INCORPORATING EXCEPTIONS: RE-LINKING ENVIRONMENTAL AND ACCESSIBILE DESIGN IN PRACTICE

by

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Historically in architecture, designers had fairly similar approaches to design practices regarding both people with disabilities and the natural environment surrounding the space. Examining early historical construction as well as vernacular solutions in writings like Bernard Rudofsky's *Architecture Without Architects* shows humanity's propensity to live in within and around their natural surroundings and overcoming the physical challenges of navigating these spaces without the benefit of modern technological innovation. In the last two hundred years, we have still approached design problems with the intent to solve the problems imposed by the environment on people of all abilities, but the ways that designers and the public receive and think of these two challenges has shifted drastically.

In contemporary society, clients may request varying degrees of sustainable measures in their buildings. Because the public takes a keen interest in how designers are respecting the environment in their buildings, and because institutions exist solely to rate building performance based on their sustainability metrics, these clients want to ensure their building is well received and so look to add these features or receive

sustainability certification. Contrary to all of this, while regulations exist in many countries today to ensure that public spaces are accessible to people with disabilities, accessibility features are often treated as secondary aspects when compared to the broader vision of a building's form and function, and they can added on last-minute to comply with construction regulations without necessarily respecting the spirit of said regulations. This practice of nondiscrimination still sends a discriminatory message to anyone who does not fit the stereotype of an able-bodied individual that they are of secondary or lesser importance to their societies.

This thesis examines the relationship of the history of disability and environmental design conditions to determine the underlying factors that motivate designers for each and applies these conclusions to contemporary society to propose a new series of design consideration and practices that would create a practice for disability design that enhances built environments for all users without discriminating against any group of people of different abilities.

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Table of Contents

List of Accompanying Materials

1. Incorporating Exceptions Presentation Slides
2. Example – UO North Quad Athletic R&D
3. UO North Quad R&D Egress Diagram
4. UO North Campus R&D Occupancy Diagram

List of Figures

Chapter One: History of Design and Nature

To understand how our design relationships between nature and accessibility are linked, we must first understand the history they are grounded in to understand how they developed and what caused them to change over time. Humanity has been living in concert with nature since before the start of recorded history. Nature was the first architect of human space, and evidence all over the world, from South America to China shows that people have been using their environments to take advantage of features that their early shelters lacked or to enhance those shelters with those same advantages. The impact of our species' earliest constructions still lingers with us up to the present day: amphitheaters, stadiums, arcades, and homes of today draw their form from past constructions. All of our architecture carries with it links to previously built spaces and the environments they were made in, and this progression of ideas continues to shape our conceptions of space today.

Image 1: Inca tribe amphitheatre

Before industrial technology, humanity took advantage of their environment to create the spaces we now build artificially. These theaters built into ancient craters by the Inca tribe of the Maras is a stunning example of this phenomenon.[1]

Stephen Kellert describes these conceptions and explores the human relationship with nature. Making use of the term "biophilia," described as a person's "innate desire to connect with nature," Kellert links natural connection to personal wellbeing, emotional healing, and self-improvement."[2] We can study the development of human biophilia by examining the development of architecture around the world and its relationship with its environments. Using examples from Bernard Rudofsky's *Architecture Without Architects*, we can examine what he calls "nonpedigreed" architecture to find the connections between human design and nature. A critic of

[1] Rudofsky, Bernard. Architecture without Architects: A Short Introduction to Non-Pedigreed Architecture. Albuquerque: University of New Mexico Press, 1987. Pg.10.
[2] Kellert, Stephen R. Building for Life: Designing and Understanding the Human-Nature Connection. Washington DC: Island Press, 2012. Pg. 18.

contemporary design, Rudofsky calls for people to “welcome the climate and challenges of topography” rather than rejecting it as we attempt to “conquer nature.”[3]

Even as human building technology advanced, they still used nature to their advantage when constructing spaces or planning settlements. Unable to provide themselves with anything resembling complete climate control in their interior spaces, early designers drew inspiration from their environment, and drew upon the imagery of their surroundings to create spaces for human habitation. Going one step further, these designers would often use their environment to their advantage, designing space to make use of the local topography and climate conditions, rather than trying to imitate them artificially, and from this we see some of the earliest examples of natural design. Shallow valleys became terrace farms to produce food, or amphitheaters for gathering. Cliffside openings became safe homes sheltered from the elements and out of harm’s reach, and the earth itself became walls and roofs to insulate dwellings and provide climate conditioning in extreme environments.

[3] Rudofsky, Bernard. Architecture without Architects: A Short Introduction to Non-Pedigreed Architecture. Albuquerque: University of New Mexico Press, 1987. Pg.4.

