idea of “wildlife”; it produced stereotypical illustrations of “tribe” and “race.”

All photography and videography bear the imprint of the person taking the picture. The medium gives the photographer the ability to at once distance themselves from a person or place of interest, to construct an image that conforms to their ideals and ideology, and retain that image permanently—imparting a sense of power, control, and ownership over other people, places, and things. It is difficult to overstate how much the message contained in the medium of photography is or can be one of control, domination, and appropriation. As in colonial Africa, the history of photography in the western United States was inextricably part of the process of manifest destiny, territorial appropriation, othering, and genocide on both a physical and cultural level. Even more important to the specific context of our project is the fact that photography and videography are still in many ways the provenance of Euro-America; they are not available or utilized by members of the Northern Arapaho tribe nearly as much as they are by researchers or the media. In the very act of taking a photo or a video of a Native American today we can hear the echoes of salvage anthropology, appropriation, and exotic othering.

360 panoramic photography and videography carry many of the same messages and history of photography but are distinct in that a 360 panorama in VR becomes much more than a picture on a wall or a digital image or video on a flat two-dimensional screen. In VR, 360 panoramas become immersive experiences that give the viewer the sense that they are standing in that place, thereby subverting the traditional subject-object relationships between the viewer and the viewed present in traditional two-dimensional photography and video. When a 360 panorama or virtually any photo is taken on a smart device it is automatically combined with Global Positioning System (GPS) locational data derived by measuring the time it takes to receive radio signals from four or more satellites floating overhead. The worldwide web is now full of 360 panoramas with GPS data, most prominently on Google Earth, which allows anyone to see millions of physical locations on the globe without being there.

Mapping and spatial technologies like GPS can be seen as extensions of the colonial project of map making that has named and thereby asserted
its power across the globe. GPS has the further connotation of being originally developed and still maintained in large part by the U.S. military. In a world where we can instantaneously reach out through the internet to see, explore, and appropriate a huge percentage of the earth, how can that technology in the context of Indigenous People and lands be seen as anything other than an extension of the exploring colonial gaze? It is truly frightening how quickly and easily web-based technologies “often reimagine colonialist practices by eliding Indigenous concerns about culturally appropriate conditions for access.”

**Drone Video**

Drone videography carries the history and connotations of photography and cannot be separated from the history and messages of drones themselves. Drones, or unmanned aerial vehicles, were first employed by the Austrian military in its siege of Venice in 1849 when it sent balloons loaded with explosives to drop into the city. Later that century, military reconnaissance techniques in the Spanish-American War were developed that used early versions of cameras attached to kites. Since then, the technology has been continuously refined by the U.S. military and others to its present form of lethal surveillance; moreover, use of these surveillance technologies has become the general practice of security and control employed by nation-states around the world. However, drone videography can become something else entirely in the hands of a documentary filmmaker or activist. For example, the stunning images of wild nature and endangered animals captured by drones give people a window into parts of our planet that they often cannot (and more importantly never should) visit—this is done to protect those places and the plant and animal life they support. More important here are the ways that drones have recently been used by Indigenous activists to document abuses of state power. The most prominent example of Indigenous drone activism is the extensive use of drones by the activists at Standing Rock, North Dakota, in their opposition to the proposed Dakota Access Pipeline (DAPL). DAPL construction threatened Lakota cultural and sacred sites and Standing Rock’s sovereignty because the pipeline would bring more than five hundred thousand barrels of oil under Lake Oahe, the only source of drinking water for the Standing Rock Sioux Nation and millions of others downstream. The activists were pitted against militarized police, National Guard roadblocks, heavy surveillance from local, state, and federal forces; they used drone technology to document the militarized force and brutality being perpetrated upon them and then broadcast images of that brutality around the world. Drone video footage is also becoming a tool for global Indigenous Peoples to protect their lands and strengthen
their claims to that land. Drone technology may have a militaristic message in society in general, but it is being increasingly utilized in ways that run counter to that message.

Academic research on Indigenous Peoples has traditionally been a largely extractive process whereby unique worldviews, knowledge, and languages have been collected, removed, and then studied in academic contexts. Each layer of this extractive process has been in large part facilitated by Euro-Western technologies from the pen to the aerial drone. We strive to find new and restorative processes that use these same technologies to return places and knowledge to Indigenous communities while challenging tired stereotypes that find use of cutting-edge technology by Indigenous Peoples “unexpected,” implausible, or somehow unnatural.

