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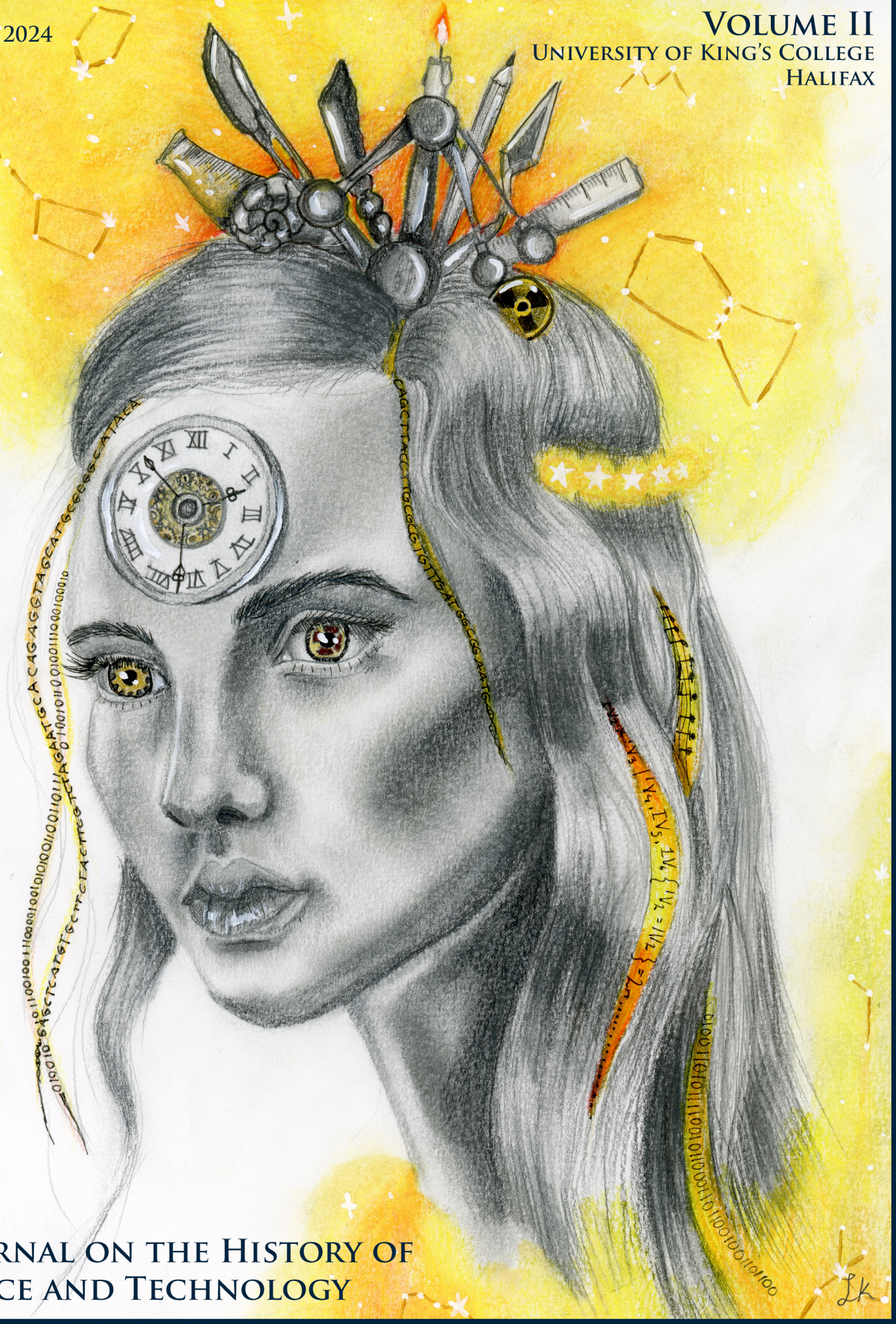

A Journal on the History of Science and Technology

Contents

A Note on Cover Art: "Synthesis"

Lauren Konok

This piece celebrates the enduring contributions of women in S.T.E.M fields via the blending of both arts and sciences. The piece is dominated by Lady History, who is crowned with various instruments that are crucial to the development of these fields, including Maria the Alchemist's alembic, a scalpel, pencil, measuring stick, trowel, beaker, and ammonite fossil. Woven throughout her hair are stars, music, Ada Lovelace's Note G, as well as binary and DNA codes that translate into words such as revelation, guide, curiosity, and of course, Mycelium. Surrounding Lady History are cosmic clouds and constellations which hearken not only to the brilliant work of female astronomers, but also as a reminder that every single person who has contributed to humanity's collective knowledge base has seen and lived under those stars. Thus, they represent a unifying connection between the innovators of yesterday, today, and tomorrow. I am truly honoured to present this piece as a symbol of what can be achieved with dedication, perseverance, and courage. Although textbooks may never mention the names of every single contributor to science and technology, Lady History will not forget.

Selling the Front Lawn: The Insignia of a Prosperous and Civilized American Middle Class

Deirdre Beaumont

What comes to mind when you hear the words 'Suburban America'? You most likely picture a mid-sized colonial home set far back from the sidewalk. Maybe Dad's grilling hamburgers while Mom tends to the garden and the kids toss a ball around the front yard.
Perhaps in the distance you can hear the faint hum of a power mower mixed in to a symphony of birds chirping and dogs barking. Maybe you picture a quiet row of nearly identical homes separated from one another by stark white picket fences and distinguishable only by some lawn furniture or a gaudy plastic flamingo. Or maybe you picture a small group of adults settled into lawn chairs, sipping happy hour cocktails while an automatic sprinkler mists the grass behind them. No matter what kind of home you're picturing, there are two things that are likely an important part of your vision: a happy and successful all-American family, and a perfectly manicured bright green lawn surrounding the home. Why are these two images such central features of American culture in the mid-twentieth century? What can they teach us about the formation of the stereotypical American identity, and how did something as seemingly insignificant as a stretch of grass in front of a suburban home become an important symbol of social status and moral sensibility? There are two key developments that together tell the story of how the American front lawn was turned into an icon of suburban life: the popularization of landscape architecture in the mid-nineteenth century, and the social and economic transformations that took place in America between the late nineteenth and mid-twentieth centuries. I will begin with a brief description of the literature that created the foundation for American landscape design to explain how the home grounds became associated with one's moral character and social standing. I will then analyze a well-known 1955 illustration to showcase just how effective the front lawn aesthetic was in forming and promoting specific assumptions about the stereotypical suburban-American identity in the twentieth century. In this essay I will guide you through the rapidly changing residential landscapes of suburban America to uncover the role that mass media and advertisements play in the formation and dissemination of new social and cultural norms.

I. The Grass Roots of the Front Lawn Aesthetic

Our story begins in the second half of the nineteenth century, when the works of two prominent authors, Andrew Jackson Downing and Frank J. Scott, helped direct the attention of Americans towards the aesthetic composition of their estates. Downing, America's first professional landscape architect, transformed the way that Americans designed and perceived their homes.[1] He was captivated by the large rural estates of England's upper class, believing that they represented refined aesthetic and moral sensibilities that had yet to be cultivated among

[1] Virginia Scott Jenkins, *The Lawn: A History of an American Obsession.* (Washington, D.C: Smithsonian Institution Press, 1994) p. 21.

American homeowners.[2] Downing found that Americans neglected the visual elements of their landscapes in favour of functionality and utility, producing domestic architecture that clashed with its natural surroundings.[3] His goal was to foster a deeper appreciation of beauty among his readers and to provide them a set of guiding principles to design estates that added to, rather than detracted from, natural beauty.[4] Downing believed that nature possessed all the essential qualities that constituted true beauty. The most pleasing natural landscapes were attractive because of their undeniable order, harmony, and balance.[5] Because nature and beauty were so intimately linked, Downing emphasized the importance of gardening in landscape architecture. He taught readers what to plant, how and where to plant it, and why such choices were important. The goal of gardening was not merely to replicate or mimic natural beauty. Rather, Downing told his readers that by choosing the correct plants and arranging them in a specific manner, they could not only channel, but maximize the harmony, order and balance already present in nature when personalizing their properties.[6] He believed that the homeowner who followed his principles would unify nature and artifice, effectively transforming their home grounds into a work of fine art.[7]

Beautifying the home grounds did more than elevate the aesthetic value of the home. By embellishing the home grounds, the homeowner not only increased the happiness of their family, but improved the "taste, and [added] to the loveliness of the country at large."[8] Downing believed that exposure to beauty increased the quality of one's life by maximizing sources of joy and comfort.[9] Further, Downing saw that an orderly and nicely balanced residential landscape was a testament to one's moral composition: "all beauty is an outward expression of inward good."[10] Downing explained that truly beautiful home grounds served two important purposes.[11] On one hand, they indicated to the public that the homeowner was a sophisticated and well- mannered member of society. On the other, they acted as a model for passers-by to refer to when designing their own home grounds. Downing hoped that his principles of landscape gardening and architecture would elevate the appearance of American cities and the quality of their

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[2] Andrew J. Downing, preface to *A Treatise on the Theory and Practice of Landscape Gardening: Adapted to North America: With a View to the Improvement of Country Residences: With Remarks on Rural Architecture* (New York: Moore, 1859) p. ii

[3] Andrew J. Downing, *Cottage Residences : Or, A Series of Designs for Rural Cottages and Cottage Villas, and Their Gardens and Grounds, Adapted to North America* (New York: J. Wiley, 1852) pp. i, ii, 25

[4] Downing, preface, *Cottage Residences*, p. ii-iii.

[5] Downing, *A Treatise on the Theory and Practice of Landscape Gardening*, p. 32

[6] Downing, *A Treatise on the Theory and Practice of Landscape Gardening*, p. 33

[7] Downing, *A Treatise on the Theory and Practice of Landscape Gardening*, p. 35

[8] Downing, preface, *A Treatise on the Theory and Practice of Landscape Gardening*, p. iii

[9] Downing, preface, *A Treatise on the Theory and Practice of Landscape Gardening*, p. iii

[10] Downing, preface, *Cottage Residences*, p. iii

[11] Downing, preface, *A Treatise on the Theory and Practice of Landscape Gardening*, p. iii

residents. It is important to note that while his target demographic was not strictly the American upper class, the vast majority of Americans did not have the time nor the means to dedicate to landscape architecture in the way that Downing had envisioned. The lawns and gardens he described were expansive and required time and resources to achieve and maintain and therefore remained mostly a luxury for the wealthy to enjoy.[12] He did, however, provide a starting point for later authors to democratize landscape architecture.

Our second important figure is Frank J. Scott, who, inspired by Downing, published the first work dedicated entirely to suburban landscape gardening.[13] Scott wanted to create a set of standards that would help guide the design of suburban neighbourhoods that were rapidly gaining popularity across American cities.[14] Unlike Downing, Scott's goal was specifically to teach readers how to maximize the beauty of their grounds while minimizing the associated costs and energy.[15] He wanted to simplify Downing's ideology so that the busy middle class could participate in beautifying their homes and their cities in a way that did not demand a significant portion of their time and income.[16] Rather than Downing's grand displays of trees and flowers, Scott promoted a small and smooth lawn with one or more large trees to create a visually pleasing suburban property.[17] Lawns were of the greatest importance for Scott. He believed that "a smooth, closely shaven surface of grass [was] by far the most essential element of beauty on the grounds of a suburban home."[18] No matter how extravagant the home grounds were, they were incomplete and unsatisfactory without a smooth stretch of grass.[19] The front lawn was a relatively inexpensive and time efficient investment that enabled families of more modest means to elevate the beauty of their homes. Scott provided the lower and middles classes with what Downing had provided America's wealthiest citizens: a set of rules and principles to follow to maximize the aesthetic value of their home grounds.

Downing and Scott are by no means the only notable authors of their kind, though they do play important roles in our story. Downing's works contributed to the development of the notion that the appearance of a home conveyed important messages about the homeowner and their character, while Scott's works provide insight into the importance of the front lawn in relation to the American suburban aesthetic. Later we will see how much of both Downing and

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[12] Jenkins, *The Lawn*, p. 24

[13] David P. Handlin, *The American Home: Architecture and Society, 1815-1915* (Boston: Little, Brown, 1979) p. 171

[14] Handlin, *The American Home*, p. 171

[15] Frank J. Scott, introduction to *The Art of Beautifying Suburban Home Grounds of Small Extent : Illustrated by Upward of Two Hundred Plate and Engravings of Plans for Residences and Their Grounds, of Trees and Shrubs, and Garden Embellishments; with Descriptions of the Beautiful and Hardy Trees and Shrubs Grown in the United States* (New York (State): Amer. bk. exchange, 1881), p. 14

[16] Scott, *The Art of Beautifying Suburban Home Grounds of Small Extent*, p. 22

[17] Scott, *The Art of Beautifying Suburban Home Grounds of Small Extent*, p. 22-23

[18] Scott, *The Art of Beautifying Suburban Home Grounds of Small Extent*, p. 107

[19] Scott, *The Art of Beautifying Suburban Home Grounds of Small Extent*, p. 107-08

Scott's ideology was incorporated into popular media in the early and mid-twentieth century to both cultivate and promote a specific lifestyle through the sale of lawn-related products.

II. You Are What You Own!

Before moving on to discuss the relation of the front lawn to the suburban American aesthetic, we must first understand how advertisements and mass media came to be so intimately linked to the stereotypical American identity. Of the various transformations that took place in America between the late nineteenth and early twentieth centuries, there is one in particular that significantly shaped the American identity: the development of national markets for consumer goods.[20] Industrialization and the associated expansion of the working class boosted productive capacity to unprecedented levels, turning consumerism into a central feature of the American lifestyle.[21] Further, the concurrent establishment of a country-wide railroad system meant that the availability of goods and information was no longer dependent on the consumer's proximity to the manufacturers.[22] Americans all across the country were buying the same products, following the same trends and reading the same material. As the range of available commodities grew, consumer choices became a kind of social statement. What one purchased was an indication of their financial status, their values and the kind of lifestyle they conformed to.[23] As a result, advertisements, mail-order catalogues and lifestyle magazines earned increasingly important roles in the lives of consumers.[24] They both reflected and informed consumer desires. This was done in two ways: either by promoting products that responded to existing needs, or by crafting new needs that could be met only with the purchase of specific products.[25] They told consumers that what they purchased was not merely a commodity, but was an essential feature of the lifestyle they wanted.[26] These catalogues became almost analogous to textbooks; even if the reader had no intention of purchasing the advertised products, the beautifully composed images acted as blueprints for many Americans to embody the kind of lifestyles they desired.[27] The spread of goods and information on a national level meant that the vast majority of Americans were presented with the same exaggerated image of a perfect, prosperous lifestyle, making it possible to feed almost an entire population a standardized image of the new ideal American identity that was defined by what they had and what they looked like.

Another outcome of a rapidly industrializing America was the growth of the middle-class. As wealth gradually accumulated, homeownership was no longer a distant and unrealistic dream

[20] Jenkins, *The Lawn*, p. 64
[21] Jenkins, *The Lawn*, p. 65
[22] Jenkins, *The Lawn*, p. 64
[23] Jenkins, *The Lawn*, p. 64, 66
[24] Jenkins, *The Lawn*, p. 65
[25] Jenkins, *The Lawn*, p. 67
[26] Jenkins, *The Lawn*, p. 64
[27] Jenkins, *The Lawn*, p. 66

for many American families.[28] Suburban neighbourhoods multiplied across America as more and more families left the city to settle down in their first long-term homes.[29] It was in these suburban neighbourhoods that the typical front lawn aesthetic truly became an icon of the stereotypical American lifestyle. The technological advances that had come out of American industrialism made a front lawn infinitely easier to achieve and to maintain. Motorized lawn mowers, improved grass seed, home irrigation systems and chemical fertilizers and pesticides are among some of the products that enabled much of suburban America to adopt the front lawn aesthetic.[30] Thinkers like Downing and Scott had long before established a strong connection between the front lawn and specific kinds of people.[31] The emergence of improved lawn technology and the pre-existing association of the front lawn aesthetic with high-class society made the front lawn the perfect vessel with which to sell a contrived and idealized American identity to a growing group of eager consumers.[32] The lawn was a perfect combination of social symbol and commodity. A smooth, bright green lawn indicated to the public that the homeowner had the time and money to spend in order to achieve it and the discipline and moral sensibility necessary to maintain it.[33] The way that one managed their lawn more profoundly represented the way that they managed their lives, meaning that the most attractive front lawns represented the finest members of American society.

[28] Jenkins, *The Lawn*, p. 63-65

[29] Paul Robbins, *Lawn People: How Grasses, Weeds and Chemicals Make us who we are*, (Philadelphia: Temple University Press, 2007), see pages 28-30 for more information on the growth of suburban neighbourhoods in America during the twentieth century.

[30] Jenkins, *The Lawn*, p. 28, 30

[31] Robbins, *Lawn People*, p. 29

[32] Jenkins, *The Lawn*, p. 63, 65

[33] Robbins, *Lawn People*, p. 29

III. *Showing off the new Power Mower*

There is an almost endless supply of media that shows just how significant the front lawn aesthetic was to American society in the mid-twentieth century — one must simply flip through any old magazine and they will be bombarded with image after image of dazzling green lawns and shiny power-mowers. There is, however, one image in particular I feel is worth our attention. Made in 1955, Fred Siebel's illustration titled *Showing off the new Power Mower* perfectly encapsulates the relationship between suburban-American consumers, advertising companies and the front lawn aesthetic.[34] What is unique about this image is that there is no specific product being sold. Rather, the image was used by the United States Brewing Foundation (USBF), who

[34] Siebel, *Showing off the New Power Mower*, illustration, "The Great American Mow Down," accessed November 25, 2023, https://envisioningtheamericandream.com/2012/05/10/the-great-american-mow-down/

wanted to ‘refurbish’ the reputation of beer in general.[35] This image was given a full-page feature in various magazines in hopes of promoting beer sales using the subliminal messaging about morality and sophistication that had been strategically woven into the front lawn aesthetic. The eye is immediately drawn to the bright red power-mower and golden beer in the centre of the image, set against a velvety, bright green carpet of grass. Gathered around the mower are three well-dressed middle class men sporting the typical suburban uniform of golf shirts tucked into khaki pants, beers in hands and big smiles on their faces. Tucked away in the background is a moderate sized suburban home. This image says “look! If the well-mannered suburbanites are drinking beer, you should too! And what better place to enjoy an ice cold, American-made beer than the beautiful front lawn you work hard to maintain?” The only thing sold by this advertisement is the stereotypical American way of life.

The front lawn is something that most people hardly ever think twice about — and why should they? It has been the norm across North American residential neighbourhoods for nearly a century. However, even a brief glance at the history of the front lawn will reveal that it is not merely an insignificant convention of the Western world. Rather, it is an icon of American culture that represents consumerism and the obsession with aesthetics that overtook American society in the mid-twentieth century. While it does not represent actual social realities, the front lawn aesthetic is the epitome of a drastically idealized image of society in suburban America. By digging into its origins and looking at how the concept of a front lawn evolved from figures like Downing and Scott to its depiction in popular media, we are prompted to question what kind of ideology might be motivating seemingly neutral decisions, like the clothes we wear or the books we read. The story of the front lawn can lead us to assess our relation to the media we consume and how it influences our understandings of ourselves and one another.

[35] Sally Edelstein, “A Blue Print for the Middle Class” from *Envisioning the American Dream,* 24 September 2012, https://envisioningtheamericandream.com/2012/09/24/a-blueprint-for-the-middle-class/

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Figure

Siebel, *Showing off the New Power Mower*, illustration, "The Great American Mow Down," accessed November 25, 2023, https://envisioningtheamericandream.com/2012/05/10/the- great-american-mow-down/

How can we know what we are? Boundaries of difference in *Blade Runner* (1982)

Claire Blackmer

The setting is Los Angeles, 2019. Acid rain falls from the sky without end, and a blimp lazily patrols the skies, advertising an off-world colony full of luxury to the humans who have had to stay on Earth because they cannot afford it. It is on these streets that we find Rick Deckard, a (reluctant) blade runner, a specialized member of the LAPD whose job it is to track down and 'retire' replicants. These replicants, manufactured human-like beings who are not human enough, are created to work on these colonies in slave-like conditions, never allowed to come to Earth. In this world, keeping the boundary between humans and replicants strong is essential for the operation of the off-world colonies, and the public's belief that what the Tyrell corporation, and humans more widely, are doing is fine, even good. *Blade Runner* creates a firm boundary between humans and replicants, one which it must uphold, through the use of blade runners, in order to continue to function. As the film progresses this boundary is dissolved, and eventually annihilated, in the eyes of both the film's protagonist and its viewers. While keeping in mind the question at the heart of Ridley Scott's 1982 film: "What does it mean to be human?", this exploration and analysis of the destruction of the boundary between humans and replicants will focus on exploring just how different the two groups are, as well as how Deckard deconstructs the idea that he has spent his entire career upholding: that humans and replicants are essentially different.

A blade runner is someone who operates on the thin edge between humans and replicants, someone whose job it is "to police the boundaries of difference" between them.[1] These two groups are defined in their opposition to one another – a human is born, a replicant is created; a human is killed, a replicant is retired; a human can live wherever they please, a replicant cannot live on Earth. Because they are defined by their differences, replicants are 'othered' both conceptually and spatially in order to maintain the structures of power that necessitate their subservience.

The conceptual 'othering' of replicants is best exhibited in the language used by blade runners to describe their job. Replicants (or "skin jobs", as Deckard's boss refers to them),[2] are not killed, they are 'retired'. This term "implies the purpose of their lives is labour"[3] and serves to separate them from humans, upholding the notion that replicants are not living things with inherent rights and freedoms, but the possessions of humans. This othering is dependent on replicants not only being conceptually separated from humans, but geographically separated as well. This "imaginative geography"[4] means that if a replicant were to cross the geographic boundary between the off-world colony where it works and the Earth where they are not allowed to live, they would be asserting their agency, jeopardizing the conceptual boundary, and upsetting the power relations that define them as disposable.[5] The blade runners thus affirm this

[1] Tihana Bertek, "The Authenticity of the Replica: A Post-Human Reading of *Blade Runner*", *Literary Refractions* 5, no. 1 (2015), p. 4.
[2] *Blade Runner*, directed by Ridley Scott (U.S., Warner Bros, 1982).
[3] Bertek, "The Authenticity of the Replica", p. 4.
[4] Bertek, "The Authenticity of the Replica", p. 4.
[5] Bertek, "The Authenticity of the Replica", p. 4.

boundary of difference with every 'retirement', further dehumanizing replicants and creating a sense of urgency associated with their destruction. It is because the blade runner's job is to uphold this separation that they must believe in it and thus be able to justify it.

