DISPLAY

REPRESENT

USING NETWORKS
OF INFORMATION

THINKING

OF THOUGHTS

MOMENTUM

The Journal of Science, Technology, and Society

THE NEED TO ORGANIZE INFORMATION

THE NEED TO ORGANIZE INFORMATION

THE NEED TO UTILIZE INFORMATION

at the University of Pennsylvania

OUTPUTS
NEW KNOWLEDGE

Spring 2018

Volume V

INFORMATION ENCODED INTO INFORMATION
ENCODED INTO DECISIONS

INTERACT WITH SITUATIONS

DIGITAL INTERFACE

CONTROLS FLOW OF INFORMATION

ALGORITHM - GOVERNED BY SET OF HUMAN INSTRUCTIONS

PROCESSES DATA

COMPUTATION - DECISION MAKING BINARY OR COMPLEX FORMULA

THE MORE DATA YOU HAVE THE MORE INNOVATION IS ENABLED

THE MORE YOU UNDERSTAND THE MORE DESIGN IS ENABLED

"Geometries of Network"

Cover Art

Amy Chen, University of Pennsylvania

Artist Statement

Geometries of a Network is an exploration of the invisible architecture that exists in the systems that surround us. Present in the work is a stream of consciousness disguised as a data visualization, telling a story about how humans interact with the digital. The design language subverts traditional uses of data visualization; there is no logic behind the geometry and no additional information in the structure. Rather, it only provides a suggestion of what the digital system may look like in exploded view.

Letter from the Editor

Dear Reader,

Welcome to Momentum, the University of Pennsylvania's Science, Technology, and Society (STSC) Academic Journal. The Spring 2018 Edition presents a revival of the former journal (inactive since 2015) with an accessible and diverse spirit. In today's world, technology often becomes synonymous with billion dollar startup companies or the newest iPhone applications. Our goal for this journal is to demonstrate how pervasive and multifaceted technology can be, and the various, if not unexpected ways, we encounter it.

The subsequent collection of essays and art works will touch on a few of the many exchanges we share with technology. From the 2015 viral blue-and-black-or-white-and-gold dress to cinematic depictions of dogs, we aim to highlight the vast array of technologies and our interactions. We hope to inspire you to reflect on more of your own experiences and to internalize the expansive role technology has played in history, society, and your own individual life.

Thank you and enjoy,
The Momentum Team

Minna Fingerhood
Editor-in-Chief

Tunika Onnekikami
Designer

James Prell
Editor

Bianca Schilling
Editor

Emily Yao
Designer

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Vision as an Experience of Virtual Reality

Gaby Coetzee, University of Pennsylvania

IN 2014, A SIMPLE PICTURE OF A WOMAN'S DRESS took the internet by storm. After being posted on a popular photo-sharing website, the image (left) began receiving hundreds of comments debating the color of the featured dress; Some users argued it was black and blue, whereas others insisted it was white and gold. The conviction of both parties led the debate to quickly spread to other forms of social media where, within 24 hours, the dress was viewed over 28 million times. After weeks of circulating the internet, the public was unable to reach a consensus. Furthermore, individuals advocating each color combination were outraged by their counterparts' interpretations of the image. This phenomenon, now referred to as "The Dress," provides a salient example of the fact that human perception is a subjective experience.

Uproar over the color of "The Dress" captured the attention of neuroscientists and psychologists, who were eager to discover the underlying scientific reason for this great controversy. After examining the composition of the image, which in reality depicted a blue and black dress, they arrived at the consensus that the picture's lighting was to blame: parts of the background seemed to imply backlighting, creating an illusion that the dress was cast in a blue shadow. If the brain of the viewer interpreted the blue color as a shadow, rather than part of the dress, it subtracted the bluish tint – this in turn gave rise to the perception of the dress as white and gold. In contrast, if the brain of the viewer did not register and remove a blue shadow, the dress was perceived as black and blue. Essentially, one's interpretation of the picture depended upon the manner in which their brain processed luminance. Scientists studying "The Dress" argued that individual differences in luminance perception are the result of personal experience—specifically, exposure to different types of light. People who wake up in the early morning, so-called "early birds," are exposed to more short-wavelength, bluish natural daylight than their "night owl" counterparts. Therefore, these early risers perceive the dress as white and gold because their brains, accustomed to adjusting for blue tints, are trained to remove the blue shadow. Surveys conducted to study the association between sleeping schedules and interpretation of "The Dress" supported this theory (Wallisch, 2016).

"The Dress" serves as an extraordinary example of how brain processes that interpret visual information can create a perceptual experience that vastly differs from reality. A more commonplace phenomenon that leads human perception to differ subtly from an observed stimulus is the neurological mechanism of lateral inhibition. Lateral inhibition refers to the capacity of excited neurons to inhibit neighboring neurons in order to enhance contrast sensitivity. Horizontal retinal cells, which function to integrate and modulate information from multiple photoreceptors, are the key players in this process. When a horizontal retinal cell detects that a specific group of

photoreceptors are receiving a large magnitude of stimulation, it will inhibit adjacent photoreceptive cells that are experiencing relatively less stimulation. This neurological process improves the human ability to detect contrasts or edges, however it results in a perception of an image that differs from the true stimulus. For instance, lateral inhibition will lead one to perceive a gray square as a lighter color when surrounded by a white background and as a darker color when surrounded by a black background. Additionally, lateral inhibition causes the Mach band visual effect—which exaggerates the contrast between surfaces with different degrees of luminance. These effects are highly adaptive, helping humans to efficiently perceive the edges of objects in order to navigate the environment.

"The Dress" internet sensation and lateral inhibition demonstrate that perception is an experience of virtual reality. Rather than simply absorbing coherent images in their entirety, as does a camera, the human brain breaks down an image into its constituent parts. These individual features are processed by the brain and later reassembled to produce a coherent image. As evidenced by "The Dress" phenomenon, personal experience can alter the visual interpretation system of the brain, giving rise to individual differences in the perception of a single image. An analysis of lateral inhibition illustrates the existence of a universal, hard-wired neural mechanism that enhances perception of color and contrast. Together, "The Dress" and lateral inhibition exemplify how human perception is not an objective representation of the external world, but instead a highly subjective experience of virtual reality.

Image depicting the perceptual experience of those who saw white and gold

Representation of the actual colors of the dress

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Olivia Schiff, University of Pennsylvania
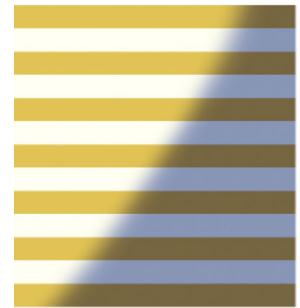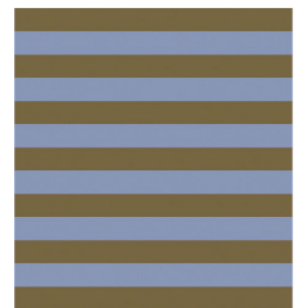
Artist Statement

My name is Olivia Schiff and I am currently enrolled in Art, Design & Digital Culture. The course uses technology to explore our current visual world. In it, we use a variety of media to respond to our visual culture. In our first project, we created three pieces that were made exclusively on Adobe Illustrator. In Project 1.1, we recorded a sound and then created an abstract image. I used the sound of rain to inspire my design. In Project 1.2, we were instructed to create a sign that represented our fear of something that might potentially occur in the future. My work was meant to illustrate how technology and social media are making human contact slowly unessential and how it is also ruining modern love. The final part of Project 1 was to create an abstract representation of a city described in Italo Calvino's Invisible Cities, *and I chose the city of Zodeide. The story was of a woman who escaped the city and was sought after by men for generations.*
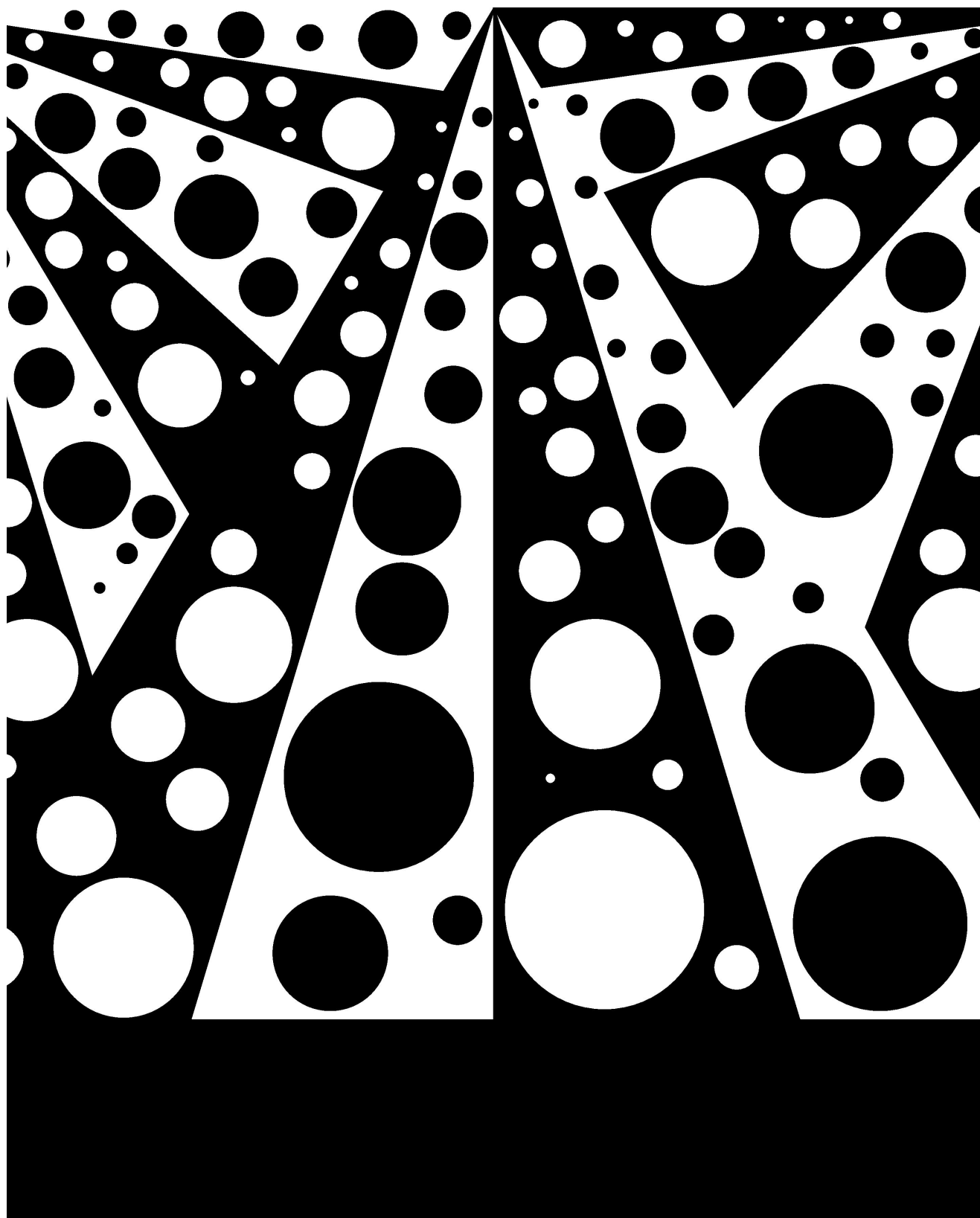
GOOD BOY

(representations of canines in cinema)

Good Boy

Canine Representation in Cinema

Caleb Chodosh, University of Pennsylvania

Abstract

This essay explores the ubiquity of dogs in cinema as means of eliciting fear, love and excitement. Although dogs have acquired several universally recognized traits in society, their depictions on screen vary wildly and do not cohere to form a singular meaning . Dogs appear in many roles: as "good boys" in domestic comedies, as the hero in a coming home flick, and as the muscle to a villain; they have been commercialized, anthropomorphized, weaponized, and racialized. This essay looks as the various ways in which dogs are depicted and what their varying symbolism represents.

1 Jaws, directed by Steven Spielberg (1975; Hollywood: Universal Pictures).

2 Katarina Gregersdotter, *Animal Horror Cinema: Genre, History and Criticism.* (Basingstoke: Palgrave Macmillan, 2015), 7.

I. INTRODUCTION: THE DOG DIFFERENCE

MOST ANIMALS ELICIT A CERTAIN RESPONSE AS SOON AS THEY APPEAR ON screen. Before a single shark appears on screen in *Jaws*,[1] tension is built solely on the idea of the existence of this borderline mythological creature. By the time the shark finally appears, the audience is terrified; their worst fears surrounding the shark have been confirmed. In the cinema that followed Spielberg's master-class in horror, few films (re: *Finding Nemo*) attempted to subvert or disrupt the shark's image as a beacon of terror. Films such as *Deep Blue Sea* and the more recent *The Shallows* have capitalized on this image with little variation; yet, these films still succeed because of the implicit cultural understanding of the shark. Viewer's reactions can influence their attitudes toward animals. "This fact has often been emphasized in the critical literature about Spielberg's *Jaws*, which is said to have had a considerable impact on attitudes towards the acutely endangered Great White Shark."[2]

In a similar vein, the appearance of a deer on screen often carries a single connotation. Whether in childhood fare like *Bambi*, or contemporary thrillers like *Get Out*, the appearance (and oftentimes killing) of a deer without fail symbolizes some form of innocence. The deer, like the shark, has a singular cultural image and meaning. This attribute would make financing a film about evil deer or law-abiding sharks inherently difficult, unless perhaps you are Pixar.

The dog is an animal with a far more prolific and complex cultural legacy. Although dogs have also acquired several universally recognized traits, the depictions of dogs on screen do not cohere to form a singular cultural meaning. Depictions of dogs vary wildly in pop culture. Dogs appear in many roles: as "good boys" in domestic comedies, as the hero in a coming home flick, and even as the muscle to a villain. Any appearance could incite "awwww" or "ahhhhh!" from the audience. This scale of adorability to ferocity is distinctive in the animal kingdom.

A couple of surface level observations can explain some of this diversity. For one, the dog is represented differently on screen compared to other animals because it is different. Dogs are more ingrained in human society than arguably any other animal, given that dogs were domesticated over 15,000 years ago. Plainly, humans have had more time to both cultivate relationships with and establish mythology surrounding the dog. Dogs seem more connected to humans than any other animal, something that is undoubtedly reflected in culture.

This paper will wade through the noise to glean several key insights about the dog's representation on screen. First, we must question the ubiquity of the dog movie itself. How and why are dogs more frequently featured on film than other animals? Then this paper will focus on certain threads traced through time period and genre in which dogs have a significant narrative role. These threads are just a few of the fascinatingly complex ways in which dogs appear on screen. Because of the dog's proximity to humanity, attempting to trace all of these themes would be akin to tracing all themes in cinema featuring humans, and is far beyond the scope of this project. In this light, this analysis will focus on three particularly compelling threads. The emergence of the "Coming Home" narrative post World-War II, and the utilization of the dog as a symbol illustrate the breadth and essentiality of the dog in popular culture.

The full scope of canine cinema is remarkably multifaceted, and goes far beyond the cute childhood films that first come to mind. Dogs have been commercialized,

anthropomorphized, weaponized, and racialized. Dogs on film have transcended genre to serve as a proxy for what we fear and value about humanity itself. While other animals are pigeonholed into creating a singular emotional response; dogs can be equally compelling as heroes, villains, or romantic leads. The choices made in depicting these creatures on film are both driven by culture and impact culture in a circular feedback loop.

II. RIN TIN TIN & CANINE COMMERCIALIZATION

WHY ARE DOG MOVIES SO PREVALENT? IT SEEMS ANYTIME ONE GOES TO THE Cineplex or browses films on a cross-country flight, there is at least one movie featuring a cheekily anthropomorphic dog front and center on the poster. This is no new trend; in fact, from the outset of Hollywood dogs have been stars of the screen.

The dog actually owes much of its stardom to the acting failures of its genetic ancestor, the wolf. The famous German shepherd Rin Tin Tin "unsuccessfully made the rounds of Hollywood studios until, one day in 1922... a wolf refuse[d] repeatedly to perform its scene on the set of a Warner Bros. movie, *The Man From Hell's River*."[3] His owner, a man named Duncan, convinced the director that Rinty could do the scene in a single take. After that Rin Tin Tin was a full-blown star, and made twenty-six films for Warner Brothers. Film historians often *solely* credit Rin Tin Tin with saving Warner Brothers and turning them into a relevant studio.[4]

The implications of Rinty's success are evidence of Hollywood's susceptibility to trends and fads. Films starring dogs became hugely popular, and at the height of this craze there were an estimated eighty German shepherd actors alone.[5] Although the Great Depression put an end to this wave, the reverberations had a profound impact on the popularity of the breed not just on screen but in the home. According to Derr, the German Shephard accounted for 36 percent of all dogs registered by the American Kennel Club.[6]

A 2014 study by Ghirlanda et al supplements this anecdote. In the study the authors found that "data suggest[s] that viewing a movie may cause a long-lasting preference for a breed that can be expressed years later... when the time comes to buy a dog."[7] Logically, when a breed of dog becomes popular on screen, they become more popular at home.

However, this study also found that the sheer amount of films featuring dogs has increased at a rate higher than the growth of Hollywood's output. Dog movies were released at a rate of less than one per year until 1940, a rate that grew to more than seven per year by 2005.[8] In a sense, the rise of dog movies has mirrored the rise of the dog itself. As more dogs made their way on screen more dogs were purchased, and vice versa.

Interestingly, Ghirlanda et al also points to the power of cinema itself as a highly accessible and influential art form. While the authors found a strong correlation between breed population and cultural representations, they also found breeds that win the Westminster Club Dog Show do not become more popular as a result. This suggests "reaching a small specialized audience may not be as effective as reaching the general public."[9]

3 Mark Derr, *A Dog's History of America* (New York City, NY: North Point Press, 2004), 272.

4 Susan Orlean, "The Dog Star: Rin Tin Tin and the Making of Warner Bros," *The New Yorker*, August 2011.

5 Robert Hanks, "Fall of the Wild," British Film Institute, Aug. 11, 2015.

6 Derr, 273.

7 Stefano Ghirlanda and Alberto Acerbi and Harold Herzog, "Dog Movie Stars and Dog Breed Popularity," Public Library of Science (2014).

8 Ghirlanda et al.

9 Ghirlanda et al

10 Jonathan Burt, *Animals in Film* (London: Reaktion Books, 2002), Prologue.

11 Derr, 272.

12 Hilary Busis, "Coco Review," *Vanity Fair*, Nov. 21, 2017.

13 Rebecca Hawkes, "Remembering The Artist's Uggie: One of Cinema's Top Dogs," *The Telegraph* (London, UK), Dec. 25, 2016.

Filmmakers have also theorized that dog movies are also prudent investments. When asked why he was putting a dog in a show, an early producer responded, "A dog is worth two points in prime time. One point is about 850,000 sets. You do the math."[10]

It seems the "cult of the dog hero" established by Rin Tin Tin became both culturally significant and profitable for filmmakers.[11] In addition to being easier to work with than other animals, dogs have a seemingly universal quality that transcends the boundaries of human culture. While everyone may not understand what is depicted on screen, we can all relate to the dog. Websites like doesthedogdie.com view cinema itself through the lens of the dog's experience. Indeed, this shows that the communities established in neighborhood dog parks extend into the digital and cultural realms.

