Riding the Trail of Tears is a novel by Cherokee writer Blake Hausman. It is a surrealistic sci-fi take on virtual reality, featuring an immersive tourist trap through which visitors relive the Cherokee Removal in the winter of 1838–1839. The novel’s first section is narrated by Nunnehi, a Little Person or creature from the old Cherokee stories. Nunnehi describes the genesis of the Tsalagi Removal Exodus Point Park (TREPP) and recounts how he and others like him came to be alive and resident within the ride. By the end of the book, Nunnehi and his siblings complete a long-gestating insurrection, lay claim to the digital territory delineated by TREPP, and start rewriting the narrative to re-center the story of the Trail of Tears around the Cherokee experience rather than the settlers’ gaze. Early on, Nunnehi says: “the virtual Trail of Tears . . . [is] my homeland. I’m probably more Indigenous than you, and the digital earth is where I’m Indigenous.”

This chapter is about the digital earth, its composition, and how we might be Indigenous in it. It is about new ways of understanding our role in the computational ecosystems we are building, and how we might make kin with the other entities that we create in it and emerge from it. It is about nurturing the digital
earth from which it will all grow — silicon soil in which our descendants will stick their virtual toes, wiggle them around, and think, "This is a good place to be Cherokee. This is a good place to be Mohawk. This is a good place for our people."

The Stack and Its Corruptions

Let us start with where we are at.

As I have written elsewhere, modern computing systems work via a very narrow logic, admit only certain kinds of information as data, and can perform operations representative of only a small, impoverished subset of the operations we enact as humans every day. These systems exist as components of the stack, the vertically interrelated and interdependent series of hardware configurations and software protocols that make high-level media computation and networking possible. The software stack sits on top of the hardware stack. Moving up the hardware stack is to move from circuits to micro-chips to computers to networks; moving up the software stack is to move from machine code to programming languages to protocols to systems. As you go upward, you are moving from custom solutions to generalized solutions, from specifics to abstractions. As you make this traversal from the deep structure to the surface interface, ever more of the details of the underlying configurations are hidden from you. With the increasing opacity, your ability to assert fine control over the execution of the underlying algorithms decreases. Eventually you get to the software application or web service layer of the stack. It is at this highly abstract level that most people interact with computational systems, as they use Microsoft Word, Google Search, play a video game, or enter into an immersive environment.

The sheer complexity of these layers, both horizontally, as different components interact with one another, and vertically, as different layers distribute data to the human interface and back, making it difficult to impossible for any single human actor to understand or effectively manipulate the whole system. Yet we are subject to the regimes the stack places upon us. In the same way the law embodies and polices the dominant culture's expectations about people's behavior, computational systems materialize and constrain the dominant culture's expectations of what counts as data, what algorithms are appropriate for processing that data, and what are valid results of that processing.

Cultural bias coupled with the pervasiveness of computational technology means that we are creating computer systems that are dangerous in their blindness. The last few years have seen this realization penetrating Silicon Valley.
culture, as technology developers at Google, Facebook, and others begin to comprehend that “unbiased algorithm” is as much an oxymoron as “pure meritocracy.” Scholars such as Kate Crawford,4 D. Fox Harrel,5 and Safiya Umoja Noble,6 among others, have brought the discussion of these biases into greater focus. This has brought the critique out of the academy, where the argument about how computational systems reflect the culture within which they are developed has a long history, and into the public sphere.7

Algorithmic bias exists in the non-digital world, of course. One of the most notable examples is the color reference cards first used in the 1940s to calibrate image printing processes. These “Shirley” cards “generally showed a single white woman dressed in bright clothes” to facilitate calibration as “color film chemistry at the time was designed with a bias towards light skin.”8 Communications scholar Lorna Roth has conducted extensive research into the use of Shirley cards. In 2009 she wrote: “Until recently, due to a light-skin bias embedded in color film stock emulsions and digital camera design, the rendering of non-Caucasian skin tones was highly deficient and required the development of compensatory practices and technology improvements to redress its shortcomings.”9 Roth points out how this practice continued for decades after the first complaints were made, with the first substantive change only made in the 1970s. At that time, image calibration cards were redesigned not out of a desire to rectify their skin tone bias but rather to satisfy furniture and chocolate makers who had been complaining that the cards did a poor job of representing the darker tones of their commercial products.