Rick Deckard's name pays homage to the seventeenth-century thinker René Descartes, often considered the founder of modern Western philosophy. Though he wrote many foundational texts, there is one concept which is especially important to readings of *Blade Runner*. This concept, of course, is Descartes' famous dictum *cogito, ergo sum*, most commonly translated as "I think, therefore I am." For Descartes, consciousness defined humanity. The fact that humans were thinking beings was for him, "the essential difference between human beings and all other living things."[6] It is this human exceptionalism that is challenged by Roy Batty, the leader of a group of rebel replicants, and his lover Pris as they have breakfast with Sebastian, one of the human scientists responsible for the creation of replicants. When an excited Sebastian asks the replicants to show him "something", Roy Batty becomes offended, telling him that "We're not computers, we're physical", to which Pris adds Descartes' dictum, "I think, therefore I am."[7] In this exchange, Batty asserts the replicants' physical existence, while Pris asserts their mental existence, proving that they meet Descartes' criteria for humanity. They are physical, rational beings, and thus are as human as Sebastian, and deserving of the same respect.
Unfortunately, in the world of *Blade Runner*, meeting this definition is not enough. The Voigt-Kampff test, the only true way to know whether someone is a replicant or not, is designed to reveal replicants "by detecting minute changes in the subject's iris fluctuation, capillary dilation, and blush response elicited by the subject's emotional responses to a series of carefully designed questions that involve human or animal suffering."[8] Replicants, the film explains, lack the empathy that humans possess. Thus, Descartes' notion that humans are unique in being thinking beings is altered to recognize humans as unique in being *feeling* beings.

Blade Runner works hard to draw the line between human and replicant, and it works even harder to destroy it. In his book *Philosophy and Blade Runner*, Timothy Shanahan argues that this is done by giving the replicants human characteristics, by "depicting human beings as lacking characteristics often considered to be distinctly human", and by reversing the roles of replicants and humans at moments of heightened tension.[9]

To properly explore Shanahan's argument, it is useful to note how replicants and humans actually differ, not just how they are *purported* to be different. As previously stated, replicants are not born. They are created, and they have a set four-year life span. They are "designed with specific physical and mental attributes to make them well-suited for performing tasks that many humans would tend to find unpleasant and/or unnecessarily hazardous" in their lives off-world, meaning that many of them are physically and intellectually superior to humans.[10] Since they did not have a developmental period, they lack emotional maturity. Some replicants have implanted memories, and all are believed to lack empathy, the trait by which they are identified through the use of through the use of the Voigt-Kampff test. These differences, however, are not as damning to the inhumanity of replicants as the film's world would like its people to believe.

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[6] Timothy Shanahan, *Philosophy and Blade Runner* (Hampshire: Palgrave Macmillan, 2014), p. 24.
[7] *Blade Runner*, 1982.
[8] Shanahan, *Philosophy and Blade Runner*, p. 36.
[9] Shanahan, *Philosophy and Blade Runner*, p. 33.
[10] Shanahan, *Philosophy and Blade Runner*, p. 56.

The group of replicants which Deckard is assigned to hunt down consists of Roy Batty, the leader and combat model, Pris, "a basic pleasure model", Leon, a "nuclear loader", and Zohra, a member of "an off-world kick-murder squad".[11] Having come down to earth to find a way to extend their lifespans, these replicants each possess a unique identity, exhibit unique character traits, and each one of their deaths "demonstrates the tenacity and will with which these replicants cling to life – another human trait."[12] These four replicants (as well as a fifth member of the group who dies before the film begins) are the closest thing to a family unit shown in the film. They are immensely loyal and share deep, lasting bonds. Their interactions with one another demonstrate a level of care, and indeed empathy, which the humans in the film notably do not show each other. On top of being feeling beings, they are "clearly rational beings – they reason, they plan, they value their own lives and experiences, and they wish to determine their own fates."[13]

Rachael is the other replicant introduced by the film. A woman who does not know that she is a replicant, Rachael has been given memories by Tyrell, granting her a distinct sense of self, and confidence in her identity as human. Both in *Blade Runner*'s universe and our own, memory "plays a central role in human life and individual identity."[14] Not only do memories help us to explain our past, and therefore our present, they allow us to create an image of the future – a future that replicants, with their limited life span, will never see. Perhaps this deception of Tyrell's is part of Deckard's outrage at Rachael's existence. "How can it not know what it is?" he asks Tyrell, unknowingly pointing to a much larger ontological problem.[15]

Though Rachael's memories are implanted, they are not functionally any less real for her. As she begins to suspect that she is not what she has lived her whole (extremely limited) life believing she is, she goes to Deckard's apartment in order to convince him, and herself, that she is truly human. With her, she brings photographs, "artefacts of memory"[16] which help her to confirm her identity. "Photographs," Ridley Scott says, "are essentially history, which is what these replicants don't have."[17] Because she has photographs, and because she has memories, she must believe she has history. When it is revealed to her by Deckard that these memories are not authentically hers, the basis for Rachael's identity comes crashing down around her. If her memories do not belong to her, then who is she? Though her identity has, in a way, been nullified by the reveal that her memories are inauthentic, that does not mean that they are no longer real. Her memories of piano lessons are implanted, but she can play the piano. Her memories are false, but they have nevertheless affected who she is and how she acts. As Rachael is perceived to be the most 'human' of the replicants, and her only true difference is her memories, it is thus implied that memories are what the film perceives to grant an individual human empathy and advanced emotional maturity – thus, the Voigt-Kampff test is not as

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[11] *Blade Runner*, 1982.
[12] Joseph Francavilla, "The Android as *Doppelgänger*", p. 13.
[13] Shanahan, *Philosophy and Blade Runner*, p. 49.
[14] Deborah Knight and George McKnight, "What is it to be Human?", in Steven Sanders, ed., *The Philosophy of Science Fiction Film* (Lexington: University Press of Kentucky, 2008), p. 30.
[15] *Blade Runner*, 1982.
[16] John Byron, "Replicants R Us: The Crisis of Authenticity in 'Blade Runner'", *Sydney Studies in English* 34 (2008), p. 48.
[17] Ridley Scott, quoted in Rickman, "I Think, Therefore I Am", in Gregg Rickman, ed., *The Science Fiction Film Reader* (New York: Limelight Editions, 2004), p. 303.

efficient as it normally is, and Deckard must ask over a hundred questions to confirm that she is, in fact, a replicant. This decrease in the effectiveness of the one true test of humanity serves to destabilize the boundary that Tyrell himself has helped to establish.

Further destabilizing is the fact that the humans in the film seem to lack the characteristics that are conceived of as human. While the replicants operate in a family unit, none of the humans are shown to share strong emotional bonds. Furthermore, though these humans supposedly have empathy as their natural birthright, they do not demonstrate it.[18] Empathy is only truly demonstrated when it comes to the replicants – the humans do not seem to care much for or about one another, and very rarely do they overtly express emotion, unlike the replicants. Deckard is the best example of this. A true hard-boiled detective, Shanahan describes him with a list of unsavoury traits: he is affectionless, predictable, compliant, coldly logical, emotionally dead, and grimly serious.[19] All of these are traits that one would typically ascribe to a robot rather than a human. This list can be contrasted with Shanahan's description of the emotional states Roy Batty demonstrates: "Roy is playful and poetic in his interrogation of Chew, full of rage when he kills Tyrell, vengeful when he breaks Deckard's fingers, and tender when he kisses Pris' lifeless lips."[20] While it is true that Deckard also demonstrates rage, and perhaps even vengeance, he is never playful, never poetic, and he is arguably only tender at the end of the film, when his character development is complete. Deckard is so cold and unemotional that Rachael asks him during their first meeting whether he has ever taken the Voigt-Kampff test himself. The implication here is that "Deckard himself lacks the very quality that is supposed to distinguish humans from replicants."[21]

When replicants demonstrate more human characteristics than humans do, it is not difficult to find the truth in Tyrell's boast that his creations are "more human than human."[22] As humanity is increasingly associated with the replicants, and Deckard begins to question the truth that he has spent his entire career affirming, the line between human and replicant blurs, and roles are reversed. Deckard is assigned to hunt down and 'retire' Roy Batty's group – he is the hunter. However, in his fights with both male replicants, Leon and Roy Batty, he becomes the hunted. The replicants are able to overcome their given roles as prey and become predators. Even at the beginning of the film, Leon takes down the blade runner who is administering his Voigt- Kampff test. With their ability to reverse the physical identities of hunter / hunted, and their abilities to reverse the conceptual identities of feeling / unfeeling, they endanger and dissolve the boundaries of difference which Deckard must believe in in order to continue on his path. These boundaries thus begin to dissolve not only for the viewer, but for Deckard himself.

When the audience is introduced to him, Deckard's view of replicants is in line with his role as blade runner. His opinion of both replicants and his job is illustrated when he tells Rachael that "Replicants are like any other machine. They're either a benefit or a hazard. If they're a benefit, it's not my problem."[23] This begins to shift when he realizes that Rachael does not know that she is a replicant. If she does not know, and she feels that she is human, then how different can the

[18] Shanahan, *Philosophy and Blade Runner*, p. 19.
[19] Shanahan, *Philosophy and Blade Runner*, p. 38.
[20] Shanahan, *Philosophy and Blade Runner*, p. 35.
[21] Shanahan, *Philosophy and Blade Runner*, p. 38.
[22] *Blade Runner*, 1982.
[23] *Blade Runner*, 1982.

two really be? The more time the two spend together, the less certain he is that what he has been taught is correct. It is when Rachael kills Leon and saves Deckard's life in the process that he realizes that none of the beliefs he holds about replicants apply to her. And if there is one exception to the rule, then the rule itself may be useless.

Deckard's relationship with Rachael does not only make him question how he views replicants, but how he views himself. If memories, artefacts of memory, and the conviction that one is human no longer guarantee one's humanity, then what does? Deckard's question to Tyrell regarding Rachael at the beginning of the film: "How can it not know what it is?"[24] is no longer about her, but about himself. Deckard begins to lose interest in the question of how one can know whether or not someone is a replicant, and begins to question whether a person can know for certain that they are truly human.[25] The answer is that they no longer can. The problem of self-knowledge becomes unsolvable, and any certainty that Deckard once felt regarding his identity crumbles. As he begins to question his humanity, so does the audience. The "Deck-a-Rep" debate, as Shanahan calls it, continues to rage online, forty years after *Blade Runner*'s premier.[26] All that can really be certain is that no one can be, least of all Deckard.

While Deckard steadily dissolves his belief in the boundary between human and replicant throughout the film, it is Roy Batty's death which destroys it for good. Roy Batty, the last surviving member of the group of replicants, has learned about the death of his friends, killed his maker, and witnessed his lover's murder at the hands of Deckard. Everything has been taken from him, and he knows that there is no way for him to get out of his final battle with Deckard alive, not truly. He can kill Deckard, but there will always be another blade runner, and eventually, his time will run out. It is with this knowledge that he becomes a brutal hunter, exhibiting inhuman feats of strength as he chases Deckard through the dilapidated buildings of Los Angeles, climbing higher and higher and finally arriving on the rain-soaked roof. It is here that Deckard slips in his attempt to run from Roy Batty, dangling from the rooftop, his life now fully in Roy Batty's hands. "Quite an experience to live in fear, isn't it?" Roy Batty asks him. "That's what it is to be a slave."[27] When Deckard slips, Roy Batty's hand shoots out, saving Deckard from a fall that would have killed him. While the replicant's motivation for saving Deckard is unclear, and even contested among the cast and crew of *Blade Runner*, the outcome is the same.[28] Roy Batty saves Deckard, and the two of them face each other on the rooftop, bloody and beaten, each understanding the other. Deckard now understands the replicants' experience, "what it is to live in fear," and Batty understands the risk that replicants pose to the humans' perception of self-knowledge.

It is in this truce, in this moment of understanding, that Roy Batty dies. With Deckard as his witness, Batty delivers a final monologue not about the people he's lost, nor about the pain he's in, nor about the evils of humans, but about his memories, and the beauty he's witnessed in the universe. Roy Batty, the replicant who quotes poetry, dies speaking it. It is with his death that the vestiges of Deckard's belief in the boundaries between replicants and humans shatter, and he comes to fully realize that whether or not they are different does not matter any longer, cannot matter any longer to him. It is because of this final battle, because Deckard "*cannot* kill Batty"

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[24] *Blade Runner*, 1982.
[25] Byron, "Replicants R Us", p. 48.
[26] Shanahan, *Philosophy and Blade Runner*, p. 20.
[27] *Blade Runner*, 1982.
[28] Paul Sammon, *Future Noir: The Making of Blade Runner* (New York: Dey Street Books, 2017), pp. 227-8.

that he realizes he "*will* not kill Rachael,"[29] and completely severs his ties with his old life and belief system, escaping with Rachael into the unknown and accepting that her humanity is equal to his own.

Throughout the film, and indeed, throughout this essay, the boundaries that were established as essential are unraveled and left destroyed. The boundary between humans and replicants, so essential for the maintenance of the power structures that exist in *Blade Runner*'s Los Angeles and the off-world colonies, is extremely fragile. An exploration of the role of blade runners, Descartes' definition of humanity, the differences between replicants and humans, and how Deckard's belief in the system he upholds dissolves, has shown that the line between human and inhuman is not as stable as those in power want it to be, and perhaps it never is. In a world where replicants do not know what they are, what does it mean to be a human?

[29] Francavilla, "The Android as *Doppelgänger*", p. 13.

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Disembodied Data: An Ecofeminist Reading of Mind/Body Dualisms in Ecological Narrative

By Jessica Casey

One accusation that may keep some biologists up at night is whether their work could be considered anthropocentric. Here, "anthropocentric" refers to centering humanness as the essential element of existence instead of seeing non-human animals and plant life as beings in their own right. However, there are also dangers to presenting the study of other-than-human beings as though it is unaffected by the researchers' position as an embodied human with certain belief systems and backgrounds. The suppression of human subjectivity and embodied perception is central to the claim of scientific objectivity, a public narrative reinforced by governmental bodies that "science," as a knowledge-producing institution, is "unbiased," unburdened from the influence of any particular social or political background. This narrative might suggest that humans, for instance, can document the objective, complete, and measurable truth about how a tree species interacts with fungi. Instead, many critical scholars claim that engaging in scientific practice in a way not situated by particular belief systems is impossible. Further, many ecofeminists and feminist science scholars would say that within dominant science, these belief systems have been historically laden with patriarchal narratives. In "The Power and Promise of Ecological Feminism," Karen Warren analyzes patriarchal narratives in terms of dichotomies —male/female, subject/object, mind/body— which people can manipulate to justify the joint exploitation of women and nature. In *Gender and Science*, Evelyn Fox Keller unpacks the roles of many of these same dichotomies in the history of science, especially through the example of metaphors in scientific writing. One of the reasons these dichotomies persist in dominant science may be because many scientists in the Western tradition have personal investments in certain systems, such as the material and intellectual domination of nature. Through a case study, Keller explores what it means to do science in a way that actively divests from these norms and traditions. As both Warren and Keller suggest, the notion of the "mind" as a disembodied masculine scientific entity is central to normative patriarchal ways of viewing nature. Therefore, I argue that there is radical potential in considering the human body as a relational player during human/non-human interactions of knowledge production. This suggestion is not to privilege "body" over "mind" by introducing an alternative value hierarchy but instead to reimagine "mind" and "body" as inextricable and culturally constructed parts that comprise the fullness of human subjective experience.

Mind/body dualism has long been tacitly present in dominant scientific rhetoric, which can sometimes reveal itself through figurative language. Karen Warren includes mind/body dualism as one of the dichotomies inherent in the justifications for the domination of women and nature. "The Power and Promise of Ecological Feminism" offers the critical framework for 'ecofeminism,' a movement which seeks the liberation of both nature and women, acknowledging that the oppression of both are intimately intertwined and operate on similar oppressive conceptual frameworks. She outlines three significant features of an oppressive framework of thinking: value-hierarchical thinking, value dualisms, and the logic of domination. In the second section, "value-dualisms," Warren organizes two distinct and discrete categories: "mind, reason and male" and "body, emotion and female." She writes an example of an oppressive syllogism that conceptually identifies women with "nature" and the

"physical," and associates men with the word "human" and the "realm of the mental" (22). As the framework assumes that [women/nature/body] are inferior to [male/human/mind] and also that inferiority justifies subjugation, therefore, the syllogism vindicates patriarchy. Warren proves that this syllogism includes all three features of an oppressive framework. From the very start, this framework assumes a mind-body dualism. One particularly rich example of mind and body as a value-dualism emerges in Evelyn Fox Keller's rhetorical analysis of Western scientific writing in her book *Gender and Science*. She analyzes marital metaphors in the writing of Francis Bacon, a Viscount and English philosopher who influenced Newton, Hobbes and Locke. Keller summarizes Bacon's metaphorical writings about "Nature" and "man" as the following: "It is Nature herself who is to be the bride, who requires taming, shaping and subduing by the scientific mind" (48). Similar to Warren's ecofeminist analysis, intellectual men are cast here as the masculine "scientific mind," rather than part of the feminine realm of physicality and embodiment. This encounter between humankind and nature operates as a gendered subject/object relation. This narrative of man's relationship with nature creates and naturalizes the notion that knowledge production always consists of a process where a knowing subject encounters an embodied object of study.

All work that leads to knowledge production has stakes. Beyond grant funding and awards (though these are influential as well), personal investments into the outcomes of a scientist or team of scientists' findings can unconsciously shape their practices. Those who continue to benefit from status quo systems of value-hierarchies, value-dualisms and the logic of domination in society are likely to have some level of core investment into these basic tenets. Even the idea that science is impersonal (and is therefore objective and valid) is something that scientists may have personal investments in. Personal investments themselves are not inherently wrong; they are a normal part of being in the world. For instance, when Warren writes about a rock climber's first-person narrative of climbing a mountain, the climber's sensitivity to the situation emerges during a pause for reflection. Though at the start of his narration, the climber is determined to reach the top and "conquer the rock" (Warren 26), they then slow down to reflect and begin to think of themself as in a relationship with the mountain instead. Upon acknowledging this relation, they discover their personal investments in the rock, saying, "I felt an overwhelming sense of gratitude for what it offered me—a chance to know myself and the rock differently" (26). Using the language of "investment" may be helpful when describing human connections to the land and our other-than-human kin. Unlike "bias," it has no lingering connotations of "error" or "oversight." Though having personal investments is an expected result of being in the world, not acknowledging or analyzing them can prove problematic. One case study of personal investments affecting scientific practice came from Evelyn Fox Keller's biography of Barbara McClintock, an American cytogeneticist who won a Nobel Prize in 1983. Many other biographers may have lauded McClintock for breaking through the gender barriers to succeed in her field and become similarly successful as her male contemporaries. Instead, Keller wrote about McClintock's fundamentally unique way of seeing things compared to her peers. For instance, McClintock did not commit herself to the view that all non-human life submits to being neatly categorized and governed by a series of definite natural "laws." This view of "natural laws" is a socially constructed idea: the common phrase that nature is "governed" by "laws," even uses language that figuratively gestures to human legal systems. The view that natural bodies will always follow definitive rules is a background that will produce certain scientific practices. Keller writes of McClintock, "[s]he has no investment in the passivity of nature" (171).

Therefore, McClintock could welcome the anomalies she observed while in the field not as evidence of disorder but as a signal to larger systems of order that are irreducible to a single fundamental law or theory. More than just "diversity" for its own sake, this example illustrates how adding people with different backgrounds and investments can fundamentally change a field.

The human body mediates all human observation. This statement may sound like an absurd or self-evident conclusion, but it works in tension with the idea of an unbiased "scientific mind." The notion that the mind can be separated from the body is often evident in metaphor, in phrases such as "mind over matter," "the scientific mind," or "the best minds of my generation." Beyond metaphor, the notion that the body is integral to gaining an understanding of the world around us is not necessarily self-evident in all spaces. Métis scientist Max Liboiron runs a feminist anti-colonial laboratory in Newfoundland called CLEAR Labs. In their book *Pollution is Colonialism,* Liboiron wrote about the practices they laid out for every lab technician as they studied fish samples. These include avoiding headphones in order to feel present with the animal, acknowledging the sample the technicians work with as a life, and documenting how the technicians feel before doing the work, along with information such as the date and time (Liboiron 123). This set of guidelines creates a unique and intentional practice of being with the animal that guides the technicians' work. More than just showing a generic "respect" for the animal, it also suggests that embodied subjective experience matters considerably during data collection. This idea is quite common in anthropology, where ethnographers generally accept the notion that the embodied subject is the instrument of data collection (Madden 19). However, examining how the embodied positionality of scientists affects their practice and investment in their work is less common.

As described previously, the investment into claims of "objectivity" can be necessary for the perceived validity of scientific work. The break from traditional narratives of objectivity is why practices at CLEAR labs are quite radical: it opens the door to the idea that the embodied, emotional self matters in the laboratory. Perhaps a person who is tense or disgruntled will hold lab mice more tightly, making them more afraid and less likely to succeed in their tasks. Someone in a positive mood may be more likely to interpret data optimistically. It is impossible for a person to completely switch off integral faculties like emotions, backgrounds, life events, belief systems and embodied feelings at work, nor should that be an expectation. In *Mishkos Kenomagwen*, Anishinaabe plant scientist and writer Robin Wall-Kimmerer writes, "[i]t is said that humans have at least four ways to understand the world - with mind, body, emotion and spirit. We do not fully comprehend unless we are using all four" (Kimmerer 46). Kimmerer offers a crucial reminder that understanding the world does not happen through discrete or reducible faculties—they are all interconnected. Therefore, the pretense of objectivity and the erasure of the scientist's embodiment in their observations of non-humans can be limiting, and a more reflective consideration of the holistic self can change the scientific orientation to learning from and with non-human relatives.