It is telling that many of the reviews of *Coco*, film critics tend to hone in on Dante the dog as an important symbol and selling point. Although the themes specific to Latino culture may not resonate with all moviegoers, the film bets that the mere promise of a cute pooch (featured heavily in promotional materials) will provide common ground and raise ticket sales. Vanity Fair's headline promises "Wit, Style, and a Very Good Dog."[12] This reflects a more calculated interpretation of the dog: as a bridge of sorts for viewers to cross into other cultures and walks of life. Importantly, Dante's breed is never specified. He is a mutt, a blank canvas for viewers to identify with.

The Artist featured a dog in a similar functional role. As a French drama produced in the style of a 1920s era silent film, *The Artist* would have no pitch for the everyman without its scene-stealing pup. Many reviews and marketing materials prominently featured the pooch, and the dog was often used as entry point for cinephiles to convince their blockbuster conditioned friends to give the silent film a chance. When Uggie (the dog who played Jack) died of prostate cancer, several publications eulogized the pup's performance as one of the all time-greats. The Guardian's Rebecca Hawkes even goes so far as to suggest Uggie should have won an Oscar for Best Supporting Actor.[13]

In this manner, movies not explicitly about dogs can profit from the inclusion of a dog. Critics and moviegoers alike often pitch these movies based on the appearance of a cute dog. Fundamentally flawed movies like *Max*, escape critical panning based on the presence of a "good boy."

However, the ubiquity of the dog is not explained solely by the universal appeal of the dog in connection to the home. For one, dogs are easier to work with than other animals, and because of advanced anthropomorphism, more easily can convey character traits. Additionally, cinema is somewhat grounded in real-world trends. Given this, it makes sense that the rise of canine cinema paralleled the rise of the canine itself. That is, as dog populations in America rose, more dog films were produced. While these patterns don't entirely explain the success of these films, they illuminate the sheer number and cultural power of these images.

III. COMING HOME

ONE TROPE IN DOG-CENTRIC FILMS HAS BEEN EXPLORED TO THE POINT OF exhaustion. There is a dog. The dog is adorable, yet mischievous and free-spirited. Its place is in the home where a hetero-normative family loves (but never coddles) it.

Something goes wrong, and the dog is tragically separated from the family. The rest of the film focuses on a singular narrative: getting home.

The emergence of this "coming home" narrative has deep historical antecedents. Depictions of animals were influenced by the social era itself. Stone asserts, "dogs emerged as companions" in the years following World War II.[14]

Certainly, the post-war period could be defined by a move back to the home. After the war-centric 1940s, Americans were ready to enter the cult of domesticity. This shift is most clear in the advertising of the time. Cigarette advertisements sold smokes alongside images of relaxation, leisure, and family. Advertisements for home improvement products attempted to reestablish the sanctity of the American home, while reinforcing gender roles that may have been subverted in wartime.

While America was experiencing its own coming home story, that same narrative was repeatedly played out on screen. *Lassie Comes Home* was arguably the most influential in this movement.[15] Released in 1943 in full Technicolor, this film documented the bond between a boy named Joe and his dog Lassie.

The plot focuses on Lassie's journey "home," after she is sold to another family and is set on returning to her young master. Importantly, the film was a huge box office hit, making about nine times its budget. This success shows the thematic elements, specifically coming home, resonated with viewers enough to spark six sequels.
Here, Lassie's plight mirrors the American desire to return home from the warfront. Essential to the impact of this film was Lassie's acting itself. In a famous scene where Lassie climbs out of a river instead of naturally shaking off the water, Lassie "staggers around bedraggled and exhausted."[16] According to Burt, this is what makes Lassie a great actor, "behaving more like a human than a dog."[17] The complications of this performance position it as "more than a human projection."[18] This anthropomorphism serves a specific function: to get humans to identify with Lassie in the wartime context.

After *Lassie Come Home*, this trope only grew in ubiquity. 1963 film *The Incredible Journey*[19] covers similar thematic ground albeit in a different context. This Disney picture sets up a clear binary between nature and the home, presenting the wilderness itself as the main antagonist. The original trailer pits the animals (two dogs and one cat) against a "menacing and hostile wilderness" as they fight their way home. The purpose of this is two-fold. One, to assert that dogs belong in the home. And two, to more holistically posit that what belongs in the home should stay in the home. As it relates to Post-War America, this narrative of domestic animals making it home directly mirrors the anxieties of heading off to war. At the film's close, the animals are indeed greeted like returning veterans.

This trope reflects the deep-rooted fear of losing control of the domestic realm. Thematically, these films send the message that the structure of the home is sacred and natural, and that this structure will always return to its equilibrium. Plenty of dogs get lost in less serendipitous ways, such as running away. However, these scenarios are rarely represented on screen. Rather, filmmakers present scenarios where the dog innately, instinctively knows both where home is and who their rightful owner is. These scenarios validate the connection owners feel with their dogs, while also subversively conjuring utopic images of the traditional American home.
This trope also confirms the image of the "loyal" dog. In this narrative, dogs are so

14 Sherril Stone, "The Psychology of Using Animals in Advertising," (Hawaii University International Conferences: Arts, Humanities & Social Sciences, 2014), 12.

15 *Lassie Comes Home*, directed by F. Wilcox (1943; Los Angeles, CA: Metro-Goldwyn-Mayer).

16 Burt, 32.

17 Burt, 32.

18 Courtney White, "Tony the Wonder Horse: A Star Study," in *Historical Animal*, edited by Susan Nance, 293. Syracuse, New York: Syracuse University Press, 2015.

19 The Incredible Journey, directed by F. Markle (1963; Los Angeles, CA: Walt Disney Production).

20 *Fruitvale Station*, directed by Ryan Coogler (2013; Los Angeles, CA: Significant Productions).

21 Mike Ryan, "Ryan Coogler, *Fruitvale Station* Director, Defends His Controversial Scene," Huffington Post, Jul. 12, 2013.

22 Yasmin Nair, "Racism and the American Pit Bull," *Current Affairs*, Sep. 19, 2016.

remarkably loyal that all they care about is getting home to their rightful owners. Survival becomes secondary; in a sense, the trope suggests that a dog without an owner is no dog at all. By building the mythology of coming home, filmmakers position the marriage between owner and dog as a sacred institution. Reunions replete with tears, embraces, and swelling music; the climaxes of these narratives more closely resemble a dramatic romance than a light-hearted pup-driven caper.

IV. SYMBOLIC DOGS

NOT ALL SIGNIFICANT WORKS FEATURE DOGS IN PRIMARY ROLES. OFTEN, filmmakers use dogs as symbols in film's that have little to do with dogs themselves. These symbolizations often play off the cultural stereotypes associated with certain breeds or styles of dog. This symbolism is used to great effect in the 2013 biographical drama *Fruitvale Station*, directed by Ryan Coogler.[20] The film is based on the events leading up to the shooting of unarmed black man Oscar Grant on the BART public transportation system in 2009. Upon release, on scene in particular attracted a lot of attention.

In the scene, Oscar Grant pulls up to a gas station. A car runs over a dog in the adjacent street. Oscar Grant runs to investigate, and comforts the dog in his arms as it dies. Not by coincidence, the dog happens to be a pit bull.

This scene stands out for a couple reasons. All of the scenes in the film are based on accurately reconstructing Oscar Grant's last day in the Bay Area. However, director Ryan Coogler found a gap in which Grant's movements and actions were not accounted for. Coogler decided to fill this gap in time with the pit bull scene. Therefore, this scene appears incongruent with the rest of the film.

The scene garnered a lot of criticism upon release for being emotionally manipulative and not relevant to the subject matter. To counter, Coogler explained his intentions in an interview in the Huffington Post. In it, Coogler draws a parallel between the experience of the pit bull and the experience of the black man in America.
He states, "You never hear about a pit bull doing anything good in the media. And they have a stigma to them...and, in many ways, pit bulls are like young African-American males. Whenever you see us in the news it's for getting shot and killed or shooting and killing somebody¬—for being a stereotype."[21]

Here is an explicit example of a filmmaker using a dog's image to draw a symbolic parallel with a character. Coogler capitalizes on a collective cultural understanding of the pit bull, strong animals often associated with violence, to create a powerful image of a misunderstood creature. Additionally, pit bulls are often linked to African-American culture.

Few breeds are as demonized as the pit bull, a demonization process that mirrors the dehumanization of African-Americans in American society. Indeed, one can see similarities in the media vilification of pit bulls and the presentation of "urban" stories in the 1980s.[22] Based on cultural conditioning, many Americans exhibit more fearful responses when confronted with a pit bull, as compared to their less threatening compatriots such as the fluffy labradoodle. Coogler compares this experience with the experience of the black man; feared, misunderstood, and ultimately shoved aside

in moments of need.

That the sequence foreshadows the loss of innocence (in the form of Grant's death) at the end of the movie makes it heartbreaking to watch. Whether emotionally manipulative, or emotionally resonant, Coogler undoubtedly draws a compelling comparison between the pit bull and the plight of Oscar Grant. He uses collective understanding of the pit bull as a breed to subversively illustrate the oppression of African-Americans.

The Hungarian 2014 drama *White God* also uses dogs as an entry point to discuss race.[23] The film follows a mixed breed dog named Hagen who is cast aside due to his status as a "mongrel." "White God" criticizes the arrogance of humanity for carrying themselves "as if they have unquestioned dominion over all nature, especially animals."[24] The movie follows the rise of these street dogs as a sort of slave revolt against the humans who cast them aside. The filmmakers often employ shots at ground level to ask the audience to empathize with their plight, and by the end of the film, actively desire revenge on some of the less savory humans.

With regard to race, the film uses Hagen's status as a "mongrel" to lampoon how humanity values arbitrary things like the purity of bloodlines. The father's proposal, to buy a pure breed dog for his daughter Lilly if she agrees to get rid of Hagen, is depicted as both cruel and illogical. While the desire for pure breed dogs can be justified in many tangible ways, it becomes perverse when presented on this societal scale. Lines like, "Mutts have to be reported," evoke imagery of segregation and dehumanization. Interestingly, the film is structured as a distorted coming home tale, as Hagen and his pack slaughter multiple humans before finally submitting to Lilly. This suggests that even in the most allegorical of films, dogs still desire a home.

A film similar in both title and theme is the 1982 American drama, *White Dog*.[25] *White Dog* follows a dog trainer (who is black) as he attempts to rehabilitate a stray dog that has been conditioned to attack people of color. The dog is used as a proxy for racism, which is presented as an ambiguously curable mental illness.[26] The trainer's obsession with curing the dog stems from his belief that there may be an antidote to racism.

The director exposes the perversion of weaponizing an ideology using a dog by playing with audience expectations of what a dog can and can't be. A dog cannot intrinsically be racist, but it can be conditioned to be. The decision to use a dog to look at systemic racism lacks nuance in an inspired way. In depicting racist humans, filmmakers often fall into the trap of justifying the person's behaviors with nuanced backstories or sympathetic performances. However, the corruption of this dog is evil in a beautifully unambiguous way. By using such an innocent and recognizable image, the clean domestic dog, and corrupting it to the point of no return; the filmmakers manage to construct a film whose "anti-racist message is about as ambiguous as a slap in the face."[27] In their mind, there is nothing worse than training a good dog to do bad things.

This establishes the duality of the dog: a symbol of both domestic loyalty and truly disgusting evil. Indeed, what animal has played more roles on both sides of the spectrum, both heroic and villainous? However, more often than not, these films refuse to condemn the dogs themselves instead using the malleability of canine

23 *White God*, directed by Kornél Mundruczó (2014; Hungary: The Chimney Pot).

24 Matt Zoller Seitz, "White God Review," RogerEbert.com. Mar. 27, 2015, https://www.rogerebert.com/reviews/white-god-2015.

25 *White Dog*, directed by Sam Fuller (1982; Los Angeles, CA: Paramount Pictures).

26 Dave Kehr, "Fuller's Fable," *Chicago Tribune*, Nov. 29, 1991.

27 Kehr, "Fuller's Fable."

28 *Game of Thrones*. Created by David Benioff & D.B. Weiss. HBO, 2011-2017.

behavior to put more blame on the humans in charge.

Game of Thrones[28] impeccably explores this duality through the canine companions of the Starks and the Boltons. While both the Stark's direwolves and the Bolton's hounds are vicious killers, they are portrayed in wildly different ways.

At face value, the direwolves should be more dangerous. Mythical creatures of the far north, they are supposed to inspire fear everywhere they go. Despite multiple instances of savagery (murder, biting off digits, etc.) they are depicted as docile and loyal domesticated pets. In contrast, Ramsay Bolton's hounds (a kind of modified Rottweiler) are portrayed as bloodthirsty and savage beasts. They are never seen in any kind of anthropomorphic or sentimental light; so much so that at the moment they brutally kill their own master, it elicits glee rather than surprise.

Although these animals both commit objectively heinous acts, one appears unmistakably good and the other as uninhibited evil. Here, the only difference is in the audience's perception of their owners. When the direwolves follow orders it is confirmation of their loyalty. Their bloodthirstiness only extends as far as protecting their kin. When Ramsay's hounds follow an order, it is an act of evil aggression. These notions are not dependent on the actions of the animals themselves; rather, a reflection of their owner. The direwolves enhance the humanity of the Stark family through violence while the hounds detract from Ramsay's. In one case, loyalty is earned; in the other, it is coerced.

In short, the behavior of a dog on screen is an indictment on the owner and not the dog itself. The image of the villainous dog does not posit that dogs are evil; rather, that the corruption of a dog is evil. On screen, behind vicious dogs, there is a human who made them that way. In this way, culture proposes that dogs are inherently *good* and only through careful and committed human intervention can this nature be changed.

V. THREADS AND CONCLUSIONS

The standard depiction of the dog is aptly summed up by Dug, the dog from the 2009 animated film *Up*.[29] In possession of a miraculous device that turns his puppy thoughts into human speech, Dug is anthropomorphically adorable, all ears and eyes. His owner, the curmudgeon Carl, has successfully launched his house into the sky with the power of helium balloons. Dug was supposed to stay behind, on the ground. When Carl finds Dug on the porch; Dug justifies his deception simply. "I was hiding under your porch because I love you. Can I stay?" he says.

This exemplifies the universality of the domestic dog. When a dog enters the frame in this context, we as an audience assume several things about it that are usually verified. For one, they are loyal. A true dog has a strong sense of home and its rightful owner. These dogs are also good at heart. If they have any flaws, it only reflects poorly on their potentially villainous owners.

There is an unusual interplay between this universality and the sheer number of examples that explore the complexity of the dog. This dichotomy is a central point of tension that helps dogs become such poignant symbols and impactful characters. While audiences retain a set image of what a dog should be, this image can be twisted,

subverted, and explored in fascinating ways. This complexity and range enables dogs to play equally compelling villains, friends, and everything in-between.

While this analysis picked up several threads regarding canines and cinema, it is worth mentioning a few bonus compelling patterns and trends. For one, dogs are portrayed captivatingly in animation. Animation as a medium offers filmmakers a chance to use dogs in ways that are not possible with physical actors. Not having to control an animal's performance, or worry about proper treatment are both pluses. Because of this, dogs are a common foil for filmmakers in all types of animation.

Being able to fully control the dog's body makes for easier visual subversion or confirmation of certain tropes. Take two examples from popular network television shows. In *Family Guy*, creator Seth McFarlane brilliantly subverts the stereotype of the domestic suburban dog by portraying Brian, the Griffin's dog, as a cultured and alcoholic Labrador. Brian is anthropomorphized in several ways. He walks on two legs, talks, drives, and even loves jazz. These traits appear in the context of Brian's life as a miserable failed-writer turned misogynist and recovering drug addict. In anthropomorphizing Brian to this extreme, the creators suggest that it does not make sense for a dog that is simply "loyal" to be deemed anthropomorphic. Instead, a fully anthropomorphized dog should embody the full spectrum of human qualities, warts and all.

As a counterpoint, TV series *Futurama* uses the form to confirm our hopes about dogs. In an Emmy-award nominated episode titled "Jurassic Bark," a convoluted time travel plot reveals a heart-wrenching story.[30] The protagonist Fry gives a command to his dog Seymour, telling him to wait outside of a pizza shop until he gets back. Fry then gets cryogenically frozen, but finds a fossilized Seymour years later in a museum. After recovering the remains he discovers Seymour lived until the ripe age of fifteen, twelve years after he left him on the stoop of the pizzeria. In what remains one of the saddest ever endings to a cartoon show, a montage set to "I Will Wait for You" sung by Connie Francis plays out. It reveals a devastating truth: Seymour never stopped waiting for his master. The final shot, a gaunt Seymour finally closing his eyes after twelve years on the sidewalk, is emotionally haunting and confirms the ideal of a dog's unconditional love. This narrative closely mirrors the 1987 Japanese film, *Hachiko Monogatari*, in which a dog walks to his owner's train stop every day despite the owner's death.

Another rich theme not explored above is the connection between dogs and the apocalypse. A lone hero and his or her hound pops up time and again, most popularly in Will Smith vehicle *I Am Legend*.[31] The loss of his pet dog Sam, the last thing tethering him to domestic life and memories of his family, drives him into a suicidal rage. It is not coincidental that many depictions of apocalypse, or even realistic poverty, often focus on shots of stray and wild dogs. Seeing dogs outside of the context of the home signals to the audience that something has gone horribly wrong. The natural order has been disrupted.

There are so many more films worth discussing. From the sociopathic pooch in "Baxter" to the buddy-cop dynamic of *Turner & Hooch*, there are canine-centric films in every genre and style. All of the favored tropes, such as the dog knowing whom the bad guy is or where the danger is before humans, could fill an encyclopedia.
In summation, portrayals of dogs undoubtedly cover more complex territory than any

30 *Futurama*, "Jurassic Bark," Season 4 Episode 7, directed by Swinton O. Scott III, written by Eric Kaplan, Fox, 2002.

31 *I Am Legend*, directed by Francis Lawrence (2007; Hollywood: Warner Brothers).

32 *My Dog Skip*, directed by Jay Russell
(2000; Hollywood: Warner Brothers).

other domestic or wild animal. The dog has deep historical roots in the development of modern society, and truly in the birth of Hollywood as well. Early canine stars such as Rin Tin Tin and Lassie exposed the profitability of that feeling of familiarity when a dog appears on screen, a resource producers have mined throughout film history. Dog movies are equally reflexive with regard to historical and cultural context, as shown by the emergence of the "coming home" narrative in post-war America. Furthermore, the complexity of the dog enables more nuanced symbolizations on screen.

Without a doubt, these representations matter. An influential film featuring a dog can affect treatment and purchase patterns of a particular breed in actuality. More importantly, these images peel back and expose the human condition. In this sense, dogs are an excellent proxy to explore human society itself. Dogs condition humans with idealized versions of loyalty and the sanctity of the home. Dogs are an excellent lens to look at complex issues of race, poverty, and violence within humankind. More often than not, these tales serve as parables that warn against certain societal ills.