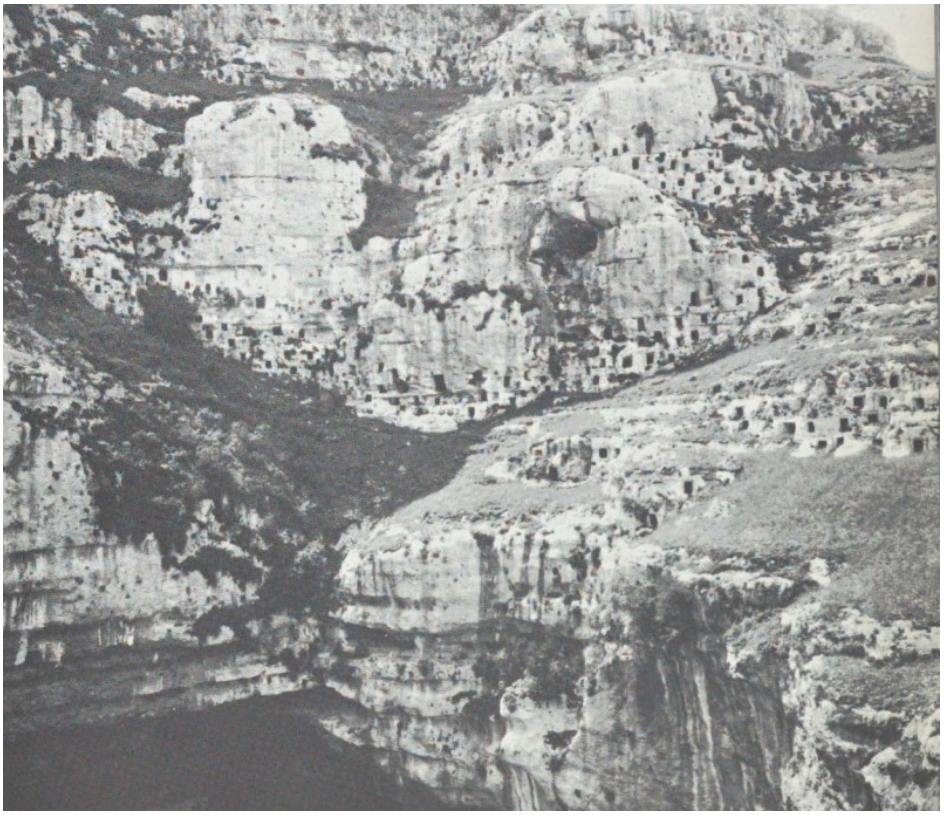

Image 2:Cave Dwellings of Pantalica, Italy

In Pantalica Italy, dwellings carved into homes provided safety from the elements as well as ground threats. Converted from burial grounds to apartments, the cave system was good enough protection to be repurposed and used for hundreds of years.[4]

Over hundreds of years of work and technological development, humanity eventually began to develop built environments that were more capable of mimicking the features of the natural world. Even in ancient civilizations from as early as 6,000 BCE, walls and moats provided the safety similar to cliffs and rivers, and people were building settlements capable of reproducing larger scale natural effects, marking the start of human control over their built climates. That is not to say that they did not still use their natural surroundings to their benefit however, as Classical Era and medieval structures were often built atop or within geologically strategic positions, or in the ruins

[4] Ibid. pg. 15.

of even older structures whose location was originally chosen for the natural defense and security these location provided to enhance their built works. It was not that the environment had changed, but rather humanity's ability to interact with and shape it. Built atop a crater on the Greek island of Santorini, the settlement of Thera shows that "humankind has been exploiting topology for views and a sense of beauty, as well as security in the form of mountain fortresses for thousands of years."[5] Originally prized for its height as a form of natural security and beauty, Thera would have made an excellent defensive settlement when originally constructed. As human engineering and design improved over time however, Thera did not become less secure as much as it became possible to design other settlements that were equally secure without having to find a volcanic crater upon which to perch a fortress.

[5] Rudofsky, Bernard. Architecture without Architects: a Short Introduction to Non-Pedigreed Architecture. Albuquerque: University of New Mexico Press, 1987. Pg. 40.

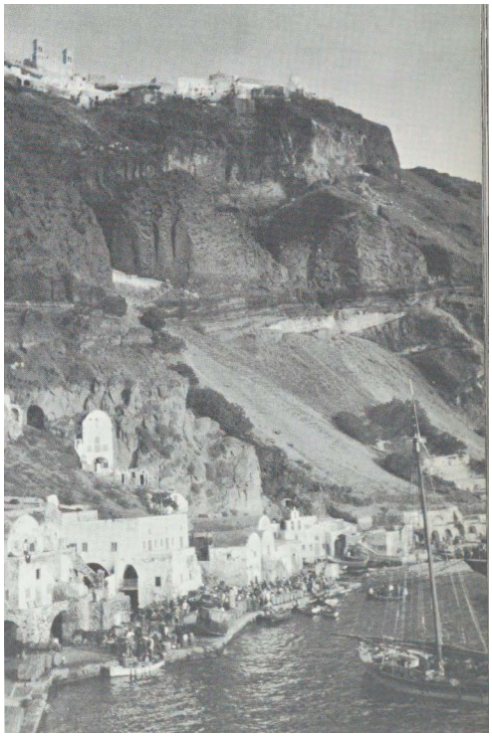

Image 3: Settlement at Thera, Greece

As modern technology progressed, engineering technology allowed manmade walls to serve a similar purpose to the cliffside security provided to the settlement in Thera, Greece, which eventually aided the spread of settlements across the globe and away from any natural defenses.[6]

It is important to note that this new ability to construct spaces did not mean that humanity turned its back on its environmental surroundings. Rudofsky offers several examples of building designs that work in harmony with its environment to create better spaces while still being a wholly artificial construction. For example, photos 113-115 in *Architecture Without Architect* show buildings in West Pakistan outfitted with windscopes. Designed to make use of the wind in the area, these windscopes "create climate control in buildings where the weather can become hot, but the wind's direction remains fixed."[7] These buildings are representative humanity's growing control over

[6] Rudofsky, Bernard. Architecture without Architects: A Short Introduction to Non-Pedigreed Architecture. Albuquerque: University of New Mexico Press, 1987. Pg. 29.
[7] Ibid. Pg. 101.

natural design processes, and displays our capability to shelter ourselves in harsh climates. It is also indicative of the progression of building innovations that humans were then capable of designing to accentuate our comfort in unpleasant environments. These windscopes connect us with our natural surroundings and enhance our biophilia the way Kellert argues we inherently desire, while also providing us very tangible comfort and control over our living conditions.