Bringing the body into the equation is a radical addition to traditional scientific practice because it opposes patriarchal assumptions that one's observations of nature can be not situated or disembodied. Ecofeminism can provide the tools and theoretical framework to do this: that is, by privileging sense experience, being cognizant of one's standpoint and being relentlessly opposed to the idea that one can obtain a view from nowhere. Often, narratives

that scientific analysis of the environment around us can be done with perfect objectivity close the door to a lot of opportunities. There are opportunities to resist these narratives, to learn and relate to non-human relatives in ways that do not require a person to cast off their human perspective. Resistance will require listening to the voices of those like Keller, Warren, and Kimmerer, who encourage learning from and with the non-human world while acknowledging the fullness of embodied experience.

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Are Physics and Mathematics Immune to Feminist Analysis?

Eleanor Friddell

In *Has Feminism Changed Science?*, Londa Schiebinger articulates the typical challenge to feminist critiques of physics and mathematics: "Is there a concrete example of gender in the substance of physics or math? Can you point to gender distortion in Newton's laws or Einstein's theory of relativity? If not, the feminist critique is insignificant."[1] Schiebinger goes on to thoroughly rebuke this challenge, and following her example, this essay will argue that physics and mathematics are not at all immune to feminist analysis; in fact, they may be even more susceptible to gender bias than less abstract fields of inquiry, precisely because their subject matter is not overtly gendered, allowing biases to remain hidden and therefore more easily resist critique. To start, although such instances are admittedly rare, there is some evidence of gender directly affecting the substance of physics and mathematics, such as in the false dichotomy between arithmetic and geometry, which carries gendered connotations. However, while useful to consider, gendered subject matter clearly is not the main predictor of women's participation in a given discipline, since biology admits women at a much higher rate than physics and mathematics despite the abundance of gendered research topics in the life sciences. Instead, culture, rather than content, seems to have the greater impact on women's participation, and the reverence for objectivity in the mathematical sciences allows gender bias in these fields to persist unexamined. This is supported by data on gender bias in hiring practices and standardised testing, both of which have been shown to subtly disadvantage women attempting to enter careers involving mathematics. Furthermore, it has been shown that deterring women from studying physics and mathematics negatively affects not only women themselves but science as a whole, since women's unique life experiences can cast even highly abstract mathematical problems in a new light, generating new knowledge and positively influencing the future of science. The question of gender in physics and mathematics really ought not to hinge on whether Newton's laws are sexist or not; the very fact that women are discouraged from studying said laws is motivation enough for feminist critique.

Firstly, it is indisputable that fields which study living beings, such as biology and sociology, have more inherently gendered content than comparatively abstract ones like physics and mathematics, but even so, the latter's content is still undoubtedly influenced by gender. For example, Schiebinger recounts a remark made by a nuclear weapons designer at Los Alamos who characterised her work, disturbingly, as "being a peeping Tom on Mother Nature".[2] Clearly, physicists are fully capable of projecting gendered imagery onto their objects of study. Similarly, the projection of gendered categories and hierarchies onto mathematics is explored at length in

[1] Londa Schiebinger, "Physics and Math," in *Has Feminism Changed Science?* (Cambridge: Harvard University Press, 1999), 159.
[2] Schiebinger, "Physics and Math," 168.

Alexander Galloway's article "The Gender of Math", which investigates the long-held classification of arithmetic and geometry as categorically separate systems of inquiry. He argues that gender bias is intrinsic to mathematics, on the grounds that since antiquity, the subject has been classified, or gendered, into these two mutually exclusive subfields, with arithmetic being viewed as inherently superior.[3] In particular, Galloway references Aristotle's position that mixing these subfields, such as employing geometric principles in an arithmetic proof, is a category error that invalidates any results of said proof.[4] This principle was strengthened in the nineteenth and twentieth centuries when the entire subfield of geometry was systematically arithmetised; due to a deep disdain for geometric intuition, mathematicians rejoiced in finally being able to conquer geometry, soundly rejecting its principles of continuity, embodiment and approximation in favour of arithmetic discreteness and homogeneity.[5] While not a physical gendering, it is clear that geometry and arithmetic have been assigned stereotypically gendered traits and then judged accordingly; as Galloway remarks,

…in this case geometry is explicitly feminized, almost to the point of cliché, particularly around the theme of intuition. If arithmetic extracts true theorems using axioms and proofs, geometry finds its truth in the pure intuition of material experience. If algebra displays the masculine virtues of rigor or abstraction, geometry is, classically speaking, embodied and materially extended. If arithmetic is paradigmatically "whole" and "natural," geometry is the place of the 'real' and even the 'irrational.'[6]

Here Galloway is not arguing that geometry is inherently feminine; rather, he is revealing the projection of socially contingent gender stereotypes onto mathematics, which has in turn profoundly shaped its subject matter. Mathematical structures have no intrinsic gender, but that does not mean that the attitudes informing their investigation are unbiased in this way.

However, such projections clearly are not the main predictor of women's participation in various scientific fields, given that the content of biology is far more overtly gendered than that of mathematics and physics, while the proportion of Ph.D.s being awarded to women in the former is much higher than in the latter.[7] If gendered subject matter were the main driver of gender discrimination, then the opposite trend would be expected; so why would physics and mathematics be considered immune to feminist critique when these fields are demonstrably less tolerant towards women? Schiebinger argues that "The very scarcity of women in physics may be insulating the discipline from feminist critique," since women are less likely to have the training and familiarity required to deeply analyse the field.[8] This suggests that gender bias in the culture of physics and mathematics is likely the cause of the disparity in participation between

[3] Alexander Galloway, "The Gender of Math," *differences* 32.3 (2021): 6. https://read.dukeupress.edu/differences/article/32/3/1/293536/The-Gender-of-Math.
[4] Galloway, "The Gender of Math," 11.
[5] Galloway, "The Gender of Math," 7-9.
[6] Galloway, "The Gender of Math," 13.
[7] Schiebinger, "Physics and Math," 159-160.
[8] Schiebinger, "Physics and Math," 178.

men and women, and as Schiebinger points out, "The content of physics is not distinct from its cultures."[9] Her reasoning certainly fits this data more closely than the widely accepted attribution of women's relatively low participation in the mathematical sciences to biological factors, where "the differences we see in boys' and girls', men's and women's mathematics ability are a function of sex-specific brain organization."[10] This egregious example of biological essentialism immediately begins to crumble upon examination of the history of computer science, itself a highly mathematical area of study. As Caroline Criado Perez recounts in *Invisible Women: Data Bias in a World Designed for Men*, computer science was not always male-dominated like it is today:

…women were the original 'computers', doing complex maths problems by hand for the military before the machine that took their name replaced them. Even after they were replaced by a machine, it took years before they were replaced by men. ENIAC, the world's first fully functional digital computer, was unveiled in 1946, having been programmed by six women. During the 1940s and 50s, women remained the dominant sex in programming.[11]

Women's success in computer science only began to diminish once programming became a profitable and prestigious industry, and this field which had once employed many women began to systematically exclude them.[12] Considering examples like this, it becomes clear that reframing the question of women's mathematical ability as a biological one excludes the social and historical context behind the cultural evolution of mathematical disciplines like computer science and physics. The cultures of physics and mathematics are steeped in strongly-held beliefs about gender, just like every other aspect of human society, regardless of the presence or absence of gendered subject matter.

Furthermore, it is worth investigating which elements of the cultures of physics and mathematics make these fields particularly hostile towards women. Criado Perez's account of the history of computer science hints at such an explanation, given that the field became male-dominated precisely when it began to gain popularity and prestige.[13] Similarly, Schiebinger states that "The hardness of the science — in what it studies, how it studies it, and the degree of difficulty attributed to it — correlates with prestige, with funding, and, negatively, with the number of women in the field…the more math that is required for a particular job, the higher the pay and the lower the rate of female participation."[14] Lisa Weasel gives an even more compelling explanation as to why relatively abstract sciences are particularly unwelcoming towards women in her article "The Cell in Relation: An Ecofeminist Revision of Cell and Molecular Biology":

[9] Schiebinger, "Physics and Math," 178.
[10] Schiebinger, "Physics and Math," 171.
[11] Caroline Criado Perez, *Invisible Women: Data Bias in a World Designed for Men* (New York: Abrams Press, 2021), 105-106.
[12] Criado Perez, *Invisible Women*, 106.
[13] Criado Perez, *Invisible Women*, 105-106.
[14] Schiebinger, "Physics and Math," 162.

The field of cell and molecular biology…has perhaps been more immune to feminist intervention than have other biological disciplines. This may be because its objects of study are one step removed from everyday life… It is much easier to spot outright sexism or even an androcentric bias in theories and experiments concerning women's reproductive anatomy, or in descriptions of mating behaviour among non-human primates, than in theories concerning abstract concepts like genes, proteins and cells.[15]

Here Weasel notes that within biology, more abstract subfields are less likely to be the subjects of feminist critique than more applied ones. She goes on to generalize this observation, saying that "As a rule, the more abstract the science, the greater the challenge for both critique and revision."[16] Since physics and mathematics are typically considered to be the "hardest" and most abstract sciences, Weasel's observation explains why these disciplines can be particularly hostile towards women and resistant to feminist analysis, aligning closely with Criado Perez and Schiebinger's accounts. These gender biases are not overt, but instead quite subtle, as seen in Galloway's feminist critique of arithmetic and geometry, and analysing them requires rare interdisciplinary expertise. Observing, analysing and preventing subtle bias is much more difficult than doing so for overt bias, and this has allowed the effects of gender on physics and mathematics to persist largely undetected.

Under the metaphorical cloak provided by objectivity and abstraction, the cultures of physics and mathematics have resisted feminist analysis and discouraged women from participating in large numbers. It is no longer socially acceptable to openly advocate for the exclusion of women, but that does not prevent unconscious bias from subtly affecting these fields. One could argue that scientists' strong commitment to objectivity would prevent this, but as Corinne Moss-Racusin observes in the study "Science faculty's subtle gender biases favor male students," "people who value their objectivity and fairness are paradoxically particularly likely to fall prey to biases, in part because they are not on guard against subtle bias."[17] In other words, it is precisely because of their strong commitment to objectivity that scientists are susceptible to gender bias, and it follows that physics and mathematics are likely especially affected, due to their fields' heavy mathematicisation and emphasis on rigorous logic.

Moss-Racusin's study found that female applicants were consistently rated by science faculty as less hireable, less competent, less deserving of mentoring and a good salary, but paradoxically more likeable, as compared to identically described male applicants.[18] While probably unintentional, this bias nonetheless constitutes a significant barrier to the success of women in science. In a similar vein, Schiebinger highlights discrimination against female students writing the SAT exam. In an attempt to equalize boys' and girls' scores, the Educational Testing Service

[15] Lisa Weasel, "The Cell in Relation: An Ecofeminist Revision of Cell and Molecular Biology," *Women's Studies International Forum* 20.1 (1997): 50.
[16] Weasel, "The Cell in Relation," 51.
[17] Corinne A. Moss-Racusin et al, "Science Faculty's Subtle Gender Biases Favor Male Students," *Proceedings of the National Academy of Sciences* 109.41 (October 2012): 16475.
[18] Moss-Racusin, "Science Faculty's Subtle Gender Biases Favor Male Students," 16475-16477.

adjusted the verbal section in order to decrease girls' advantage in that area, causing it to favour boys slightly, but did not attempt to reduce boys' significant lead in the mathematics section.[19] While supposedly done in the name of gender equality, this adjustment only deepened girls' disadvantage on the SAT, which in turn continues to have significant consequences on university admissions, scholarships, enrichment opportunities, and self-esteem for girls and women in the United States.[20] Even though outright support for gender discrimination has largely ended, success in physics and mathematics is still an uphill battle for women, since the embedded biases causing such unfair treatment are shielded by the illusion of objectivity.

Consequently, since the unexamined pursuit of objectivity discourages women from participating in and questioning the cultures and practices of physics and mathematics, women's perspectives are often excluded from the generation of new knowledge. Schiebinger brings this out in her description of women's typically low positions in the hierarchies of physics departments, which is correlated with less funding and acclaim for their projects.[21] This lack of resources in turn means that "Women often work on small-scale problems, like the surface of the sun, while men choose large-scale problems, like the structure of the universe, not because of inherent gender differences but because men are more likely to have the security and financing needed for large-scale problems."[22] Consequently, since men are much more likely to occupy positions that involve interpreting data and drawing conclusions from large-scale projects, women's different life experiences and perspectives are ignored, to the detriment of the field.
Criado Perez gives a salient example of this in her account of mathematician Daina Taimina's work on visual representations of hyperbolic space. Taimina attended a workshop in 1997 wherein the presenter attempted to construct an example of a hyperbolic surface out of paper, but he was unable to successfully model it.[23] Constructing such a model was a long-standing problem in mathematics until Taimina realised that her expertise in crocheting lent itself perfectly to the problem at hand.[24] She then decided to try crocheting hyperbolic surfaces, and found that in doing so "'you get a very concrete sense of the space expanding exponentially. The first rows take no time but the later rows can take literally hours, they have so many stitches. You get a visceral sense of what 'hyperbolic' really means.'"[25] In this situation, simply having a woman present with experience in traditionally feminine activities introduced a new perspective that allowed a long-standing mathematical problem to be solved. Taimina's project not only revolutionised how hyperbolic space is taught to students, but filled a vital knowledge gap, given that some physicists believe the universe itself to be hyperbolic in shape, and visual

[19] Schiebinger, "Physics and Math," 174-175.
[20] Schiebinger, "Physics and Math," 176.
[21] Schiebinger, "Physics and Math," 169
[22] Schiebinger, "Physics and Math," 169
[23] Criado Perez, *Invisible Women*, 310.
[24] Criado Perez, *Invisible Women*, 310-312.
[25] Criado Perez, *Invisible Women*, 311-312.

representations are key to understanding it properly.[26] That is to say, while hyperbolic space and other abstract concepts may not be inherently gendered, human approaches to studying them certainly are. If women are not welcomed into physics and mathematics, and feminist criticism is not applied to these fields, then vital insights like Taimina's will continue to go undiscovered and unappreciated, to the detriment of science as a whole.

Clearly, physics and mathematics are not immune to feminist analysis, given their long history of excluding women, both overtly and subtly, in both culture and substance. This can be shown concretely through the gendering of both nuclear weapons research and the arithmetic-geometry dichotomy, in which stereotypes about masculinity and femininity are cast onto non-gendered scientific phenomena. More generally, the fact that women are less represented in physics and mathematics departments than in biology departments, despite the latter involving the study of actually gendered creatures, as well as the past successes of women in computer science, points to a clear problem in culture rather than substance. Weasel's analysis of abstraction in the biological sciences reveals the cause of this disparity; her conclusion that disciplines farther removed from familiar, embodied life are better able to cloak their prejudices and evade scrutiny suggests that physics and mathematics sustain a particularly pervasive culture of gender bias. Then, having established this negative effect of objectivity and abstraction on physics and mathematics, examples of bias towards women in hiring and testing practices can be examined, and women's disproportionately small presence in these fields can be structurally understood. Social attitudes that marginalise those women, who do succeed in becoming faculty in physics and mathematics departments, can also be understood in this framework; and then, the work of properly appreciating women scientists and their vital contributions can begin. Without such a project of self-reflection, overreliance on objectivity and abstraction will only continue to bolster gender disparities in physics and mathematics, and the myth that these disciplines are immune to feminist criticism will erroneously persist.

[26] Criado Perez, *Invisible Women*, 311.

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Aliens and the ABCs: *Arrival* and the Influence of Language on Thought

Ana Furtado

The 2016 science fiction film *Arrival*, directed by Denis Villeneuve, accompanies linguist Louise Banks as she is recruited by the United States army in order to attempt communication with aliens that have arrived on Earth. These aliens, which researchers have named "heptapods," have landed in twelve separate locations around the planet. Banks must learn how to converse with the aliens, which she does by simultaneously teaching them English and learning their language, composed of a variety of circular symbols. The science component of this science fiction film comes from not only the existence of extraterrestrial life, but also from the idea that language can determine or influence thought. This is known as the Sapir-Whorf hypothesis or the hypothesis of linguistic relativity, a theory which presents itself in two forms: the strong version and the weak version. This film explores the strong version of this theory, which states that language determines thought; seen in the movie by Louise's newfound ability to experience time differently after learning the alien language. For the linguist, past, present, and future are no longer divided but exist simultaneously – events in the "future" can (and do) impact the present. Although the strong version of this theory is not supported by scientific evidence, the weak version supports the idea that although language does not determine thought, it certainly has an influence on it. *Arrival* introduces the concept of how language can impact Louise's concept of reality and time, and leads the audience to question the influence of language on cognition, perception, memory, and emotional responses.

The Sapir-Whorf hypothesis is a crucial element to the plot of *Arrival* and an important linguistic theory. Anthropologist and linguist Edward Sapir and his graduate student Benjamin Lee Whorf are credited with the development of the hypothesis in the 1920's, although the two thinkers never introduced the term themselves, but rather another one of Sapir's students. In fact, neither Sapir or Whorf have directly published writing on the hypothesis; which cannot even be technically considered a hypothesis, as this denomination "makes sense only within a view of language as a map of nonlinguistic reality" (Hill et al. 1992). The distinction between the strong and the weak versions of this theory was also later introduced. Although the name of the theory is inconsistent with its origins, the ideas it brings up are very relevant to the world of linguistics: that the formulation of thought is related to the vocabulary and grammar of the language you speak. The hypothesis "implies that the speakers of different languages think and perceive reality in different ways and that each language has its own world view" (Hussein 2012) unrelated to the differences brought on by cultural discrepancies but solely impacted by the language that surrounds you. Sapir's beliefs can be summarized by two statements; "the language we speak and think in shapes the way we perceive the world" and "the existence of the various language systems implies that the people who think in these different languages must perceive the world differently" (Hussein 2012). Although he could appreciate the relationship between language and culture, Sapir did not acknowledge that cultural differences could be to blame for the disparities in the way different people perceive the world, but rather that we are all "very much at the mercy of the particular language which has become the medium of expression for [our] society" (Sapir 1929).

If thought is directly related to language, as Sapir believes, then we must discuss the

impact of bilingualism on an individual's thought process. An experiment conducted in 2020 hypothesized that individuals that speak two languages could make more connections at phonological and lexical levels, as the conceptual nodes present in their process of language production are more closely linked than in individuals that only speak one language. This experiment was conducted by asking monolinguals and bilinguals to rate the relatedness in meaning of two concepts (1 meaning "not at all related" and 9 meaning "completely related"), manipulating characteristics such as proficiency, task, and semantic similarity to explore their impact. The results of the experiment showed that individuals that speak two languages fluently rated unrelated concepts as being more semantically related than individuals that only speak one language. Not only that, but the degree of fluency in both languages also influenced the ratings. Individuals that were fluent in both languages gave higher ratings than those that were not equally fluent in both languages (Ning et al. 2020). Unlike Sapir, Whorf brought awareness to multilingual individuals, stating that

We handle even our plain English with much greater effect if we direct it from the vantage point of a multilingual awareness. For this reason I believe that those who envision a future world speaking only one tongue [...] hold a misguided ideal and would do the evolution of the human mind the greatest disservice (Whorf 1941).

Unfortunately, his concerns over multilingual awareness were seemingly erased with time, as his writing was viewed as provocative and caused controversy between scholars. Partially responsible for the transformation of Whorf's ideas were Roger William Brown and Eric Heinz Lennenberg, adapting Whorf's ideas to fit their own narrative and publishing their own study in language and cognition to The Journal of Abnormal and Social Psychology in 1954 (Pavlenko 2016).
Arrival is not the first piece of media to interact with the hypothesis of linguistic relativity; and although the novel does not deal as directly with the Sapir-Whorf hypothesis as *Arrival*, George Orwell's *1984* presents language as a way to control and influence thought. In this dystopian future, the government, also known as "The Party," enforces the use of a language called "Newspeak." This fictional language is constructed by simplifying the English language to the most basic terms possible, restricting the population's vocabulary – with the idea that if the population lacks the language to express concepts such as "revolution" or "sense of self", they will be unimaginable and the people of Oceania will therefore remain under the control of The Party. In the Appendix of *1984*, Orwell describes Newspeak in detail, stating that

The purpose of Newspeak was not only to provide a medium of expression for the world-view and mental habits proper to the devotees of Ingsoc, but to make all other modes of thought impossible. It was intended that when Newspeak had been adopted once and for all and Oldspeak forgotten, a heretical thought—that is, a thought diverging from the principles of Ingsoc—should be literally unthinkable, at least so far as thought is dependent on words. Its vocabulary was so constructed as to give exact and often very subtle expression to every meaning that a Party member could properly wish to express, while excluding all other meanings and also the possibility of arriving at them by indirect methods (Orwell 1949).

Although a work of fiction, Orwell seems to incorporate his own personal ideals into his novel; in his 1946 essay *Politics and the English Language*, published three years before *1984*, the novelist states that "when the general atmosphere is bad, language must suffer [...] if thought corrupts language, language can also corrupt thought" (Orwell 1946) – an idea seen clearly in *1984* through the implicit criticism of Newspeak.

The impact of language on thought must also impact communication and human connection, as "language plays a vital role in fundamental human connections" (Atkin 2021). Language, unlike any other method of communication observed in other species, allows for the expression of cognitive thoughts and emotions. Although no language will have a one-to-one translation to another, cognitive thoughts and emotions can still be translated in order to create genuine connections. In *Arrival*, Louise Banks attempts to do just that. When the heptapods are first introduced, shown on the other side of a glass wall, the military sees them more as something to watch rather than something to interact with; an "I-it" relationship rather than an "I-thou" relationship (Derry 2016). Banks breaks this separation between aliens and humans by removing her protective suit and placing her bare hand against the glass that divides the aliens from the researchers, which prompts one of the heptapods to do the same. From that point on, the military assumes a "partnership" type of approach, in which both parties attempt to learn the other's language. Communication is much more effective, leading to enough shared vocabulary so that Banks can ask the heptapods what their purpose on Earth is; simultaneously, the Chinese military has also been able to get an answer to this question. Banks receives the answer "offer weapon" and interprets this as "offer tool," meaning the aliens came here in peace, to help humanity against some unknown threat. The Chinese, on the other hand, receive the answer "use weapon," and believe this is a sign that the heptapods are not peaceful and intend to attack the planet. The discrepancy in Banks' and the Chinese military's interpretation of the same sentence is derived from the fact that Banks established communication by exchanging languages, while the Chinese did so by using mahjong, a game of skill and strategy that is extremely competitive. The way communication is established between the researchers and the heptapods influences what they learn from the conversation, and although the movie does not shed light on how countries apart from the United States and China are communicating with the aliens, we can deduce they are also obtaining their own set of results and interpreting them differently. The difference in how the Americans and the Chinese interpreted virtually the same message in completely opposite tones is an example of how *Arrival* deals with how the form of communication impacts interpretation and the Sapir-Whorf hypothesis of how language determines thought.