Dogs, usefully, are the easiest ways to define their owners. There is no such thing as a bad dog; only a bad owner or a bad government. Dogs in film are often villainous but never faulted, often loud but never grating, and often get lost but always come back. Whenever a suburban dogs crazily barks out the window at nothing, in the world of film, it signals intelligence and insight. Dogs can also transcend human limitations: a golden retriever in *Air Bud* does not miss a shot all movie, something LeBron James and Michael Jordan have never done. 2000 film *My Dog Skip* perfectly captures this sentiment when the narrator states, "Like all dogs, Skip was colorblind. He made friends easily with people of all races and origins. The town was segregated back then, but as we know, dogs are a whole lot smarter than people."[32] Dogs represent our best selves; likewise, the corruption of a dog denotes our worst selves. The duality of dogs on screen mirrors the duality of humans. This push and pull between universality and complexity makes canines as fascinating on screen as they are in life.
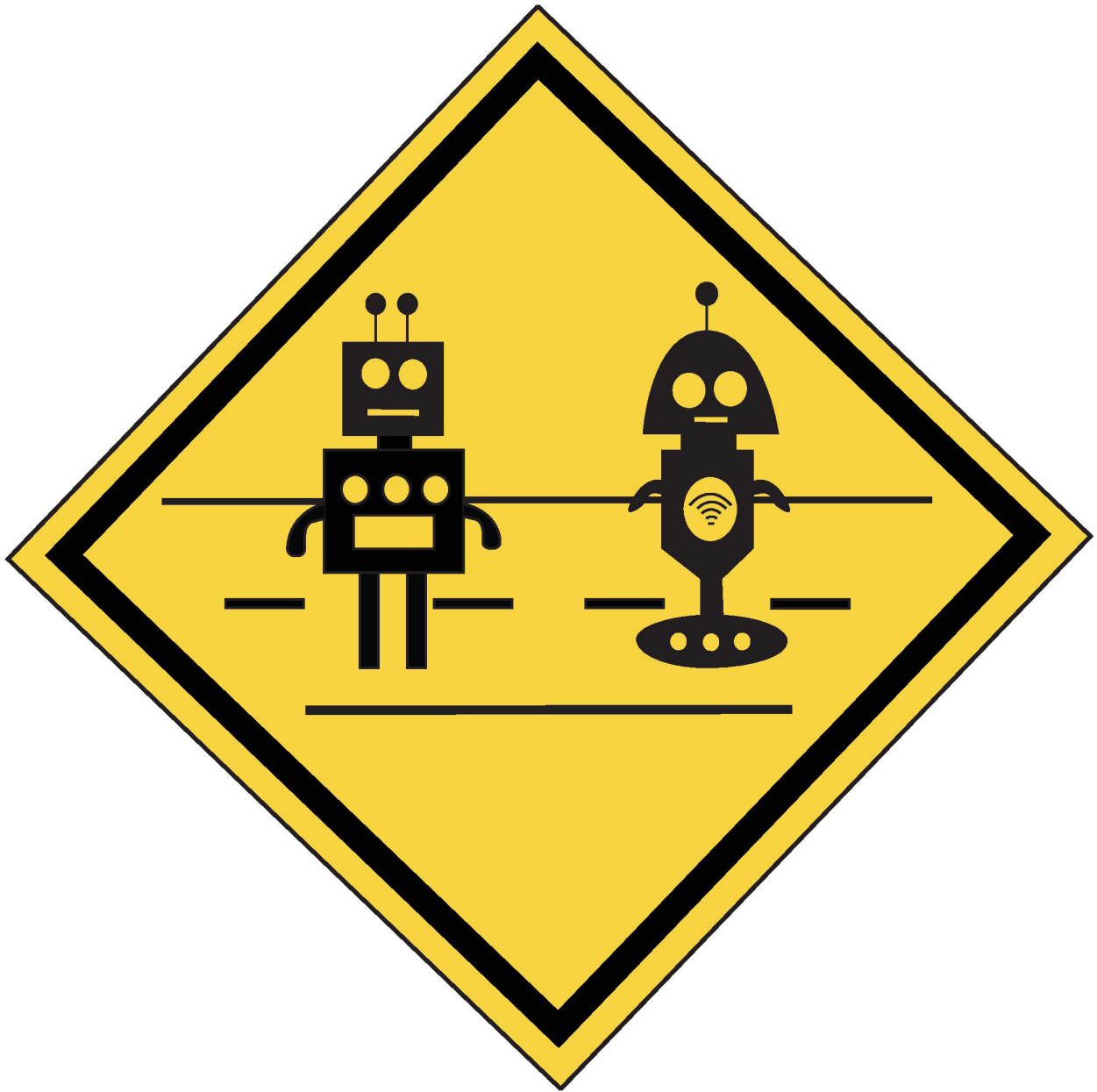
Abigail Smidt, University of Pennsylvania

Artist Statment

For this project, I created a symbol that depicted how technology will present itself in the future. My intention was to create a pedestrian traffic sign that replaces the human figure with robot figures. I want the audience to be left with the message to "take caution of robots", implying that technology will soon takeover and pose a threat to the future of our world.

Making an ImPACT

How Immediate Post Concussion Assessment and Cognitive Testing Became a Standard in Sport

Carrie Crook, University of Pennsylvania

Abstract

This paper evaluates how the Immediate Post Concussion Assessment and Cognitive Testing (ImPACT) system became a standard in the NCAA from its release in 2001 to today. ImPACT is a computerized neurocognitive testing system that physicians use in assessing and managing concussions. Sociological study often discusses the creation of standards in a broad sense. This paper focuses expressly on the creation of a particular standard in a particular context: ImPACT in the NCAA. The effort, tinkering, reformulation, and doubt that surrounds the creation of a standard is often forgotten once that standard is accepted. This paper unearths the process necessary to establish ImPACT as a standard. It evaluates primary evidence from international conferences on concussion in sport, national medical organization position statements on concussion, and the NCAA's guidelines to concussion management. Support from powerful institutions, technological expertise, and monetary and practical impetus promoted ImPACT as the standard for concussion assessment in the NCAA.

I. WHAT IS IMPACT, AND WHY DO WE CARE?

MANY UNIVERSITY OF PENNSYLVANIA ATHLETES HAVE HAD A CONCUSSION themselves or have had a teammate who was had to go through the concussion protocol mandated by Penn Sports Medicine. First, some sort of blow to the head occurs, in my case, it was a collision between my defender's cleat and my head during our season opening soccer game against the University of Maryland in the fifteenth minute. Next, the athlete is brought to the athletic trainer. Generally, after the sideline evaluation by a certified athletic trainer, an athlete can expect a prescription for complete brain rest: no exercising, no drinking, no schoolwork, no socialization, no light, and most importantly, no electronic screens. Then the counterintuitive nature of concussion management begins. A short time from the initial head injury, the athlete can expect to walk to a nearby clinic; to sit in a small, very bright room in front of a computer screen; and to take a challenging computerized neurocognitive testing battery. In the case of Penn athletes and most other NCAA athletes, this testing battery is Immediate Post-Concussion Assessment and Cognitive Testing, colloquially known as ImPACT.

The ImPACT test is the gold standard of computerized concussion management tools.[1] ImPACT proudly advertises that over 7.5 million people have taken its test for some form of concussion management.[2] According to its website, it is "the most widely used and most scientifically validated computerized concussion management tool available" with "more than 250 peer-reviewed and 145 independent studies" supporting it.[3] It is a 25 minute online test that is administered by physicians, nurses, athletic trainers, and other medical personnel first as a baseline test prior to any competition in sport and if necessary as a post-injury test.[4] In the event of injury, a medical provider can use the comparison between the scores on the baseline test and the post-injury test in association with other neurocognitive assessments to assess and manage the injury.[5] It should be noted that the ImPACT system does not require baseline testing.[6] Medical professionals can use ImPACT's database of age-specific test scores to compare with an athlete's post injury test.[7] Not only is ImPACT the most widely used test of this form, with its implementation in approximately one thousand colleges and universities, in two hundred professional sports programs, and in nine hundred clinical centers,[8] it is also the first test of this kind to be certified by the Food and Drug Administration as a tool for doctors to use to assess head injuries.[9]

But why is ImPACT considered the "standard," when there are other available testing methods to help assess head and brain injuries?[10] It is unclear if this test is actually the best tool to use in the management of concussions for athletes. There are several other neurocognitive testing batteries including some whose tests do not require the potentially concussed athlete to stare at a computer screen. For example, the Sport Concussion Assessment Tools 2 and 3 (SCAT2 and SCAT3) are pencil and paper concussion tests designed to measure post-concussion cognitive abilities on the sideline for free.[11] ImPACT charges anywhere from $10 to $20 per examination.[12]

This paper will analyze how ImPACT gained the approval and trust of the NCAA, and which factors were involved with its rise to becoming a standard. ImPACT is a tool to objectify concussion symptoms and severity in an athlete. It is a useful tool for standardized research on concussions. The practice of evidence-based medicine in the clinical setting created ideal conditions for the development of NCAA protocols for concussion management. Systems with specific cognitive assessment capabilities, like

1 Bill Bradley, "Researchers Question Reliability of ImPACT Testing for Concussions." NFL.com. September 17, 2013. Accessed December 03, 2016. http://www.nfl.com/news/story/0ap1000000245812/article/researchers-question-reliability-of-impact-testing-for-concussions

2 "ImPACT Test." Ing & Computerized Neurocognitive Assessment Tools. Accessed September 29, 2016. https://www.impacttest.com/.

3 Ibid.

4 Ibid.

5 Ibid.

6 Ibid.

7 Ibid.

8 Ibid.

9 U.S. Food and Drug Administration. "FDA Allows Marketing of First-of-kind Computerized Cognitive Tests to Help Assess Cognitive Skills after a Head Injury." News release, August 22, 2016. FDA.gov. Accessed October 20, 2016. http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm517526.htm.

10 "ImPACT Test"

11 Christie Aschwanden. "Fancy Concussion Tests Won't Protect Our Student Athletes." Slate Magazine. January 20, 2012. Accessed October 25, 2016. http://www.slate.com/articles/health_and_science/medical_examiner/2012/01/impact_and_other_concussion_tests_for_athletes_may_not_work_.html

12 Ibid.

13 Stefan Timmermans, and Steven Epstein. "A world of standards but not a standard world: toward a sociology of standards and standardization*." *Annual review of Sociology* 36 (2010): 69.

14 Ibid, 72.

15 Ibid, 72.

16 Ibid, 83.

17 Ibid, 72.

18 Ibid, 73.

19 Ibid, 79.

20 Ibid.

21 Ibid.

22 Stefan Timmermans, and Rene Almeling. "Objectification, standardization, and commodification in health care: a conceptual readjustment." *Social Science & Medicine* 69, no. 1 (2009): 25.

23 David L. Sackett, "Evidence-based medicine." In *Seminars in perinatology,* vol. 21, no. 1, pp. 3 WB Saunders, 1997.

ImPACT, are included in these NCAA protocols. Support from powerful institutions, technological expertise, and monetary and practical impetus promoted Immediate Post Concussion Assessment and Cognitive Testing as the standard for concussion assessment in the NCAA.

II. THE SOCIOLOGY OF STANDARDS

STANDARDS

STANDARDS ARE UNIVERSAL AND PERVASIVE. THEY REPRESENT THOSE TOOLS that are recognized and used in the same context across heterogeneous cultures. As Timmermans and Epstein explain in their 2010 review article about standards, they "aim to render the world equivalent across cultures, time, and geography."[13] Standards can range from mundane tools, like a No. 2 pencil, to the complex protocols that govern modern biomedicine. Because of their pervasiveness within our society, the study of standards has gained much popularity within the field of sociological study.[14] However, while sociologists typically study standards more generally, the study of particular standards is far less common.[15] Sociologists Timmermans and Epstein claim that much of the work put into establishing a standard and the uncertainty that may have originally surrounded a new tool or concept "is [rendered] invisible" once the standard is accepted.[16] That is, the lobbying, tinkering, campaigning, and reformulating that go into the creation of standard and some doubts surrounding the creation of a standard tend to become either irrelevant or disappear once the standard is applied across heterogeneous contexts. Timmermans and Epstein reveal that there is much discourse on the broader terms on standards such as gold standards, standards-of-living, and double standards, but there is less study on particular standards.[17] This paper focuses on the study of a particular standard: The ImPACT test.

Expertise plays a large role in developing and implementing standards.[18] For example, those authorities most trusted in developing a standard for trade regulation will be those persons or entities considered experts in trade. The same is true for those standard-setting with regard to branches of medicine. Experts in cognitive function and neurology will be the expected and accepted authorities to create the standards within concussion management. However, experts may not be the only stakeholders involved in the creation of the standards.

A standard can also be backed by a particular institution to promote its use. This institution will incentivize other stakeholders to adopt the standard.[19] For example, governments may require trade organizations to adhere to regulatory standards in exchange for permission to transport goods over that nation's borders.[20] Third parties can act to incentivize standards through monetary gain for those who adopt the standard; other times standards can be adopted because of "crowd effect," in which it is a loss not to adopt the standard.[21]

Within medicine, the standard of "evidence-based medicine" has been widely accepted and utilized in clinical practice. According to Timmermans and Almeling, "[evidence-based medicine] generally denotes the use of standardized clinical practice guidelines based on the best available scientific evidence to inform medical decision making and encourage a more effective care."[22] "Evidence-based medicine" began gaining popularity in the mid-1800s in Paris.[23] It encourages physicians to integrate

their own personal knowledge with "the best available external clinical research."[24] To gain acceptance, evidence-based medicine practices and guidelines were supported by several professional medical organizations.[25] First, the implementation of a protocol or guideline begins with a specific clinical problem an existing institution wants to address.[26] These organizations, like national medical associations, will provide many resources and financial incentives to attempt to motivate clinicians to adhere to their new standard.[27] However, it is important to note that in the case of evidence-based medicine– and in the case of many other standards– its support from professional organizations and the strong incentive measures put in place did not ensure total adherence to the guidelines by clinicians in daily practice.[28] The adoption of evidence-based medicine has put two dueling medical epistemologies into struggle: the qualitative knowledge possessed by clinicians themselves gained by experience and the quantitative knowledge resulting from randomized controlled trials and the production of statistical knowledge in medicine.[29] To resolve this struggle, medical practice today requires the ability to turn qualitative experiences like symptoms into objective facts via grading scales and measurement tools. A significant portion of decision-making in medicine requires objectification and standardization.

Standardization "[constructs] uniformities across time and space," and is often supported by outside entities.[30] Standards are the tangible product or guidelines accepted across space and communities; standardization is the result of the application of the standard. Third parties may promote standardization by offering financial incentives linked to performance measures that reward providing service according to the standard.[31] The acceptance of evidence-based medicine in the clinical setting standardizes the care patients receive. As such, clinical practice guidelines will determine what care a patient receives based on that patient's affliction.[32] Therefore, if a patient is an athlete diagnosed with sports-related concussion, the physician will be enticed to follow the clinical guidelines set forth by some outside entity to manage and treat that diagnosis.

OBJECTIFICATION

Since the 1800s, medicine has moved away from subjective reporting of symptoms to the more objective, mechanistic model of biomedicine today.[33] This required a change in how symptoms were reported and measured, resulting in the use of grading scales that often use numerical values. Objectification of patient symptoms can provide "a… way of getting things done in medicine."[34] It can provide an avenue to connect a patient's illness with an appropriate decision and practice guidelines.

Some critiques of medical objectification include its capacity to take uniquely human experience and transform them into something that can be manipulated by medicine, and that it signals a loss of patient agency in the clinical encounter.[35] Physicians have faced the challenge of transforming the patient's experience of illness or disease into something they can assess with medical knowledge.[36] For example, the common 0-10 grading scale that is commonly used to assess pain developed out of the need to study pain in a clinical setting.[37] Pain is a qualitative symptom that manifests differently in different people. To account for this variation in the experience of pain enough to study it, researchers developed a pain scale from 0-10 to make the individualistic nature of pain into something that can be understood by the observers: clinicians and researchers.[38] Many other standards in medicine follow this model.

24 Ibid.

25 Timmermans and Almeling "Objectification, standardization and commodification in health care," 25.

26 Ibid.

27 Ibid.

28 Ibid.

29 Carl May, Tim Rapley, Tiago Moreira, Tracy Finch, and Ben Heaven. "Technogovernance: Evidence, subjectivity, and the clinical encounter in primary care medicine." *Social science & medicine* 62, no. 4 (2006): 1022.

30 Stefan Timmermans, "A World of Standards, but not a Standard World," 71.

31 Stefan Timmermans, "Objectification, standardization, and commodification in health care," 25.

32 Ibid.

33 Carl May, "Technogovernance," 1023.

34 Stefan Timmermans "Objectification, standardization, and commodification in health care," 23.

35 Timmermans and Almeling " Objectification, standardization, and commodification in health care," 22.

36 Carl May, "Technogovernance,"1023.

37 Elana Gordon, "Reassessing the assessment of pain: how the numeric scale became so popular in health care." The Pulse. Podcast audio, September, 2016. http://www.newsworks.org/index.php/thepulse/item/96922-reassessing-the-assessment-of-pain-how-the-numeric-scale-became-so-popular-in-health-care

38 Ibid.

39 Ibid, 54.

40 Ibid.

41 Ibid, 58.

42 Ibid.

43 Ibid, 61.

44 Ibid.

45 Ibid, 62.

46 Michael W. Collins, Mark R. Lovell, and Douglas B. Mckeag. "Current issues in managing sports-related concussion." *JAMA* 282, no. 24 (1999): 2283.

47 Ibid, 2283-84.

48 Ibid.

49 Ibid, 2284.

50 Ibid.

51 Mark Lovell is the creator of the ImPACT Test. This article was published in JAMA prior to the release of ImPACT. However, ImPACT was released within two years of 1999 and it is probable that the authors of this article were recommending a concussion management system in which the newly released ImPACT test would have a place.

52 Collins, "Current Issues in Managing Sports-Related Concussion," 2285.

53 Ibid.

54 Resch, Jacob E., Michael A. McCrea, and C. Munro Cullum. "Computerized neurocognitive testing in the management of sport-related concussion: an update." Neuropsychology review 23, no. 4 (2013): 336.

55 This information is not readily available on impacttest.com. I placed a call with

III. THE DIFFICULTY IN MANAGING CONCUSSIONS FROM 1991 TO 2001

PRIOR TO THE ESTABLISHMENT AND ACCEPTANCE OF COMPUTERIZED neurocognitive testing batteries, like ImPACT, concussion management guidelines were still standardized across state and national lines. For example, in 1991 the Colorado Medical Society created and submitted Guidelines for the Management of Concussions in Sports to several national professional organizations, including the American Academy of Pediatrics, the American Academy of Sports Physicians, and the American College of Surgeons Committee on Trauma.[39] According to physicians Kelly and Rosenberg, once accepted, this set of guidelines was one of the first standard procedures for concussion management and care.[40] Even in this first nationally accepted guideline, a short, verbal sideline evaluation was given to assess cognitive and mental function.[41] The American Academy of Neurology recommended a standardized test, Standardized Assessment of Concussion, to detect any mental deficits and lack of cognitive functioning present to allow the physician to manage the injury effectively.[42] To manage concussion in the early 1990s, athletic trainers and physicians used grading scales with grades 1 through 3.[43] Under the grading system, the severity of the concussion was determined by loss of consciousness and length of time the abnormalities from the sideline evaluation last.[44] The return-to-play decisions made by physicians were determined by the concussion grade assigned to the athlete after the sideline assessment by the medical personnel on the scene.[45] The Standardized Assessment of Concussion objectified the severity of concussions to allow for management and care. *The Guidelines for the Management of Concussions in Sports* was the first set of concussion management protocols to standardize management on a larger scale for physicians. This testing system and this set of guidelines were precursors to the current model of care for concussions today.