Image 4: Windscopes in West Pakistan

In West Pakistan, roof architecture evolved take advantage of environmental conditions and work alongside them. These windscopes capture the wind that comes from a fixed direction to provide conditioned interiors in the hot climate.

As these technological innovations progressed, our ability to control our own living conditions grew by leaps and bounds. By the 19th century, technological developments of the previous century had significantly increased humanity's ability to grow food, and many rural families made their way to rapidly industrializing cities for work creating goods in factories instead of growing food on the farm. While this yield increase was solved in the eastern region of the world by increasing the number of

people working high yield crops,[8] yield increases of "about a quarter between 1700 and 1800, and then by about a half between 1800 and 1850" were possible in Britain through the discovery of high-yield crop rotation technology.[9] Also chief among these technological innovations was the advent of the technologies that made modern construction possible: heating, electric lighting, mechanical ventilation, and the elevator. Without the advent of modern these new technologies that were gaining popularity and usage in the late 1800s, the fine-tuned machine of the city would seize up and operations would fail. The elevator, in particular, was noted for its import, with one journalist in 1881 remarking that they "had to make twelve office visits, eleven of which required an elevator. He calculated that he was lifted a total of sixty-two stories, an average of more than five -and-a-half for each trip," but that does not discount the value of artificial lighting and conditioning.[10] In 1887, The *Sanitary Engineer*, an engineering journal of the time, criticized the growing buildings for their unsafe construction conditions, citing "absence of sunlight and dependence on artificial light" and "difficulty of providing adequate ventilation" among other complaints.[11] Criticizing them on their separation from nature, as well as on fire safety concerns, is something that modern building construction has been critiqued on for nearly as long as the practices allowing it to do so have existed. Once people found a way to free themselves from the demands of their environment and empower their buildings to be warm, lit,

[8] Merson, John. *The Genius That Was China: East and West in the Making of the Modern World*. Woodstock, NY: The Overlook Press, 1990. https://archive.org/details/geniusthatwaschi0000mers/mode/2up.
[9] Overton, Professor Mark. "History - British History in Depth: Agricultural Revolution in England 1500 - 1850." BBC. BBC, February 17, 2011. http://www.bbc.co.uk/history/british/empire_seapower/agricultural_revolution_01.shtml.
[10] Landau, Sarah Bradford., and Carl W. Condit. *Rise of the New York Skyscraper: 1865-1913*. New Haven: Yale University Press, 1999. Pg. 110.
[11] Ibid pg. 113.

and well-ventilated despite their surroundings, the appeal to do so was irresistible. In his book *The Culture of Building*, Howard Davis describes why this phenomena can be better observed in Western culture than elsewhere in the world. Davis argues that:

> "On one hand, buildings exist as stand-alone artifacts, and on the other, they are artifacts that express the deep meanings, aspirations, and social order of a culture. Like the building culture that produces them, they are at the same time autonomous and interdependent with the culture at large."[12]

While in other parts of the world "Only a few [settlements] exist… in cultures where there has been quite a bit of contact with the modern world but where traditional village life persists" while many others "are changing rapidly under the impact of agricultural modernization, industrialization, and the internationalization of the economy."[13] One can understand why a culture in the middle of industrializing would "aspire," as David puts it, to these new building technologies: it makes sense that city dwellers at the time would want clean air inside when its streets were clogged with soot, why bedrooms in New York City were required to have windows to the outside, and how electric heat and light brought comfort and efficiency to many. This is also why at the same time those not subject to the forces of the Industrial Revolution (and not necessarily sold on its aspirations of efficiency and progress) wouldn't see a need adopt a more industrial lifestyle and embrace the changes offered by these technologies. Inferring from Davis' argument that our built spaces reflect on our desires as a culture, it is clear in industrial buildings and their systems that autonomy and control are important cultural values, and that freedom from the previously controlling forces of our environment was a cause for celebration. Without this dependence on the surrounding environment to shape a

[12] Davis, Howard. 2006. The Culture of Building. Cary: Oxford University Press, Incorporated. Accessed April 11, 2020. ProQuest Ebook Central. Pg. 28.
[13] Ibid. pg. 28.

building's design however, buildings were shaped by the harsh practicalities of lot lines, city plans, and mechanical efficiency, where our values, as Davis would label them, were focused on profit and spatial efficiency. By divorcing themselves from their connection to nature, industrial Western civilization found itself separated not just from the harsh controlling factors of nature, but the deep beauty and wellbeing that those forces gave to its inhabitants as well.

With the advent of these modern cities, humanity gained a level of environmental control that far outstripped anything they had previously experienced. As time passed and humanity developed these new innovations further and further, they slowly came to understand what they had lost by separating themselves from their environment. In his book, Building for Life: Designing and Understanding the Human-Nature Connection, Stephen Kellert tries to understand how we allowed this separation to happen, and why we crave a more natural environment to our artificial cityscapes. "Many believe that the progress of civilization," he says, "depends on subjugating and converting, if not conquering, the natural world. Indeed, many see this progression as the essence of civilization."[14] And indeed, when we look back at history, we can see why many make that assumption. The overwhelming majority of our time as a species has been one where our control over our surroundings was superficial or ephemeral: while we had means of mimicking natural phenomena to create shelter or distance ourselves from the elements, our methods of doing so were less complete than what postindustrial solutions are capable of today, and as such our exploitation of our natural resources was similarly less impactful. As time went on, however, civilizations were