Much of the current interest in looking at bias in computational systems stems from artificial intelligence yet again becoming a locus of substantial research, development, and deployment. Numerous studies over the last decade show how bias is embedded into every aspect of such systems. Examples include machine systems for learning human languages incorporating the human prejudices embedded and expressed in the corpora of natural languages on which the systems are trained,10 and machine systems for learning to recognize people learning that beauty is a trait possessed primarily by white people.11 One of the most egregious classes of these biases discovered to date is that embedded in the criminal justice system. The investigative journal *ProPublica* conducted an investigation into the risk assessment software that is increasingly used in the United States to provide advice to judges, lawyers, and parole officials throughout the judicial process — determining bail, setting sentences, guiding parole conditions, etc.12 The authors quote US attorney general Eric Holder addressing the use of such
software in 2014: “I am concerned that [risk assessment software] inadvertently undermine[s] our efforts to ensure individualized and equal justice . . . they may exacerbate unwarranted and unjust disparities that are already far too common in our criminal justice system and in our society.” In 2016, ProPublica raised concerns that suggest that Holder’s concern was justified. Its investigation into the use of COMPAS software turned up “significant racial disparities . . . falsely flagging black defendants as future criminals . . . at twice the rate as white defendants” and misidentifying white defendants as “low risk more often than black defendants.”

Social scientists such as Crawford have pointed out how difficult it is to rid ourselves of the deep bias in the datasets feeding the algorithms driving these systems. Many times “new” datasets are actually based on or include information from older datasets that were collected using outmoded or discredited methods. “Classifications,” notes Crawford, “can be sticky, and sometimes they stick around a lot longer than we intend them to even when they are harmful.” This stickiness means that, even if system designers made the effort to counter the bias in their algorithms, the data they feed those algorithms may taint the entire endeavor.

**White Supremacy: Not Just for People Anymore**

Media scholar Lisa Nakamura notes that, “[t]hough computer memory modules double in speed every couple of years, users are still running operating systems which reflect phantasmatic visions of race and gender. Moore’s Law does not obtain in the ‘cultural layer’.” In other words, the exponential evolution in computational processing power since the early 1980s has not been accompanied by a comparably rapid evolution in equality in North America. Statistics comparing Indigenous people and African Americans to the majority population in Canada and the US, respectively, show just how far both societies are from eliminating racial bias. It should be no surprise that our computational systems reflect a worldview in which this is not only accepted but — given the stickiness of the phenomenon — perhaps preferred by the majority population. Expecting our tools to be more enlightened than we ourselves is a foolish self-delusion.

Computational artist Trevor Paglen has observed that, “one of the philosophical dangers of using widespread automation . . . is that it fixes meaning.” That inertia, combined with the data bias identified by Crawford and the extension of racial bias into cyberspace identified by Nakamura, drastically increases what is at
stake when these systems are designed and deployed. The underlying algorithms must make assumptions about the world in order to operate; even if these assumptions themselves are not biased, they may make use of biased classification methods. And even if the classification is not biased, the data feeding the process may be biased. All these aspects of computational systems are often obscured, either purposively in order to protect intellectual property or as a byproduct of a technical complexity that prohibits non-specialists from understanding and evaluating them. The system becomes a fact of the world, stubborn and difficult to unfix. The result is that, in a society where it is increasingly difficult to do anything without touching on a computational interface of some sort, the decisions that developers are making all the time have profound and long-lasting consequences for how we live our lives.

Indigenous people are intimately familiar with how the old ways of thinking and looking at the world become sedimented into our contemporary worldviews. Marcia Cosby and others have written about how the “Imaginary Indian” was constructed to justify the theft of Indigenous lands, and that imaginary person remains the dominant image that most settlers have of Indigenous people. This is the image settlers draw upon when they parse news about life in Indigenous communities, when jurors and judges consider court cases involving Indigenous people, and when the mall security guard is deciding who looks suspicious and who does not. As Harrel’s work on phantasmal media shows, these are exactly the sorts of images that get embedded into our computational systems. “Computational media,” he writes, “play roles in constructing ideas that we unconsciously accept as true and constructive of reality yet are in fact imaginatively grounded constructions based in particular worldviews.” Or, in Crawford’s more blunt assessment, “[These systems are] not free of bias; this is just bias encoded.”

As we struggle to “write the thoughts of systems,” in the words of computational philosopher and poet David Jhave Johnston, and as those systems become ever-more pervasive, we are beginning to see that it is a political act to define the protocols that guide these systems’ thoughts. It is about how power is exercised, and by whom.