The influence language has on thought subsequently influences cognition, perception, memory, and emotional responses. When it comes to memory – taking in information, processing it, storing it, and later recalling it – language plays a role in how easily individuals can recall information previously presented. For example, when shown a sequence of letters to remember, subjects will usually utter them silently to themselves. The phonological characteristics of the letters will then influence their retention of the sequence. When presented with letters that sound very differently from one another, such as "B, W, Y, K, R, and X," subjects have no issue remembering them; however, when presented with similar sounding letters such as "T, C, V, D, B, and G," subjects tend to have difficulties in recalling all of them or remembering the correct

sequence. Using words rather than letters produces the same effect; while 80% of subjects were able to recall the sequence "pit, day, cow, sup, and pen," less than 20% were able to recall "man, cat, map, and cab" (Baddeley 2003). These results will certainly vary with different languages, especially those with different alphabets.

Language and emotions are related when it comes to the unique words that each language presents. While conceptual contents are "determined by words and their semantic differences" and therefore can be "borrowed among languages and exchanged among cultures" (Perlovsky 2009), emotional differences tend to be related to grammar, and the lack of one-to-one translations between languages makes it so that these cannot be borrowed or shared. Portuguese, for example, uses the word "saudade" to describe the melancholic feeling of missing a place, person, or thing that is gone or far away; in Arabic, the word "tarab" is used to describe a state of euphoria brought on by music. Words like these lack one-to-one translations and cannot be properly expressed. Language can also impact how bilingual speakers describe their emotions; a study conducted in 1990 found that bilinguals that spoke both English and Spanish were able to manifest more intense emotions when speaking Spanish than when speaking English, regardless of which one was their first language (Perlovsky 2009). These disparities between English and Spanish could possibly be justified by the different origins of both languages – Spanish evolved from Latin and is considered a Romance language, while English is a Germanic language, derived from the Proto-Germanic language spoken around 500 BC.

Cognition is a broad term that encompasses the acquisition of knowledge and the understanding of it through thought, experience, and sensation; it is the states and processes involved in knowing, which includes perception and judgement. The Language and Situated Simulation (LASS) theory states that both these components play a role in conceptual processing; "when a word is processed in a conceptual task, it first activates other linguistic forms" (Perlovsky et al. 2014). Under an fMRI machine, a series of experiments were performed in order to test out the LASS theory. After performing a "control" task to provide a measure of conceptual processing, participants performed tasks that measured word association and situated simulation. The results showed that "activations early in conceptual processing overlapped with activations for word association" and "activations late in conceptual processing overlapped with activations for situation generation" (Perlovsky et al. 2014), further strengthening the LASS theory. The relationship between cognition and language is still mostly unknown, as they seem to be linked in some ways, but unrelated in others; for example, we learn language in the first few years of our lives, far before we develop a good cognitive understanding of the world around us (Perlovsky et al. 2014). Perception, a part of cognition, is the ability to become aware of something through the use of our senses, and many studies show that perception is widely affected by language. The language an individual speaks can impact their ability to describe sounds, colors, tastes, and scents, to name a few. Children that grow up speaking English, for example, have a broader vocabulary to describe different colors than children that grow up speaking Lao, which has far less individual names for colors. On the flip side, Lao speaking children can better classify certain scents in comparison to English speaking children. Perception can also be impacted by using language to set up certain expectations; such as the placebo analgesia effect. If told that a regular cream is an analgesic and will lower sensations of pain, subjects that apply the cream will report lower pain ratings when compared to subjects that receive the exact same stimulus, but that were not given the "analgesic" cream (Lupyan et al. 2020). Although the stimulus applied is

the exact same to all subjects, simply having the expectation that it will not be as painful as it could be makes it feel less painful.

The strong version of the Sapir-Whorf hypothesis presented in Denis Villenueve's *Arrival,* although not supported by scientific evidence, brings the linguistic theory to the general public and encourages the audience to question the impact language can have on cognition, perception, memory, and emotional responses as a result of its impact on thought. The weak version of the hypothesis, supported by scientific evidence, states that although thought is not determined by language, it is influenced by it; and that certain discrepancies in thought are exclusively related to language rather than to cultural differences. Language impacts how we interact with the world and how we interact with each other; from the way we can perceive colors and scents to how accurately we can communicate thoughts and emotions. It impacts our recall of information, the way in which we can express emotion, our conceptual processing, and even our response to pain. Although not a powerful enough force to alter how we experience time, as seen with Louise Banks in *Arrival,* language is a fundamental aspect of humankind and impacts the human experience far more than we think.

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The Places We Work, Live, and Play: A Consideration of Giovanna Di Chiro's "Nature as Community: The Convergence of Environment and Social Justice"

Erin Inglis

The environmental movement has historically maintained a very narrow conception of what spaces constitute "the environment" and consequently, what spaces are deserving of preservation. Giovanna Di Chiro's article "Nature as Community: The Convergence of Environment and Social Justice" considers the implications that this definition of "environment" has on everyday people, and particularly marginalised individuals. Di Chiro details the experience of Robin Cannon, a South Central Los Angeles resident who brought her concerns about a 1, 600-ton-per-day solid-waste incinerator that the city was planning to install in her neighbourhood to local environmental groups, such as the Sierra Club and the Environmental Defense Fund, but was told that her issue was "not an environmental one" (Di Chiro 299). These environmental groups turned a blind eye to an issue that, based on the contents of an environmental impact report, would clearly have a negative impact on the environment, because the location it would be affecting was an urban community. Had there been plans to install the incinerator within the 130, 000 acres of protected wilderness areas just outside the city, there would be no question of its validity as an "environmental" (299) issue. As Di Chiro explains, environmental justice activists like Robin Cannon "define the environment as 'the place you work, the place you live, the place you play'" (301), and believe that the humans within these spaces are just as deserving of preservation as the non-human nature around them. For many mainstream environmental activists, the spaces most in need of preservation are those where humans *are not*, spaces defined under The Wilderness Act as those "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain" (USFS 1). This essay will delineate these opposing definitions and argue that this narrow conception of "environment" perpetuated by mainstream environmentalists is the result of an extremely privileged relationship to the environments in which they *work, live, and play.*

Environmentalists have largely eschewed the definition of "environment" as "'the place you work, the place you live, the place you play'" (Di Chiro 301) because of its "apparent anthropocentrism" (301). What these environmentalists fail to recognize is that their own definitions of "environment" are not immune to anthropocentrism. The "wild" spaces so valued by mainstream environmentalists are praised for their lack of human presence, yet their value arises from their availability as sites of human recreation. When John Muir, the founder of the Sierra Club, wrote that "mountain parks and reservations are useful not only as fountains of timber and irrigating rivers, but as fountains of life" (3), he was not arguing for the value of wilderness in itself, but its recreational value for the "thousands of tired, nerve-shaken, over-civilized people" (Muir 3) who retreat into nature in their leisure time. The United States Forest Service maintains this sentiment to this day, as their website describes the Angeles National Forest as "an important part of the overall health and well being of the area population. It provides open space, solitude from the everyday stress of modern living, a place to conduct research, a haven for wildlife, and offers a wide variety of recreation opportunities" (USFS 1). While the preservation of the environments in which people like Robin Cannon "work" and "live" (Di Chiro 301) is seen as unimportant by groups like the Sierra Club, the preservation of environments reserved for "play" has been, and continues to be, the key tenet of mainstream environmentalism.

Conservationists have long used this distinction between "living" and "playing" environments to exercise racial and economic discrimination. From the outset, the function of the United States Forest Service was to restrict *who* could use the American wilderness, and for what ends. Theodore Roosevelt, the founder of the USFS and a figurehead of early American environmentalism, was "a sportsman-hunter all his life" (NPS 1) and first travelled to the West seeking "a chance to hunt the big game of North America before they disappeared. Although his writings depict numerous hunting trips and successful kills, they are laced with lament for the loss of species and habitat" (NPS 1). Roosevelt staked a federal claim over some 230 million acres of "public land" (NPS 1) over the course of his presidency, turning the land into national parks, national forests, national monuments, federal bird reserves, and national game preserves. The people for whom these lands were seen as "living" environments were given no say, and all but removed from the narrative perpetuated by conservationists: Emily Vernizzi explains that "the park system was promoting the land as untouched and pristine, but in reality, Native Americans, and even some white frontier families, had inhabited the lands for years" (16-17).

Daniel Justin Herman similarly claims that early American conservationists "transformed 'local commons' used by subsistence hunters … into 'national' or 'state' commons used by elites" (29). While Roosevelt (and others *like him*) maintained his right to enter into these protected wilderness areas as a "visitor who does not remain" (USFS 1), the people residing on the land were forcibly removed and relocated to preserve this false ideal of wilderness as "untrammeled by man" (USFS 1).

The preservation of these "wild" environments has, despite claims to the contrary, never been undertaken for the benefits of everyone: they have traditionally been spaces in which only the privileged few are granted the opportunity to "play" (Di Chiro 301). Joe Weber and Selima Sultana consider the discrepancy between the "the assertion that national parks reflect central values of American culture and that public land is open to all" (438), and the fact that minority people are statistically less likely to visit national parks:

> Visitation to all of these sites has been and remains overwhelmingly a practice of the white population. A 2003 survey of visitation found that 36 percent of non-Hispanic whites visited a park unit in the last two years, compared to 33 percent of Native Americans, 29 percent of Asian Americans, 27 percent of Hispanics, and only 13 percent of African Americans. A 2009 survey reported similar results (438).

Why might this be the case? Weber and Sultana consider the issue from multiple angles: socioeconomic marginality, differing cultural norms, the lingering legacy of discrimination, but mainly, the geographical restrictions and inaccessibility of national parks for marginalised groups. They argue, to put it simply, that marginalised people tend to live farther away from, or in smaller numbers around, national parks. We might also consider the elitist undertones within the works of early environmentalists like Aldo Leopold, who spoke out against the construction of roadways which would allow automobile access to national parks. Miles A. Powell explains that Leopold "claimed that by preserving US wilderness areas, he was keeping them accessible to working-class Americans who could not afford to travel abroad in pursuit of the wild" (206), yet he failed to consider that most labourers "could far more easily fit a weekend car camping trip into their schedules than the sort of 'two week's pack trip' he saw as the defining characteristic of a wilderness experience" (206). Whether the inaccessibility of national parks resulted from intentional discrimination or a privileged misunderstanding of the realities of

minority people is difficult to prove, but the fact remains that minority people *are* less likely to use and reap the benefits of these environments intended for "play" (Di Chiro 301).

Having established that the environments most deserving of protection for mainstream environmentalists are those designated for "play" (Di Chiro 301), and predominantly the "play" of affluent white men, we will now consider the perspective of environmental justice activists, whose "living" and "working" environments have been threatened by environmental hazards. Robert D. Bullard explains that not only are rich (and white) neighbourhoods *not* being threatened by environmental infractions, but the waste and pollutants generated *by* the rich are often shipped into poor neighbourhoods through hazardous waste transactions and "offered as short-term remedies for poverty of the poor" (165). Bullard writes that "consumption and production patterns, especially in nations with wasteful 'throw-away' lifestyles as the United States … create and maintain unequal and unjust waste burdens within and between affluent and poor communities, states, and regions of the world" (165). Di Chiro points out that mainstream environmentalists have avoided "putting humans at the centre of environmental discourse … because humans are the perpetrators of environmental problems in the first place" (301), yet those same humans who are producing the most waste, and causing the most harm to the environment, will not have to "work" and "live" in the environments most affected by their pollutants. To truly understand the impact of environmental issues, we would be well advised to listen to those who actually experience them.

The effects of environmental racism have had extremely negative consequences on the environments in which marginalised people *work, live, and play*. People of colour have historically been excluded from conversations about environmental policy-making, been prevented from holding positions where they might have influence over such policy-making, and even been denied leadership roles within environmental groups like the Sierra Club. And perhaps unsurprisingly, people of colour are more likely to have their neighbourhoods targeted for landfills, incinerators, and waste facilities:

> A national study … determined that people of colour suffered a "disproportionate risk" to the health of their families and their environments, with 60 percent of African American and Latino communities and over 50 percent of Asian and Native Americans living in areas with one or more uncontrolled toxic waste sites. The report also disclosed that 40 percent of the nation's toxic landfill capacity is concentrated in three communities—Emelle, Alabama, with a 78.9 percent African American population; Scotlandville, Louisiana, with 93 percent African Americans; and Kettleman City, California, which is 78.4 percent Latino (Di Chiro 304).

Despite their first-hand experience of the consequences of environmental policy-making, marginalised individuals have historically been ignored by the government and the mainstream environmentalists when they voice their concerns. People of colour speak out against "health department experts who would claim that there is nothing wrong with the environments in which they are living" (Di Chiro 314), and cite their own empirical observations of the illnesses and ailments suffered by themselves and those within their communities, yet their testimonies have rarely been appreciated as evidence of environmental contamination and their credibility is subjected to doubt. Those who have the most influence over environmental policy-making are far less likely to be affected by the negative consequences of these policies; because government officials fail to advocate for the safety of marginalised communities, the responsibility falls to

individuals like Robin Cannon to take the initiative, educate themselves on the issues, and raise well-researched concerns about how projects like the LANCER incinerator will affect their living environments before it is too late, and the damage has already been done.

There are, additionally, considerable barriers preventing poor and marginalised people from leaving their endangered living environments and unsafe working environments. Beyond the sometimes-insurmountable financial barrier of relocation, discrimination within the housing market has made it difficult for people of colour to leave their polluted communities and find safer housing. Bullard writes that "the imbalance between residential amenities and land uses assigned to central cities and suburbs cannot be explained by class factors alone. People of colour and whites do not have the same opportunities to 'vote with their feet' and escape undesirable physical environments" (158). Another factor is the rise of "industry flight" (158) from urban areas, as corporations opt to move their manufacturing plants to other, poorer countries where land and labour can be bought cheaply and where they are not pressured to adhere to the same environmental policies that they would be on American soil. As industries relocate and begin to outsource labour, the urban communities they leave behind become economically depressed, and workers who had relied on these jobs to make a living are "forced to choose between unemployment and a job that may result in risks to their health, their family's health, and the health of their community" (158). Bullard calls this "economic blackmail" (159), and notes that it is hardly a coincidence that people of colour communities are "especially vulnerable to this practice" (159). With this in mind, one can appreciate the interconnected nature of social justice issues and environmental issues: those who are most likely to experience discrimination for their race or class are also most likely to experience environmental injustice.

As this essay has outlined, the way that different environmentalists define what spaces constitute "environment" is informed by their relation to the places in which they *work, live, and play*. When considering the story of Robin Cannon, one can imagine that environmentalists like John Muir, Aldo Leopold, and Theodore Roosevelt never had to worry about an incinerator being installed in their backyards, and perhaps consequently, never fully appreciated the necessity for "living" and "working" environments be protected against pollutants like the environments where they went to "play" (Di Chiro 301). Rather than arguing that the environmental movement should make a decisive shift towards "anthropocentric" (301) environmental issues, environmental justice activists argue for the necessity that both urban *and* wild areas be protected. Di Chiro describes the experience of Paul Ruffins, an African American journalist who had his mind changed about this issue by those he encountered at the 1991 People of Colour Environmental Leadership Summit in Washington DC. Ruffins wrote that, going in to the summit, he resented "white environmentalists for their concern with saving birds and forests and whales while urban children were suffering from lead paint poisoning" (Di Chiro 312), but that after "hearing Native Americans who have been oppressed since 1492 explain the need to protect 'our brothers the whales'" (312), began to appreciate the importance of wilderness preservation from a perspective not based on tenets of white supremacy. The narrower we allow our definition of "environment" to become, the less human and non-human nature will benefit from the work of the environmental movement. We would, then, be well advised to listen to the perspectives of more people, and to consider how their *living, working, and playing* environments are impacted by environmental policies.

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The Extra-Empirical Considerations of Charles Lyell

Alan Iturriaga

A Whiggish view of the development of geology as a science is that it only came into its own once Charles Lyell had broken ground, in terms of the method of the discipline and the development of a theory about geological history that was superior to what came before him. Lyell's own writing framed his enterprise in these slightly romantic terms, and, intentionally or not, had led some of us to believe that there had been no meaningful progress before 1830, and that, in Khunian terms, the ideas presented in *The Principles of Geology* had embodied the first true paradigm in scientific geology (Rudwick, "Uniformity" 209-210). The picture that Lyell illustrates of his contemporaries and predecessors is that of an approach to geology that is crude, speculative, reliant on—and stubbornly committed—to biblical interpretation, and as conflating geology with theorizing about the origin of the earth. Lyell's opponents, according to his own assessment, were reluctant to accept the superior view of geological time as vast and functionally unending, and were committed, instead, to a geological history plagued with abrupt and dramatic revolutions in which extraordinary geological events occurred that accounted for the similar abrupt and dramatic organization of our empirical record, and conveniently aligned with biblical stories of supernatural floods and similar exercises of the awesome power of God (Rudwick, "Introduction" xi). In contrast, Lyell's own geological project—again, per his own framing of the dispute—was of a crusade against the use of biblical interpretation and speculation versus a definitive separation of scriptural literalism and science, as well as a distinction between geology and cosmogony (Rudwick, "Introduction" xvi). Drawing from a handful of commentaries, Rudwick's most of all, I would like to suggest in this paper that Lyell may have not adhered to his theory because of a strict commitment to empiricism. Instead, he made extra-empirical considerations, including both religious and heuristic, when approaching the construction of a geological theory.

It would seem that, unlike his rival contemporaries, which he dubs Catastrophists, Lyell is committed to the view that an examination of the causes of current geological phenomena must yield us some information about geological history. In this sense, Lyell does seem to be committing himself to some robustly common-sense heuristic principles. It makes good empirical sense to only speculate so far as to what can be observed. And, Lyell certainly described his opponents as deviating from this injunction to a fault. However, if Lyell is not going to grant that the geological presents abrupt breaks between fossils and between strata because of violent geological events beyond those that are presently acting, how is he going to account for them?
Lyell is paradoxical in that, while making an empirical critique of the Catastrophists, he adopts the Huttonian model of vast time to account for geological activity, which was perceived at the time to be a crude speculation (Rudwick, "Introduction" xv). And yet, Hutton would turn out to be more or less compatible with the Catastrophist model. The more surprisingly speculative of Lyell's commitments was his proposal of a 'steady-state' and cyclical system of geological physics, where apparently dramatic geological events were interpreted only as a momentary disturbance from an overall mean of the geological conditions (Rudwick, "Introduction" xviii). Lyell's counter-theory is that dynamism within the system in the form of major volcanic activities, floods, or similarly impressive geological events, never strayed too far

from a state of normalcy to which they eventually returned. In other words, more often than not, the world has functioned just as it does now.

Both parties thought of each other as making unwarranted assumptions. What, then are we to make of this dispute? How are we to assess the success of the Lyellian system weighed against the theories of his contemporaries? Many years after Lyell, Hans Reichenbach sketched out an approach by which to assess the merits of competing theories about the natural world. He writes in his *Rise of Scientific Philosophy* that we may be tempted to think of the interpretation of data as embodied by Lyell's stable system or the Catastrophists' revolutions to be "guesswork inaccessible to logical analysis" (Reichenbach 230). Further, he describes scientists as gamblers who can only predict events based on repetition and that repetitive patterns should be the extent of interpretation. Reichenbach believes that a "mere collection of observational facts… would never have led a scientist to the discovery of the law of attraction" (Reichenbach 103). Mathematization had to be brought into science for patterns to be revealed. Herein lies, for Reichenbach, the mediation between reason and experience. "The empiricists analyzed only one side of science, its observational side" he writes, "the rationalists emphasized the mathematical side" (Reichenbach 106). Science ends up being not about causal relationships deduced from axioms, as someone like Laplace would hold, but likelihood based on repetition. These repetitive patterns are laws, and we can deduce from them, but not with the same certainty as deductive axioms afford us. What about retroactive interpretative claims that cannot be verified going forward, like Lyell's?[1]

Further, are the mathematical relations which Reichenbach holds in such high esteem immune from interpretation? In the case of geometry, for example, conventionalists would hold that "geometry does not express a property of the physical world and is merely a subjective addition" (Reichenbach 133). Imagine, Reichenbach asks us, to think that we are not sure whether Euclidean or non-Euclidean geometry accurately describes the world. In a world, *a*, we notice that either the world is described in non-Euclidean terms or in Euclidean terms, given we assume universal forces slightly warp our perceptions. Vice versa, in a world, *b*, the opposite occurs and the world can only be described in non-Euclidean terms if we assume the warping of our perceptions by a universal force. Conventionalists, Reichenbach says, are right in saying that both theories in world *a* are equivalent to each other and both theories in world *b* are equivalent to each other. However, they are only locally equivalent– meaning that they are only equivalent insofar as they describe the same world (Reichenbach 136). At the end of the day, Reichenbach argues, although two theories may be functionally equivalent to us in a given world, it does not mean any and all theories map onto the world. And further, it does not mean that either the Euclidean or non-Euclidean will remain equally supported by empirical evidence (Reichenbach, 137). On this point about the primacy of empirical data in discriminating between theories, Lyell writes that given our evidence is wrought out of the geological record, "we may be deceived in the inferences which we draw, in the same manner as we often mistake the nature and import of phenomena observed in the daily course of nature; but our liability to err is confined to the interpretation, and, if this be correct, our information is certain" (Lyell 3). Are catastrophists wrong, then, because they consider less evidence from the geological record than Lyell does?