[14] Kellert, Stephen R. Building for Life: Designing and Understanding the Human-Nature Connection. Washington DC: Island Press, 2012. Pg. 1.

marked by their built monuments and their control over space, and by that virtue, control over nature. In the present though, the ability to control our surroundings is great, and can take place on an unprecedented scale where "natural diversity [is converted] into largely homogeneous landscapes of impervious surface, consuming enormous amounts of resources and materials, and generating huge quantities of waste and pollutants."[15] As it exists, climate control technology today vastly outstrips its preindustrial counterparts to the degree that when the old of idea progress as dominion over nature is applied to current capabilities, severe problems of sustainability and safety arise as we are now capable of harming our entire planetary ecosystem through our actions as a species. It is this process of urbanization and domination that Kellert argues we must change, as it will inevitably lead to long term problems of sustainability. He also points out that despite the commonly held belief that progress is marked by domination over nature, that "the natural world often seems neither necessary nor germane to the functioning of a modern urban society."[16]

Described as "an innate tendency to seek connections with nature and other forms of life," studies have shown that people who are more frequently exposed to nature are likely better off than those cut off from it. This desire, Kellert explains, is biophilia. Natural space, which I broadly define as "any environment touched by nature, be it plants, animals, landscape, or any combination thereof" has been linked to "rest, relaxation, curiosity, creativity, an enhanced exploratory drive, a greater capacity for problem solving, and the recognition of symmetry and harmony," and generally "led to improvements in qualities like self-esteem, self-confidence, and 'self-concept.'"[17] To

[15] Ibid. pg. 2.
[16] Ibid pg. 3.
[17] Ibid pg. 15-18.

put it plainly: being in or around nature makes people feel and perform better. In many of our modern-day cities, nature is confined to small, designated areas: corner parks, potted greenery, or neighborhood gardens. These small concessions are beneficial, Kellert explains, and even just depictions of nature have proven beneficial, but many contemporary city-dwellers aren't even exposed to nature in that small degree, and this deprivation has been linked to increased levels of stress and poorer emotional well-being.[18] He also writes that this connection to nature is tied to what he calls a "spirit of place," and that places that are culturally and ecologically cherished places are perceived as more valuable than their surroundings because of an innate appreciation our species has for these places to provide us with the benefits listed above.[19] This desire to bring natural forms into the built environment brings us at last to the present moment – where studies like Stephen Kellert's emphasize the value of biophilia in design, and building systems like LEED and the Living Building Challenge grade building designs partly on its connections and interactions with its environment, as well as its ability to improve its surroundings. From here, the future of ecological design seems to be seeking a middle ground not unlike the previous example of the windscopes; by using our own technological advancement to enhance and improve our spaces by working in concert with our environment, designers should strive to create safe, controllable spaces that celebrate the human connection to nature rather than separate us from it. The SUNY College of Environmental Science and Forestry's Gateway Center is a contemporary example of a building that seeks to strike this balance in its construction. The building features an "intensive, 10,000-square-foot

[18] Ibid pg. 14-15.
[19] Ibid pg. 46.

green roof designed to study the environmentally sensitive Alvar Grasslands and Great Lakes Dune plant communities" as well as a "7,000-square-foot combined heat-and-power plant fueled by waste wood pellets" that provides over 60 percent of the campus' annual heating needs and over 20 percent of its energy usage.[20] In addition to the literal incorporation of nature into the form of the building's roof and energy systems, every part of the building is within 15 feet of an operable window, allowing users the freedom to regulate their environment themselves and connect them to outdoor views.[21] Combined with intelligently placed shading devices north and south facades of the building that regulate daylight to prevent unnecessary heat gain while still lighting much of the building naturally, the Gateway Center was one of only ten buildings selected by the American Institute of Architects' Committee on the Environment (COTE) in 2014 to receive recognition for how well it balanced principles of responsible, sustainable design with design principles that promote human wellness.[22] Judging spaces by what they call the "Framework for Design Excellence, COTE looks at factors of Designing for Integration, Equitable Communities, Ecology, Water, Economy, Energy, Wellness, Resources, Change, and Discovery when it examines buildings,[23] and much of what it calls for reinforces the idea of a built environment that connects us to nature the way Kellert's study finds is most beneficial for us

[20] Ward, Lohgan, Katie Weeks, and Annie Milewski. "2014 AIA COTE Top Ten Winner: SUNY College of Environmental Science & Forestry Gateway Center." architectmagazine.com. Accessed April 12, 2020. https://www.architectmagazine.com/design/2014-aia-cote-top-ten-winner-suny-college-of-environmental-science-forestry-gateway-center_o.
[21] Ibid.
[22] Ibid.
[23] "Framework for Design Excellence." The American Institute of Architects. Accessed May 15, 2020. https://www.aia.org/resources/6077668-framework-for-design-excellence.

History of Design and Accessibility

Humanity's relationship to accessibility and accessible space runs parallel to our relationship with our environment for much of our time on earth. Long before the invention of accessibility regulations, ramped access points, and elevators, people still needed ways to get up an incline, across a gap, or around an obstacle that was physically simple enough for the less physically-abled to complete. Additionally, living in a society where the weak and injured can be cared for without having to meet the same demands its healthy and whole counterparts had to is a relatively new state of being. To be clear, I am not arguing that previous societies did not take care of their members who fell sick, grew injured or old, or were born with a disability, but that those injured or less able people were still expected to contribute something to their society in that state of being. Included among those people are not just those with mobility impairment disabilities, but anyone whose senses or cognitive functions were in any way impaired. People with blindness would not take jobs that required sight, but they were still members of their community and expected to find ways of contributing to its survival. Just like how humanity had to find ways to adapt to their natural surroundings and cope with their inability to control their environment, every member was expected to play a part and contribute to their communities. For example, the journal *Social History* examines the working conditions of the average 19th and 20th century British coal miner. By 1938, author Mike Mantin writes, "78% of new disablement cases in Britain were attributed to the coalmining industry," yet the compensation for injuries was "half a workers wages and came with a two week wait." In the miner's position, "even a day out [meant] that someone must go short" and so

those who were injured found ways to return to work or perform other jobs while recovering, relying on their family and community for temporary support.[24] For those miners who were more permanently injured, work was still found at the mine, performing menial tasks operating underground machines or performing "light work" aboveground as a coal picker or an administrator.