The Fast and the Slow

Nakamura, in her extensive research on race in cyberspace, notes that “in order to think rigorously, humanely, and imaginatively about virtuality and the
post-human, it is absolutely necessary to ground critique in the lived realities of the human, in all their particularity and specificity. The nuanced realities of virtuality—racial, gendered, Othered—live in the body. When we pay attention to the bodies producing these protocols, we can see they are not just a random collection of homo sapiens. They are clustered in certain geolocations, particularly Silicon Valley, but with outposts in places like Seattle, Boston, Waterloo, and Oxford. They are working within an intellectual lineage that stretches back to the Greeks, even if they themselves might not be descendants of Europeans. Their education and professional practice rarely incorporate ideas or even data that comes from Africa, or South America, or large swathes of Asia. They are overwhelmingly white and male, and underwhelmingly brown and female—and, even when brown bodies appear, “they participate in the ‘cultural hegemony that privileges a white race.’”24

Going back to Winograd and Flores (1987) theorizing about the contextually coupled nature of cognition, Haraway’s (1991) critique of the interpenetrating relationship between human, non-human, and machine bodies, and Reeves & Nass’s (1996) experiments showing that “[i]ndividuals’ interactions with computers, television, and new media are fundamentally social and natural, just like interactions in real life,” critical approaches to computational culture have argued for acknowledging the deep entanglements among the cultural and computational layers of the stack. Now, after three decades in which computational systems have grown ever more ubiquitous and complex, we are starting to see clearly the consequence of the radical disjuncture between the high velocity evolution of our digital tools and the much slower evolution of our societal configurations.

Making Space

We founded the Aboriginal Territories in Cyberspace (AbTeC) research network in 2006 to ensure that Indigenous people were present in cyberspace and possessed the knowledge necessary to bend it to our needs. We were also interested in speeding up the rate at which Indigenous people increased their understanding of computational media. One hope was that this would help address and counter the white supremacy being baked into the computational layer, and resist its replication into cyberspace. AbTeC did this by exploring the question of what it means to be Indigenous in cyberspace—how do we make, maintain, and vivify Indigenous places within that archipelago of websites, immersive environments, social media, and video games that increasingly interpenetrates “real” space?28

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How Indigenous people related to cyberspace had been a topic of conversation within Indigenous media arts circles at least a decade before AbTeC launched. Cree filmmaker Loretta Todd's groundbreaking 1996 essay, "Aboriginal Narratives in Cyberspace," asked the question: "Can [Indigenous] narratives, histories, languages and knowledge find meaning in cyberspace?" She considers how cyberspace might be (re)conceptualized as an Indigenous space, starting with the kinds of questions that should be asked by those building and inhabiting it: the kinds of questions that should be asked by those building and inhabiting it.

Cree filmmaker Lorena Todd's groundbreaking 1996 essay, "Aboriginal narratives in cyberspace might be (re)conceptualized as an Indigenous space, starting with languages and knowledge find meaning in cyberspace?" She considers how "Will cyberspace enable people to communicate in ways that rupture the power relations of the colonizer and the colonized? Or is cyberspace a clever guise for neo-colonialism, where tyranny will find further domain? What if with each technological advancement the question of its effect on the seventh generation relations of the colonizer and the colonized?

Over the last decade, AbTeC has mounted numerous projects designed to address Todd and Skawennati concern with consciously shaping cyberspace to serve Indigenous ends. We have worked with numerous North American Indigenous youth and artists to develop their technical and conceptual capacities for manipulating computational media in order to tell their stories their way (Skins Workshops on Aboriginal Storytelling and Digital Media Design); supported the creation of original artwork that uses cyberspace as a medium (Time Travellers); and built tools for manipulating digital media (Mr. Softie, NextText). Each project claims new territory in cyberspace.

Making Cyberspace

In 2014, AbTeC started the Initiative for Indigenous Futures (IIF) to understand how Indigenous people are envisioning the future. One way we do this is to ask people what it means to make cyberspace Indigenous. We have delineated territory and turned its resources toward our own ends in video games, websites, machinimas, and virtual reality environments created by Indigenous minds, rooted in Indigenous worldviews, telling Indigenous stories, for Indigenous people to become Indians who make cyberspace?

Within Indigenous media arts circles at least a decade before AbTeC launched, Cree filmmaker Loretta Todd's groundbreaking 1996 essay, "Aboriginal Narratives in Cyberspace," asked the question: "Can [Indigenous] narratives, histories, languages and knowledge find meaning in cyberspace?" She considers how cyberspace might be (re)conceptualized as an Indigenous space, starting with the kinds of questions that should be asked by those building and inhabiting it.