In 1999, concussion management followed similar practices to those set forth by the Colorado Medical Society. However, concussion management did face several challenges. As described by the JAMA 1999 article by concussion researchers Collins, Lovell, and McKeag, there was no general consensus among experts on the definition of a concussion.[46] Secondly, medical professionals assessing sports-related concussion could use one of fourteen different concussion grading scales, and all of them required some sort of subjective judgment as to the severity of the concussion.[47] Thus, the diagnosis and management could change from athletic trainer to physician to medical system, leading to variable care for the athlete. Lastly, each of the recommended concussion grading scales had different return-to-play guidelines.[48] For example, if an athlete is diagnosed with a grade 2 concussion, a physician using the Colorado Guidelines will not permit return to play for one week.[49] However, if the physician uses the Cantu scale, he or she may not return to play for two weeks.[50] Sports-related concussion experts Collins, Lovell[51], and McKeag, reported, "because current guidelines are not evidenced-based, concussion is difficult to categorize. Further, response to injury is highly individualized."[52] These experts recommended that more cognitive testing besides a simple sideline evaluation take place in order to "delineate the subtle cognitive changes associated with concussion."[53]

Prior to the release of ImPACT, there were concussion management guidelines present, but there was no consensus on the appropriate measures to diagnose a concussion. Since 1996, there was a push from some experts for physicians and athletic trainers to perform baseline testing of cognitive function for athletes who could be at risk of sports-related concussion in their athletic endeavors.[54] However, there was no

standard concussion testing system or national set of guidelines. The ImPACT test was uniquely positioned the fit within the vacancies of concussion management in the 1990s. In 2001, ImPACT was released by ImPACT Applications™ in an initial desktop version.[55] Seven years later in 2008, the online platform of ImPACT testing was released.[56] This is the recognizable form of ImPACT today.

IV. FROM RESEARCH TOOL TO STANDARD OF CARE: IMPACT FROM 2001 TO TODAY

INTERNATIONAL SUPPORT: THE CONFERENCES ON CONCUSSION IN SPORT 2001-2012

THE 2001 CONFERENCE ON CONCUSSION IN SPORT (CONCUSSION IN SPORT GROUP) in held in Vienna invited experts involved research of sports-related concussion, the International Ice Hockey Federation (IIHF), the Federation Internationale de Football Association Medical Assessment and Research Centre (FIFA, F-MARC), and the International Olympic Committee Medical Commission (IOC) to define concussion and to establish a protocol for concussion management in sport.[57] The Concussion in Sport Group (CISG) formally defined concussion as:

> Concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces. Several common features that incorporate clinical, pathological, and biomechanical injury constructs that may be used in defining the nature of a concussive head injury include:
> (1) Concussion may be caused by a direct blow to the head, face, neck, or elsewhere on the body with an "impulsive" force transmitted to the head.
> (2) Concussion typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously.
> (3) Concussion may result in neuro-pathological changes but the acute clinical symptoms largely reflect a functional disturbance rather than structural injury.
> (4) Concussion results in a graded set of clinical syndromes that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course.
> (5) Concussion is typically associated with grossly normal structural neuroimaging studies.[58]

This conference, held shortly after the release of ImPACT, released a globally accepted concussion protocol system, including discussion on the recommended methods to evaluate concussion.[59] The CISG claimed that sideline evaluation of the injured athlete is necessary for proper concussion management.[60] Additionally, the CISG showed strong support for neuropsychological assessment following the diagnosis of concussion to determine appropriate management and return to play.[61] In fact, the CISG named the newly released ImPACT specifically as an acceptable mean of neuropsychological assessment.[62] "The Summary and Agreement Statement of the 1st International Symposium on Concussion in Sport" published in the Clinical Journal of Sports Medicine stated: "the consensus of the CISG was that neuropsychological testing is one of the cornerstones of concussion evaluation and contributes significantly to both understanding of the injury and management of the individual."[63]

ImPACT Applications Inc. and inquired. The sales representative gave precise dates for ImPACTs release.

56 Ibid.

57 M Aubry, Cantu R, Dvorak J, et al. "Summary and agreement statement of the 1st international symposium on concussion in sport," Vienna 2001. *Clin J Sport Med* 2002;12: 6.

58 Ibid, 6.

59 Ibid, 6-11.

60 Aubry, "Summary and agreement statement of the 1st international symposium on concussion in sport," 7.

61 Ibid, 8.

62 Ibid, 8.

63 Ibid.

64 Although three other computerized neurocognitive testing systems were named in the report from the "Summary and agreement statement of the first International Conference on Concussion in Sport, Vienna 2001," Mark Lovell, creator of ImPACT, was the only founder of these testing systems involved with this conference. This could potentially mean that the governing sports bodies in attendance (IIHF, FIFA, and the IOC), had more exposure to ImPACT than the other computerized neurocognitive testing.

65 Paul McCrory, Karen Johnston, Willem Meeuwisse, Mark Aubry, Robert Cantu, Jiri Dvorak, Toni Graf-Baumann, James Kelly, Mark Lovell, and Patrick Schamasch. "Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague 2004." *British journal of sports medicine* 39, no. 4 (2005): 196.

66 Ibid, 197.

67 Ibid, 197.

68 Ibid, 201.

69 Ibid, 201.

70 Ibid, 201.

71 Ibid, 201.

72 Ibid, 201.

73 This conference group of experts included the Chief Medical Officer of the International Ice Hockey Federarion, the Chairman of the Fifa Medical Research and Assessment Center and various professors of neurosur-gery and exercise science.

74 Timmermans and Epstein. "A world of standards but not a standard world" 69.

75 Paul McCrory, Willem Meeuwisse, Karen Johnston, Jiri Dvorak, Mark Aubry, Mick Molloy, and Robert Cantu. "Consensus statement on concussion in sport: the 3rd International Conference on Concussion in

The 1st International Conference on Concussion in Sport gathered major stakeholders in sports-related concussions and institutions with power to enforce any concussion decisions (FIFA, IIHF, and the IOC) to develop a standard protocol for managing sports-related concussion. By recognizing neurocognitive testing as an integral part in concussion management, and ImPACT as an accurate and useful tool to assess concussion in this manner, ImPACT was supported by several large institutions that control many levels of professional and collegiate sport.[64]

The 2nd International Conference on Concussion in Sport in 2004 assembled the same core group of experts; FIFA, IIHF, and the IOC, along with experts in trauma and sports psychology.[65] These experts, a group again containing ImPACT founder Mark Lovell, recommended the absolution of concussion grading scales.[66] Instead, the experts recommended a system that can determine the severity of a concussion.[67] The CISG continued their support for neuropsychological assessment in managing concussions.[68] They posited that computerized testing may allow for easier administration than traditional pencil and paper testing.[69] According to the Concussion in Sports Group in their 2004 published statement, "inherent problems with most [pencil and paper] neuropsychological tests include the normal ranges, sensitivity and specificity of tests, and practice or learning effect, as well as the observation that players may return to baseline while still symptomatic."[70] The experts in the CISG reported that the "infinitely variable test paradigms" of computerized cognitive testing could overcome some of these concerns.[71] Furthermore, computerized testing systems were more practical because team physicians could administer the test without a neuropsychologist present.[72] While ImPACT is not specifically named in this conference report, this conference began the process of creating a standard of practice in sport-related concussion management by heavily supporting computerized neurocognitive testing measures. Moreover, the conference members represent the experts[73] and expertise necessary for the establishment of a standard as explained by Timmermans and Epstein.[74]

Unlike the two conferences in 2001 and 2004, Mark Lovell, founder of ImPACT, was not present at the 3rd International Conference on Concussion in Sport in Zurich in 2008.[75] Unlike the previous concussion conferences, the main emphasis was placed on the pencil and paper SCAT2 sideline concussion assessment.[76] Some of the research produced about the ImPACT test was referenced in the bibliography as relevant evidence to the concussion management protocols established.[77] For example, the Concussion in Sport Group consulted a research study produced by Mark Lovell that focused on the successful use of ImPACT in the NFL and speculated about how its use can extended to college football.[78] Another one the studies referenced, again produced by Lovell, used ImPACT to determine the correlation between concussion and neurocognitive performance in collegiate football players.[79] The consensus statement issued by the Concussion in Sport Group cited eight different studies produced by Mark Lovell that used ImPACT.[80] Experts were using medical knowledge, produced specifically about the ImPACT to form medical guidelines for sports medicine practices globally.

In 2012 the 4th International Conference on Concussion in Sport assembly of institutions and experts did not include Mark Lovell.[81] The group of experts and sporting body institutions supported SCAT3 for the initial neuropsychological assessment tool.[82] However, the consensus statement also recommends that "all athletes should have a clinical neurological assessment... as part of their overall

management. This will normally be performed by the treating physician often in conjunction with computerized neuropsychological screening tools."[83] In other words, the governing international conglomerate of experts on concussion in sport recommended that computerized testing batteries be used to manage concussions. [84]Although the statement does not mention ImPACT by name, nor does it mention any other computerized testing battery, it does include a section on the viability of computerized testing assessment to diagnose and manage concussion:

> *"Concussion management programmes that use neuropsychological assessment to assist in clinical decision-making have been instituted in professional sports, colleges and high schools. Brief computerised cognitive evaluation tools are the mainstay of these assessments worldwide, given the logistical limitation in accessing trained neuropsychologists."*[85]

That is, the conference recognized that many concussion management protocols at every level of sport use computerized cognitive testing tools as they allow access to neuropsychological assessment without the presence of a neuropsychologist. However, the conference did not recommend baseline testing, for lack of sufficient evidence that this practice was necessary.[87,88]

Overall, the four conferences on concussion in sport created an environment backed by powerful sporting institutions and concussion management expertise that supported neurocognitive testing programs like ImPACT. Although ImPACT was only mentioned in the earlier conferences when the founder was included in the group of experts coming to consensus about concussion management, all of conferences utilized medical knowledge produced about the ImPACT test via randomized controlled trials and statistical studies. The conferences illustrate the trend of evidence-based medicine in the practice of concussion management because they utilize acceptable medical knowledge[89] to determine the best practice guidelines for sports medicine physicians and neuropsychologists assessing sport-related concussions. In these standard-setting conferences, ImPACT is given a special nod as an important tool for concussion management, as it creates the biomedical facts necessary for use in evidence-based medicine. These conferences consolidated technological expertise on sports-related concussion and institutions invested in the management of sports-related concussion. Both relevant expertise and institutional support are instrumental components creating and enforcing standards.

NATIONAL SUPPORT: POSITION STATEMENTS OF SPORTS MEDICINE PERSONNEL 2004-2014

The international conferences on concussion in sport had far-reaching influence. Their determinations played a vital role in the protocol established for management of concussion in the United States. In 2004, the same year as the 2nd International Conference on Concussion in Sports, the National Athletic Trainers' Association (NATA) released a statement of the protocols that American trainers should follow when treating sport-related concussion.[90] First, this statement adopted the definition of concussion as posed by the 1st International Conference on Concussion in Sport.[91] This position statement offered three approaches to the treatment and management of sport-related concussion, including using a grading scale at the time of injury, using a grading scale after symptoms have resolved, or "not using a grading scale but rather focusing attention on the athlete's recovery via symptoms, neurocognitive testing,

Sport held in Zurich, November 2008." *British journal of sports medicine* 43, no. Suppl 1 (2009): 76-84.

76 McCrory, "Consensus statement on concussion in sport: the 3rd International Conference on Concussion in Sport held in Zurich, November 2008," 76.

77 Ibid, i82.

78 Mark R. Lovell, and Michael W. Collins. "Neuropsychological assessment of the college football player." *The Journal of head trauma rehabilitation* 13, no. 2 (1998): 9-26.

79 M. Collins, S Grindel, M Lovell, et al. Relationship between concussion and neuropsychological performance in college football players. *JAMA* 1999;282:964–70.

80 McCrory et al, "Consensus statement on concussion in sport: the 3rd International Conference on Concussion in Sport," i84.

81 Paul McCrory, Willem H. Meeuwisse, Mark Aubry, Bob Cantu, Jiří Dvořák, Ruben J. Echemendia, Lars Engebretsen et al. "Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012." *British journal of sports medicine* 47, no. 5 (2013): 250-258.

82 Ibid, 251.

83 Ibid, 252.

84 Ibid.

85 Ibid, 256.

86 Ibid, 253.

87 Ibid.

88 As referenced on the ImPACT test website (www.impacttest.com), ImPACT does not require baseline cognitive testing and contains a database with scoring metrics to compare to the injured athletes.

89 Kelly and Rosenburg define acceptable evidence for concussion management in the earliest concussion protocol in the 1990s as "evidence provided by one or more well-designed randomized controlled clinical trials." This definition is still applicable in later published data protocols for concussion management.

90 Kevin Guskiewicz, Scott L. Bruce, Robert C. Cantu, and Michael S. Ferrara. "National Athletic Trainers' Association position statement: management of sport-related concussion." *Journal of athletic training* 39, no. 3 (2004): 280-297.

91 Ibid, 283.

92 Ibid, 281.

93 Ibid, 282.

94 Ibid, 285.

95 Ibid, 285.

96 Ibid, 288-9.

97 Practice in testing refers to the downfall of pencil and paper tests mentioned early. Because pencil and paper tests only offer one paradigm, athletes can get better results simply because of testing and retesting. Computerized tests have several paradigms to prevent this effect.

98 The AMSSM's statement was endorsed by NATA and the American College of Sports Medicine.

99 Kimberly G. Harmon, Jonathan A. Drezner, Matthew Gammons, Kevin M. Guskiewicz, Mark Halstead, Stanley A. Herring, Jeffrey S. Kutcher, Andrea Pana, Margot Putukian, and William O. Roberts. "American Medical Society for Sports Medicine position statement: concussion in sport." *British journal of sports medicine* 47, no. 1 (2013): 15-26

100 Ibid.

and postural-stability testing."[92] In considering the third approach, which NATA gives the most time and care to describing appropriate measures, the association recommends the use of neurocognitive testing measures with "population-specific normative data, test-retest reliability, clinical validity, and sufficient sensitivity and specificity established in the peer-reviewed literature," thereby illustrating the importance of statistically relevant, scientifically produced medical knowledge in the evidence-based medicine practices of athletic trainers.[93] NATA does admit that there is a lack of consensus among which of the grading scales to use in the management of sports-related concussion.[94] Furthermore, the position statement addressed that using loss of consciousness and amnesia– a metric proven via scientific evidence to occur infrequently in concussion– to determine concussion severity may not be accurate.[95] Finally, the NATA position statement supported the use of computerized neurocognitive tests, including ImPACT, for their "ease of administration," "ability to baseline test a large number of athletes in a short period of time, and multiple forms used within the testing paradigm to reduce" effect of practice in testing.[96][97]

Later in 2012, the American Medical Society for Sports Medicine (AMSSM)[98] released a similar position statement on the management of concussion in sport.[99] This statement did not use the exact language employed by the international conferences on concussion in sport.[100] Even still, the AMSSM more strongly supported computerized neuropsychological testing the more time-consuming, expensive traditional pencil and paper testing.[101] The AMSSM, like the prior conferences on concussion, recommended computerized neuropsychological testing to aid physicians in managing a concussion, not in diagnosing a concussion alone.[102]

Within the next two years, NATA released an update on their position on concussion in sport. NATA remained supportive of the definition of concussion proposed by the CISG, and of neurocognitive testing in the management of concussions.[103] Again, it calls for programs that have demonstrated sensitivity to detect changes in cognitive function and test-retest reliability.[104]

The three position statements issued by two of the most important institutions for sports medicine in the United States represents the path of ImPACT (and computerized neurocognitive testing in general) moving from a new technology to the gold standard in concussion management and evaluation. By issuing a formal statement and guidelines to managing concussion, NATA and the AMSSM attempted to standardize the practice of concussion management among national boundaries. ImPACT was included as a tool for standardization. NATA and AMSSM represent national medical organizations that offered institutional backing to computerized neurocognitive testing systems.

IMPACT AND THE NCAA TODAY

In 2014, following the publication of the notes from the four conference on concussion in sport and the position statements issued by the NATA and AMSSM, the National Collegiate Athletics Association issued "Inter-Association Guidelines" to be followed by the universities and athletic teams participating in NCAA sport.[105] Drawing from the determinations of the Fourth Conference on Concussion in Sport, and the most recent statements issued by the NATA and AMSSM, the NCAA established legislation to ensure that all concussion policies would be treated with the same policies in colleges and universities across the nation.[106] Although the NCAA does remain skeptical in

the use of neuropsychological assessment as a diagnostic tool on its own, it argues that they can be useful in appropriately managing a concussion.[107] Moreover, the NCAA supports a system in which all athletes are baseline tested prior to competing in NCAA athletic competitions and practices via cognitive assessment.[108] It should be noted that this stipulation would require colleges and universities to test large numbers of individuals at the same time with limited staff present: a problem that both NATA and the AMSSM said is easily solved by administration of computerized cognitive testing.[109,110]

In the event of a concussion, the NCAA supports the use of "brief concussion evaluation tools," like the SCAT3 and the SAC.[111] These tools are useful for evaluation because they "provide standardized methods and can be compared to a baseline evaluation."[112] Though ImPACT is not specifically mentioned, the NCAA calls for the use of neurocognitive testing methods that can be administered in large quantities over short periods of time. The NCAA also promotes the use of tests that can be compared to a baseline score taken earlier. The NCAA standardizes concussion management across state boundaries. It calls for a specific method of managing concussions that few testing systems can support. For example, the concussion policy for the NCAA member University of Miami uses ImPACT specifically in its concussion because "per NCAA guidelines, institutions should record a baseline assessment for ALL student-athletes prior to the first practice."[113]

All NCAA universities may not use ImPACT, but because of guidelines mandated by the NCAA to achieve standardization and the need to objectify concussion severity into a metric that can be interpreted by physicians and trainers, ImPACT soon rose to be heavily utilized in collegiate athletics. Additionally, because ImPACT was able to offer several peer-reviewed studies representing its efficacy, national organizations and universities were more persuaded to use this system.[114,115,116]

In addition to the concussion protocols that the NCAA set forth for its member colleges and universities, the NCAA is a part of an ongoing research project called the CARE Consortium with the Department of Defense.[117] This study is currently being conducted across thirty different NCAA universities with over 16,000 college athletes currently enrolled.[118] Moreover, the NCAA and the institutions involved in conducting this concussion research are funded by a $30 million dollar grant from the Department of Defense to "help change the culture of concussion reporting management."[119] At some sites in the CARE Consortium, ImPACT is the tool used assess baseline neurocognitive function and post-injury neurocognitive function.[120] Within the NCAA since 2014, ImPACT has been a tool to study sports-related concussion and to create future concussion management protocols.