The idea that any physically, mentally, or developmentally handicapped person is incapable or working or deserves special social accommodations is a relatively recent one in the scope of human civilization – likely only a few hundred years old in most places, nor is it one that is universally agreed upon. For example, Beth Williamson writes in her book *Accessible America: A History of Disability and Design* about the progression we can observe about the perceived social roles of a person of disability by looking at the artifacts of their time that were designed for them. She references the change we can observe over the last 200 years as the "invalid chairs" of the 1880s, designed to keep people in their homes have been replaced with sleek, lightweight wheelchairs that emphasize mobility and freedom.[25] If we look back far enough, we see that although the science of prosthetics can be dated as far back as the 600s BCE with a prosthetic toe found in Egypt, and later, an entire leg found in Capua, Italy dating to roughly 300 BCE. We do not see, however, the artifacts of disability that Williamson describes. This is because she starts the discussion on her book's subject matter in the 1800s after a significant cultural shift has occurred.

[24] Goodwin, Grainne, and Grainne Goodwin. "Disability and Coal in 20th-Century Britain by Mike Mantin." Social History Blog, April 11, 2016. http://socialhistoryblog.com/disability-and-coal-in-20th-century-britain-by-mike-mantin/.
[25] Williamson, Bess. *Accessible America: a History of Disability and Design*. S.l.: New York University Press, 2019. Pg. 193

Starting in the Industrial Revolution, around when we see the major technological elements that allow humanity to divorce its built spaces from their surrounding environments, we can also observe a significant shift in the way we structured Western societies. In his analytical article on Maurice Dobb's *Studies in the Development of Capitalism* for the *Cambridge Journal of Economics*, Robert Brenner describes how this shift came to be. The feudal system of the Middle Ages had begun to crumble as their new, more efficient agricultural technologies freed feudal laborers to pursue other work as a new "trading bourgeoisie class." As this group of people grew, inhabitants of former farming communities moved towards cities and burgeoning urban centers to find work in factory production lines and mining facilities. As this new wage-earning middle class entered the economy, which in turn "[impelled] the construction of new, more suitable (capitalist) class relations.[26]" While the new capitalist system had still just begun, humanity's relationship with disability and disabled persons remained the same: similar to the previous story of English coal miners, everyone old enough to work had to work every day because it was the only way to afford the costs of living in their home in a city or new factory town. As time progressed and society destabilized, workers organized into unions and bargained with employers to secure for themselves certain protections and a living wage. It is this movement, which began in the early 1800s and solidified by the end of the 19th century,[27] where we begin to observe the shift in our perception of disability. Previously, if someone was injured that had to continue working because they still needed to put food on the table. With protections like hazard

[26] Brenner, Robert. "Dobb on the Transition from Feudalism to Capitalism." *Cambridge Journal of Economics* 2, no. 2 (1978): 121-40. Accessed April 22, 2020. www.jstor.org/stable/23596403.
[27] History.com Editors. "Labor Movement." History.com. A&E Television Networks, October 29, 2009. https://www.history.com/topics/19th-century/labor.

pay and a living wage however, middle class workers made enough money to fall back on savings in hard times and were compensated for on the job injuries promptly and fully (at least in theory), and a social stigma grew up around people who still had to work if they were disabled and they were labelled "invalids," unfit for work, people to be sheltered from the public eye.[28] This stigma grew more pronounced in the 1900s as "new ideas of streamlining design and eliminating inefficiency inspired similar ideas about eliminating 'human inefficiency' as well."[29] As new ideas about eugenics spread across the globe, gaining prominence and being featured on global stages like World's Fairs, people with physical and cognitive disabilities were more and more frequently encouraged to stay hidden from polite society rather than continuing to live as normal to not embarrass their families. This breakaway from traditional responses to disability neatly parallels our break from our natural surroundings both in time and in spirit (attitude): both occurred during the later end of the Industrial Revolution and both came about from new technologies that made such opportunities possible. Although our relation to our environment has shifted again, this time towards understanding our connection to it (biophilia) and seeking to strike a balance between our natural and artificial environments, this social stigma surrounding disability and accessibility remains to this day.

[28] Williamson, Bess. *Accessible America: a History of Disability and Design*. S.l.: New York University Press, 2019. Pgs.5-7.
[29] Ibid. pg. 8.