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How Indigenous people related to cyberspace before and after
within Indigenous media art circles is at first a shock to many.
Cree filmmaker Loreta Todd's groundbreaking 2004 project, "Territory in Cyberspace," asked the question: "Can Indigenous terms, languages and knowledge that make a claim to its own cyber space might be (re)conceptualized as an ontological, the kinds of questions that should be asked of the Internet.

"Will cyberspace enable people to communicate across vast, real relations of the colonizer and the colonized?" 13 In non-colonial, where true relations will find a natural footing of technological advancement the question of reification was considered?" 14 Mohawk artist and Cree educator for the 1998 edition of the printing "Gone: Bringing it home," a website as an instance tool for information dissemination to similar interests whom you may have not met here to help shape this medium, let's do this right..." (at the very root of our stories, to inform people about us, set underpinnings of our problems.)

Over the last decade, AhiTeC has received many grant applications from artists to develop video and audio content; for manipulating computational media to relate the idea of AhiTeC in an attempt to extend the creation of original artwork or an opportunity to participate in the creation of a shared knowledge base around what we knew about each other's stories with regards to our position as human beings. 15 In her essay "Code talkers: Coded Territories" for the 2002 edition of the printing "Territory in Cyberspace," as a result of our ancestors naturally led them along the well-established paths, which, over time, became roadways and thoroughfares. With the advent of the telegraph and the telephone, wire was hung along these thoroughfares that literally became the beginnings of the physical network that allowed packets of information to move as freely as our ancestors.

Where L'Hiendelle discerns Indigenous protocol embedded at the bottom layer of the stack, Cree artist Archer Pechawis, in his Coded Territories essay, imagines it spreading everywhere: "I am looking to a future in which Indigenous is the protocol, an all-encompassing embrace of creation: the realms of earth, sky, water, plant, animal, human, spirit, and, most importantly, a profound humility with regards to our position as humans within that constellation." 16

I am interested in what happens if we embrace L'Hiendelle's Indigenous thinking that will shed light on how the foundations of the network and extend Pechawis' circle of relationships to include our machine creations in an attempt to articulate, in the words of Tuxawna art historian Jolene Rickard, "a more complex view of how [digital networked technology] is situated in people's cultures." 17

Very little of the current work being done on algorithmic and dataset bias or the ethics of artificial intelligence grapples with the fundamental corruption of the stack - the willful flattening of people's cultures that is a consequence of its...
monocultural origins. That corruption flows from numerous original sins: Platonic ideals; Aristotelian classification methods; Old Testament dominion over the natural world; Cartesian duality; Boolean binarism; Darwinian fitness. Even tonic ideals; Aristotelian classification methods; Old Testament dominion over rejects aspects of these knowledge frameworks, they still haunt our data and the design of our computational systems.

The question, then, becomes this: how do we breathe humanity into our computational creations in a way that avoids Western anthropocentric concerns?

Re-imaging Relations

Remember Nunnehi, the Cherokee Little Person from Riding the Trail of Tears? Hausman does not clarify whether he and his siblings emerged out of the complexity of the code running the Trail of Tears virtual reality ride or if already-existing Little People used the environment to manifest themselves. Either way, the computational infrastructure running TREPP evolves into an ecosystem operating far beyond the parameters envisioned by the original designers.

By the end of the novel, all hell has broken lose. Nunnehi and his kin have compromised the system, reordering it to better support themselves and to resist the chopped up, remixed, gets to control the simulation. Towards the end, the main character, Tallula- become, struggles to make sense of it all. She says to one of the "native-born" replies: "Could be something wrong with your imagination." 41

We are experiencing a similar failure of imagination in the present moment. We are confronting challenges in understanding the computational systems in which we have now enmeshed ourselves, as they become more complex and as we write more autonomy into them. The algorithmic bias discussed above exemplifies how such systems often end up subverting their intended purposes, largely because we refuse to see ourselves clearly. Mistakes in our eye become glitches in the code, which then go on to become "global protocols.”

What if we took a fundamentally different approach to understanding the digital beings we are creating, particularly those collections of code that act as an autonomous degree of autonomy — from network daemons42 to the most complex artificial intelligence? What if, instead of treating them as tools and servants, we take place for them in our circle of relationships?