To even begin to assess that question, it is important to note that, to a fairly substantial extent, Lyell caricatured the views of the Catastrophists. As Rudwick observes, Lyell's work was not actually conceived in a pre-scientific, pre-paradigm, and methodless geology. The

[1] A stable system operating on vast time of the kind Lyell describes can be verified in principle, but not functionally, as it is well beyond the lifespan of a human to do so.

Catastrophist project, which Rudwick dubs Directionalism, was a sophisticated theory of geology that partly based itself off the available physical theories of the time– hardly a backwards, unempirical enterprise. Directionalists believed they recognized a pattern in the earth's temperature which appeared to be supported by Fourier's work in physics (Rudwick, "Uniformity" 213-214). The gist of the theory is that the earth had been gradually cooling, which in part accounted for the appearance of increasingly stable geological conditions, as well as for the direction of the evolution of life on earth. Cuvier's work, in particular, highlights how the cooling-earth principle's explanatory power can account for the apparently directional progression from a few vertebrates, to reptiles, to mammals in the geological record (Rudwick, "Uniformity" 215-216). Further, a literal interpretation of the biological remains in the geological record seemed to suggest that transition between species was not gradual. As Stephen J. Gould puts it in his *Time's Arrow, Time's Cycle*, the "defence of Catastrophism was rooted in the most direct (or minimally "interpretative") reading of geological evidence", therefore, the "characteristic method of Catastrophy… was empirical literalism" (Gould 133). The Directionalist stance can be summed up charitably by presenting its cooling-earth as at the very least agreeing with the physics of the time, and their postulation of cycles or revolutions to account for geological activity as, at the very least, being methodologically parsimonious or committed to empirical literalism.

Therefore, the Directionalists would have thought that Lyell's theory appeared as more immediately speculative than that of their own rank and file. As Rudwick puts it in his introduction to the first edition of the *Principles*, "Lyell's approach, far from being simply empiricist, embodies a more sophisticated understanding of the role of interpretation" (Rudwick, "Introduction" xix), which hints to us that the discrimination criteria of Lyell's theory was not entirely a matter of empirical commitments, like data collection. In fact, as we have seen, empirical data seems to contest Lyell's project in a handful of ways. Our brief comparative assessment of Lyell and the Directionalists, as well as our consideration of Reichenbach, forces us, I think, to grapple with the difficulty wherever Lyell may have been correct he may have not been so for strictly empirical reasons. He may have had reasonable arguments that compelled him towards a stable system. However, it may be the case that the theory discriminations Lyell made were not reduced to a simple matter of having more or less evidence.

For instance, there is reason to believe that Lyell's rejection of Lamarck and of the directionalist project might have been in part religiously motivated, which is a noteworthy irony, especially considering his criticism of his contemporaries rested, in part, on their own religious commitments. It is true that Lyell resisted Lamarck's directionalism in part because of its clash with the former's stable-earth theory. If the environment is relatively stable, then a Cuvierian or Lamarckian account of the direction of species' development loses a lot of its explanatory power. But, interestingly, he was also concerned that Lamarck's species directionalism led to evolutionism and, possibly, to materialism (Rudwick, "Introduction" xi). Rudwick acknowledges that why Lyell resisted this move is highly contested. J. M. I. Klaver suggested that, at least by 1832, Lyell's "objection to Lamarck's transmutation was, at this stage, not on a religious plane, but… in Lamarck's evidence" (Klaver 54). Lamarck appeared to get rid of the reality of species beyond convention. Lyell, however, needed species to be real beyond convention in his method of determining the age and order of the record, so he would have been resistant to Lamarck in those grounds (Klaver 52-53). For Lyell, identifying a period of geological history was not a matter of, for example, identifying a particular species tied to a particular time, but noticing how many extinct versus extant species a portion of the record shows (Rudwick, "Introduction" xlii).

However, as Rudwick writes, "to accept any process of gradual and continuous transmutation would be to undermine the method on which his demonstration of steady-state earth history depends" (Rudwick, "Introduction" xliii).

There are some extra-empirical commitments which Lyell may have held that discriminated against Lamarck's work. In part, these consisted of incompatibility with his own theory. Thus, we must ask ourselves what positive criteria bent Lyell towards the positions he did take about geology. A proper assessment of the question is beyond the scope of this paper. Nevertheless, I would like to briefly consider the possibility that his theory was induced by extra-empirical means. Lyell was, in general, motivated by a religious commitment to the idea that biblical literalism, otherwise known as Mosaicism, was harmful to both science and religion. In his youth, he had taken note that Hutton's proto-uniformitarianism had met resistance from religious orthodoxy (Klaver 20). Further, even if geologists accepted that the Mosaic account of time was not perfect, Lyell had wanted vast time of the kind that seemed to contest any Mosaic cosmology, be it strict or flexible (Klaver 24-25). Additionally, Lyell's assessment of Lamarck was that the latter's transmutation of species would, at the very least, minimize humanity's connection to God, as, even if life was created, humanity may have evolved. This possibility made Lyell uncomfortable (Klaver 24). Lyell eventually begrudgingly accepted evolution (though, not natural selection) (Gould 171). But, he did so, granted that a wider conception of steady-earth uniformitarianism could remain more or less intact (Gould 173). Steady-earth uniformitarianism itself, however, is arrived at in part by what Gould calls a "creative confusion" (Gould 117).

A primary component of Lyell's work is the idea that Geological history can be interpreted based on causes acting in the present. This idea can more or less be traced to Enlightenment principles embodied by Isaac Newton, for instance. Lyell adopts the idea of *vera causa*, which entails, as Rudwick puts it succinctly, that "phenomena should be explained only in terms of causal agencies that are observably effective" (Rudwick, "Lyell" 3). The principle is, in a way, an empirical commitment and an exercise in methodological parsimony. It is a particularly crucial methodological consideration— the assumption that the laws of nature have remained more or less constant everywhere is often necessary for scientific progress. In the case of Newton, it allowed him to universalize his observations. For Lyell, it allowed him to account for past geological events in terms of what he saw in his lifespan. The issue, Gould argues, is that Lyell brought under the aegis of this methodological uniformitarianism about the laws of nature a more ambitious, speculative uniformitarianism about the way the world is (Gould 118). Methodological uniformitarianism was embraced, in some form or other, by geologists. After all, it is necessary to rely on present observations to engage in inductive inference. Not everyone, however, agreed that if you were willing to accept Lyell's claims about method, you must also accept his claims about nature. Lyell "pulled a fast one" (Gould 119), and presented the methodologically uniformitarian ideas that (a) a stable and universal view of the laws of nature is necessary for induction and that (b) we should hold to the parsimonious principle that, if we can explain phenomena in terms of present causes, we should not invent causes unnecessarily as necessarily entailing the substantive uniformitarian idea of a stable-earth system where gradation accounts for the geological record, which does not yield as heading in a particular direction *a la* cooling earth or Darwin's natural selection (Gould 119-124). This move, according to Gould, is not warranted, and it simply conflated what all scientists already knew together with Lyell's own theory– attempting to bound the latter as a logical suggestion of the first.

What can we say about stable-earth uniformitarianism, given that we grant the possibility that his adherence may not have been entirely determined by evidence, but instead by a kind of sleight-of-hand from Lyell's part? His empirical reliance on actual causes may certainly lend itself to suggest a stable-earth system. But, as we have seen, even if a stability of the laws of nature is granted, many other theories beyond earth-stability can be posed. The closest Lyell gets to some sort of philosophy of method, which might push us by means of extra-empirical or heuristic considerations for or against a geological theory, is his aforementioned parsimony principle, as well as his comments about bias-correction.

When considering the methodological tools used to examine social history (Rudwick, "Historical" 102-103), as well as when discussing Huttonian vast time (Rudwick, "Introduction" xix) Lyell argues that his transformation of our imagination about geological processes is warranted by the fact that humans are deeply misled about the mechanics of geology. Rudwick writes that "He suggests that it is our naturally biased viewpoint which has led to an overemphasis on the destructive or 'wasting' aspects of geological processes and to a corresponding underemphasis on the renovating or formative aspects (Rudwick, "Introduction" xix)."

In other words, Lyell's theory is successful in that it corrects our inbuilt biases and allows him to present stable-earth uniformitarianism as having the explanatory power to account for geological events while, at first glance, having the additional heuristic advantage of correcting our bias. To briefly review, Lyell's stable-earth was based on the idea that the sudden disruptions in the geological record do not suggest a series of even more dramatic events than those we witness, but instead can be explained by a system of disruptions that amount to a geological mean. Geological events of opposing forces balanced each other without pointing towards a progression of any kind (Rudwick, "Introduction" xxix). Ever-occurring butting heads of opposing geological phenomena makes the record appear more dramatic than it actually is, as continuous geological "depositions" and "compositions" maintain a mean but, sadly, taint our ability to interpret the record (Rudwick, "Introduction" xxxix). There is a frustrating circularity lingering in Lyell's argument. Bias-correction is a very laudable and useful heuristic consideration. If I wake up in the morning knowing that I have astigmatism and see that my ceiling lamp is blurry I can, without engaging in further empirical experimentation, reasonably assume that the lamp is not blurry because its physical composition has somehow changed overnight, but that I simply do not have my glasses on. Once I put them on, the blurriness will likely give in to a sharp image. But, in the meantime, my assumption is preferable because I know it corrects a bias, in this case astigmatism, that I am aware of. The issue with Lyell is that the bias he attempts to correct is a bias that he may not be warranted in assuming– in other words, that there is such a thing as Huttonian vast time and that the earth really is geologically stable as he describes it, but that the reason competing theories fail to recognize it is that we, as humans, are naturally predisposed to not recognize it from our immediate experience of reality. I do not believe Lyell is being irrational or malicious. After all, he does have some good reason to think we are biased in such a way as he describes. His motivation to identify this bias is drawn out of comparison from historiography. Lyell suggests that, if we are examining the remains of an ancient city, we will find several kinds of remaining monuments of varying sophistication and scale peppered around the area. If we did not have sophisticated dating methods or commemorative inscriptions, or otherwise a record of their construction, we may be tempted to say that all of these edifices clearly belong to the same epoch and must have been spawned in an incredible act of nature! Would it not be, against Occam's injunction to avoid multiplying entities

unnecessarily, a mistake to speculate about the whole history of a people and how they may have come about constructing this city during such a brief period? Lyell writes that the simple, conservative interpretation of our imperfect record would lead us to infer that "such a portion of history would immediately assume the air of romance; the events would be devoid of credibility…" (Lyell 66) and, given we accept the city was built overnight, or that the geological record really does present abrupt breaks between fossils and between strata, then, we may think we are "justified in inferring that subterranean movements were once far more energetic than in our own times" (Lyell 67).

Even if accepted, Lyell's historiographical injunction can only be levied against catastrophism and the refusal to adopt gradualism. And yet, this heuristic consideration can not help us understand whether a stable-earth system is warranted. After all, there could be a geological theory which is gradualistic and non-catastrophist, but which is, nevertheless, directionalist. To deny that these abrupt breaks in the geological record are not caused by events violent beyond presently observed and that the geological record is for some reason incomplete and vast time should be assumed is one thing; to assert that all of this can be explained because of a stable-earth system of "dynamic equilibrium of the earth [which is] the result of a summation of innumerable concrete local events" (Rudwick, "Historical" 101) is another. To say that the latter is warranted because of a methodological appeal to bias correction is not appropriately justified by any empirical or extra-empirical reasons given by Lyell, at least as far as I could tell. Though it may be explained, for historiographical purposes, by some other, non-heuristic, extra-empirical commitments that Lyell may have held.

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Balance in Trade, Balance in Health: The Humours of Health in Early Modern Colonialism

Daniel Konopelski

The Inca medical practices during the period of colonisation focused a lot on indigenous as well as imported goods from Europe. Garcilaso de la Vega explores this dynamic between the Inca and the Spanish in his work “Royal Commentaries of the Incas and General History of Peru” that explores the political dynamic that had been in development during the colonial era of scientific history. An adaptation of Ibn Ridwan’s *Prevention of the Bodily Ills in Egypt* discusses the emerging colonial enterprises within early modernity. The trading between Europe and the Western Hemisphere also brought forth the theories of antiquity that have been developed and diffused across the West. However, with these theories applied well after the colonial period has ended, a discrepancy that emerges shows that health systems of the pre-colonised world were in the same theory of the colonists but were overcast by the political motives of the colonial enterprise. One of those realisations was that the Inca culture of health was like that of humoral health theories of antiquity. Their application with the colonial enterprises that emerged reveals an expanse not across the Atlantic, but beyond the tangible observations of the humours.

The Incas used the natural resources around them to build a system like that with the four humours as they adapted to a similar theory without the intervention of the European theatre of science. One of which was the use of herbs to recover ailments such as an instance where the user, from Spain, was able to use resources from the Inca’s territory that restored their eyesight; bringing them back to a state of balance (de la Vega 123). While brought by the Spanish back to the European side of the exchange, the use of medicinal herbs, such as “Pachacamac” was implemented in the indigenous tradition before being manufactured into the Spanish for further refinement, all of which were for the result of a balanced healthy body from a humoral perspective (de la Vega 123). Specifically, when “[the] state of the body's temperament is good in the balanced air; the digestion improves because the light animal spirit that is in us becomes clear” when returned to a state of balance, or in contemporary terms: homeostasis, whether it be from climate or illness that disrupted the equilibrium of the four humours (Ibn Ridwan 115).

However, at the cost of memory as “[many] of [Garcilaso’s] relatives used many other herbs of which I have forgotten” because of European influence disabling the linguistic tradition of the Inca if it happened naturally pre-colonisation (de la Vega 123). This is a discussion of the ambiguity of the colonists in the history of science.

Another key component of humoral medicine and the understanding of the human body is the natural immunity that has taken place because of exposure and “little to no Indians have those diseases” that were transferred by the Spanish, and high-ranking Incas like Garcilaso, back to Europe (de la Vega 123). Under the humoral system, each of the four characteristics of bodily imbalance is parallel to that of the four earthly elements. For disease, specifically, it is “[the] air that deviates from the balance changes the bodies that are not accustomed to it but does not harm the bodies that are used to it” that determines a bodily imbalance (Ibn Ridwan 116). The theory explains the lack of adaptation to the Inca territory by the Spanish that prompted them to be more prone to disease; hence, the Spanish were more likely to contract such illnesses as their bodies were not used to the environment. However, the persistence of the empire would prevail with their own form of humours that enforce it as superior over the Inca Empire.

The exotic nature of the Spanish in the perspective of the Inca led to them becoming humours themselves in balancing out the colonised peoples in the territory though the exchange of goods with the Inca and Spanish; like how the environment was throwing the Spanish colonists out of balance. Whereas the medicinal herbs used by the Inca were exchanged across to Europe, the Europeans would send foods and plants foreign to the environment to the Incas.

Fruits such as "apples of any kind, quinces, peaches, apricots, and many of the kinds of plums" that were sought after by the Spanish and, in exchange, provided the Incas with their delicacies (de la Vega 600). The latter component is notable as delicacies would reveal a state of class to the Spanish and enforce a conformity to the colonised Inca without explicitly enforcing Eurocentric ideas. One of these encounters was with asparagus where despite preparing the delicacy for Spanish colonial elites, Garcilaso was not able to do so because of his state as a mixed-race individual in the Spanish and Inca along with not being content with the Spanish implementation of imported foods (de la Vega 510). This moral dilemma proves that "it is evident from what we have said that" factors of a person's external environment such as the climate, and social state "produces and sustains good health if its quantity" as well as turn it against themselves (Ibn Ridwan 117). Along with this, the environment of a particular region also impacted the health of its people such as with Egypt in early mediaeval times with "the southern region of the country is the hottest, and less corruption exists in the southern water of the Nile than in the northern" and thus prompts a need for southern water because of how humoral balance is maintained (Ibn Ridwan 115). The corruption in this case is ambiguous with the use of corruption in water as well as corruption in the air from a particular environment such as the Spanish when exerting their political influence from Spain to the Inca territory. Therefore, with the concept of corruption spreading through air and prompting a humoral imbalance, the Columbian exchange which enforced trade between the Inca by the Spanish became a humour to balance out a colonial empire, and as a method to encourage immigration to the colonising state. All under the guise of maintaining a humoral balance for the Spanish with Inca exports, and the Spanish keeping the Incas to their standards with delicacies of the colonising state.

The humoural balance of people through environment and empire has been effective as a defence mechanism for colonisation for both the coloniser and the colonised. Through the analysis of the natural environment of the Inca territory through its flora and fauna, the Spanish Colonists had a challenge with claiming the territory as their own. Their success in their conquest and the respective moral dilemmas with their delicacies would expand the humoral system of health beyond that of food and environment but to more abstract ideas that would lead people to balance themselves for uncanny reasons as seen in Garcilaso's account. The adaptation of this account through the lens of Islamic humoralism with Ibn Ridwan's *Prevention of the Bodily Ills in Egypt* reflects that the environment of a particular location has its own effects on the humours of someone and onto others. Therefore, the colonial enterprises of early modernity have affirmed the humoral effects between people as they transition from antiquity to modern scientific theory.

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"Laws of Nature" Through the Eyes of Auguste Comte and Evelyn Fox Keller

Grace Lloyd

A controversial feature of modern science is the concept of "laws of nature", or the idea that natural phenomena can be divided into rigid classes and follow consistent, predictable "laws". These laws may seem to be a 'given' to anyone with experience in the field, as they have intimately informed modern science's development since the late 16th and early 17th centuries, or the era of Francis Bacon. In the 19th century, positivists like Auguste Comte enthusiastically took up this concept and used laws of nature to homogenize nature to the greatest extent possible. Theories like Comte's construct laws of nature not as a lens through which to look at natural phenomena, but as an objective description of how nature actually behaves. However, with the (relatively) recent emergence of social constructivism, many systems and ideas which had long been thought to be natural or objective were shown to be subjective and socially constructed—direct products of hegemonic voices and their interests. Laws of nature, Evelyn Fox Keller argues, are one of these constructs. While Comte pursues laws of nature, Keller rejects them, claiming they are constructs rooted in anthropocentrism. As a result of his efforts to impose these laws, Comte faces challenges and contradictions, exposing issues in his theory.

Keller, on the other hand, advocates for natural "order" rather than "law," allowing the full scope of natural phenomena to exist as they are, and respecting rather than undermining difference.

Before beginning in earnest, I feel a brief discussion of the significance of language would be beneficial. One may think that critics of the idea of laws of nature are putting too much stock into what could simply be an innocent, convenient choice of words. However, as Keller argues in *Reflections on Gender and Science*, words hold significant meaning, and the phrase "laws of nature" is entrenched in political and ideological histories which persist in its present usage. To demonstrate this, Keller cites the Oxford English Dictionary, which states that "by those who first used the term, [laws of nature] were viewed as commands imposed by the Deity upon matter, and even writers who do not accept this view often speak of them as 'obeyed' by the phenomena." (Oxford English Dictionary, cited in Keller 131) Therefore, "the very concept of "laws of nature" is, in contemporary usage, both a product and an expression of the absence of reflectivity… introduc[ing] into the study of nature a metaphor indelibly marked by its political origins." (Keller 131) Simply by using this phrase, even those with the best of intentions introduce the language of domination and subservience into the human-nature relationship, and confine nature to man-made classifications and understandings of order. Laws were created by and for *peopl*e, so why would we describe non-human nature according to the same structures, if not driven by a human-centered understanding of the world? Using the phrase "laws of nature", then, is more than arbitrary word choice— it implies an *a priori* anthropocentric assumption that nature must conform to the same guidelines as humans.

Beyond these initial linguistic concerns, the actual imposition of the laws of nature is also intimately connected to narratives of domination and submission. Keller makes an important distinction between laws of state and laws of nature which emphasizes these narratives, stating, "whereas laws of state are open to lawful change, there is no constitutional recourse against a law of nature. Laws of nature are (at least in principle) ordinances to which matter is forever subservient." (Keller 131) Furthermore, while people often (but not always) have at least some opportunities to provide input in the laws that govern them, through democratic processes like

elections and council, nature has no such privileges, leaving non-human beings entirely subject to human will. There are, however, many similarities between laws of state and laws of nature as well, leading scientific theories to parallel human forms of government in ways which do not necessarily reflect how nature is truly ordered. As Keller puts it, "the actual theoretical structures generated by a mindset looking for deterministic laws frequently exhibit internal, uni-directional hierarchies of their own;" Watson and Crick's "central dogma" of molecular biology is a prime example of this tendency to characterize control as "located in a sovereign governing body," as "it depicts DNA as the executive governor of cellular organization, with unidirectional transfer or information." (Keller 132-133)

Comte also exemplifies these criticisms from Keller in his *Positive Philosophy*, highlighting the anthropocentrism implicit in pursuing and studying laws of nature. In this work, Comte discusses five "fundamental sciences", one of which he calls "Social Physics". This science is newer and therefore "behind" the others in its development and does not yet fit his positive philosophy, but Comte assures us that "the same character of positivity which is impressed on all the others will be shown to belong to [social physics]." (Comte 8) This is not the consolation Comte may wish it to be, as it shows that laws of nature are not laws which natural phenomena exhibit themselves, but which scientists must "impress" upon them. Comte's theory of historical and dogmatic methods of science also actualizes Keller's criticisms. He states that through the historical method, "knowledge is presented in the same order as it was actually obtained by the human mind, together with the way in which it was obtained," while through the dogmatic method, "the system of ideas is presented as it might be conceived of at this day, by a mind which, duly prepared at the right point of view, should begin to reconstitute the science as a whole." (Comte 24) Comte asserts that while a new science should be studied historically, once the "demand for a more natural logical order" has been met for that science, "the more effectual the dogmatic" method becomes "because the new conceptions bring forward the earlier ones in a fresh light;" therefore, "the Dogmatic Method is for ever superseding the Historical." (Comte 24) Comte openly advocates for developing a scientific practice informed by man-made dogma rather than by nature itself, further entrenching modern science in notions of human superiority. Laws of nature, then, are created by and for humans, perpetuating anthropocentric ideals and subordinating nature to man's will and structures.