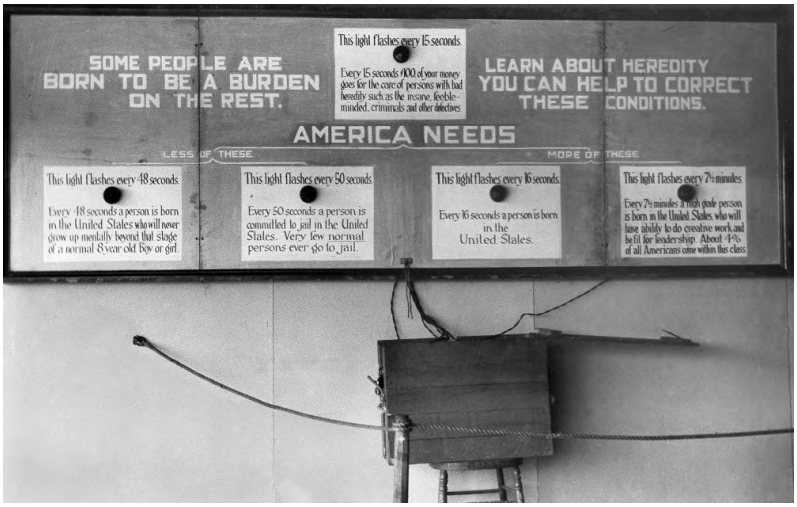

Image 5: American Euegenics Society Display, 1926

An American Eugenics Society display from a "Fitter Families" contest in 1926. In the late 19th and early 20th century, as public ideas of modernity began to embrace the ideas of mechanization and efficiency, some adopted eugenic ideologies of making the human race more "efficient" as well. This signaled a clear break from pre-industrial lifestyles where people lived and worked alongside each other out of necessity, regardless of ability[30]

When looking at our modern-day relationship with disabilities, Bess Williamson focuses on the United States and the idea of the "American Dream" and how people with disabilities were meant to realize that dream. To be clear, Williamson first refers to this idea as the "easy and casual" domestic lifestyle where someone (a man, in the case of this referenced time period) was self-reliant and did not need to look to anyone to help him go about his daily routine, finding the act of relying on others, particularly women, as especially humiliating. Beginning in the 1900s in the wake of the growing popularity of eugenics philosophies, it was only the disabled veterans of both World War One and Two who received any public sympathy for the physical disabilities they

[30] Krzeminski, Jessica. "Whose Utopia? American Ecofascism Since the 1880s." Edge Effects, October 12, 2019. https://edgeeffects.net/ecofascism/.

received fighting for their country. Rehabilitation projects, designed to reincorporate these young men back into American life focused exclusively on "rehabilitating *veterans*, not the larger population of 'the handicapped.'"[31] This idea of rehabilitation spoke of returning these men to a state where they could partake in the American dream and all the activities that came with it. After WWI, these activities included being independent and able to perform basic activities like shaving, driving, and shopping on their own without assistance as both veterans and the US government tried "forcing a 'return' to an imagined nondisabled state."[32]

[31] Williamson, Bess. *Accessible America: a History of Disability and Design*. S.l.: New York University Press, 2019. pg. 28
[32] Ibid. pg.37.

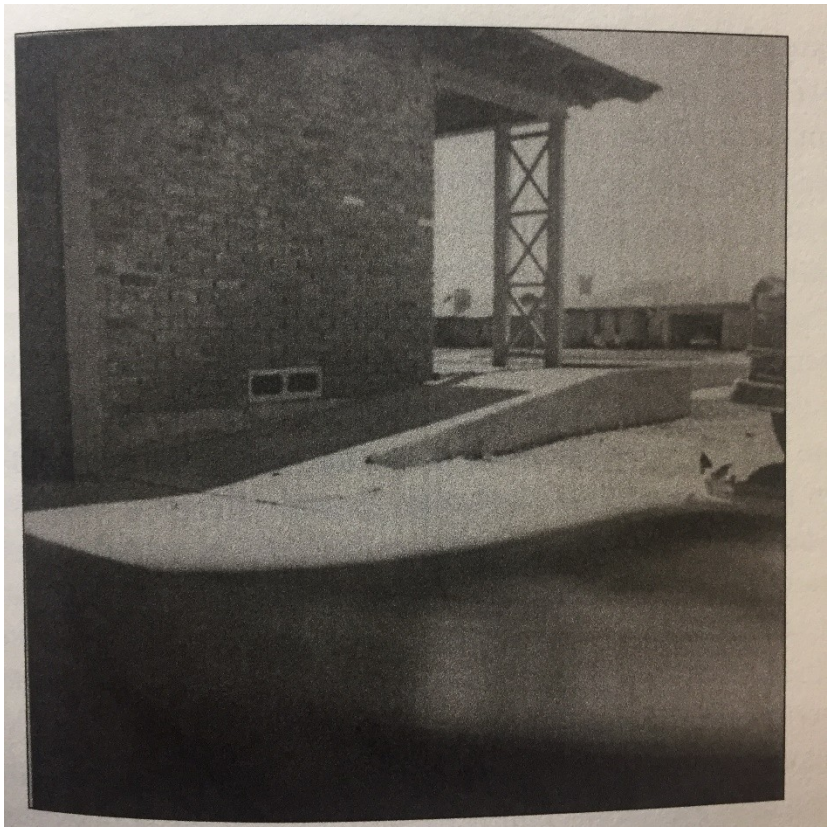

Image 6: Roger Boatwright's Paraplegic House. 1952

"The American Dream," as Williamson describes it in her book, focuses on the public mindset of what it meant to be "normal" and what a "normal" person is capable of and how those expectations shifted over time. While the phrase "The American Dream" has meant many things throughout history and held different meaning for different types of things, the architecture of Williamson's "American Dream" differs greatly from the accepted "American Dream" architecture of the time. Pictured above is the "Paraplegic House designed in 1952 by Roger Boatwright. This house was designed with accessibility in mind as a single story unit capable of restoring independence around the home to its disabled occupant while the "normal" homes of the time were often one or two story structures designed to accommodate non-disabled, nuclear families.[33]

While this was expanded by the Servicemen's Readjustment Act (more commonly known as the G.I. Bill) of 1944 to include things like a college education and homes designed to facilitate inhabitants with wheelchairs, these projects were still

[33] Ibid. pg.39.

aimed exclusively at veterans and were designed to be as “normal” as possible by fitting accessibility accommodation spaces into a stereotypical two story suburban home. Whether intentional or not, this act of design and this focus on the “normal” fed back into the stigma that the rest of “the handicapped” population were *not* “normal,” and by extension were not first class members of society because they were not capable of partaking in the spirit of the American dream. It was homes like those depicted in Image 6 that let disabled veterans participate in the American Dream for themselves. Specifically designed as one story homes, houses like those depicted above restored the idea of autonomy and self-reliance to those who could not find it in a “normal” house layout.