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Notes
3. One can get even more abstract, as Benjamin Bratton does in The Stack: On Software Architecture (Cambridge: The MIT Press, 2015), and articulate the stack in terms of a network of interacting entities ("Stack: On Software Architecture,")
A digital being itches largely because it exemplifies as we chopped up, remixed, settler operating the computational infrastructure running more data and operating far beyond the parameters envisioned by its design.

The question, then, becomes this: how do we think computational creations is a way that works? More importantly:

Re-imagining Relations

Remember Nissiwi, the Cherokee Little House has long gone. Hausman does not clarify whether he and his colleagues employed plenty of the code running the Trail of Tears trail in a way that even existing Little People used the environment to master knowledge that the computational infrastructure running more data of the computational virtual entities have phased in being, regarding signs and getting to control the simulation. Toward the end, the main thread of the story, the Cherokee grandfathers and the virtual entities, are the ones who struggle to make sense of it all. The words used to design the virtual entities, "I never imagined this group of people was human." We are experiencing a similar failure of imagination as we confront challenging questions in understanding the processes with which we have now entangled ourselves. As we have seen, even as we write more autonomously into them, the algorithm has the power to exemplify how such systems often end up advantageously representing some groups of people while neglecting others, leading to us to see ourselves clearly. We are truly without any degree of autonomy — from network daemons to the most complex artificial intelligence. What if, instead of treating them as tools and servants, we made a place for them in our circle of relationships?

After a century of subordinating the hard work of making common culture to the imperatives of the market, and failed after failed experiment in using technology to compensate, the Western consciousness has been left ill-prepared to lead such a conversation. The hegemonic social imaginary reduces all such talk to superstition and elicits any attempts to widen the kinship circle beyond the human by insisting empiricism is the final word in understanding who we are.

Yet many Indigenous communities remember. We retain the protocols for understanding a kinship network that extends to all aspects of the world around us — animals and plants, wind and rocks, mountains and ocean. Our languages contain the conceptual formations that enable us to engage in dialogue with our non-human kin, and help create mutually intelligible discourses across vast differences in material, vibrancy, and genealogy. As Blackfoot philosopher Leroy Little Bear observes, "The human brain is a station on the radio dial, picking in one spot, it is deaf to all the other stations — the animals, rocks, trees, simultaneously broadcasting across the whole spectrum of sentence."

Because we created them, we think we should know how to tune into the stations on which our machine creations communicate. Yet we are only now waking up to the corruptions permeating all levels of the stack. Our difficulties in articulating the ontology of increasingly complex computational processes, and our inability to foresee the results of these complex processes interacting with one another and with the human and natural world, all point to the conclusion that we do not actually understand them. And if we do not understand them, they most likely do not understand us. Such profound mutual incomprehensibility is a recipe for disaster. Ask any Indian.

Notes

3. One can get even more abstract, as Benjamin Bratton does in The Stack: On Software and Sovereignty (Cambridge: The MIT Press, 2016), and articulate the stack in terms of
globally spanning megastructures. At that level, however, all the lived politics involving real bodies—and thus the utility outside of academic argument—have been drained out.


Law is a proposition made by Gordon Moore, then chairman of the computer chip maker Intel, in 1965, that the number of transistors on a chip would double every two years. This doubling of capacity as well as increases in transistor speed are the material foundations on which the rapid pace of computational advances have been built over the last five decades.


29. Todd, Aboriginal Narratives in Cyberspace, 3.


41. Hausman, Riding the Trail of Tears, 323.
42. Temrick McKenzie, Internet Daemons: Digital Communications Possessed (Minneapolis: University of Minnesota Press, 2018).
43. Attempts to widen the animacy lens and flatten the species hierarchy from within the Western tradition do exist, of course: Sprouse's monadism, Haraway's cyborg, Timothy Morton's hyperobjects, Jane Bennett's vibrant matter, Graham Harman's object oriented philosophy, etc. My aim here, though, is to introduce sources for thinking about the question of machine relationships from outside the Western canon. In addition, I side with Zoe Todd's ethical critique of the myopia of these intellectual genealogies: "here we were celebrating and worshipping a European thinker for 'discovering' or newly articulating by drawing on a European intellectual heritage, what many an Indigenous thinker around the world could have told you for millennia." See Zoe Todd, "An Indigenous Feminist's Take on the Ontological Turn: 'Ontology' Is Just Another Word For Colonialism," Journal of Historical Sociology 21.1 (April 1, 2008).
display=frameset;bookid=5015;frameset=book-frameset;viewmode=book.
35. Hill, "Listening."

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