V. WHY IMPACT?

EVEN WITH ALL OF THE CONCUSSION ASSESSMENT OPTIONS AVAILABLE TO NCAA sports teams, ImPACT is the most widely used system among NCAA universities.[121] While the NCAA guidelines, the international concussion conferences, and the national position statements of sports medicine professionals all advocate for the use of a system like ImPACT, these entities never mandate the use of this system. So, how has ImPACT grown to become the leading computerized cognitive testing system in

101 Ibid, 20.

102 Ibid.

103 Steven Broglio, Robert C. Cantu, Gerard A. Gioia, Kevin M. Guskiewicz, Jeffrey Kutcher, Michael Palm, and Tamara C. Valovich McLeod. "National Athletic Trainers' Association position statement: management of sport concussion." *Journal of athletic training* 49, no. 2 (2014): 245-252.

104 Ibid, 252.

105 "Sport-Related Concussion." In *2014-2015 Sports Medicine Handbook Guideline* 21, compiled by John T. Parsons, 56-64. 25th ed. Indianapolis, Indiana: National Collegiate Athletic Association, 2014: 56-64.

106 Ibid, 56-7.

107 Ibid, 56.

108 Ibid, 58.

109 Steven Broglio, "National Athletic Trainers' Association position statement: management of sport concussion." 245-252.

110 Kimberly G. Harmon, "American Medical Society for Sports Medicine position statement: concussion in sport." 15-26

111 "Sport-Related Concussion," 59.

112 Ibid.

113 "ImPACT Test."

114 Derk A. Van Kampen, Mark R. Lovell, Jamie E. Pardini, Michael W. Collins, and Freddie H. Fu. "The "value added" of neurocognitive testing after sports-related concussion." *The American journal of sports medicine* 34, no. 10 (2006): 1630-1635.

115 Tracey Covassin, Robert J. Elbin III, Jennifer L. Stiller-Ostrowski, and Anthony P. Kontos. "Immediate post-concussion assessment and cognitive testing (ImPACT)

practices of sports medicine professionals."
Journal of athletic training 44, no. 6 (2009):
639-644.

116 Anthony P. De Marco, , and Donna K.
Broshek. "Computerized cognitive testing in
the management of youth sports-related
concussion." *Journal of child neurology* 31, no.
1 (2016): 68-75. Concussion policy for
University of Miami

117 "Concussion." NCAA.org - The Official Site
of the NCAA. Accessed December 06, 2016.
http://www.ncaa.org/health-and-safety/
medical-conditions/concussion.

118 Ibid.

119 NCAA. "Concussion and College Sports."
Digital image. Ncaa.org. December 15, 2015.
Accessed December 6, 2016.

120 After reaching out to the Deputy Director
of Administrative Operations Core of the
CARE Consortium via e-mail, she provided the
information that sites involved with this study
do, indeed, use ImPACT. However, the use of
ImPACT was not mandated by the Consortium,
only the use of a neurocognitive assessment
tool in general.

121 NCAA. "Concussion and College Sports."
Digital image. Ncaa.org. December 15, 2015.
Accessed December 6, 2016.

122 Timmermans and Epstein, "A World of
Standards but not a Standard World," 73.

123 Objectification, Standardization, and
Commodification in Health Care," 25.

124 Ibid.

125 Ibid.

126 Kelly, and Rosenberg. "The development
of guidelines for the management of
concussion in sports." 53-65.

127 "Sport-Related Concussion," 56-64.

the industry?

To establish a standard, some key components are necessary: support from scientific expertise[122], support from a well-established institution,[123] and incentives for the adoption of the standard.[124] Timmermans and Almeling assert that the evidence-based medicine system promotes the use of standard protocol guidelines for practice.[125] This has been especially true with regard to medical practice regarding concussion in sport, as evidenced by the early concussion protocols[126] and *Guideline 21* released by the NCAA.[127] The new concussion management guidelines set forth by the NCAA[128] created an environment in which collegiate athletic programs had to use a form of neurocognitive assessment in their sports-related concussion management protocols.[129] Moreover, these programs had to use a system that was easily accessible and could be administered to thousands of athletes for the mandatory baseline testing.[130] The development of these guidelines was indicative of the scientific consensus of experts in concussion on how to manage sports-related concussions for college athletes. Support from scientific expertise also came in the form of the published scientific studies evaluating the efficacy, and statistical sensitivity and specificity of ImPACT.[131] [132] Another study asserted that ImPACT was a culturally competent form to measure concussion testing.[133] According to ImPACT's website, hundreds of peer-reviewed scientific studies cite ImPACT.[134] This amalgamation of scientific research and expertise in support of Immediate Post Concussion Assessment and Cognitive Testing created conditions that were favorable for ImPACT to prevail as the standard of care in assessing sports-related concussion. However, these conditions alone were not sufficient for ImPACT's ascension.

ImPACT also had the support of several institutions supporting its use including: the NCAA, the National Athletic Trainers Association, the American Medical Society for Sports Medicine, the IOC, IIHF, FIFA, and the Department of Defense. Popular media attributes ImPACT's success to partnerships with Wells Fargo Bank, Dick's Sporting Goods, and high profile professional athletes.[135] Another article published by ESPN postulates that the widespread acceptance of ImPACT stems from founder Mark Lovell's personal relationships as a consultant for the NFL and NHL and Riddell Helmets.[136] ImPACT had reputable national organizations acknowledging its efficacy and role in the management of concussions. Moreover, some institutions like Wells Fargo and Dick's Sporting Goods actively promoted its use as the standard for neurocognitive testing.[137]

The vast array of sport and medical institutions supporting the use of ImPACT, created incentive to use this system. One such incentive may be "crowd effect," which was previously introduced.[138] "Crowd effect" occurs when a standard is so pervasive, that it is a loss not to have it.[139] In sports-related concussion testing, when a majority of powerful institutions support a system, like ImPACT, it is a loss to any other institutions that does not support ImPACT. ImPACT is a proprietary, for-profit system, and there is also monetary incentive to using ImPACT. For many schools, ImPACT is a more cost-effective and time-saving technique to administer neuropsychological assessment to its athletes. Secondly, with $30 million grant from the Department of Defense study, universities have large monetary incentive to participate.[140] If a university joins this Department of Defense study for monetary incentives, they may adopt the ImPACT testing system to record data, as many other study participants do.[141]

Lastly, ImPACT became a standard partially because of convenience. Ongoing studies, like the Department of Defense study, and other independent and smaller studies on concussions used the ImPACT test as a metric. ImPACT was already being used to assess sports related concussion for research purposes. Much like how the pain scale became a standard-of-care in modern medicine, the ImPACT test too became a standard because it was already present.[142] ImPACT is a technology that was present in the literature from its release in 2001 to the currently ongoing Department of Defense study. It was a familiar technology supported by expertise, powerful institutions, and promoted by incentive. Together, these favorable circumstances elevated the Immediate Post Concussion Assessment and Cognitive Testing system to a standard for concussion testing in the NCAA.

VI. CONCLUSION: FUTURE DIRECTIONS

IMPACT ADDRESSES THE SPECIFIC NEED TO QUANTIFY COGNITIVE FUNCTION before and after concussion for physicians. There appears to be a unique focus on how to measure and treat concussion effectively. However, there also appears to be an exclusion of a discourse on concussion prevention. None of the international conferences on concussion in sport nor the national position statements of NATA and AMSSM address policies concerning concussion prevention in sport. The Department of Defense and NCAA study focuses what happens to athletes after concussion and return-to-play, but does not study reliable preventative measures.[143] Perhaps ImPACT benefitted from an environment unwilling to alter the nature of sport. That is, institutions like the NCAA, NFL, IIHF, and FIFA could have been more receptive of tools that could provide "damage control" once a concussion happened rather than a policy that would prevent tackling in football or prevent heading in soccer. College athletes in the last five years have suffered from approximately 10,500 concussions with the largest rates in wrestling, football, hockey, and women's soccer.[144] Future concussion management protocols must extend to the preventative phase to protect high school, NCAA, and professional athletes. While ImPACT Applications™ may provide accessible, commonly used concussion management software, the company does not provide a solution to rates of concussion in sport.

136 Peter Keating. "Concussion Test May Not Be Panacea." *ESPN.* August 26, 2012. Accessed October 20, 2016. http://www.espn.com/espn/otl/story/_/id/8297794/neuropsychological-testing-concussions-not-panacea.

137 "Fancy Concussion Tests Won't Protect Our Student Athletes."

138 Stefan Timmermans, and Steven Epstein. "A world of standards but not a standard world: toward a sociology of standards and standardization*." 79.

139 Ibid.

140 NCAA. "Concussion and College Sports."

141 The Deputy Director of Administrative Operations Core of the CARE Consortium explained that many participant sites in the study use ImPACT as a testing system via e-mail.

142 Gordon "Reassessing the assessment of pain."

143 "Concussion."

144 NCAA, "Concussion and College Sports."

128 NCAA guidelines were influenced by the International Conferences on Concussion in Sport and the Position statements of Sports Medicine professionals.

129 "Sport-Related Concussion," 56-64.

130 Ibid.

131 "The 'value added' of neurocognitive testing after sports-related concussion."

132 Philip Schatz, Jamie E. Pardini, Mark R. Lovell, Michael W. Collins, and Kenneth Podell. "Sensitivity and specificity of the ImPACT Test Battery for concussion in athletes." *Archives of Clinical Neuropsychology* 21, no. 1 (2006): 91-99.

133 Anthony P. Kontos, Robert J. Elbin, Tracey Covassin, and Elizabeth Larson. "Exploring differences in computerized neurocognitive concussion testing between African American and White athletes." *Archives of clinical neuropsychology* (2010): acq068.

134 "The ImPACT Test."

135 "Fancy Concussion Tests Won't Protect Our Student Athletes."

"Bird's Eye View"

Dunedin, New Zealand ~ Wide-Field Astrophotography

Kaitlin Moore, University of Pennsylvania

Artist Statement

I am a time traveller, tourist, and newly discovered cryptid. Combining an inexplicable love of physics with a stubborn attachment to writing, I craft (with varying degrees of success) stories that experiment with time, space, and superpositive cats that are both alive and dead. I am the author of four novels, and my works of short fiction, poetry, and astrophotography have appeared in Mad Scientist Journal, Red Cedar Review, Supplement, Tinge, *and others. I just want to take a nap.*

Modern Architecture & Ideology

Modernism as a Political Tool in Sweden and the Soviet Union

Robert Levine, University of Pennsylvania C'17

Abstract

This paper examines the role of architecture in the promotion of political ideologies through the study of modern architecture in the 20th century. First, it historicizes the development of modern architecture and establishes the style as a tool to convey progressive thought; following this perspective, the paper examines Swedish Functionalism and Constructivism in the Soviet Union as two case studies exploring how politicians react to modern architecture and the ideas that it promotes. In Sweden, Modernism's ideals of moving past "tradition," embracing modernity, and striving to improve life were in lock step with the folkhemmet, unleashing the nation from its past and ushering it into the future. In the Soviet Union, on the other hand, these ideals represented an ideological threat to Stalin's totalitarian state.

INTRODUCTION

MODERN ARCHITECTURE EMERGED IN THE LATE NINETEENTH CENTURY AS THE style for the industrial age, conscious of its modernity and striving to break from the traditions of the past.[1] Ornamentation was replaced with simplicity. Timber and stone were traded for steel and glass. Romanticism was swapped for rationality. By the half-way point of the twentieth-century, Modernism was established as the dominant global movement in architecture.[2]

Many designers, historians, and philosophers maintain that Modern Architecture contains and transmits meaning – that it is more than just structure. Yoshio Taniguchi, the Modernist Japanese architect, once said, "Architecture is basically a container of something. I hope you will enjoy not so much the teacup, but the tea."[3] Donald J Olsen, his American contemporary, wrote, "Architecture is a deliberate artistic creation intended not merely to give pleasure, but to *contain ideas, inculcate values, and serve as tangible expressions of systems of thought*."[4]

Modern Architecture's ability "to contain ideas, inculcate values, and serve as tangible expressions of systems of thought" caught the attention of many politicians, who embraced architecture as a tool to promote their ideas. This thesis investigates the connection between the architect and the politician, between the aesthetic and the ideological, in Sweden and the Soviet Union, two places where the connection was particularly rich. In Sweden, Functionalist architecture, a Scandinavian breed of Modernism, emerged alongside the Swedish Welfare State. *Why? How was Functionalism used to support this political project?* At the same time, 800 miles away in Joseph Stalin's Soviet Union, Constructivist architecture, the Russian strain of Modernism, was purged. *How come? What about Constructivism was so toxic to Stalin's ideology?* Together, these inquiries will help answer the larger question at stake: *How was Modern Architecture used as a political tool?*

I have organized this thesis into four sections. The first, "A Basic Understanding of Modern Architecture," is a summary of the most important Modernist architects, writings, and principles. I hope that it will be as refreshing to those already familiar with Modern Architecture as it is informative to those learning about Modern Architecture for the first time.[5] From here, "Functionalism and the Swedish Modernization Project" explores the link between Functionalist Architecture and the creation of the Swedish Welfare State. It starts by considering the reasons politicians sought to create a Welfare State, then outlines Sweden's architectural history, and ultimately discusses the ways that Functionalism was used to promote the Welfare project. It demonstrates that Modern Architecture possesses an innate and indelible progressive spirit. "Constructivism and Stalin's Soviet Union," the next section, looks at the relationship between Constructivist Architecture and Joseph Stalin. It digests Stalin's totalitarian ideology, looks at the ways that Constructivism was threatening to this ideology, and concludes with an examination of the architecture that Stalin chose to support his ideas. It demonstrates that Modern Architecture's progressive spirit was so powerful that is was perceived as an enemy of the totalitarian state. The final section, "Meditations," draws conclusions about the relationship between Modern Architecture and Ideology and explores the ever-important relationship between architecture and politics in our day.

My goal in all of this is not to be exhaustive. My goal is to provide a new kind of

1 Here, "industrial age" refers specifically to the Second Industrial Revolution, a phase of rapid industrialization in the final third of the nineteenth-century and the beginning of the twentieth-century. Whereas the First Industrial Revolution, which ended in the early-mid 1800s, introduced the transition from hand production to machine production, the Second Industrial Revolution was responsible for laying the foundation of modernity as we know it, producing electrical power, telephones, interchangeable parts, and the Fordian production line.

2 A word on terminology: I use – more or less interchangeably – the terms 'Modern Architecture', 'Modernism', 'Modernist,' and 'Modern' to refer to the progressive architectural movements of the 1900s–1940s as a whole.

3 Yoshio Taniguchi, as quoted in *New York Voices: MoMA Returns*, dir. Rafael Roman (Thirteen: New York Public Media, 2004).

4 Donald J. Olsen, *The City as a Work of Art*: London, Paris, Vienna (New Haven: Yale University Press, 1986), p. 4.

5 At the very least, you should walk away from this section confident in your ability to hold a cocktail-party chat with a highfalutin architectural historian. I would recommend, based on past experience, that you do not seek such a conversation.

1 As science studies scholar Cathy Gere observes in *Knossos and the Prophets of Modernism*, "naming a past era with a word that means 'of the present time'" is confusing.

2 Modernists defined "traditional" as anything preceding the Industrial Age, some 3,000 years of human history.

3 Cathy, Gere, *Knossos and the Prophets of Modernism* (Chicago: University of Chicago Press, 2009), p. 6.

4 Although I refer to the "The Modern architect" to represent the doctrines of Modern architects as a whole, not all Modern architects were the same – some were dogmatic in their belief in Modernist principles, and others held Modernist principles more loosely. In fact, there were many different variations, or "schools," of Modern architecture, each of which interpreted Modernism in their own way. To learn about these schools in more depth, consult Alan Colquhoun's *Modern Architecture* (Oxford History of Art Press), which discusses everything from the Bauhaus to the Chicago School to Futurism.

5 In this section I cite many of Modern architecture's most influential figures. Lescaze was not one of them. The New York Times appropriately characterized him as "a curious figure in the history of twentieth-century architecture – not quite major, hardly minor." Still, his essay "The Meaning of Modern Architecture" is one of the clearest expressions of Modernist architectural philosophy.

6 Edgar Kaufmann Jr., "What is Modern Design?" for *The Museum of Modern Art: New York*, p. 7.

7 Zeitgest, often used in design history, refers to the "spirit of the age." It

reading of Modern Architecture – one that is friendly, unpretentious, and beautiful in its clarity. Beyond that, I hope to show that design is a visual language capable of communicating ideas. An awareness of design's "meaning power" is important not only to me as a graphic designer, but to all of us, who live in a world so surrounded by design. Throughout, I will raise more questions than I answer. I hope they make you think. And I hope you enjoy.

A BASIC UNDERSTANDING OF MODERN ARCHITECTURE

IN ARCHITECTURE, "MODERN" REFERS NOT TO THE CONTEMPORANEOUS, BUT to a specific design movement that emerged in the mid-nineteenth century and dominated the mid-twentieth century.[1] Modern architecture was but one expression of Modernism, an intellectual movement that felt the "traditional" forms of art, architecture, literature, social organization, and daily life were outdated amidst the newly industrialized world.[2, 3] Modern architecture is built on three basic principles, emblematic of Modernism at large – *a Rejection of Ornamentation and Tradition, an Embrace of Newfound Industrial Forms and Materials, and an Ambition to Improve and Reshape Life.*

REJECTION OF TRADITION AND ORNAMENTATION

The Modern architect believed that "traditional" architecture failed to reflect the spirit of the new age.[4] William Lescaze, a Swiss-born architect who pioneered Modernist architecture in America, typified this belief in his 1937 essay "The Meaning of Modern Architecture."

> *Architecture is a social art, and every architectural movement has a social origin. Life, today, differs radically even from that of a hundred years ago, and it is the great change in the fundamental characteristics of our lives that is necessitating a new form of shelter…Our buildings have changed because our life has changed. One cannot, architecturally put new wine into old bottles.*[5]

Edgar Kaufmann Jr., a prominent American Modern architect, echoed Lescaze in his 1950 essay for the Museum of Modern Art, "What is Modern Design?": "Modern design is the planning and making of objects *suited to our way of life, our abilities, our ideals.* It began when creative and perceptive people reacted to the vast problems posed by technological change and mass production."[6]

While the typical Modernist architect held that "traditional" architecture failed to reflect the zeitgeist, particularly radical Modernist architects like the Viennese Adolf Loos charged that it held back human progress altogether.[7] In his 1908 manifesto "Ornament and Crime," a foundational text for the Modern movement, Loos wrote: "those who measure everything by the past *impede the cultural development of nations and of humanity itself.*"[8] F.T. Marinetti, founder of the avant-garde movement Futurism, echoed Loos' point in more poetic terms: "Let's break out of the horrible shell of wisdom and throw ourselves like pride-ripened fruit into the wide, contorted mouth of the wind! Let's give ourselves utterly to the Unknown, not in desperation but only to replenish the deep wells of the Absurd."[9]

fig. 1, below: Majolica House, designed by Otto Wager, represents the ornamentation that Modern architects reviled.

fig. 2, right: Modernists viewed heavy adornment, such as that on the interior of Dominikus Zimmermann's 1738 Wieskirche, as paradigmatic of "traditional" architecture.