This feeling of being excluded built up over the 1900s, with attempts by communities of people with disabilities to find ways to partake in the freedoms other Western citizens were enjoying after the World Wars, and they took action to fight the lingering stigma of being “handicapped.” With buildings being exhibited like the Weissenhof Estate in 1927 in Germany being noticed around the world[34], it could be noted that modern home design was leaving people with disabilities behind. The estate, which was constructed the same year it was exhibited, was a landscape outside Stuttgart where prominent European architects of the time designed structures meant to showcase the future of “modern, healthy, affordable, and functional living,”[35] these structures depicted a landscape that lacked simple accessible features that many people with disabilities would need to live in such a space, with features like entrances to the building being built on slopes that required a staircase to navigate.

[34] “Welcome.” Weissenhofmuseum. Accessed May 15, 2020. https://weissenhofmuseum.de/en/siedlung/#.
[35] Ibid.

In *Accessible America*, Williamson writes about how people with disabilities found their sense of freedom and independence in performing everyday tasks like cooking, getting dressed, or cleaning because "performing these activities with as little help as possible meant avoiding being perceived as 'homebound,' 'invalids,' or 'shut-ins,' or having to live in an institution."[36] In the mid-1900s, these labels were effectively social suicide, and someone perceived as "homebound" or "invalid" suddenly found themselves forced into the position of one, regardless of their abilities. Due to a recent surge in the number of people in the disabled community with the addition of polio survivors, this desire for independence led to the formation of new communities through media, where people with disabilities could feel connected and share solutions to living in a society that didn't accommodate them. Magazines like the *Toomey J Gazette* were written by members of the disabled community to share stories and encourage a "do it yourself" attitude to living independently with a physical disability. These publications contained stories from readers that reaffirms "their aspirations to a certain model of midcentury American [everyday] life: living in single-family homes, driving automobiles, and using the appliances and conveniences of middle-class comfort."[37]

[36] Williamson, Bess. *Accessible America: a History of Disability and Design*. S.l.: New York University Press, 2019. pg.83.
[37] Ibid. pg.76.

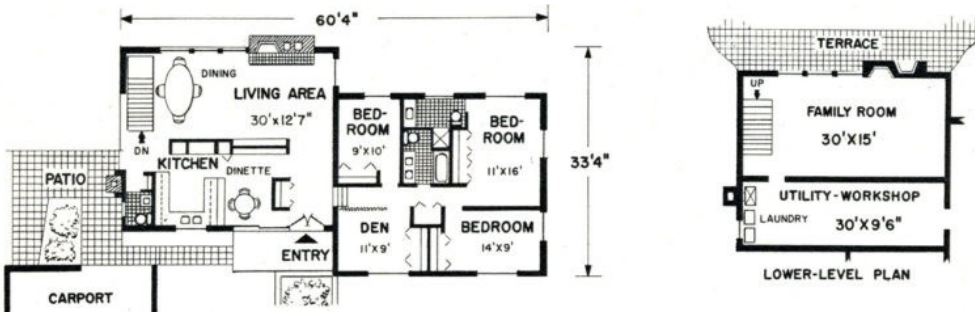

Image 7*:* Floor plan of a prefabricated 1950s home

Depicted above is an example of a typical, prefabricated single family home from the 1950s. Notice that the front of house spaces (kitchen, living area, where guests might see) are separated from living spaces (bedrooms, family spaces) by stairs, making traversal difficult if not impossible for people with a physical disability to live in this style of home. It was because of divides like this, as well as their inability to use other everyday devices like automobiles or kitchen equipment that drove people with disabilities to seek others who understood their desire to fit in in publications like the Toomey J Gazette.[38]

The attitude held by these communities was not enough to however, to combat the social separation between them and the able-bodied world that didn't seem to recognize their struggle. For example, "Members of the medical establishment often ignored or dismissed patient input, assuming that whatever medical supply companies or research programs had produced was good enough" and introduced many families from privileged backgrounds to "life on the margins of consumer culture" when a family member came down with polio.[39] According to the CDC, over 16,000 paralytic polio cases were reported each year from 1951-1954.[40] And as public exposure to the

[38] Warycka, Andrew. "What Did a Typical 1950s Suburban House Look like? Feast Your Eyes on This Fab Prefab Home Built in 1958." Click Americana, October 31, 2019. https://clickamericana.com/topics/home-garden/look-whats-happening-to-prefabs-1958.
[39] Williamson, Bess. *Accessible America: a History of Disability and Design*. S.l.: New York University Press, 2019. pg.78.
[40] "Achievements in Public Health, 1900-1999 Impact of Vaccines Universally Recommended for Children -- United States, 1990-1998." Centers for Disease Control and Prevention. Centers for Disease Control and Prevention. Accessed April 22, 2020. https://www.cdc.gov/mmwr/preview/mmwrhtml/00056803.htm.

social margins grew across the Western world and the United States specifically, a new generation of people with disabilities were no longer content to live on the outskirts of society.