**Part III: COVID-19, Research, and Data Sovereignty**

With the emergence of COVID-19 our elder Northern Arapaho collaborators and all members of the NALCC went into isolation to protect themselves from contracting the virus and the project ground to a halt. We were forced to search yet again for new ways to reconnect places and knowledge to Indigenous communities. The process had unforeseen consequences that engendered a deeper decolonization of our research methodology: during the spring of 2020 in collaboration with the campus 3D visualization center we developed a mobile version of our Buffalo Roads VR elicitation application that could be run on a mobile phone with a portable VR headset. Mobile VR kits could be sent directly to our collaborators without any risk of transmission of COVID-19, removing us physically from the process. Our original work plan had required the physical presence of at least two of our project team to run both the VR application via a desktop or laptop computer and record the elders as they talked about the places they were visiting in VR. Over the summer and early fall of 2020 two Northern Arapaho elders were able to virtually visit the Buffalo Roads and record their knowledge and language in a way that was safe and convenient to them. This new method placed the locus of control over every aspect of the language elicitation sessions firmly in the hands of the elders themselves: the elders were able to explore the locations in private and at will. The sessions were successful in moving the project forward. One elder speaker remarked “I feel happy because I see these things, what all I am seeing right now I feel happy due to this. A long time ago, these places, that was where all the Arapahos lived, . . . They looked for buffalo. . . . It’s like I just feel I am present here again, like an Arapaho. I am an Arapaho.”

At the time of writing, we are working on recording the five locales and
collecting relevant hunting stories. A growing concern in Indigenous studies is data ownership, storage, and the problems that arise with data collection in Indigenous communities: Who owns the data? Who stores the data? How is that data used and who has access to it? Here are some of our data sovereignty procedures:

- In accordance with the NALCC wishes, upon completion of the project all data will be archived with the Sam Noble Native American Languages Collection and at the University of Wyoming American Heritage Center in perpetuity. Both archives have an ongoing and trusted relationship with the tribe.
- In accordance with NALCC wishes, all materials in both archives will be freely available. The Sam Noble Native American Languages Collection will also make the materials freely available on their website.
- We will donate all equipment, VR software applications, and all curricular materials funded by the grant to the NALCC and whatever schools on the Wind River Reservation request these materials.
- The only foreseeable exception to the above stipulations is data containing drone video of places or people where permission was not secured ahead of time or given after request. Such material will be deleted.

Ultimately, this project represents a small but necessary step toward fully immersive VR language applications—VR video games—where the user/player must be able to understand, use, and speak an Indigenous language to progress through the game. We hope to see in our lifetimes VR games where we have to speak tribal languages and understand tribal cultures and protocols in order to progress through the game. Can a VR video game become an authentic cultural experience? It may be time to redefine the authentic.

As we prepared to leave Buffalo Roads and the Fortress that day in September 2019, we could not help but think of the difference between the two names (Fortress and Buffalo Roads) both of which were recently placed upon the landscape. The name Fortress, which nonnative anthropologists applied to the stone monolith, implies a military stronghold and a martial, aggressive worldview. It also denotes a barricading from the outside world. As such, perhaps it says more about the anthropologists’ view of precolonized Indigenous People than it does about any Indigenous reality past or present. The Buffalo Roads, which was the name the Arapaho gave to the area near the Fortress, implies movement, connection among living worlds, and ties between the Indigenous People and the buffalo. We cannot help but wonder what name the Arapaho elders would have given the Fortress if the
anthropologists had not already signified it, if the Arapaho were allowed to spend time on the now private ranch and get to know the area once again. We walked one last time through the Buffalo Roads themselves, the trenches cut into the lithified clay and bedrock by the millions of buffalo hooves migrating through the area over the thousands of years. We, too, carried away a little clay on our feet.

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References


Notes

1. The members of the NALCC who collaborated most often on the project are Wayne C’Hair, Nii’eihii Neecee, Ray Underwood, and Marian Scott.

2. The family who owns the land has asked we not provide location names, coordinates, or anything specific that can identify the area and potentially bring souvenir hunters onto their land.
3. The Sand Creek Massacre took place on November 29, 1864, in what is now southeast Colorado. The Third Colorado Cavalry under the command of John Chivington massacred hundreds of Cheyenne and Arapaho men, women, and children, mutilating and desecrating their bodies afterward.

4. The Buffalo Roads area is located on a private ranch owned by a nonnative family. The ranch is fenced and the access to the Buffalo Roads is difficult—it must be done on foot or with an ATV. As such, the Buffalo Roads, for all intents and purposes, remains off-limits to visitors.


6. The authors already had a good working relationship with the NALCC. Wayne C’Hair of the NALCC had been instrumental in setting up our university’s Northern Arapaho language courses. We reached out to him for permission to demonstrate our VR project at the weekly NALCC meeting.

7. A major component of our research depends on elicitation sessions with the NALCC and others—especially language learners. With the help of the NALCC members, we have created a series of questions in Northern Arapaho to ask participants while they are wearing the VR gear.

8. Elders use the term “their language” when speaking about Northern Arapaho even when referring to younger generations, whose first language is English. There is still a very real sense that English is not their language. Rather, English is an interloper and eventually the Northern Arapaho will return to speaking and using Northern Arapaho as their main language.


10. Smith, *Decolonizing Methodologies*, 41.


22. The term “8K” refers to the high-resolution camera’s ability to digitally capture video at an approximate width of eight thousand pixels.


24. Hartmann, Silvester, and Hayes, eds., *The Colonising Camera*.


29. Paneque-Gálvez et al., “Grassroots Innovation,” 86.