Modern architects like Lescaze, Kaufmann Jr., Loos, and Marinetti put their rejection of the "traditional" into practice by eschewing ornamentation. The title of Loos' canonical work, "Ornament and Crime," expresses the Modern architect's frustration with the meaningless bells, whistles, flourishes, and accents that long decorated the homes of the cultural élite. Le Corbusier, the Swiss architect who is the most widely recognized Modernist designer, cried out against ornamentation in his 1923 essay "Eyes Which Do Not See:" "Tail pieces and garlands, exquisite ovals where triangular doves preen themselves or one another, boudoirs embellished with 'poufs' in gold and black velvet, are now no more than the intolerable witnesses to a dead spirit *(see figs. 1 & 2)*."[10]

EMBRACE OF NEWFOUND INDUSTRIAL FORMS AND MATERIALS

The Modern architect replaced the ill-suited "traditional" style with one that emerged out of the new possibilities of industrial machinery. This *machine aesthetic*, as Modern architects called it, embraced the "precision, calculation, flawlessness, simplicity, and economy" on display in the "iron bridges, locomotives, automobiles, telescopes, airport-hangars, and funicular railways" of the day.[11,12] Corbusier, in his 1923 book *Vers Une Architecture* (Towards A New Architecture), juxtaposed photos of the Parthenon and the Ford Model T, each as the hallmark of beauty in its age and remarked, "a house is a machine for living in *(see figs. 3 & 4)*."[13] The most famous, now clichéd, expression of the Modern architect's enthusiasm for the functionality and efficiency of the machine aesthetic was the American Frank Lloyd Wright's demand that "form follow function." Wright elaborates on his axiom, in "The Art and Craft on the Machine," from 1901:

> *In the years which have been devoted in my own life to working out in stubborn materials a feeling for the beautiful, in the vortex of distorted complex conditions, a hope has grown stronger with the experience of each year, amounting now to a gradually deepening conviction that in the machine lies the only future of art and craft – as I believe, a glorious future; that the*

is of German origin – *zeit* (time) and *geist* (spirit or ghost).

8 Adolf Loos, "Ornament and Crime," as translated by Wilfried Wang in *The Architecture of Adolf Loos*, p. 101.

9 F.T. Marinetti, "The Founding and Manifesto of Futurism (1909)," as translated by R.W. Flint in *Futurist Manifestos*, p. 19.

10 Le Corbusier, "Eyes Which Do Not See," as translated by Fredrick Etchells, in *Towards a New Architecture*, 1923, p. 85.

11 Theo van Doesburg, "The Will to Style," as translated by Joost Baljeu in *Theo Van Doesburg*, 1974, p. 123.

12 Louis Mumford, "The Growth of Civilization," in *Technics and Civilization*, 1934, p. 350.
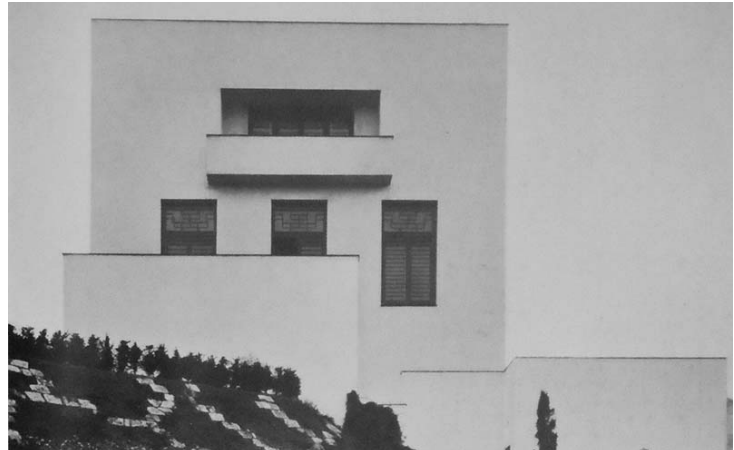
13 David Gartman, *From Autos to Architecture: Fordism and Architectural Aesthetics in the Twentieth Century*, 2009, p. 25

fig. 3, left: Corbusier's 1927 Villa Stein with the Ford Model T in its garage. Modern Architects were inspired by such inventions of the industrial era.

fig. 4, below: Adolf Loos's 1930 Müller House, typical of Modernist architectural simplicity.

14 Frank Lloyd Wright, "The Art and Craft of the Machine (1901)," in *Collected Writings* as edited by Bruce Brooks Pfeiffer, p. 59. Frank Lloyd Wright's discussions of the machine are interesting for many reasons, among them that he genders the machine as male – "for his nature holds the key" – while artists typically typically gender beauty as female – e.g., "mother nature."

15 William Lescaze, "The Meaning of Modern Architecture," in *The North American Review*, 244(1937), pp. 115–16.

16 Ibid.

17 I use "his" here because the overwhelming majority of Modern architects were male. Architecture has long been, and still remains, a male-dominated field.

18 William Lescaze, "The Meaning of Modern Architecture," in *The North American Review*, 244(1937), pp. 115–16.

19 H.J. Henket, "Modernity, Modernism and the Modern Move-

machine is, in fact, the metamorphosis of ancient art and craft; that we are at last face to face with the machine – the modern Sphinx – whose riddle the artist must solve for if he would that art live – for his nature holds the key.[14]

The Modernist stress on simplicity and rationality grew out of and was enabled by new materials. Metals, cements, and glass offered unprecedented "durability, strength, weather resistance, heat transmission and insulation, and flexibility."[15] "Traditional" architectural materials, like wood and stone, did not disappear entirely, but were supplemented by steel frames which "brought about radical changes in the contours of the house."[16]

AMBITION TO IMPROVE AND RESHAPE LIFE

Undergirding the Modern architect's rejection of the "traditional" and his embrace of the future was a belief that his buildings had the power to improve the life of modern man, both spiritually and functionally.[17] He conceived of his job in larger terms than just structure: "No building can function by itself. Our [job] is a complete society, and only in social terms can architecture be thought of."[18] As architectural historian H.J. Henket explains, Modern architects shared a "strong sense of social responsibility in that architecture should raise the living conditions of the masses."[19]

Modern architecture's thaumaturgic, or miraculously curing, ambition rested on the belief that the visual can express meaning. Walter Gropius, a leading German architect, epitomizes this Modernist faith in design's meaning power: "Shapes can be exciting and soothing. In addition, their colors – shrill or soft – can increase the intended effect. Color and texture of surfaces have an effect existence of their own, sending out physical energies which can be measured."[20] The belief that architecture has the potential to contain and transmit meaning is as old as architecture itself. It is not an invention of Modernism. From Vitruvius, working in the 1st Century BC, architects and writers on architecture have maintained that buildings are more than utilitarian; they are instruments by which emotions, ideas, and beliefs are expressed.[21]

However, the effort to use architecture to transmit meaning, particularly to heal the ills of modern society, was amplified by Modernist architects.

Armed with this basic understanding of Modern architecture's aesthetic and philosophical principles, we are now ready to explore how they helped the emergence of the Swedish Welfare State.

FUNCTIONALISM AND THE SWEDISH MODERNIZATION PROJECT

IN THE EARLY YEARS OF THE TWENTIETH-CENTURY, SWEDISH POLITICIANS launched the *folkhemmet*, an ambitious experiment to jolt their struggling country into the new age. Functionalism, the Swedish strain of Modern Architecture, was a critical part of this modernization project, used by politicians to visually manifest the promises of modernity.

THE FOLKHEMMET

Sweden entered the 20th century on the wrong foot. Its economy had failed to recover from "the great hunger years" (*suuret nälkävuodet*), a period some 30 years earlier, from 1866–1868, during which a series of harsh winters and dry summers knocked out the nation's economy, caused a sixth of the Swedish workforce to flee the country, and forced 100,000 Swedes to starve to death.[1] The nation was severely underdeveloped. In the decades before the 20th century, nearly one-fifth of Swedish children (17.6%) did not survive their first birthday, and life expectancy at birth was a meager 43 years.[2] Urbanization – a metric widely used to measure a nation's development – lagged, with as many as 85 percent of Swedes living in the countryside as late as 1880. Industrialization was late to hit Swedish shores, but all the more powerful when it finally did. With its arrival, the structures and institutions which had long provided Swedes with a sense of stability no longer made sense. As Scandinavian historian Håkan Arvidsson noted, "modernity impacted swiftly and heavily, crushing old patterns of living, organizational structures, and value systems."[3] Between economic collapse, underdevelopment, and the destabilizing impact of modernization, the status Sweden enjoyed as one of the great European powers of the seventeenth-century was only a distant memory.[4]

In the face of these challenges, a modern ambition was taking shape, "a new, forward-looking and benign great power dream: the vision of Sweden as a cutting-edge industrial and economic world power."[5] This ambition manifested in the modernization project, an effort to "lift [Sweden] by the bootstraps and transform it from a land of sour gooseberries to a land flowing with milk and honey."[6] Modernization centered around the concept of *folkhemmet*, the use of the home and family as a model for society – the term *folkhemmet* is a combination of *folk* (people) and *hemmet* (home). If the good home hinged on good parents who are able to put food on the table and orchestrate the lives of their children, the *folkhemmet*, similarly, hinged on the good ruling power, a state that could provide the conditions for a good life and guide its citizens towards it.[7] Per Albin Hansson, the Modernization project's figurehead, outlined the *folkhemmet* vision in his classic statement from 1928:

> *On special and indeed on everyday occasions, we often speak of society – the state, the municipality – as our common home, the people's home (folkhemmet), the civic home … The foundations of the home are community and the sense*

ment," in H.J. Henket, *Utopia: The Challenge of the Modern Movement* (Rotterdam: 010 Publishers), p. 10.

20   Walter Gropius, *Scope of Total Architecture*, 1943, p. 36.

21   William White, "How Do Buildings Mean? Some Issues Of Interpretation In The History Of Architecture," in *History and Theory*, Vol. 45 (May 2006), p. 154.

1   In 1867, The New York Times reported on the conditions in "Famine-Stricken Sweden": "Telegrams from Stockholm, Sweden confirm the distressing accounts of the famine in Northern Sweden … The starving people are eating pine bark, which is dried, ground to powder, mixed with stewed Iceland moss and made into a kind of famine bread."

2   At the dawn of the 20th century, Sweden's infant mortality rate and life expectancy were worse than that of modern day Sierra Leone – a reality that illustrates the challenges that Sweden faced at the turn of the 20th century and reminds us of the uneven development of our world today.

3   Håkan Arvidsson, *Modernization and Welfare* (Stockholm University Press: 1994), p. 4.

4   Francis J Sejersted, *The Age of Social Democracy: Norway and Sweden in the Twentieth Century* (Princeton: PrincetonUniversity Press, 2011), p. 1.

5   Ibid., p. 11.

6   Arvidsson, *Modernization and Welfare*, p. 4.

7   Mauricio Rojas, *Sweden after the Swedish Model* (Stockholm: Timbro Publishers, 2005), p. 19.

8   Ibid., p. 23.

9   Sejersted, *The Age of Social Democracy: Norway and Sweden in the Twentieth Century*, p. 1.

10 Ibid.

11 Ibid., p. 2.

12 Ibid.

13 Rojas, *Sweden after the Swedish Model*, p. 13.

14 Jania Gosseye, Review of "The Multiple Modernities of Sweden," in *The European Welfare State Project: Ideals, Politics, Cities and Buildings*, Vol. 5.2 (Autumn 2011), p. 92.

15 Rojas, *Sweden after the Swedish Model*, p. 11.

of belonging together. The good home knows no privileged and disadvantaged, no favorites and no stepchildren. None there looks down on any other, none tries to gain an advantage at the expense of others, the strong does not oppress and plunder the weak. In the good home, equality, consideration, cooperation, and helpfulness prevail. Applied to the great home of the people and citizenry, this would signify the breaking down of all social and economic barriers which now divide citizens into privileged and disadvantaged, rulers and dependents, rich and poor, propertied and impoverished, exploiters and exploited.[8]

Francis Sejersted, the late Scandinavian historian, asserts four key ingredients of this modernization project – *liberation, economic development through technological progress, differentiation, and consolidation of the nationstate.* First, modernization relied on *liberation*, on using human rights and democracy to dissolve personal and systemic oppression.[9] Hence, "the good home knows no privileged and disadvantaged, no favorites and no stepchildren…In the good home, equality, consideration, cooperation, helpfulness prevail." Second, modernization meant *economic development through technological progress*, or the release from poverty via technological development.[10] Hannsson expressed this clearly – "the breaking down of all social and economic barriers which now divide citizens into privileged and disadvantaged, rulers and dependents, rich and poor, propertied and impoverished, exploiters and exploited." Third, modernization implied *differentiation*, or the splintering of a homogenous society into many discrete entities, each with their own culture and values – something, admittedly, Hannsson did not vocalize in the included excerpt.[11] And finally, modernization revolved around a *consolidation of the nation-state*, or the congealment of these differentiated entities under one banner – "the foundations of the home are community and the sense of belonging together."[12] Modernization did not just entail a changing of the national facade, it was wholesale political, economic, and sociocultural re-design. In a sense, it even represented a utopia project, an attempt to balance the divisive individualism of capitalism, the tyrannical collectivism of communism, and the newfound scientific rationality of the modern age.

While the *folkhemmet* was a radically new type of project, it did derive many of its ingredients from the nation's past. Its paternalist and state-interventionist qualities echoed policies dating back centuries. During the Vasa dynasty, for instance, Gustav I ruled over an absolutist, highly centralized state which carried out important religious and administrative tasks.[13] The underlying moral logic of the Swedish Modernization project, the ambition to liberate the individual from all forms of subordination, is intrinsically linked to the long-standing Swedish theory of love, by which relationships are structured on the principle of egalitarianism, not dependency.[14] As the Swedish journalist Per Ohlsson writes in *Gudarnas*, "quite contrary to non-socialist assumptions of recent years, the thoroughly regulated, protected society is not a Social Democratic invention. It is a national project, founded in ideas and laws which are much older than the labor movement."[15] The state-interventionist, unifying project of *folkhemmet* – though greatly exceeding anything seen before – was not entirely new. It gave age-old ingredients industrial scale.

I find the name *folkhemmet* particularly interesting. Imaginably, Per Albin Hansson, the *folkhemmet's* father, could have named it "People's Place," "People's Nation," or any variant of the like. But the use of "People's Home" set the stage for the program's critical architectural component. And even if Hansson's phrasing was not considered,

even if it was unconscious, it was the ultimate Freudian slip – architecture was to be instrumental in building Sweden's future.

SWEDISH ARCHITECTURE UNTIL FUNCTIONALISM: ARCHITECTURE AS MEMORY

Between Sweden's founding in 1397 and the twentieth century, the nation underwent a host of "traditional" architectural styles. Caught up in the powerful currents of style, the nation was thrown between the Gothic, Renaissance, Baroque, Romantic, and Neoclassical. These styles were hardly befit for the modern age and, come the twentieth-century, moored Sweden to the very past it was trying to move beyond.

Architecture is, at its most basic, a technology of shelter. In the northern latitudes, finding a warm, dry cave to live in was not an easy task, so Sweden's earliest settlers had to fabricate shelter from the elements by some other means. They took to building crude huts and tepees centered around an open fire. The earliest of dwellings were dug deep into the ground, until their roofs were all that could be seen of them.[16] Building materials were scavenged from the immediate surroundings, with wood and birchbark readily available in the heavily forested parts of the country and straw and clay elsewhere. Structures were simple and entirely dictated by what could be done with the limited materials at hand. Gradually, once Swedes solved the need for protection against the elements, they turned their attention to the symbolic value of their dwellings. A carved door or porch, for instance, became a status symbol, and the higher one's social standing, the more care was taken in adorning their abode.[17] I read this as an indication that Swedes have long appreciated the expressive value of architecture – the very same expressivity central to Modern Architecture.

This simple, vernacular architecture did not change until the Middle Ages, when the construction of durable buildings became more important. Undressed stone and brick were used to reinforce timber constructions and in some instances became mandatory as early building codes were instituted to prevent fire. Churches became opulently endowed with brick to the glory of God. Town walls and castles were fortified to strike fear into enemies.[18] Between church and castle, the symbolism of architecture was being used on a new scale. Along with the new materials stone came the technique of vaulting, by which ceilings could be curved and structures could be larger and heavier. With this new technique and these new materials, Sweden was able to embrace the Gothic style, an invention of the French cathedral builder Abbé Suger, which wound its way to Scandinavia along new global trade routes.[19] Beginning in the early 1200s, Gothic churches were built with a fury – 1,500 of them total – and medieval towns like Stockholm's *Gamla Stan* were arranged according to Gothic planning ideals *(see fig. 5, overleaf)*.[20]

Gothic architecture prevailed between the fourteenth to fifteenth centuries, until the Renaissance style of the sixteenth-century. The castles of Gripsholm and Kalmar, with their massive walls and fusion of medieval and Renaissance features were erected, for example, in 1537 during the reign of Gustavus I. Stockholm's Royal Palace, designed by the German architect Nicodemus Tessin was perhaps the most overt expression of Sweden's Renaissance energy *(see fig. 6, overleaf)*. Its construction, the largest and most costly project in Sweden, extended over a period of more than fifty years and was designed with extreme attention to the Renaissance's stress on symmetry, proportion, and geometry.[21]

16   Ivan Lindgren, "Stockholm: A History of Its Development," in *Town Planning Review,* Vol. 12 (Dec 1927), p. 260.

17   *Sweden's Architectural History.* Moderna Mussett, Stockholm.

18   Ibid.

19   Paul J Halsall,. *Abbé Suger: On What Was Done During His Administration* (University of Vermont, 1996), p. 21.

20   Lindgren, "Stockholm: A History of Its Development," p. 264.

21   Mårtin Snickare, "The Construction of Autocracy: Nicodemus Tessin the Younger and the Architecture of Stockholm," in *Studies in the History of Art*, 66(2005), p. 65.

fig. 6, right: Elias Martin's 1801 painting *View of Stockholm from the Royal Palace* shows Nicodemus Tessin's Royal Palace, the high-point of Rennaisance architecture in Sweden.

fig. 5, below: The gothic Upsala Cathedral, as engraved in 1770 by Fredrik Akrel.
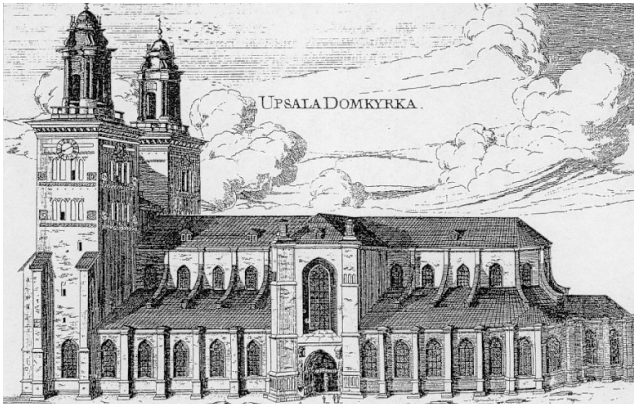
22 August Hahr, *Architecture in Sweden: A Survey of Swedish Architecture Throughout the Ages and Up to the Present Day* (Stockholm: Bonniers 1938), p. 37.

23 *Sweden's Architectural History.* Moderna Mussett, Stockholm.

24 Ibid.

25 Jonas M. Nordin, "Archaeology in the World of Display: A Material Study of the Use of History in the Stockholm Exhibition of 1897" (Online: 2004), 360.