Another issue with laws of nature, which I have already alluded to and which is tied to this anthropocentrism, is the fact that imposing laws upon nature often involves manipulating natural phenomena to fit into discrete boxes, limiting nature to stay within the bounds of human structures and understanding. In line with her previously-mentioned criticisms, Keller asserts that "to assume that all perceptible regularities can be represented by current (or even by future) theory is to impose a premature limit on what is possible in nature;" furthermore, to "assume that all discoverable manifestations of order can be inscribed in what we call laws may yet more seriously circumscribe the very meaning of order and accordingly limit our potential understanding." (Keller 133-134) This point underlines the importance of the language we use when studying nature, as using the same language for natural orders as we do for human orders places us in a disadvantaged position from the start, considerably limiting what we can discover and how we can define it. Keller characterizes "the most extreme case of [this] desire to turn observed regularity into law" as "the search for the one "unified" law of nature that embodies all other laws and that hence will be immune to revision." (Keller 132) Comte's philosophy, then, is certainly extreme. At the opening of *The Positive Philosophy*, he states that "the ultimate perfection of the Positive system would be (if such perfection could be hoped for) to represent all

phenomena as particular aspects of a single general fact." (Comte 3) Initially, Comte does not explicitly describe this desire for absolute reductionism in relation to laws, but then explains, "the first characteristic of the Positive Philosophy is that it regards all phenomena as subjected to invariable natural *Laws*. Our business is… to pursue an accurate discovery of these Laws, with a view to reducing them to the smallest possible number." (Comte 5-6) Comte's positivism is not just about placing laws upon natural phenomena, but about placing *as few laws as possible*, seemingly whether those phenomena actually, consistently, obey such laws or not. This calls Comte's real scientific motivations into question—does he want to truly *understand* nature or simply *classify* it and thereby *control* it? His positive philosophy also exhibits Keller's description of the single natural law "immune to revision." as he proclaims that once "all our fundamental conceptions hav[e] become homogenous, the Positive state will be fully established" and "it can never again change its character." (Comte 8) Comte's conception of laws of nature is therefore incredibly limiting in a number of ways: it restricts nature to human constructs, homogenizes nature to an extreme degree, and closes itself to criticism or alterations once that homogenization has been achieved. However, these are only Comte's *goals* for positivism. In practice, even he acknowledges that nature cannot be limited in such a way, creating contradictions in his argument which make one wonder why he would continue a pursuit which he knows is frivolous.

Comte repeatedly admits that his desire for one homogenizing law of nature is an unrealistic one, illustrating the inconsistencies one can face when pursuing the desire to control and categorize everything. Despite claiming at the beginning of *The Positive Philosophy* that the "ultimate perfection" of positivism would be to fit all natural phenomena to a singular fact, Comte later backtracks quite significantly. He declares that "it must not be supposed that we are going to consider this vast variety as proceeding from a single principle, and as subjected to a single law," as this is a "chimerical goal" which ignores the fact that "our intellectual resources are too narrow, and the universe is too complex, to leave any hope that it will ever be within our power to carry scientific perfection to its last degree of simplicity," (Comte 17) Comte also pushes back against natural orders coming from humans rather than from nature itself, specifically when discussing botany and zoology as examples of "the true principle of classification; *viz* that the classification must proceed from the study of the things to be classified, and must by no means be determined by *à priori* considerations." (Comte 20) This is an excellent principle to follow but seems in direct contradiction with Comte's desire to "impress" the character of positivity onto all sciences. If Comte does not believe it is possible to attribute all natural phenomena to one law, and rejects human-determined classification of nature, why does he continue to pursue his unrealistic goal of 'scientific perfection' Why does he even characterize it as 'perfection?' I argue that this desire stems from a common human compulsion to control that which we do not understand, and a connected fear of anything we *cannot* control or fully know. Comte essentially admits to seeing these qualities in himself and his contemporaries at multiple points, such as when he states that "[o]ur direct natural power over everything about us is extremely weak," such that "[w]henever we effect anything great it is through a knowledge of natural laws, by which we can set one agent to work upon another." (Comte 21) He also proclaims that "the most terrible sensation we are capable of, is that which we experience when any phenomenon seems to arise in violation of the familiar laws of nature," because "[t]his need of disposing facts in a comprehensible order" is "inherent in our organization." (Comte 21) One may understand laws of nature, then, as an overcompensation for

the fear that nature's intricacy and magnitude instill in us. Comte is fully aware that his philosophy of positivism is a direct result of this fear, but advocates for laws of nature anyway, a perplexing and even hypocritical position. Fortunately, Keller does not promote the same complacency, pushing for a new kind of natural order which reduces the anthropocentrism inherent in the study of laws of nature.

Rather than laws of nature, Keller proposes that modern science take on a study of *orders* of nature instead, allowing nature to present itself to the scientist more fully. Keller argues that order is conceptually "wider than law and free from its coercive, hierarchical, and centralization implications", and thus has "the potential to expand our conception of science" beyond these restrictive structures. (Keller 132) This wider scope allows for more accurate observations of nature, as it shifts "the focus of scientific inquiry from the pursuit of the unified laws of nature to an interest in the multiple and varied kinds of order actually expressed in nature." (Keller 134) A focus on order, by seeking to reduce rather than expand, thus removes many of the human interests and fears entrenched in positivism and laws of nature. Someone who exemplifies many of these counter-hegemonic values for Keller is cytogeneticist Barbara McClintock, who acknowledges that nature's complexity is beyond that which humans can understand.

McClintock's practice is radically opposed to Comte's positivism in a variety of ways, not the least of which is that it does not work "toward a unified, all-encompassing law", instead promoting a "respect for difference [which] remains content with multiplicity as an end in itself" (Keller 163). McClintock rejects the idea that there is any central dogma into which all natural phenomena fit, (Keller 162) and instead employs a "feeling for the organism" which has as its goal "not prediction per se, but understanding; not the power to manipulate, but empowerment— the kind of power that results from an understanding of the world around us, that simultaneously reflects and affirms our connection to that world." (Keller 166) By promoting respect, empathy, and relation to the natural world rather than animosity, division, and domination over it, this methodology produces results more likely to be accurate to actual natural processes, as "explanations that satisfy us about a natural world that is seen as… ontologically inferior, may seem less self-evidently satisfying for a natural world seen as complex and, itself, resourceful" (Keller 167). McClintock's science therefore requires a significant degree of humility which Comte's does not— while Comte runs from the sheer vastness, intricacy, and power of nature, McClintock and Keller face it head-on, affectively and cognitively embracing that which is greater than ourselves and celebrating our connection to it. Restrictive laws which define nature by human terms are forgotten, replaced by a humble curiosity which accepts nature as it is, denying anthropocentric tendencies in favour of an empowering inter-relationality.

I would like to once again emphasize that Comte's plight is not his alone. The dominant modern culture is fundamentally linked to various forms of domination—including but not limited to colonialism, patriarchy, white supremacy, and capitalism—, such that even if there is no ill-intent, we often find ourselves perpetuating these repressive narratives. In part due to this legacy of dualism, we often have a hard time confronting things we cannot control, so it is unsurprising that Bacon, Comte, and many other modern scientists since have attempted to bring nature within the bounds of human understanding and manipulation. Just because this practice is understandable, however, does not mean it is acceptable. Through studying and imposing laws of nature, we (consciously or not) allow these closed-minded fears to govern us, severely inhibiting our potential for both knowledge of and connection with the natural world. Thinkers like Keller

and McClintock, on the other hand, refuse to let such fears limit them, welcoming nature in its entirety and on its own terms, no matter how boundless or complex. Although the constructivists have shown that there is likely no way to ever know if our theories are "true" in the sense that they accurately reflect how nature "actually" is, this latter philosophy at least removes anthropocentric interests from science as much as possible, increasing the likelihood that its results are legitimate. In this era of confronting the oppressive structures which have governed humanity's past and present, laws of nature no longer align with our values; to rectify this, the scientific discipline must denounce these laws and take up a methodology more like Keller's and McClintock's, celebrating nature's order *and* its eccentricities.

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The Height of Parisian Society: A Giraffe, Social Stratifications, and Fashionable Dalliances in Nineteenth Century Paris

Shantelle March

At the beginning of the nineteenth century, following decades of conflict and political disorder, France was suffering a defeat of both their military and their societal stability. Historian Colin Jones aptly described the era when he wrote: "Revolution and war had brought dislocation to a city already suffering the impact of economic downturn of the last years of the Ancien Régime."[1] From the turmoil and bloodshed of the French Revolution, to Napoleon I seizing control, declaring an Empire, waging campaign after campaign, and finally suffering a great defeat in 1815 against a European coalition of forces, it is of no question that French society was emotionally exhausted.[2] With the reinstatement of the House of Bourbon by the European coalition, French society would be offered new hope for progress and stabilization.[3] However, the social climate would expand beyond stability and into excesses. By the 1820s, an ever-growing number of new, exotic, and enticing forms of entertainment were becoming widely and publicly available, some of the more exciting creations including cafes, cabarets, shopping, art centres, clubs, restaurants, theatres, zoos, gardens, and animal menageries.[4] These locations served the general public as a conduit to leisure activities, with the only barrier to their access in some cases being the cost of admission.

One of the most prominent forms of public entertainment available to Parisians was the Jardin des Plantes and its adjoining animal menagerie.[5] Formerly the Jardin du Roi prior to the French Revolution, it was reinvented as a public space liberated from the monarchy, although it continued to house regional as well as exotic flora and fauna for all to enjoy.[6] In 1827, the Jardin would become home to one of the most exotic animals barely known to Europeans: a juvenile giraffe thought to have originated in what is now the Sudan.[7] The story which brought this young female to Paris mirrors contemporary examples of animals being envoys for international diplomacy between feuding countries.[8] A gift from the Ottoman ruler of Egypt, Mehmet Ali, to Charles X, the giraffe was meant as a symbol of amiability and unity between the Ottoman Empire

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[1] Colin Jones, "Revolution and Empire," in *Paris: The Biography of a City*, (New York, NY: Penguin Books Ltd., 2004), 245.

[2] "Treaty of the Seventh Coalition – Alliance Between Great Britain and the King of Sardinia Against Napoleon – Treaty of 9 April 1815 – Treaty of 25 March 1815," napoleon.org, accessed December 07, 2023, https://www.napoleon.org/en/history-of-the-two-empires/objects/treaty-of-the-seventh-coalition-alliance- between-great-britain-and-the-king-of-sardinia-against-napoleon-treaty-of-9-april-1815-treaty-of-25-march- 1815/ .

[3] Jones, *Paris: The Biography of a City*, 262.

[4] Jones, *Paris: The Biography of a City*, 140, 246, 286-7.

[5] Jones, *Paris: The Biography of a City*, 140.

[6] Michael A. Osborne, *Nature, The Exotic, and the Science of French Colonialism* (Bloomington, IN: Indiana University press, 1994), 4-6.

[7] Michael Allin, *Zarafa: A Giraffe's True Story, from Deep in Africa to the Heart of Paris* (New York, NY: Random House, Inc., 1998), 4.

[8] Lee Tunstall, "A Long History of Animal Diplomacy (It's Not Just Pandas!)," HuffPost Canada, June 10, 2013, https://www.huffpost.com/archive/ca/entry/a-long-history-of-animal-diplomacy-its-not-just- pandas_b_3049488 .

and France.[9] As the giraffe and her transplanted Arabian handlers travelled to Paris to their eventual home at the Jardin, she would amass an enormous following and popularity amongst French society. The young giraffe would become more than simply a gesture of good international relations; she would go on to impact the human society within which she lived by influencing and motivating their fashions, art, design, and social culture.[10] Such a captivating force may have possibly even served the larger function of uniting a historically socially divided population.

Though it may be that the giraffe did facilitate some social unification across the classes by being open and accessible to the general public at the Jardin, I will argue that the giraffe's presence also contributed to a continued delineation between Parisian socio-economic groups. This is evidenced by the sensationalism which followed the giraffe's landfall in Marseilles and its subsequent arrival in Paris in 1827. The fashion, art, and general merchandising that emerged in the wake of the giraffe's arrival, while available to all, would have very likely only been accessible to those whose finances and leisure time permitted partaking in such fashionable dalliances. Additionally, the Jardin would directly contribute to the continued segregation of the social classes by selling higher priced tickets on certain days of the week, making the giraffe a commodity available to those who could afford the extra cost during these times.[11] A parallel between the giraffe's naturally elegant composure and her proximity to royalty was soon drawn, and Parisians would eventually satirically align the giraffe with Paris' "high society," further deepening the class divide.[12]

How the young giraffe came to Paris is worth some brief mention for contextualising its eventual social importance. The giraffe was captured as a juvenile likely from the region of what is now the Sudan, and brought to live at the palace of the Pasha of Egypt, Mehemet Ali, in order to grow and gain some strength. [13] Its enslaved Arabian handlers needed time to teach the young giraffe to drink milk from camels in the absence of its own mother. The giraffe was kept in the gardens of the Pasha for three months before it was sent up the Nile and boarded a ship to cross the Mediterranean.[14] The ship's hold could not accommodate the giraffe's growing height, so a hole was cut in the deck so that she could stand upright and fully extend her torso and neck. It was said that during inclement weather, the crew took great care to tarpaulin her head and the hole in the upper deck.[15] In November of 1826, the giraffe and her crew would make landfall in Marseilles, where it was decided that she would overwinter there in order continue to grow, gain health, and strength. The Prefect of Marseilles accommodated the giraffe for months at his property and doted

[9] Allin, *Zarafa*, 4.

[10] Michele Majer, "La Mode à la giraffe: Fashion, Culture, and Politics in Bourbon Restoration France," *Studies in the Decorative Arts/Fall-Winter* (2009-2010), 123.

[11] Majer, "La Mode à la giraffe," 130.

[12] Erik Ringmar, "Audience for a Giraffe: European Expansionism and the Quest for the Exotic," *Journal of World History* 17, No. 4 (December 2006): 386.

[13] In other publications, is also written as Mehmet, Mohammad, or Muhammad. Heather J. Sharkey *Canadian Journal of African Studies* 49, No. 1(April 2015): 44. Etienne Geoffroy Saint-Hilaire, "Quelques Considérations sur la Girafe," in *Annales des Sciences Naturelles Tome 11*, ed. Audouin, Brongniard, and Dumas (Paris: Imprimerie C. Thuau, 1827), 210-1.

[14] Saint-Hilaire, "Quelques Considérations," 211.

[15] Wilfrid Blunt, *The Ark in the Park: The Zoo in the Nineteenth Century*, (London: Hamish Hamilton Ltd, 1976), 74.

fondly on her.[16] Also entering the scene in Marseilles was Étienne Geoffroy Saint-Hilaire: one of the most prominent naturalists in Europe during this time.[17] He had been charged with the giraffe's care and oversight upon her arrival in France, and would join her entourage for the long walk from Marseilles to Paris the following Spring.[18] An astonishing amount of effort went into the giraffe: from its capture in Africa, to its arrival in France, the giraffe's survival and well-being was ensured through an enormous collaboration of people, time, and resources.

In Marseilles, the giraffe was an instant sensation. Unsurprisingly, the motley crew of what was the giraffe, her Arabian handlers, the famous Saint-Hilaire, the milk camels, and the doting Prefect drew throngs of people. An article in the newspaper *La Réunion* reported on May 30th, 1827 that "the giraffe had acquired such a great popularity that when it passed though the market in Marseilles, the flower girls adorned this beautiful African with scotch broom and roses."[19] Of their long walk to Paris and the ensuing giraffe-hungry crowds, Saint-Hilaire described them as "a cavalry charge" that necessitated the addition of mounted police and, eventually, military cavalry to their processional.[20] The occasion of a disorderly crowd in the Jardin des plantes in 1827 was artistic inspiration for the lithographer Henri-Daniel Plattel, who managed to capture the essence of the chaos.[21] The seeds of what history would later dub "giraffomania" had been sown.[22]

[16] Saint-Hilaire, "Quelques Considérations," 211.
[17] Osborne, *Nature, The Exotic*, 4-6.
[18] Allin, *Zarafa*, 136-7.
[19] Translations are my own unless otherwise stated. "Variétés," *La Réunion* 139 (May 30, 1827): 4, accessed Nov. 30, 2023, https://gallica.bnf.fr/ark:/12148/bpt6k9007212/f4.item .
[20] Allin, *Zarafa*, 145, 156.
[21] Majer, "La Mode à la giraffe," 130.
[22] Majer, "La Mode à la giraffe," 125.

Henri-Daniel Plattel, *Les Quartiers de Paris/Jardin des Plantes*, 1827, lithograph (photo), 27 x 37.3 cm, Musée Carnavalet, Paris, Fr.

As an adored public figure, the giraffe may have come to represent unity amongst a socially disparate people. As an international gift of serious diplomatic intention and friendship from the Ottoman Empire, the giraffe may have been a catalyst for geo-political alliances. However revered the giraffe may have been for its initial purposes, the public would come to understand the giraffe's presence in Paris within their own respective and available economic spheres.

As a public space, admission to the Jardin and its animal menagerie was free. However, the pandemonium associated with the earliest days of the giraffe's arrival in Paris inspired the enterprising Jardin employees to demarcate days and times of the week for VIP attendance only—for a fee.[23] Members of the general, working-class public would have been financially constricted from making such purchases. In *Paris: A Biography of a City*, Jones notes that "as much as one Parisian in ten was dependent on charity or poor-relief."[24] The Jardin, by creating an exclusivity

[23] Majer, "La Mode à la giraffe," 130.

[24] Jones, *Paris: The Biography of a City*, 295.

which was directly associated with the giraffe, would contribute to the deepening social divide of Paris society. There is no question that there was a growing economic schism in the city. Accordingly, Jones wrote of a "widening divide between a wealthier north-western sector and an eastern half of the city," leading him to conclude that "Paris seemed to have become a two-tiered, two-speed city."[25]

We can glean another sense of the luxuriousness that would come to be associated with the giraffe by analysing newsprint and especially feminine-oriented fashion publications from the era. In a personal letter that was published in the newspaper *La Réunion* in 1827, the author wrote that "men, women, children will no longer be able to exist without having a giraffe costume: finally the big beast will cause a revolution in luxury items . . . I will not be the last one to buy [myself] pants, a gilet, and a giraffe tie."[26] Indeed, it would not take long after the giraffe's establishment at the Jardin for clothing designers to advertise their newest giraffe-inspired creations, and the *Journal des Dames et des Modes* would become the ultimate trendsetter. Yellow would no longer be just yellow; everywhere it would be *jaune-giraffe*. On October 25th, *Journal des Dames* wrote that they had available "some satin hats of damask designs, blue, pink colour, or yellow-giraffe, have velvet linings of the same shade as the satin."[27] Previously benign clothing garnishes like belts and ribbons would suddenly become emblazoned with giraffe motifs and colour palettes. In their continued giraffe fashion instruction to their readership, they clarified that "[i]n general, we call trims *giraffe* which have more height in front than behind, and which, moreover, go [from a] high point to the low point."[28] In one article referencing past fashion trends, the journal seemingly pointed to the obvious with the statement: "Anyone who knows of *lamb sleeves* can easily imagine *giraffe sleeves*."[29] Each issue included as an addendum several high quality, colourised images of their dresses, hats, trim pieces, other accessories, and even (although to a lesser extent) giraffe- inspired pieces for gentlemen.[30]

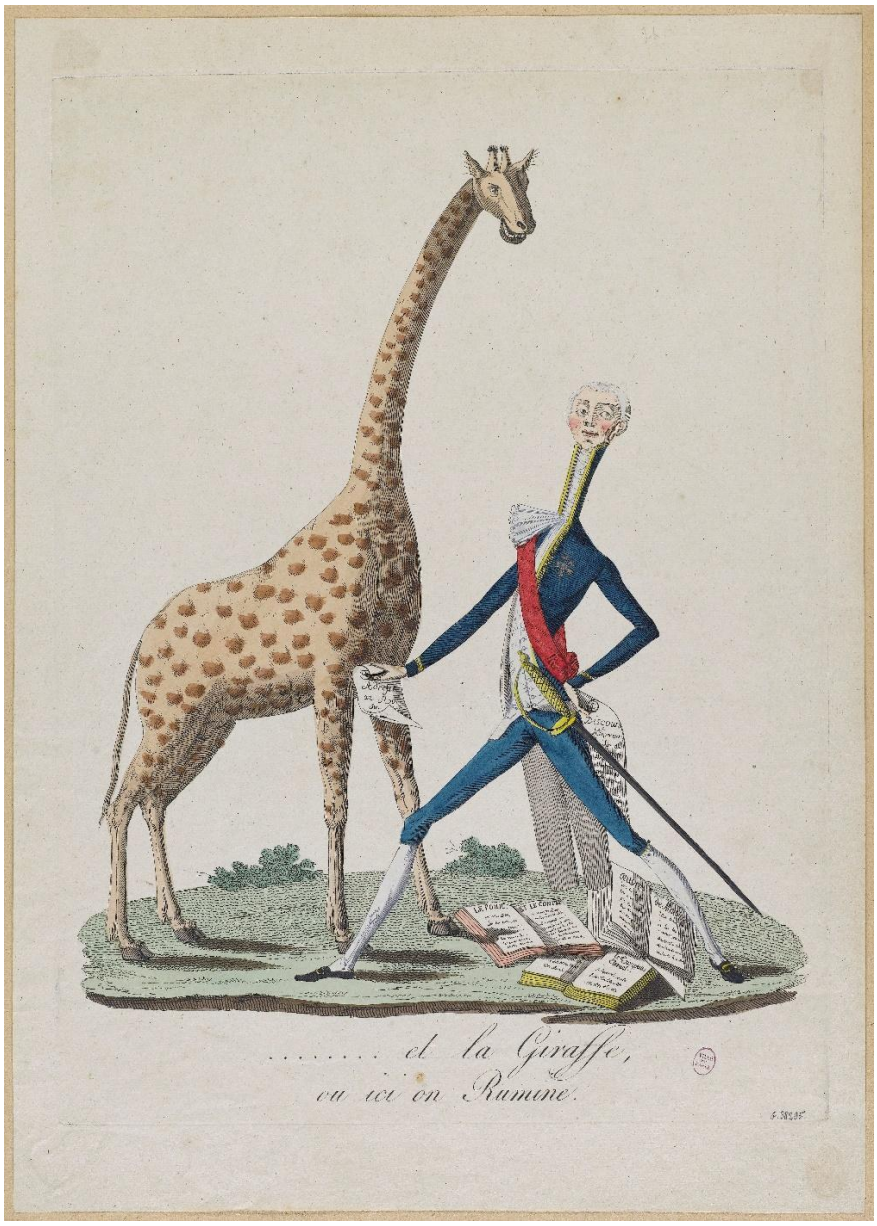
[25] Jones, *Paris: The Biography of a City*, 294.
[26] "Mode Parisiennes," *La Réunion* (July 08, 1827): 2, accessed Nov. 30, 2023, https://gallica.bnf.fr/ark:/12148/bpt6k901247r/f2.item.zoom .
[27] "Modes," *Journal des Dames et des Modes* 59 (Oct 25, 1827): 470, accessed Dec 02, 2023, https://gallica.bnf.fr/ark:/12148/bpt6k1047312p .
[28] "Modes," *Journal des Dames et des Modes* 42 (July 31, 1827): 331, accessed Dec. 03, 2023, https://gallica.bnf.fr/ark:/12148/bpt6k1043142w/f3.item .
[29] Emphases are my own. "Modes," *Journal des Dames et des Modes* 62 (Nov. 10, 1827): 494, accessed Dec. 03, 2023, https://gallica.bnf.fr/ark:/12148/bpt6k10473185/f10.item .
[30] Majer, "La Mode à la giraffe," 136, 139.