Soon enough, however, the Renaissance lingua franca of the sixteenth-century was replaced by the Baroque style. Sweden rose to be a great power in the seventeeth century and the nation's newly formed aristocracy took to reflecting their wealth in elaborate physical form – adorning their homes with the sculpted roofs and ornamentation that they saw lining the boulevards of the Parisian élite. Many Swedish architects and artists went abroad where they came under Baroque influence.[22]

With the second half of the eighteenth-century, Sweden headed in yet another architectural direction – Neoclassicism. Neoclassicist architecture was typified by strict symmetry and a pursuit of harmony in all things, from the overall concept down to the tiniest detail. The latter was achieved by using measurements and proportions known since the ancient world as being especially attractive. The architecture of ancient Greece and Rome excited much interest, but the direct influences largely came from Italy and France, with their innovative reinterpretations of classical architectural heritage.[23] The aspirations of the royal family, the military establishment, the Church, and an ever-expanding aristocracy generated great demands for new buildings along Neoclassical lines. Towns, too, were redesigned with straight streets, rectilinear blocks, and grand piazzas punctuated by a notable building in the style of Sixtus V's vision for Rome. Neoclassicism was elevated to Sweden's official style, and all buildings and structures of real importance were Neoclassically garbed.[24]

Sweden, by the time it reached the twentieth-century, had been washed over again and again by different architectural styles. Faced with the challenges of the twentieth century, many Swedes turned to architecture to anchor them in the past. This reality was laid bare at The Stockholm Exhibition of 1897, a show marked by nervous nostalgia. *Gamla Stockholm* (Old Stockholm), a massive amusement park on the exhibit's eastern edge, was modeled after a veritable Renaissance town – Stockholm in the mid-sixteenth-century – with a castle, turrets, a market square, and burghers' houses *(see figs. 7 & 8, overleaf)*.[25] In a time of discomfort, Swedes turned to the architectural past to soothe their neurasthenia.

fig. 7, left: The Stockholm Exhibition of 1897, shown here in a hand-colored print, hardly resembled something ready for the new age.

fig. 8, below: The main entrance to the "Old Stockholm" exhibition is a jumble of "traditional" architectural styles.

This "newly awakened, romantic and retrospective nationalism," rooted in architecture, was inhibitive to the modern ambitions of the *folkhemmet*.[26] Sweden's architecture, in other words, tied it to the ghost of the past it was trying to escape and shackled its modern desires.[27] For the nation to enter the new age, for it to achieve the lofty goals of its modernization project, it needed a radically new type of architecture, one that visually manifest the future-oriented ideals of the *folkhemmet*. It needed Functionalism.

FUNCTIONALISM: MODERNITY MADE PHYSICAL

Functionalism, the Swedish school of Modern Architecture, was a deliberate expression of the *folkhemmet*. If the *folkhemmet* was to offer a new order in the modern disorder, a 'Swedification' of the untamed forces of modernity, Functionalism was to do the same in physical form.

The connection between Functionalism and the *folkhemmet* was clear at the Stockholm Exhibition of 1930, which had an entirely different feel from that just before it in 1897. The "Old Stockholm" was swapped for the new and models of "traditional" buildings were replaced with those of Functionalist buildings. Gunnar Asplund was selected as the show's principal architect – perhaps because he, as a once "traditional" architect, represented the very transition from the past to present that the exhibition wanted its visitors to make. His architecture of "unmistakable charm and simplicity, and a bareness and purity of the form, materials, and colors" was sprinkled across the fairground *(see fig. 9, overleaf)*.[28] The Exhibition's housing section, which included 10 detached houses and 16 flats designed by different architects, was Functionalism at its most raw. Although the flats were small, the new ways of shaping windows to let in light yielded a new sense of spatiality. The Swedes developed studies of daylight conditions in buildings systematically, and extended this type of "scientificness" to other fields, such as the particular functions of kitchens and bathrooms *(see fig 10, overleaf)*.[29]

Swedes came to the exhibition en masse to get a glimpse of the future. Considering

26 Rojas, *Sweden after the Swedish Model*, p. 13.

27 The idea that Swedes turned to architecture to soothe their fears is interesting. It suggests that architecture has not only the ability to shape meaning in the present, but also to revive memories of the past.
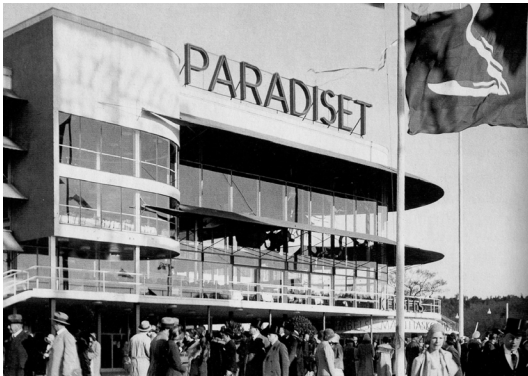
28 Elizabeth Tostrup, "The Influence of the Stockholm Exhibition of 1930 on the Development of Functionalism and Modernism in Norwegian Post-War Architecture," in *Architecture and Rhetoric: Text and Design in Architectural Competitions* (September 1996), p. 68.

29 Ibid., p 66.

fig. 10, right: An actor wears a kitchen respirator, intended to ease the task of washing dishes, in a model of the home of the future.

fig. 9, below: Gunnar Asplund's Functionalist architecture at the 1930 Stockholm Exhibition, such as the Paradiset (Paradise), openned Swedes to the potential of modern life.

30   Carl Marklund, "Acceptance and Conformity: Merging Modernity with Nationalism in the Stockholm Exhibition in 1930," in *Journal of Cultural Research*, p. 612.

31   Ivar Lo-Johansson, *Asfalt* (Stockholm: 1979), p. 455.

32   Gretchen Gasterland-Gustaffson, "Design for Living: German and Swedish Design in the Early Twentieth Century" (Minnesota University Press: 2008), p.133.

33   Tostrup, "The Influence of the Stockholm Exhibition of 1930 on the Development of Functionalism and Modernism in Norwegian Post-War Architecture," p. 64.

34   Marklund, "Acceptance and Conformity: Merging Modernity with Nationalism in the Stockholm Exhibition in 1930," p. 610.

35   Tostrup, "The Influence of the Stockholm Exhibition of 1930 on the Development of Functionalism and Modernism in Norwegian Post-War Architecture," p. 71.

the short time the show lasted, this event – part public education, part popular amusement – marked an unprecedented modern mass experience in the history of Sweden. The exhibition area on the Gärdet south sea shore was visited by almost four million guests from its opening day on May 16th to its closing day on September 29th.[30] Not all of the visitors, however, liked the Functionalist architecture they experienced and its inherent suggestion that modernity ought to be embraced. Ivar Lo-Johansson, the socialist writer, describes the air of conservatism, nostalgia and romanticism:

> *When they saw everything new in the view of the new age, their eyes became round and shielded like the eyes of owls. They did not seem able to tolerate the clarity ... Isn't that nice? They said about an old rocking chair with awful cushions which stood in a corner as an example of hideous taste.*[31]

This temporal tension between past, present, and future was uncomfortable – and productive. It "strip[ed] off the mystical veil" associated with the heavily ornamented styles of the past and opened Swedes up to the future.[32]

There were, of course, those who appreciated the newness of Functionalism outright. Gunnar Larsen, from the evening newspaper *Dagbladet*, reported: "This is a poetry of democracy, that wonderful apolitical democracy which consists of our everyday life becoming more beautiful and comfortable...The Swedish Exhibition is the Style of Functionalism beaming with Joy."[33] The architect E.A.M Mellbye reflected, "everybody was encouraged and inspired by the architecture which was practical, yet refined, light and airy, vivid and full of joy."[34] Another onlooker noted, "More than any other date since the Industrial Revolution, 1930 constitutes a boundary line between old and new [in Sweden] *(see figs. 11 & 12, overleaf)*."[35]

The 1930 Exhibition was its breakout moment, but Functionalism had been bubbling under the surface for some time. As early as 1899, Ellen Key wrote *Skonhetfor Alia* (Beauty for Everyone), which advanced the notion of improvements for everyday life

fig. 11, left: The Asplund-designed Planetarium at the 1930 Exhibition is throughly Modern in its use of simple geometry and its absence of decoration.

fig. 12, below: Functionalist architecture was enabled by new industrial materials, such as the steel frame, seen here.

through beautiful, but accessible, goods.[36] Key's insistence on the emergence of beauty and good taste emanating only from the natural world and particularly one's own specific needs and environment set an early precedent for Functionalism. Uno Ahren, an early Functionalist architect, attacked traditional architecture and the applied arts after the Paris Exhibition of 1925 – "A wild longing for air, space, freedom seized me," he wrote.[37] As Per Råberg, a Scandinavian art historian, explains: "The absence of clarity and logic, the lacking connection between purpose and form, the superfluity of pretentious artistry, filled Ahren with a feeling of deep reluctance, but simultaneously evoked a need for liberation."[38] Ahren was not alone in his distaste of the old. Gunnar Asplund, who was building in the Classicist style as late as 1920, shoved aside his ancient leanings and joined the Functionalist charge. So too did Gregor Paulsson, the director of the 1930 Exhibition itself. In 1916 he had published the book *Den Nya Arkitekturen* (The New Architecture), and in 1919 *Vakrare Vardagsvara* (More Beautiful Everyday Commodities). *Vakrare Vardagsvara* was a piece of propaganda writing in favor of uniting art and industry; it was a link in the program for raising the aesthetic quality within the mass production of applied art aimed at a broader public.[39] Joining them was Captain Hans O. Elliot, who condemned those incapable of building housing "suitable for the needs of the Zeitgeist, marked by the current and future rationalism, instead of tradition and old-fashioned romanticism." He charged further, "The essential spirit of the age? It seems to me that this essence is to a remarkable degree just noise, a loud and at times spiritually impoverished noise. With the giant loudspeaker as its symbol."[40]

The goal of Ahren, Asplund, Paulsson, Elliot, and their Functionalist colleagues was simple, just like their architecture – improve everyday living for the largest possible number of people through rationality and science.[41] Functionalism's principles were laid out in the 1930 manifesto *acceptera* (accept) – the title demonstrating its overt plea for the embrace of a new architectural and, in turn, societal age. Penned by Gunnar Asplund, *acceptera* focused on a society in transformation, touching housing and the idea of "home," industry and crafts and aesthetics. Its final sentences are its most powerful:

36 Gasterland-Gustaffson, "Design for Living: German and Swedish Design in the Early Twentieth Century" (Minnesota University Press: 2008), p. 133.

37 Tostrup, "The Influence of the Stockholm Exhibition of 1930 on the Development of Functionalism and Modernism in Norwegian Post-War Architecture," p. 65.

38 Ibid.

39 Ibid., 63.

40 Gasterland-Gustaffson, "Design for Living: German and Swedish Design in the Early Twentieth Century" (Minnesota University Press: 2008), p. 19.

41 Ibid., 12.

fig. 14, right: A main strand in Vällingby, showcasing Functionalism's cleanliness, airyness, and efficiency.

fig. 13, below: An aerial view of Vällingby, designed by Functionalist architects, which was deemed one of the "most progressive social housing projects in Europe."

42   Gunnar Asplund et al, as quoted in Lucy Creagh, "An Introduction to *acceptera*," in *Modern Swedish Design: Three Foundational Texts* (New York: The Museum of Modern Art: 2008). p. 130.

43   Lucy Creagh, "From Acceptera to Vällingby: The Discourse on Individuality and Community in Sweden," in *The European Welfare State Project: Ideals, Politics, Cities and Buildings,* 5(2011), p. 6.

44   Ibid., p. 22.

To accept the present reality – only thus we can master it, in order to change it and create a culture which is a flexible tool for life. We do not need the out-grown forms of an old culture in order to maintain our self-esteem. We cannot creep backwards out of our own age. Neither can we jump over something which is troublesome and obscure into a Utopian future. We can but look reality in the eyes and accept it in order to master it.[42]

The 1930 Exhibition is precisely the point at which Functionalism and *folkhemmet* met, where the connection between architecture and ideology was particularly raw. Functionalism's grand debut at the 1930 Stockholm Exhibition came just two short years after Per Albin Hansson announced the *folkhemme*t project. The Functionalist bible's title, *acceptera*, was adopted as the Exhibition's slogan.

Within a few years of Functionalism's grand debut, it was adopted as the official Swedish architectural style. Housing projects, the single largest initiative of the Swedish government – to quite literally give its *folk* (people) *hemmet* (homes) – were taken up by Functionalist architects in towns like Uppsala, Vällingby, and Malmo *(see figs. 13 & 14, overleaf).*[43] Sweden became a model of how a well-functioning welfare state did architecture. In 1943, the English journal *Architectural Review* devoted its entire September issue of that year to Swedish architecture, noting "There is much we have to learn from Sweden…Swedish housing is the most progressive in Europe in its social organization. Most public buildings, especially the smaller ones, are pleasant, light-hearted, almost playful, and yet strictly contemporary."[44] The successes of Functionalist architecture were closely echoed by those of the *folkhemmet.* Very soon after the Stockholm Exhibition of 1930, Sweden would enter it's 'golden age.' As the Swedish economy blossomed, so too did Functionalist structures. As unemployment rates tumbled to historical lows,so too did the inhibitive memories of Sweden's "traditional" architecture.

Functionalism was the architectural agent of the *folkhemmet*. Progressive architects joined forces with progressive politicians to will Sweden into a modern nation – into

"a land flowing with milk and honey."[45] I find Functionalism's deep politicization noteworthy, for it stands in the face of many readings of Swedish modernist architecture as innocent and soft. Functionalism illustrates that no matter how paired-down an architecture may appear to be, it always carries meaning.

CONSTRUCTIVISM AND STALIN'S SOVIET UNION

AT THE SAME TIME THAT MODERN ARCHITECTURE WAS SERVING THE *folkhemmet*, 800 miles away it was threatening Joseph Stalin's totalitarian reign. Stalin rose to power in 1928, promising to transform the Soviet Union from a peasant society into an industrial and military superpower. As Soviet life became increasingly brutal under his Five Year Plans, Stalin replaced complete information with half-truths, fables, and myths to conjure the illusion of the "good life" to come. In the process of hijacking reality, he purged Constructivist architecture and replaced it with Soviet Realism.

STALIN'S TWO TRUTHS

Joseph Stalin took the reigns of the Soviet Union on the promise of a *svetloe budushcheea* (radiant future) – a future free from burden and full of fertile, everlasting life. For this future to arrive, he argued, the Soviet people had to trust in his divine intervention and put in hard work to will the peasant nation into a modern superpower. "We are 50 or 100 years behind the advanced countries," Stalin noted. "We must make good this distance in 10 years. Either we do it, or we shall go under."[1] Stalin's Five Year Plans were rather successful in making up this distance. The first, introduced in 1928, increased national oil output from 11.7 to 21.4 million tons, the output of steel from 4 to 5.9 millions tons and the output of coal from 35.4 to 64.5 million tons. The second Five Year Plan, running from 1932 to 1937, produced similarly impressive results. Between 1932 and 1937, oil output increased from 21.4 to 28.5 million tons, the output of steel in increased from 5.9 to 17.7, and the output of coal from 64.3 to 128.5.[2] As the historian E.H Carr wrote on the eve of Stalin's death in 1953:

> *If we contrast the Russia of twenty-five years ago with the Russia of today, the outstanding and almost breathtaking contrast is the rise of Russia to become one of the two great world Powers; and this in turn is due to the astonishingly rapid expansion and modernization of the Russian economy. This achievement cannot be dissociated from the name of Stalin.*[3]

Equally as indissociable from Stalin was the terror his modernization wrought on the people of the Soviet Union. Failure to meet the intentionally unattainable goals of the Five Year Plans was punished as treason and often resulted in murder. The imposition of an uninterrupted work week wrought havoc on family life. Labor camps were set up to feed the voracious appetite of industrialization. As Alexander Solzhenitsyn, a political prisoner at the ruthless Kolyma labor camp, recalled "every tent in the settlement was surrounded with piles of frozen corpses on three or four sides."[4] By 1938, approximately eight million Russians were in labor camps with a fifth of all prisoners dying each year.[5] Collectivization, which promised to increase the food supply for the urban population by consolidating individual farms into state-owned farms, resulted in widespread famine. It is estimated that five million people died as a result of collectivization, with Stalin using "starvation as a means of punishing areas

45 Arvidsson, *Modernization and Welfare*, p. 4.

1 Joseph Stalin, "Speech Delivered at the First All-Union Conference of Leading Personnel of Socialist Industry" (Moscow: February 4, 1931), Online.

2 Josh Brooman, *Stalin and the Soviet Union* (New York: Longman 1988), 10.

3 E. H. Carr, "Stalin," in *Soviet Studies*, 5(1953), p. 7.

4 Brooman, *Stalin and the Soviet Union*, p. 15.

5 Paul Baker & Judith Bassett, *Stalin's Revolution* (Singapore: Heinemann 1988), p. 37.
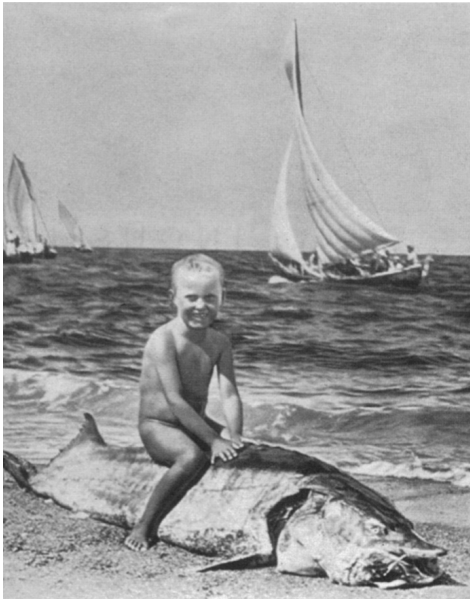
fig. 15, left: Solomon Telingater's photograph is typical of the bent reality that Stalin's used to portray his radiant future.

fig. 16, below: Aleksandr Gerasimov's 1938 painting *Joseph Stalin and Kliment Voroshilovin the Kremlin Grounds* uses the same reality reconstruction.

6 Timothy Snyder, "Hitler v Stalin: Who Killed More" on *The New York Review of Books*, Online.

7 "Sentenced To Death In Stalin's Great Purge" (Radio Free Europe), Online.

8 John E. Bowlt, "Stalin as Isis and Ra: Socialist Realism and the Art of Design," in *The Journal of Decorative and Propaganda Arts*, 24(2002), p. 46.

9 Ibid., p. 48.

which resisted his policies."[6] The Great Purge, a product of Stalin's "gloomy personality and paranoid tendencies," hit its peak between 1937–38, with secret police executing more than 1,000 alleged traitors per day, most with a single shot to the back of the head.[7]

As Soviet life became more brutal in the 1930s, with rural catastrophes, famines, and mass arrests, Stalin turned to propaganda to replace complete information with half-truths, fables, and illusions. The Soviet artist Solomon Telingater's photograph illustrating Stalin's statement, "Life has improved, comrades, life has become more joyous," embodies this turn *(see fig. 15)*. In it, a nude blond boy sits astride a dead sturgeon at the sunny seaside. As art historian John Bowlt explains, Telingater's photograph is a "conglomeration of images that may be read didactically:" the smiling child "personifies the health of the young Soviet state," the sturgeon "suggests an abundance of food for all," not just for survival, but for pleasure as well, and the sailboats "indicate the desirable presence of outdoor recreation."[8] Aleksandr Gerasimov's 1938 painting *Joseph Stalin and Kliment Voroshilov in the Kremlin Grounds* achieves the same reality reconstruction, depicting Stalin as than Voroshilov, his right-hand man and head of the Red Army, despite the reality that he was much shorter *(see fig. 16)*. [9]

In Stalin's Soviet Union two types of truth met head on – the rational, scientific truth of the industrialization and modernity he hoped to bring to peasant Russia – and the hijacked truth that his propaganda used to mask the terror. This battle between Stalin's two truths extended to architecture, where Constructivism – an architecture of rational truth – was exterminated, and replaced by Soviet Realism – an architecture of constructed truth.