Image source: "Modes," *Journal des Dames et des Modes* 49 (Sep. 05, 1827): 2533, accessed Dec 02, 2023, https://gallica.bnf.fr/ark:/12148/bpt6k1043156x/f8.item .

There is an obvious economic barrier to new fashion trends when one considers the materials and time involved in clothing production. However, a subtler barrier exists in accessing the publications which advertised such luxuries. For example, a subscription to the *Journal des Dames*, which would provide an issue approximately every 5 days, cost 36 francs for the year.[31] Certainly, it was the *Journal des Dames* that was propagating most of the giraffe-related fashions and general merchandise of the time. In the August 5th 1827 issue, a paragraph reads, "[f]rom modest gingerbread to ostentatious bronze, everything that is à la mode features a giraffe . . . We see a bronze giraffe on a yellow marble paperweight sprinkled with Sennar sand . . . In gold, the giraffe is a charm, or a shirt pin."[32] The reference of "ostentatious" bronze, gold, and marble screams that both the merchandise as well as the publication itself were intended for bourgeoisie customers.

It would not take long for the working-class newspapers to begin satirizing the giraffe and her purportedly bourgeoisie lifestyle enjoyed at the Jardin. Everything about her leading up to her life in Paris had been extraordinarily excessive, and the public was there to take notice. Of the era, Michele Majer noted that "[t]he language in the satirical press conflated the sheer physical height of the giraffe with an elevated status. Often ridiculed were the large retinue and the elaborate ceremony surrounding her daily walks in Marseilles and her journey to Paris . . . likened to those befitting an eminent visitor."[33] Of the many available monikers for use, the giraffe was often called "her highness" specifically and metaphorically connecting her extraordinary lifestyle and stature to that enjoyed by royalty.[34] In one anonymous colour print now held at the Musée Carnavalet in Paris, the giraffe juxtaposes the French King, both displaying their noble and extremely long, delicate necks. Historian Erik Ringmar reminds us of "a venerable tradition of portraying rulers in the guise of various animals" as a straightforward way to criticize a regime.[35]

[31] "Modes," *Journal des Dames et des Modes* 51 (Sep 15, 1827): 399, accessed Dec 01, 2023, https://gallica.bnf.fr/ark:/12148/bpt6k1043160t .
[32] "Modes," *Journal des Dames et des Modes* 43 (Aug 05, 1827): 337, accessed Dec. 01, 2023, https://gallica.bnf.fr/ark:/12148/bpt6k10472805 .
[33] Majer, "La Mode à la giraffe, 153.
[34] Majer, "La Mode à la giraffe, 153.
[35] Ringmar, "Audience for a Giraffe," 386.



Anon., *et la Giraffe, ou ici on Rumine*, 19th ce, print, 35.2 x 25.9 cm, Musée Carnavalet, Paris, Fr. Available at https://www.parismuseescollections.paris.fr/fr/musee-carnavalet/oeuvres/et-la-giraffe-ou-ici-on-rumine#infos-principales .

As an unintended public figure, the giraffe became available to be enjoyed by all cross sections of society who came to visit her at her home in the Jardin. Philip McCouat refers to her as "a giraffe of the people" who was not "secreted away in the king's private estate."[36] She was a muse for craftsmen for designing their giraffe-themed merchandise, textiles, jewellery, and items of home décor. But these merchandises were purpose-built for an upper class who had disposable income and disposable time that they could devote to leisure activities and fashionable dalliances. For the working class, the relationship with the giraffe was likely much less

[36] Philip McCouat, "The art of giraffe diplomacy," *Journal of Art in Society*, www.artinsociety.com, 2015, https://www.artinsociety.com/the-art-of-giraffe-diplomacy.html .

consumer-based. Given the pre-existing economic fractures in Paris during the height of the giraffe craze, the giraffe would instead become a character of political satire highlighting the real distance between the upper and lower classes of French citizen. Suddenly, the giraffe was being uncharitably compared to the aristocracy, and similarly, the aristocracy to a wild animal. Her home at the former Jardin du Roi gave her the physical proximity the resentful public needed to align her unfavourably with the royal family. The giraffe, so beloved by a select few, was less a unifying symbol of Paris as history would like to remember her and more a significant example of the divisions in Parisian society.

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Bartmann's Body: Gender and Race-Critical Understandings of the History of Science

Emma Martel

In her paper "Gender, Race, and Nation: The Comparative Anatomy of 'Hottentot' Women in Europe, 1815-1817", Anne Fausto-Sterling claims that it is impossible to have an objective knowledge of difference. Fausto-Sterling grounds this claim in the historical case-study of Sarah Bartmann, a colonial subject exploited by Enlightenment emphasis on classification and difference. For Fausto-Sterling, it is significant to unpack the context that underpins Bartmann's exploitation by science. Enlightenment science is grounded in colonialist expansionism and projects of collection and classification that focused on making the unknown an object of study. Understanding these historical systems is more revealing than any investigation into the authenticity of that science's treatment of Bartmann. Fausto-Sterling makes it clear that any inquiry into the 'truth' about Bartmann is just a reframing of the colonial project's desire to know the black female body as part of an attempt at suppression and domination. An objective knowledge of difference is not possible, because the question of difference is not itself an objective question. It is part of the legacy of racism that comes from the origin points of so-called modern science. The story of Sarah Bartmann is a useful example in an exploration of these concepts. Known only through the accounts of the scientists who used her, Bartmann's status in science is that of a specimen rather than an individual. Her historical plight tempts us to challenge the science that abused her by disproving it. However, as Fausto-Sterling and others argue, this is not the way forward. Rather than searching for the 'truth' about Bartmann, we should use Bartmann's story to actively examine the legacy of the racist gendered practice found at the origins of science.

Saartjie Baartman, or Sarah Bartmann as her Dutch-given name would be anglicized, lived between the years of 1789 and 1815.[1] Bartmann was taken from her home in South Africa and displayed by the exhibition culture of England that exploited othered bodies in ways comparable to the cabinets of curiosities made popular in the 18th century. Bartmann was later moved to France, where she would be studied by natural historians Georges Cuvier and Henri de Blainville, scientific men who were "needful of exploring non-European bodies" (Fausto-Sterling 23). Bartmann would eventually die from an illness, although Cuvier suggested that her death was helped by Bartmann's supposed excessive drinking (Fausto-Sterling 29). This last point reveals a problem encountered by all who wish to tell Bartmann's story in the present day. A key feature of Bartmann's historical narrative, as noted by many scholars who have done work on the topic, is that it is impossible to tell the story of Sarah Bartmann in her own words. No firsthand account survives, and so we are left to "read between the lines" in order to piece together a woman from the scientific scrutiny of the natural historians who examined her (Fausto-Sterling 28). As Yvette Abrahams puts it, we "do not know the simplest thing about Sara Bartman" (45). Abrahams makes the claim that one of the only things that can be known about Bartmann is that European science had a fascination with her sexuality, and that this "genital encounter… became deadly" (45). It is therefore very difficult to reconstruct Bartmann from the historical narratives

[1] Alternatively: Sara or Sarah, Baartman, Bartmann, or Bartman. Spelling varies in quotation, but the body of this essay will use 'Sarah Bartmann' in-line with Fausto-Sterling's paper.

that are available. Following Bartmann's death, her body would be dissected and preserved in a disquieting manner that would result in her preserved corpse being displayed in Paris for well over a century.

Bartmann would not return home until 2002, when her remains were repatriated to South Africa (McKittrick 113). Because the historical person is lost to time, it is tempting to paint a picture of a woman victimized by science but still fighting back in a revolutionary manner against the structures of her oppression. In reality, this is an unsupported and wishful plotline. Abrahams also expresses this impulse to grant Bartmann some posthumous agency. Writing about Bartmann's refusal to display her genitals, Abrahams says: "I should write of a lone woman, thousands of kilometres away from her home and her family, who nonetheless resisted the final indignity at the hands of seven white men. But the written sources have nothing to say about the resistance of Sara Bartman" (44). Ultimately, the unfortunate conclusion is that we cannot know Bartmann; "we can never see her except through the eyes of the white men who described her" (Fausto-Sterling 31).

Having taken that point, how can historians begin to critically engage with the story of Sarah Bartmann? Anne Fausto-Sterling acknowledges that we cannot know Bartmann herself and tries instead to know Bartmann's examiners and tormentors. She establishes the motive of her scholarship as being an attempt to "look at the fears and anxieties of the scientists, rather than worrying about the (in)accuracies of their descriptions of Sarah Bartmann and other people of color" (41). Fausto-Sterling believes this approach will avoid the pitfalls of simply reframing colonial science's questions about Bartmann's body. Challenging the accuracy of systematically flawed science does not create critical discussion about said science. Rather, it creates a reframing and rereading structure that still prioritizes the same colonial and imperialist questions. Fausto-Sterling focuses on scrutinizing the science and the scientists, rather than allowing further scrutiny of Bartmann under the guise of disproving colonial science. She is concerned that an emphasis on finding the truth about Bartmann indicates a continued belief in objective and pure science. The suggestion is that, if one re-examines Bartmann and other colonized bodies now, in a modern setting, "we ought to be able to get out our measuring tapes and find the real truth about other people's bodies" (40). That search for 'real truth' does not actually turn the scientist towards a critical review of the history of science. Instead, it legitimizes the language of difference and suggests that objective knowledge may be possible. Fausto-Sterling is firmly against this idea. By turning towards a study of the intersection between science and society, Fausto-Sterling uses feminist science studies as a method to break down the motives of science as a social activity. Through this framework she examines the fears and anxieties underpinning the colonial project. These fears are what create a language of difference, further perpetuating the myth of objective science.

To this point, Andrew Lyons unpacks Fausto-Sterling's essay in a way that identifies the importance of treating Enlightenment science and natural history with legitimacy. To dismiss it as merely a false precursor to modern science is doing a disservice to the people affected by the racist and colonial origins of Western science. On the topic of Bartmann and the scientists who studied her, Lyons writes that "Cuvier was not a 'pseudo-scientist,' a word too liberally employed by those who criticise his racism" (338). For Lyons, such terms overlook the influence

that Cuvier had and continues to have. Lyons claims that to call Cuvier a pseudo-scientist is to imply "that one secretly venerates the scientific rationality one may claim to disparage" (338). In that version of the story, Cuvier's science is 'bad science', an incorrect outlier rather than an influential model that would set the stage for systemically racist modern science. This suggests that there is still some objective difference to be observed, if only somebody other than Cuvier could do that work. Lyons argues that instead of evaluating the accuracy of Cuvier's science, it is more revealing to examine the motives of that study. What were the scientific goals that made permissible the subjection of Bartmann by – as a poem written shortly before her body's repatriation puts it – "the poking eyes of the man-made monster / who lives in the dark with his clutches of imperialism" (Ferrus 11-12). It is not valuable to consider Cuvier as an outlier, or to treat him as anything other than a "true scientist" (Lyons 339). However, Lyons gets part of Fausto-Sterling's argument wrong. Where Lyons claims that Cuvier was a true scientist marred by his own particular "moral flaws", Fausto-Sterling sees Cuvier as the product of his social and historical context rather than as a uniquely flawed individual. Fausto-Sterling places more emphasis on the overarching motives of science to explain the science of Cuvier and his peers (339).

To investigate this question of scientific motive, Fausto-Sterling places Bartmann and her examiners into their historical and geographical context, asking why "anatomical descriptions of women of color" are so important to biologists and other naturalists of the eighteenth and nineteenth centuries (20). The eighteenth and nineteenth centuries were times of expansion and exploration. Those centuries saw the massive expansion of European colonial powers. In support of the colonial project, museums came to house specimens in ways that made the unknowable and exotic into domestic collections. The aforementioned cabinets of curiosity were expanded, becoming full museums that enabled the development of eighteenth-century classification systems (Fausto-Sterling 23). These classification and collection processes created museums as locations where the unknown could be housed, allowing scientists "to place the world before their eyes without ever leaving their place of employ" (Fausto-Sterling 24). They brought the wilderness and the exotic home, "domesticating distant lands" (Fausto-Sterling 24). The history of human biology and anatomy needs to be understood within this framework, as part of the colonial project's attempts to subjugate so-called "savages" (Fausto-Sterling 24-25). This is especially significant to the story of Sarah Bartmann, as both Cuvier and de Blainville "used the technologies of dissection and comparative anatomy to create classifications" (Fausto-Sterling 25). The language of difference that emerged out of Cuvier and de Blainville's science was created in that context of expansion and suppression via classification. Cuvier's science is underpinned by "his role in supporting European dominion of more distant lands", placing the motives of colonial science at the core of Enlightenment scientific developments (Fausto-Sterling 27). Ultimately, Fausto-Sterling is arguing that the science itself is flawed past any individual argument. It is structurally rotten, in ways that emerge from eighteenth-century projects of expansion and go on to feed into nineteenth-century "concepts of race" (28). This science is applied onto the body of Sarah Bartmann, catching her within this discourse on the origins of scientific racism. As Abrahams in agreement with Fausto-Sterling puts it, "thus, upon Sara Bartman's body a superstructure of scientific racism was built which supported the continued enslavement of Africans in the Americas and the 'civilizing mission' in Africa" (45). This critique reveals sexual and racial differentiation to be the by-products of classification and colonial science.

Another way to historically ground the motives behind Bartmann's exploitation is to look at the anxieties involved in the culture of display and performance that she became trapped in. Fausto-Sterling emphasises the European show scene, describing it as the nineteenth century's "vehicle for creating visions of the nonwhite world" (30). Bartmann's display focused on her sexuality and sexualized parts of her body, linking sexuality with 'savagery'. Her display created a connection between the "wild or savage female" and a "dangerous or uncontrolled sexuality" (Fausto-Sterling 30). There was an increased interest in comparing Bartmann as a racialized body with the more controlled femaleness of white European women. Comparisons of women created an environment where female sexuality was pathologized with a focus on genitalia (Gilman 216). This language of difference allowed for a heavy focus on sexual difference, with the added weight of a racial factor. As Sander Gilman puts it in his examination of the nineteenth century connection between race and female sexuality: "[i]f their sexual parts could be shown to be inherently different, this would be a sufficient sign that the blacks were a separate (and, needless to say, lower) race" (216). Within the Linnaean classification system, this focus on genitals was encouraged. The interest of de Blainville and Cuvier on Bartmann's genitals, buttocks and bosom are part of this desire to emphasize racial and sexual difference. Leaning into existing classification structures allowed them to create a more "full account of… 'primitive woman's' genitalia", something which was "essential to putting her finally in her appropriate place" (Gilman 35). Exploring the anatomy of Bartmann allowed Cuvier to place her within a Linnaean system. Furthermore, it allowed Cuvier to expand his work outwards onto the colonial project. In his dissections, "Cuvier melds the vision of an interior or hidden Africa with the hidden or interior genitalia of the Hottentot Venus", comparing Bartmann's body directly to the "virgin soil" of Africa (Gilman 36, 22). Not only would this Linnaean emphasis on sex organs establish a genital norm or hegemony, it did so in a way that cast Bartmann as an outsider in order to "control the hidden secrets of Africa and the woman" (Gilman 42). This language of difference "separated the tamed and manageable European woman from the wild and previously unknown African" (Gilman 38). The project justified "continued expansion, colonialism, and slavery", revealing who science served in projects like the study of Bartmann's body (Gilman 40).

Another scholar who confronts the scientific motive directly is Katherine McKittrick, who makes a compelling argument about reading Bartmann's story through inspired creative works rather than through a historical narrative concerned with "authenticating Sarah Baartman"
(114). The goal is to avoid "re-centering racist biological discourses", and instead to criticize the "bifurcation of scientific and creative knowledge" (McKittrick 114). McKittrick is most concerned with the way that Bartmann becomes an icon of the black body in popular culture following her death. Ultimately she is writing about the universalization of Sarah Bartmann, and the ways that Bartmann becomes a representative of African people, something that McKittrick believes "shores up the view that science cannot be disassociated from the ways in which blackness is read in the past of the present" (118). Race and biological determinism are still tied together, leaning into the language of difference that Fausto-Sterling identified as being a product of historically racist systems of knowledge. McKittrick's focus on creative endeavours points to an attempt to "reclaim black femininity", citing the attempts of artists to have "their audiences interrogate the imperialist legacy of racism and sexism" (121). Creative works are

important "diasporic acts" that aim to take-back and talk-back, but they are also a part of the dialogue with science in ways that "breach the barrier between the natural science and the art world" (McKittrick 121). Importantly, McKittrick sees art as a way to move forwards that does not attempt to reach backwards and correct or "dispel the violence done to Baartman and other colonial subjects," rather she is suggesting art creates a different framework that honours science and creative knowledge without falling into the trap of reaching for an objective identification of difference (McKittrick 123). The products of art, for example Bester's sculpture of Sarah Bartmann or Ferrus' poem quoted earlier in this essay, establish an active reminder of history rather than a reductive one. McKittrick's analysis of the place of creativity in the story of Bartmann might suggest a way forward that has been informed by Fausto-Sterling's persuasive claim that identifying objective difference is neither possible, nor productive.

One of the immediate issues encountered when discussing the story of Sarah Bartmann is the fact that it is impossible to know her as a woman. The historical narrative has lost Bartmann, leaving only her status as a specimen to be remembered. Any attempts to know Bartmann come from the scientists who dissected and observed her body. Therefore, efforts to identify the true objective differences of Bartmann's body are futile. Such attempts are capable only of reframing and reusing colonial and racist ideas. Fausto-Sterling is more interested in identifying the motives behind science, rather than falling into this pitfall of attempting to correct history. In her paper, Fausto-Sterling posits that social circumstances produced a science guided by contemporary fears and goals. This means that it is impossible to separate the science from its socially situated context. The objectivity of science is called into doubt by certain critical readings that examine historical motives. Attempts to correct antique science lean into the idea that there is an achievable objectivity that hovers just out of reach, which supports the theories of objective difference that Fausto-Sterling is combating. Instead, Fausto-Sterling carefully reconstructs the historical context in order to make sense of Enlightenment science. She turns towards an examination of the culture of collection and classification that arose out of colonial expansionism in the eighteenth century. The fears driving expansion were anxieties over the unknown, and the status of the European in contrast with unknown bodies. Science of the time attempted to overcome these fears by making the unknown a classified and controlled other, in ways that subjugated and dominated certain peoples and bodies. Bartmann is a victim of this colonial project. It is this emphasis on classification that creates obsessions with pathologizing the genitals of racialized female bodies, setting the stage for future ideas of racial and sexual biological determinism. There can be no objective difference when the question of difference has itself arisen out of these socially driven contexts. The question Fausto-Sterling pursues becomes one about who science serves, persuasively backed by the revealing history of science. Rather than searching for that non-existent objective difference, other scholars suggest a way forward that foregrounds art as an active demonstration of the historical racism of science. Perhaps bringing art and science together, challenging the idea of what counts as a science, will allow Bartmann to be honoured in ways that do not reach for an unattainable truth about her stolen body.

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Selected Poems

Chloë Nguyen-Drury

These poems were inspired by the term *girlrot*, the act of women intentionally being lazy and unproductive as defined by modern capitalist standards. I use *-rot* as a suffix to indicate a sardonic embrace of neurodivergence and disability. I am inspired by the idea of decay not as a linear step towards a finite end but as regenerative, cyclical, holistic transformation.

"heartrot"

Chloë Nguyen-Drury

I lay idle, full, content.
Not in waiting, but in wakefulness
An unuseful part that
"Cannot function as required"
"Does not work as expected"
It's true my hands and heart are not made for the pushing of gears
And Midwestern meat processing plants glare in fluorescent tube light
The gleam, the blare
The bleary-eyes fade off a twelve-hour shift

I have not clocked in today
I want the flora and the fauna

I have not packed a lunch
I want the warm fungal hug

I am not a cog turning
I want to rot in bed

Retirement is not a destination, I want to live and die

Growth is not linear
And neither am I

"Rootrot"
Chloë Nguyen-Drury

The sick has set in to the roots of our tree
The grand old oak in the yard
At age eight I played jump rope across its reach
And later pressed lips to mine under a sprawling shade

I felt myself grow and limbs become lengthened
But on my sunny young brightness a long shadow fell
Unaware of diseases that lurk in quiet malevolence
Baffled by friends who'd cast looks over the back fence

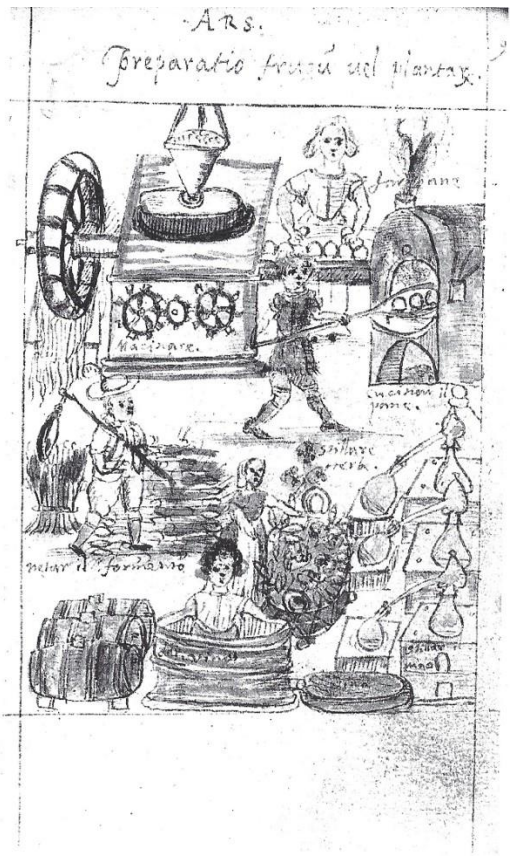
When even my mother refused to go out
I started to fear that unknown evil affliction
Then it was my turn for the coaly treacle
I didn't know what was wrong, just that it was bad

Years later now, with suns of my own
I crouch in the wholesome earth of our oak
Pressing young hands to the roots
And urging them to feel "the rot".

Women as Distillation Authorities: *The Queen-Like Closet* and Paracelsian Medicine

Eleanor Peebles

The Queen-Like Closet by Hannah Woolley, a cookbook from 1670, depicts female authority over distillation in the domestic kitchens of the seventeenth century. These spaces prevented the relegation of women to the periphery when it came to distillation and allowed them to participate directly in medicine-making in a Paracelsian manner. The frontispiece to *The Queen-Like Closet* has imagery which can be directly contrasted with the emblems of Pietre Antonio Neri's *Alchimia* to show how female authority differs between the kitchen and laboratory when it comes to the same operations. In addition, Paracelsian medicine-making and the centrality of distillation to it can be found in the creation of medicines in Woolley's recipes, as both Paracelsus and Woolley focus on separation to acquire the healing element within materials. Finally, medicine and food are intertwined in *The Queen-Like Closet* in a manner which exemplifies how the context of distillation can determine the authority of women over the process, and how the kitchen as a space can move women from being an allegorical tool to an embodied intellectual presence.



(Left) Fig. 1: Pietre Antonio Neri. "Preparation of fruits and grains," *Alchimia.* 17th century, Glasglow University Library. *The Domestic Alchemist, by* M. E. Warlick, Glasglow Emblem Studies, 1998, p. 31.
(Right) Fig. 2: John Shirley. "Frontispiece," *The Queene-like Closet, or Rich Cabinet…,* by Hannah Woolley, London: Richard Lowndes. *British Library.*
https://www.bl.uk/learning/images/texts/cooks/large858.html

The frontispiece of *The Queen-Like Closet* and images from Pietre Antonio Neri's *Alchimia* display the kitchen and the alchemical laboratory respectively, and these spaces have a significant impact on the authority of the woman occupying them. Fig. 1, the frontispiece to the first 1670 edition of *The Queen-Like Closet,* likely done by John Shirley, shows several alchemical instruments in a female dominated space. The emblems of Pietre Antonio Neri's *Alchimia,* an alchemical text from the seventeenth century, meanwhile, adhere to the "classical polarization that men are dry and firey and women moist and cool," and have gendered alchemical operations (Warlick 30). In contrast, Shirley's women not only encompass multiple operations – both those traditionally coded male and female – but they also interact with the non-feminine operations in a direct manner, such as not only standing in proximity to a fire but also facing it. Strict, gendered duties such as those in *Alchimia* fail in the face of the female-dominated space of the depicted kitchen in Shirley's frontispiece. *Alchimia* has a series of laboratory images in addition to the one depicted in Fig. 2, and these divide alchemical work into spheres with gendered expectations (Warlick 30). Fig. 2 depicts the "preparation of fruits and grains" and has clearly divided duties (Warlick 31). It "contains a woman at the top shaping loaves of bread," while under her, a man inserts the shaped loaves into the oven (Warlick 30). While Shirley's frontispiece depicts this same process in the middle left image, it does so with a woman having done both duties, with buns (presumably shaped beforehand by the woman) being inserted into a beehive oven by a woman with a paddle. In the absence of a man in the kitchen space, the woman takes on all roles. Since Woolley discusses the presence of men in kitchens within the cookbook, however, these images do not display a space that inherently excludes men – instead, they depict a space which has been dominated by women who have taken on authority. In other words, men could be in this space, but are not. A choice has been made to depict only women, and women completing a variety of tasks. The woman in the left middle image of Shirley's frontispiece occupies a stillroom, as is demarcated by the alembic to her left, which is emptying into a vessel that the woman is handling; similar vessels line the walls and further indicate the room's purpose. The stillroom is connected intimately to the other kitchen spaces depicted in Shirley's frontispiece, and "the stillroom and the manuscript recipe book served as two of the most important sites of female creativity in early modern England" (Allen 94). These stillrooms "provided the central locations for preparing medicines and cordial waters," making it likely that the woman in Shirley's image is preparing one of the medicines intertwined inextricably with the culinary recipes within Woolley's text (Allen 106). While the *Alchimia* image does depict a woman next to a line of alembics in a similar manner to Shirley's, she is completing the distillation in a shared space with men, and under their oversight in accordance with traditional alchemical emblems. In Shirley's depiction, the still has been moved into the domestic sphere and under female control. The kitchen is therefore depicted as a space of female dominance, where operations are not divided clearly along gendered lines as they are in alchemical spaces, and where distillation exists as a female operation, rather than merely taking place in proximity to a woman.

The Queen-Like Closet is a recipe book for food, but the context of the seventeenth century kitchen means that it is a recipe book for medicine as well, as women often acted as the domestic physicians of their households. Woolley's approach to the medicine within the cookbook is an inherently Paracelsian one, with the healing element of the medicine emerging from its separation from the useless parts, and distillation functioning as the process which accomplishes this separation. The term 'Paracelsian' had many connotations in the seventeenth and eighteenth centuries, but it is used here to refer to an adherence to his approach to distilled

medicine. Paracelsus believed that divine virtue existed in everything, and that to acquire this divine virtue, one must engage in the process of separation. Alchemical processes of separation, such as distillation, allow one to "separate the elements, free fifth essences, and also find the healing and perfecting secrets in all of nature" and therefore create medicine (Moran 72). Woolley's medicine-making is Paracelsian in nature, with most recipes relying on distillation to extract the healing element from the initial materials. In much the same way as the recipes describe how to make food edible, they guide the reader in making "substances [which could] in their raw or natural form . . . be outright poisons or otherwise noxious to the body" into functional and effective medicines (Moran 78). To distill correctly and effectively required access to specific materials and significant knowledge of how to work and maintain these materials, such as that which was "recorded in [both] the history of recipe collecting and those of alchemy and chemistry" (Allen 91). The use of distillation for medicine-making by women in seventeenth century households was so common that "distillation and domestic medicine [was] often characterized as "kitchen-physic" . . . [and] "ladies chemistry"" (Allen 95). In the recipe for "a very Soveraign [sic] Water," Woolley dictates a list of ingredients which are to be mixed in with wine and let stand for twelve hours (3). After this, she directs the reader to "still [the mixture] in an Alembeck," after which one should "keep the best Water by it self," meaning that they should take the resulting distillate – the best of the original mixture, extracted – and apply this to the patient who required the remedy (Woolley 3). There are distinctions made here in the dosing of the distillate – this first distillate "may [be] use[d] for aged People," but it can also be run through the alembic a second time to produce a stronger substance which must be kept separate from the first and should be applied to younger patients (Woolley 3). Recipes are not only detailed in the dosing of the distilled medicine, but also in its production – seventeenth and eighteenth century "recipe books document a variety of equipment that was used for distilling," and Woolley's is no exception (Allen 104). In her instructions for making "Spirit of Mints," Woolley describes how wine and spearmint should be steeped and then put into a "Copper Alembeck" and "draw[n] with a pretty quick fire" (Woolley 4). After the mixture has been distilled once in this manner, it should be distilled again in the same alembic in a specific manner. She remarks, however, that if one does not have a copper alembic, they "may distill it in an ordinary Still . . . but then it will not be so strong nor effectual" (Woolley 4). Her language implies a familiarity with stills and the possession of this specialized equipment – both of which she expects her audience to have as well – and a knowledge of the different results a copper alembic and an 'ordinary still' will produce. This detailed description of distillation echoes that of Paracelsus, and the products of Woolley's distillation recipes are always either medicine or a food with medicinal properties. In this way, *The Queen-Like Closet* displays a Paracelsian approach to medicine-making, which is indicated by the emphasis and detail of her instructions for distillation to extract the healing aspect of the materials used.

The domestic space of the kitchen and the intertwining of medicine and food allows the woman to be an embodied distiller, rather than restricting her to either an assistant or an allegory, as is commonly seen in alchemical emblems. The intertwining of medicine and food in seventeenth century households allows women an authority that keeps them embodied in domestic spaces. In alchemical tradition, there are often "allegorical representations [where] women often serve as vehicles to symbolize paths of learning . . . which were difficult for women to pursue in reality" (Allen 26). For Paracelsus, the creation of the physical world, which was "itself a process of separation," was one completed in a feminine context; the world was created "as from maternal wombs" (Moran 72; Moran 73). Separation is "the mother and parent

of all generation," Paracelsus writes, tying the fundamental principle behind both his alchemy and medicine to the body of a woman (qtd. in Moran 72). In this allegorical tradition, the woman is often a metaphor for processes, but her involvement stops there. Although there were certainly exceptions, the woman was frequently a mystical and powerful source in theoretical writings yet made into an assistant in the physical lab. The kitchen – at least those such as the one depicted in *The Queen-Like Closet's* text and frontispiece – does not allow this for many reasons. For one, the woman dominates the space, unable to become subservient to a man that is not present. For another, the recipes do not allow for a separation of food and medicine, a categorization of unintelligent cooking and intellectual alchemy. Not only does distillation appear in recipes for medicine and cooking alike, applied to waters, preserves, jellies, cordials, and more, but these recipes are often one and the same. *The Queen-Like Closet* is addressed to "all Ladies, Gentlewomen, and to all other of the Female Sex," and the dedicatory poem promises to teach women how to "keep [the household's] Bodies in good ease . . . [and] please the Taste, also the Eye," explicitly detailing the purpose of the book as both for cooking and medicine-making (Woolley). Women are clearly Woolley's target audience, and they are an audience which is embodied and authoritative in the space of the kitchen, unable to be restricted to an allegory. Distillation is a common and familiar process which they are experts in practicing.

Hannah Woolley's *The Queen-Like Closet* is representative of the seventeenth century woman's position as an authority in the process of distillation. The space of the kitchen centers women as active experts in distillation, and this can be seen in the frontispiece to *The Queen-Like Closet.* Shirley's depiction can be contrasted with Neri's *Alchimia* to display the difference in the gendering duties concerning alchemical processes, and how the same duties are strictly divided in a laboratory setting but not in a domestic one. In addition, *The Queen-Like Closet* represents a Paracelsian approach to medicine which emphasizes separation and the acquisition of the inner virtue of a material for medicinal purposes, in the context of the woman being a domestic physician. Finally, medicine and food are intertwined in *The Queen-Like Closet* in a manner which makes the woman an embodied distiller, in contrast to her position as an allegory in other alchemical writings. Fundamentally, the relationship between women and distillation is one which is largely dependent on the sphere in which it is taking place, with women becoming Paracelsian medical authorities in a kitchen in which they are the central authority.

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White Hyacinth: The Story of Rachel Carson and Dorothy Freeman

Sadie Quinn

Playwright's Note

As a student of History of Science & Technology and Theatre Studies, I love finding ways to connect these two very different disciplines. Ultimately, I believe they are both centered on storytelling — they can help us consider the stories that have shaped our world and will shape it in the future. A figure who exemplified the importance of stories in science was Rachel Carson (1907-1964), the American biologist and science writer best known for her book *Silent Spring*, a pioneering work of the environmental movement. Carson started out studying English and switched to biology, having a particular love for the ocean. In the 1950s, she published two successful books about marine science that captivated audiences with their poetic language and reverence for the natural world. Turning her attention to the effects of pesticide pollution, Carson released *Silent Spring* in 1962, first serialized in the *New Yorker* and then in book form a short time later. The book was extremely well-received by the American public, especially women, but was met with derision from those in the chemical industry, who Carson condemned for their unabated use of pesticides. The publication of *Silent Spring* was a significant factor in the development of legislation such as the Environmental Protection Act in 1970 and the banning of DDT in 1972. Sadly, Carson died of breast cancer in 1964 at age 56 and never got to see the full impact of her work.

Having been interested in Carson as a figure in the history of science for a few years, and wanting to see more scientific stories theatricalized, I decided to make her the focus of my playwriting course in Fall 2023. I knew I wanted to humanize Carson, to present her life as more than the above series of facts about her scientific career and political impact. Carson kept her personal life quite private, but it is known that she had a close relationship with a woman named Dorothy Freeman. Freeman and her husband Stanley had a summer home near Carson on Southport Island, Maine, and the three quickly became friends. After they met in the summer of 1953, Carson and Freeman began to write letters to each other, which came to contain flowery declarations of love — literally, in the case of the 'Hyacinth Letter,' in which Carson expressed her true feelings for the first time. Despite the fact that the two lived apart for most of the year, Freeman supported Carson in personal and professional matters for the last decade of Carson's life. The following is an excerpt from my play that shows the tension between these two sides of Carson's life.

Scene Eight

June 1962. Lights up on RACHEL at her desk. During the following speech, members of the ENSEMBLE, as readers and reporters, begin to cross the stage holding newspapers, microphones, and copies of Silent Spring.

RACHEL "The history of life on earth has been a history of interaction between living things and their surroundings. Only within the moment of time represented by the

present century has one species—man—acquired significant power to alter the nature of his world. The most alarming of all man's assaults upon the environment is the contamination of air, earth, rivers, and sea with dangerous and even lethal materials. In this now universal contamination of the environment, chemicals are the sinister and little-recognized partners of radiation in changing the very nature of the world—the very nature of its life. Chemicals sprayed on croplands or forests or gardens lie long in soil, entering into living organisms, passing from one to another in a chain of poisoning and death. Or they pass mysteriously by underground streams until they emerge and, through the alchemy of air and sunlight, combine into new forms that kill vegetation, sicken cattle, and work unknown harm on those who drink from once pure wells. As Albert Schweitzer has said, 'Man can hardly even recognize the devils of his own creation.'"[1]

Every few seconds, one or more ENSEMBLE members stop in a spotlight to deliver their response. A man, as REPORTER 1 comes downstage.

REPORTER 1 John M. Lee for *The New York Times.* "Silent Spring Is Now Noisy Summer: The three-million-dollar pesticides industry has been highly irritated by a quiet woman author whose previous works on science have been praised for the beauty and precision of the writing. In her latest work, however, Miss Carson is not so gentle. More pointed than poetic, she argues that the widespread use of pesticides is dangerously tilting the so-called balance of nature."[2]

He steps out of the spotlight and is replaced by a WOMAN, composing a letter.

HOUSEWIFE Dear Miss Carson, I want to thank you for opening my eyes to one of the most concerning issues facing Americans at this time. The wife of a businessman, I have long considered politics and the news more my husband's domain than my own. Now, however, I see that political issues play out not only in the halls of power, but on our farms, in our rivers, quite literally in our backyards. Normally not one to cause a fuss, even I am considering writing to Congress regarding the grave danger these chemicals have caused for all Americans including myself and my children. Regardless, I look forward to hearing you speak at the Silver Spring garden club in August. Your words have inspired me in print, and I can only imagine that they will continue to do so in person.

She is replaced in the light by a man as President JOHN F. KENNEDY, closely followed by REPORTER 2 with a microphone.

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[1] Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin Harcourt, 2002), p. 12.

[2] John M. Lee, "Silent Spring is Now Noisy Summer," *New York Times*, Jul. 22, 1962.

REPORTER 2 “Mr. President, there appears to be a growing concern among scientists as to the possibility of dangerous long-range side effects from the widespread use of DDT and other pesticides. Have you considered asking the Department of Agriculture or the Public Health Service to take a closer look at this?”

KENNEDY “Yes. And I know that they already are. I think, particularly, of course, since Miss Carson’s book, but they are examining the issue.”[3]

They are replaced by a man as a chemical industry SCIENTIST, holding a copy of the New Yorker.

SCIENTIST The public will be up in arms, forgetting that they most likely would not be alive if not for the innovations of pesticides in agriculture. We spend years developing these chemicals for the good of the American people, they help us win the war and feed the nation, and along comes Miss Carson suggesting that it was all based in ignorance and a lack of concern for the public. People are worrying about all sorts of ridiculous things now. The birds! The fish! The genes of our children! She conveniently left out the extensive testing that occurs at every stage of the process. Why is a spinster so interested in genetics in the first place?
He steps back as REPORTER 1 returns to the spotlight.

REPORTER 1 “The men who make the pesticides are crying foul. Some agricultural chemicals manufacturers have set their scientists to analyzing Miss Carson’s work, line by line. Other companies are preparing briefs defending the use of their products.
Meetings have been held in Washington and New York. Statements are being drafted and counter-attacks plotted. A drowsy midsummer has suddenly been enlivened by the greatest uproar in the pesticides industry since the cranberry scare of 1959.”[4]

The lights fade as the ENSEMBLE gradually exits, continuing their chatter silently.

Scene Nine

November 1962. RACHEL sits at her desk. DOROTHY sits on a chair stage left. Next to her is a small side table with a telephone and a stack of magazines and newspaper clippings. They speak on the telephone.

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[3] William Souder, *On a Farther Shore: The Life and Legacy of Rachel Carson* (New York: Crown Publishers, 2012), p. 4.
[4] Lee, “Silent Spring is Now Noisy Summer.”

RACHEL I always believed in the issue. I wouldn't have written the book if I didn't think it was important. But I never imagined anything like this.

DOROTHY You're dealing with it wonderfully. I am continually impressed by your strength.

RACHEL Thank you… That means a great deal. Especially right now.

DOROTHY Still, I'm appalled by all the horrible attacks. A witch. A Communist. A spinster with an affinity for cats.

RACHEL They haven't even met Jeffie!

DOROTHY Better if they don't, I suppose.

RACHEL It's almost comical, how threatening they make me seem.

DOROTHY I know what you mean. I can't believe the chemical companies prepared pamphlets for their workers before the book even came out. 'How to Respond to Rachel Carson.'

RACHEL I never thought I would be so important in their eyes. I've been on the periphery of the scientific community for so long, and now… Well, I've returned to the centre in a strange way.

DOROTHY Let's not think about the industry men too much. The public has been quite supportive.

RACHEL I was shocked that it was the October Book-of-the-Month. I never counted on—really never even allowed myself to hope it would be. It may or may not affect the sales, but the really exciting thing is that it will be shipped to farms and hamlets all over the country that don't know what a bookstore looks like—much less the *New Yorker*.[5]

DOROTHY I'm glad to see you're letting yourself celebrate, even quietly.

RACHEL I'm so grateful you're here to see me through it. You were exactly right when you predicted that I'd get all sorts of invitations. And when you said I'd have to decline some of them. Most of them, in fact. I agreed to attend the Air Pollution conference, but I… had a bad day, you remember. It's strange to have it committed to print.

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[5] Martha Freeman, ed., *Always, Rachel: The Letters of Rachel Carson and Dorothy Freeman*, 1952-1964 (Boston: Beacon Press, 1995), p. 407.

DOROTHY *(reading from a newspaper)* "Author of *Silent Spring* Silenced by Cold."[6]

RACHEL Good news in chemical circles, I say.[7]

DOROTHY I don't know how you manage to keep a sense of humour, but I do admire it. Especially with everything you're going through.

RACHEL I know you worry about me.

DOROTHY I love you too much not to.

RACHEL I love you too. I just want to go back to Southport with you. And the thrushes and the sparrows and the huckleberry bushes.

DOROTHY Fear not, I'll keep writing about them. I hope you can come back next year and experience it all for yourself.

RACHEL I'm trying not to think too far ahead right now. Each moment is precious.

DOROTHY I often feel the same, with Stan… I still can't believe you send us money for blood transfusions. It isn't proper.

RACHEL I insist. You've both done so much for me, it's the least I can do.

DOROTHY I only wish I could help you more. Visit you more often. Help you take care of yourself.

RACHEL I can take care of myself.

DOROTHY And Roger, and Jeffie, and Stan and me, and so many others. It's so much on your shoulders.

RACHEL That isn't what made me ill.

DOROTHY I know. It just hurts me to think of you in this condition. I'm sorry, I'm doing my best to—

RACHEL Don't apologize. That's the last thing I need. Besides, you need to be there for Stan. I won't have you neglecting him because of me.

DOROTHY He doesn't feel neglected. He knows that we love each other to a greater depth than other friendships.

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[6] Freeman, *Always, Rachel*, p. 416.
[7] Freeman, *Always, Rachel*, p. 416.

RACHEL Still, I can't bear to do anything that might turn your attention away from him.

DOROTHY My attention will always be turned in many directions at once. You understand.

RACHEL Yes. That's life. I wish we could just worry about us. Listen to the birds together. Not have to be at the centre of this battle of completing obligations.

DOROTHY Two battles for you. The personal battle, with your health and all the family obligations, and the political one. It all seems like too much.

RACHEL It is.

DOROTHY Just don't work too much. Please. For me.

RACHEL Yes, yes. I appreciate your concern, I really do. Other people will have to start accepting the honours on my behalf.

DOROTHY Whether or not you intended it, you've become one of the most important people in America.

RACHEL I wouldn't go that far. Even with all the scientists and politicians arguing, and the reporters working to continue the story, to heighten the stakes. It was never solely my story to tell, but now that the book has been published, it's completely beyond my control.

DOROTHY As I said, I admire your courage… I should go back to Stan now.

RACHEL Of course. I love you so much, do you know that?

DOROTHY The same to you. Goodnight.

RACHEL Good night.

They hang up the phone. DOROTHY stands up in a spotlight.

DOROTHY How could I not worry about her? She turned down many invitations, but she said yes to many more. The Women's National Press Club, and the Audubon Society, and… The names don't matter. The public support was encouraging, I won't deny that. Especially with all the criticism from the chemical industry.
Still, all the
requests took a toll, even if many of them were well-meaning. Everyone wanted the image of Rachel Carson. The real person didn't matter anymore.

DOROTHY exits as the lights fade.

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