CONSTRUCTIVISM: FOR THE PEOPLE, BY THE PEOPLE

One chilly night in early 1922, Moshei Ginzburg, Vladimir Maiakovskii, and Aleksei Gan huddled in a musty Moscow basement. So enthralled by a new vision of the

fig. 17, below: Moshei Ginsburg's 1929 Narkomfkin channelled Modernism's paired-down aesthetic.

fig. 18, right: The Gosstrakh Apartments building emboides Constructivism's ambition to improve the lives of working people through architecture.

world, they furiously sketched, wrote, and scribbled down ideas – pausing only for the occasional smoke. Sharp, rational strokes on blueprint paper stood next to diagrams of new machinery, which stood next to framed pictures of the 1917 October Revolution. Constructivism was in the making.

Konstruktivizm (Constructivism), the Soviet expression of Modernism, was deeply tied to the Soviet socialist movement and its promise of proletarian, or Bolshevik, revolution. In the same way that socialists promised to unseat the old intelligentsia, Constructivist architects promised to overthrow the "traditional" aesthetic order.[10] The Vitruvian triad of Firmness, Commodity, and Delight, which had more or less governed architectural discipline since the first-century BC, was to be replaced by a triad of their own – Function, Construction, Aesthetics.[11] Constructivist architects saw themselves as an important force in the impending revolution, holding that "contemporary architecture must crystallize the new socialist way of life."[12]

Implicit in Constructivism's Bolshevik bond was the quintessential Modern idea that architecture could heal the diseases of individuals and society.[13] It was an architecture for the people by the people, an architecture governed by rationality, space, freedom, and cleanliness. Constructivist architect Moisei Ginzberg's Narkomfin, for example, designed the year Stalin rose to power, was built to solve the most pressing problem of urban planning – how to avoid the isolation that comes with living in a city. It featured a library and a shop, a communal kitchen and dining room, and even a rooftop solarium for Moscow's short, hot summer. There were meeting rooms to allow the people to convene with one another. The corridors to the flats were big, wide, and open to encourage tenants to see them as the village street and stop and talk with their neighbors *(see fig. 17)*. The result was "a six-story blueprint for communal living as ingenious as it is humane."[14] The Gosstrakh Apartment complex was designed in the same thaumaturgic spirit. Built for the employees of the Gosstrakh State Insurance Organization, it combined apartments with communal facilities, emblematic of Modernism's ambition to improve and reshape life *(see fig. 18)*.[15]

10 Richard Stites, *Revolutionary Dreams: Utopian Vision and Experimental Life in the Russian Revolution* (New York: Oxford University Press 1989), p. 7.

11 Anatole Kopp, *Constructivist Architecture in the USSR* (New York: St Martin's Press, 1985), p. 38.

12 Ibid., p. 23.

13 Léopold Lambert, "Architectural Theories: The Modernist Ideology of a Normative Body," Online.

14 Kopp, *Constructivist Architecture in the USSR*, p. 56.

15 Ibid., p. 57

16 Moisei Ginzburg, *Style and Epoch* (New York: The Institute for Architecture and Urban Studies and the Massachusetts Institute of Technology, 1982), 22.

17 Hugh D. Hudson, Jr., "Terror in Soviet Architecture: The Murder of Mikhail Okhitovich," in *Slavic Review*, 51(1992),
p. 449.

18 Ibid., 451.

19 Arthur Koestler, *Darkness at Noon* (London: McMillan, 1940).

20 Harold Strauss, "The Riddles of Moscow's Trials," New York Times, Online.

21 Danilo Udovički-Selb, "Modernism and Socialist Realism: Soviet Architectural Culture under Stalin's Revolution from Above, 1928–1938," in *Journal of the Society of Architectural Historians*, 68(2009), p. 471.

22 Catherine Cooke, "Beauty as a Route to 'the Radiant Future': Responses of Soviet Architecture," in *Journal of Design History*, 10(1997), p. 142.

23 Bowlt, "Stalin as Isis and Ra: Socialist Realism and the Art of Design," p. 51.

Of course, while Constructivism was a particular response to its political, economic, and sociocultural Zeitgeist, it participated in the global discourse of Modern architecture. The Constructivist idea that "Architectural methods should resemble those of the 'inventor,' which means abandoning the recourse to borrowings from the past, whether in the field of architectural form or spatio-funtional solutions," has tinges of Swiss, German, Swedish, and American Modernism.[16]

Just as Modernists around the world gathered into their particular "schools," Constructivists formed two main organizations of their own, the ASNOVA and OSA. The Association of New Architects (ASNOVA) was founded in 1923 by the VKhUTEMAS design school professor Nikolai Ladovsky and the Organization of Contemporary Architects (OSA) was established two years later by Moisei Ginzburg and Alexander Vesnin.[17] The two groups argued over architectural nuances, but agreed that revolutionary architects must "consider contemporary materials and technological possibilities, must educate their students to solve practical problems and create real buildings that answered actual needs, and accepted the existence of psychological effects of architecture."[18]

Constructivism's inherent proliterian, rational spirit, which Stalin once hailed as a young member of the Soviet socialist party, would prove toxic to his totalitarian state.

SOCIAL REALISM AND THE GREAT ARCHITECTURAL PURGE

Arthur Koestler's 1940 novel *Darkness at Noon* follows Nikolas Rubashov, a member of the Bolshevik vanguard, arrested and jailed for political treason.[19] We live with Rubashov for several weeks in his cell and in his mind, "coming to know a man who has dedicated himself unswervingly for forty years to the program of the revolution, and who has struggled for its abstractly conceived ends by any necessary means," only to be cannibalized by his very work.[20] Rubashov is Constructivism.

As Stalin's propaganda machine worked around the clock to replace complete information with half-truths, fables, and illusions, the dictator became interested in the physical and visual transformation of the Soviet Union. Under his command, Constructivism was washed away, much like the original Bolshevik party that inspired it and in which Stalin had participated. By the mid 1930s, the ASNOVA and OSA were disbanded.[21] Constructivism's few remaining champions were rounded up and shipped off to labor camps to starve and freeze. Constructivism – an architecture of truth, made by the people for the people – was replaced by Soviet Realism – an architecture of myth and autocracy.

No moment marked Constructivism's death more clearly than the competition for the Palace of the Soviets. Between 1930 and 1932, Stalin asked the world's great architects to design the administrative center of his empire. This was a task with utmost ideological weight – the building at the center of Stalin's universe would be a beacon of his philosophy.[22] The result was an architectural face-off. On one end, stood the Constructivists, touting their ideals of science, rationality, and truth. Almost every major Constructivist submitted an entry. So too did global Modernist heavyweights Walter Gropius, Erich Mendelsohn, and Le Corbusier. Opposing them were architects of the Soviet Realist school, armed with power, myth, and intimidation. Tête-a-tête were two truths – the real and unreal.[23]

fig. 19, left: Boris Iofan winning design for the Palace of the Soviets established Stalin's Soviet Realist architectural aesthetic.

fig. 20, below: Vladimir Ščuko and Vladimir Gelfreich's Lenin Library, bearing the heavy Soviet Realist look.

The unreal won. The selected design was produced by Boris Iofan, a young Odessa-born architect. Iofan presented a "hyper-Stalinist project of oppressive monumentality," drawn to be the tallest and largest building in the world. It was the perfect crystallization of Stalin's fantastic and radical ideology – "the centralization of imperial power, all on a superhuman scale, with a waterfront orientation" that suggested he could conquer nature *(see fig. 19)*.[24] I'm not sure Stalin knew what to expect from this competition, and the fact that he openly invited architects of every style and nationality affirms his rather ambiguous aims. But he was surely stunned by the results, seeing in Soviet Realism the physical image of his state and in Modernism a potential threat. Modernists across the world called out against Iofan's design. Le Corbusier remarked, "It is hard to accept the fact that they will actually erect that odd thing which recently has flooded all of the journals."[25] Frank Lloyd Wright, addressing the First Congress of Soviet Architects, quipped, "This structure – only proposed I hope – is good if we take it for a modern version of Saint George destroying the dragon."[26]

Seeing the potential of this new architecture as propaganda, Stalin directed several efforts to develop Soviet Realism. In the years after the fateful Palace of the Soviet competition, Soviet Realist architectural academies were set up to teach the next generation of Russian architects. Buildings bearing Iofan's aesthetic shot up across the nation *(see fig. 20)*.[27]

Just as Soviet Realism was being developed to become the architectural agent of Stalinism, Constructivism was being secretly purged. There is no more clear example of this than the case of Mikhail Okhitovich, Constructivism's most radical and unrelenting theoretician. The son of a former Tsarist bureaucrat, Okhitovich joined the Soviet Party in 1917 while a soldier for the Red Army and led its early architectural efforts. Deeply educated in Marxism, he became disillusioned by Stalin's warped ideology, asserting he had abandoned the Marxist social revolution in favor of merely enhancing the political superstructure.[28] As Stalin's policies grew harsher, and his radicalism more perverted, Okhitovich became more aggressive. On January 8th,

24 Udovički-Selb, "Modernism and Socialist Realism: Soviet Architectural Culture under Stalin's Revolution from Above, 1928–1938," p. 467.

25 Le Corbusier, as quoted in "Art and Architecture Towards Political Crises: The 1937 Paris International Exhibition" (Culturedarm), Online.

26 Frank Lloyd Wright as quoted in Ibid.

27 Cooke, "Beauty as a Route to 'the Radiant Future': Responses of Soviet Architecture," p. 138.

28 Udovički-Selb, "Modernism and Socialist Realism: Soviet Architectural Culture under Stalin's Revolution from Above, 1928–1938," p. 471.

29 Hugh D. Hudson, Jr., "Terror in Soviet Architecture: The Murder of Mikhail Okhitovich," p. 453.

30 Ibid., 457.

31 Ibid., 458.

32 Ibid., 459.

1935, he delivered a cutting speech on "The National Form of Soviet Architecture," denouncing Soviet Realism as a "national form of folklore."[29] He went further, calling out the Stalinist "cult of hierarchy," which sharply opposed the anti-hierarchical nature of his Modernist architecture. As the architectural historian Hugh D. Hudson writes:

> *The lack of hierarchy in contemporary architecture constituted the antithesis of the world that Stalin and his allies sought to construct – a world in which cultural, and thus political, hierarchy was all important – a world architecturally exemplified by the proposed monumental Palace of the Soviets and by the creation of awe through giant squares, streets named Il'ich, wide boulevards with fountains and sculptures of the Renaissance, and tall buildings, all with stress on the vertical.*[30]

Okhitovich's 1935 speech, known as the "Okhitovich Affair," was his last straw. To members of Stalin's inner circle it represented "a most serious threat demanding especially serious attention."[31] Constructivist architecture, it demonstrated, possessed the dangerous ability to cut through myth with truth, and was thus kryptonite to the Stalinist state. Days after, Okhitovich's speech he was arrested. He died in a labor camp in 1937.[32] Constructivist architecture followed the path of its most courageous leader. With Okhitovich's death, Constructivism was finally purged. Stalin's truth triumphed over Modernist, rational truth.

1 Ludwig Wittgenstein, as quoted in Andrew Ballantyne, "The Pillar and the Fire," in *What is Architecture?*, ed. Andrew Ballantyne (London and New York: Routledge, 2002), p. 7.

2 Juan Pablo Bonta, *Architecture and Its Interpretation: A Study of Expressive Systems in Architecture* (London: Humphries, 1979), p. 22.

3 Doug Staker, "Trumpitecture Stands as a Sad but Honest Reflection of the Values Trump Proudly Embodies," on *Deezen,* Nov. 17, 2016, Online.

4 Joe Carmichael, "What Trump's Towers Say About His Politics," on *Inverse*, Nov. 14, 2016, Online.

MEDIATIONS

*You think philosophy is difficult enough, but I can tell you
it is nothing to the difficulty of being a good architect.*[1]

— Ludwig Wittgenstein

MODERN ARCHITECTURE IS MORE THAN STRUCTURE. IT IS VISUAL PHILOSOPHY – an embodiment of the Modernist system of thought. In Sweden, Modernism's ideals of moving past "tradition," embracing of modernity, and striving to improve life were in lock step with the *folkhemmet*, unleashing the nation from its past and ushering it into the future. In the Soviet Union, on the other hand, these ideals represented an ideological threat to Stalin's totalitarian state. While Modern architects were particularly fascinated with the expressiveness of their architecture, all architecture has such "meaning power." As the design theoretician Juan-Pablo Bonta put it, "efforts to construct a meaning-proof architecture have always been de facto unsuccessful...Even an architecture designed to be meaning-less would mean the desire to be meaningless, and thus could not actually be meaningless."[2]

I write this exactly one month before Donald Trump will be sworn in as the 45th President of the United States, and understanding architecture's ability to communicate seems as important as ever. Trump, a global real-estate developer, appreciates the symbolic power of architecture. Trumpitecture is imposing. At least one Trump Tower dreamed of being the tallest building in the world, an aspiration that "has more to do with testosterone than taste."[3] Trumpitecture is narcissistic. It abounds in glitter, glitz, and gold – loud pronouncements of Trump's self-acclaimed success. The

fig. 21, right: The Trump Tower Los Vegas glitters a fresh hue of narcissicsm in the desert sun. Its 2,800 foot "Trump" sign can be seen from miles away.

fig. 22, below: The suffocating ornamnetation of Trump's apartment surely has the Modernist masters of the early twentieth-century rolling over in their graves.

Donald even prescribed that the "Trump" sign on his Las Vegas tower be 2,800 square feet, larger than the average American home *(see fig. 21, overleaf)*.[4] Trumpitecture is regressive. It abounds in surface decoration and turgid opulence, techniques that the pioneers of Modern architectural thought discarded as failings of the past – out of touch with a modern and progressive society *(see fig. 22)*. As American architect Doug Staker recently wrote, we need "look no further than Trump's architectural prowess to envision the world he would wish upon us."[5]

Trump plans to rearchitect America by investing a trillion dollars in infrastructure. Mere hours after his election victory he declared, "we're going to rebuild our infrastructure, which will become, by the way, second to none."[6] Whether Trump will design these projects in his signature Trumpitecture style remains to be seen, but if he should, we'll be able to read through the lines. What Winston Churchhill once said with optimisim, we should take with caution: *"the things we build, build us."*[7]

5   Staker, "Trumpitecture Stands as a Sad but Honest Reflection of the Values Trump Proudly Embodies," Online.
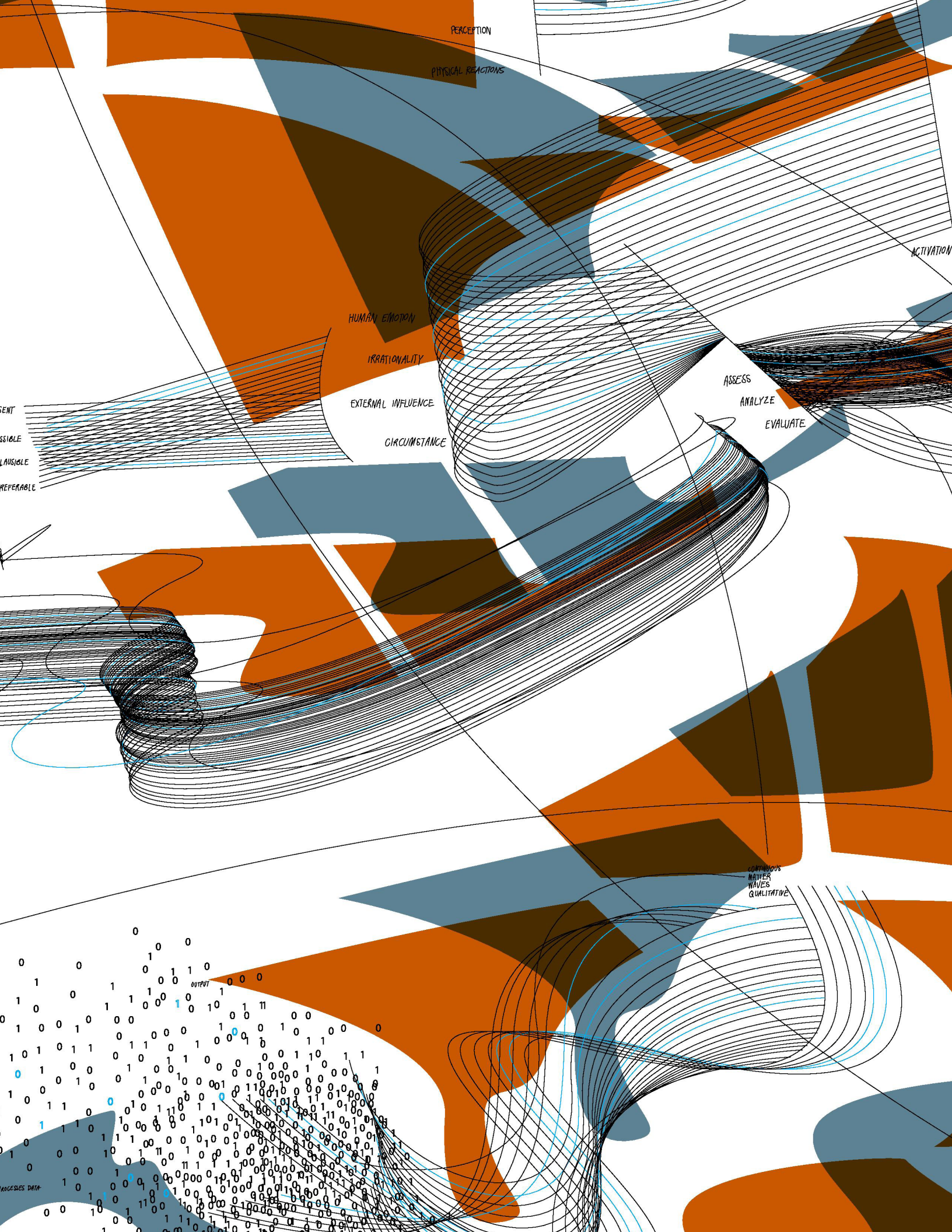
6   Ryan Bradley, "What You Need to Know About Donald Trump's $1 Trillion Infrastructure Plan," on *Fortune*, Dec. 21, 2016, Online.

7   Winston Churchill, *House of Commons Hearings* (London: Hansard, 1943), p. 403.

PERCEPTION

PHYSICAL REACTIONS

ACTIVATION

HUMAN EMOTION

IRRATIONALITY

ASSESS

ANALYZE

EXTERNAL INFLUENCE

EVALUATE

CIRCUMSTANCE

SENT

SSIBLE

LAUSIBLE

REFERABLE

CONTINUOUS
MATTER
WAVES
QUALITATIVE

OUTPUT

PROCESSES DATA