In 1977, new building guidelines were established at the federal level in the United States that addressed problems of accessibility design and the creation of a "barrier-free environment" in public buildings. These guidelines raised a" a number of questions for the institutions and their architects who must comply with it" regarding accessible design and what obligations designers had towards communities of people with disabilities that might use their buildings. Around the same time, people with disabilities were rebranding the idea of independence being linked to the "do it yourself mentality" of the earlier 1900s and changing it to be "the freedom to make life decisions for themselves."[41] With the new guidelines in place and this new, growing mentality of independent choice among the community, the stage was set for political change. Beginning in San Francisco in 1977, protesters started calling for a more accessible and accommodating American Dream, specifically beginning around the language of Section 504 of the 1973 Rehabilitation Act. This Section guaranteed inclusion and freedom from discrimination to any "otherwise qualified handicapped individual… solely by reason of [their] handicap." The previous idea that a hard-working, do it yourself lifestyle was all someone needed to participate equally in society was false they argued, and by creating a society that was inherently prohibitive to people with disabilities, society was actively trying to exclude them from participation. Section 504

[41] Williamson, Bess. *Accessible America: a History of Disability and Design*. S.l.: New York University Press, 2019. pgs.96-97.

was hotly debated and protests demanding for its full implementation were eventually successful as it was signed on April 28, 1977.[42]

A similar argument arose again from protestors in the 1980s around the University of Berkeley, who drew from the social controversy around decisions to add ramps to public building, and the shock that came from photographs of disabled people in public places. Specifically, the book *Ramps are Beautiful* by Michael Chacko Daniels, was held up in argument to this controversy. Consisting of a collection of photographs of ramps in the Berkeley area, Daniels put the book together as "a reaction to debates over plans to ramp major public sites in the Bay Area" to say that "aesthetics should be in tune with the moral values of an age" and to argue that accessibility was a basic human right.[43] Combined with photography of students from Berkeley with physical disabilities going to the park or attending sports events, the message of the protestors became clear: The photograph documents [of] disabled students' move into public space… is not overtly political," but the fact that they were daring to participate so openly in a society that rejected them "became the subject of a political action and organizing on both local and national levels."[44] It was these protests, year after year across the United States that provoked the U.S. government to pass a series of Accessibility laws that ultimately culminated in the Americans With Disabilities Act of 1990 (ADA) that laid down clear, strict guidelines that regulated accessibility in both new construction as well as renovations. As time progressed however, it has become clear that ADA guidelines are not doing enough to ensure that built spaces are accessible. Elevators seemed to be hidden away in the backs of buildings, ramped

[42] Ibid. pg.130.
[43] Ibid. pg.123.
[44] Ibid. pg.104

entrances come into the sides of buildings and open into hallways while stepped front entrances have grand lobbies or reception rooms, and it was still clear that society thought about people with disabilities as secondary users in society.

It was architect Ron Mace, who was wheelchair-bound himself that put this problem into words in the 1980s and 90s. A huge defender of accessibility, even before the ratification of ADA, described his as his "'ultimate frustration' to see buildings where architects and engineers tacked on access features only when they realized the need to comply with government regulations." He argued that those buildings still "ended up being discriminatory after all," and only reinforced the message that people with disabilities were a "marginal afterthought."[45] He did not believe that designing a building to be accessible had to be unattractive, expensive, or even particularly hard, and in 1985 he officially penned the term "Universal Design" in an article for *Designers West* magazine. Universal Design argues for a return to more applicable solutions that do not rely on modern technology to work, and in a way, it recalls mobility solutions of the past.

Looking at the buildings on the cliff in Thera, Greece there aren't any stairs connecting the upper region of the settlement to its coastal harbor because the designers were explicitly trying to create a more accessible harbor but because a switchback road going up the hill made traveling easier for all pedestrians as well as carts and animals. To reference the hill town Mojacar in the Almeria region of Spain, the steep hill town spreads down the hill and extends into the surrounding topography as sloped roads allow pedestrians and vehicles to travel along it. And while I am sure there are some

[45] Ibid pgs.147-148.

areas with stairs that allow shortcuts through parts of terrain too steep for ramps, houses are clearly laid out along the topography to create roads through them that are as sloped very gently, easing travel for everyone while simultaneously creating a beautiful, meandering street on the hill.[46]

Some examples to current-day designs that have been implementing similar ideas into their designs are the work of the firm Bjarke Ingels Group (BIG), whose projects weave themselves into their natural environments where possible and bring nature into spaces where integration is not achievable while also remaining conscious of the existing landscape and how their buildings can enhance and take advantage of those environments rather than dominating or changing them. One project of particular note is the Gammel Hellerup High School in Hellerup, Denmark. The new multipurpose hall was built under the existing school courtyard so as not to impose of the views or existing context of the site, while a new classroom space was situated under the existing football field and shapes the natural terrain to create places that naturally encourage students to gather and socialize.[47] Both facilities' front entrances can be reached by stair as well as by ramps that follow the gentle grade of the natural surroundings Similar to the layout of Mojacar, design principles like the ones used by BIG combine the demands of contemporary construction with the natural advantages of the surrounding environment humanity has been using for its entire history.

[46] Rudofsky, Bernard. Architecture without Architects: A Short Introduction to Non-Pedigreed Architecture. Albuquerque: University of New Mexico Press, 1987. Pg. 35.
[47] "NEWS." BIG. Accessed May 15, 2020. https://big.dk/#projects-ghg.

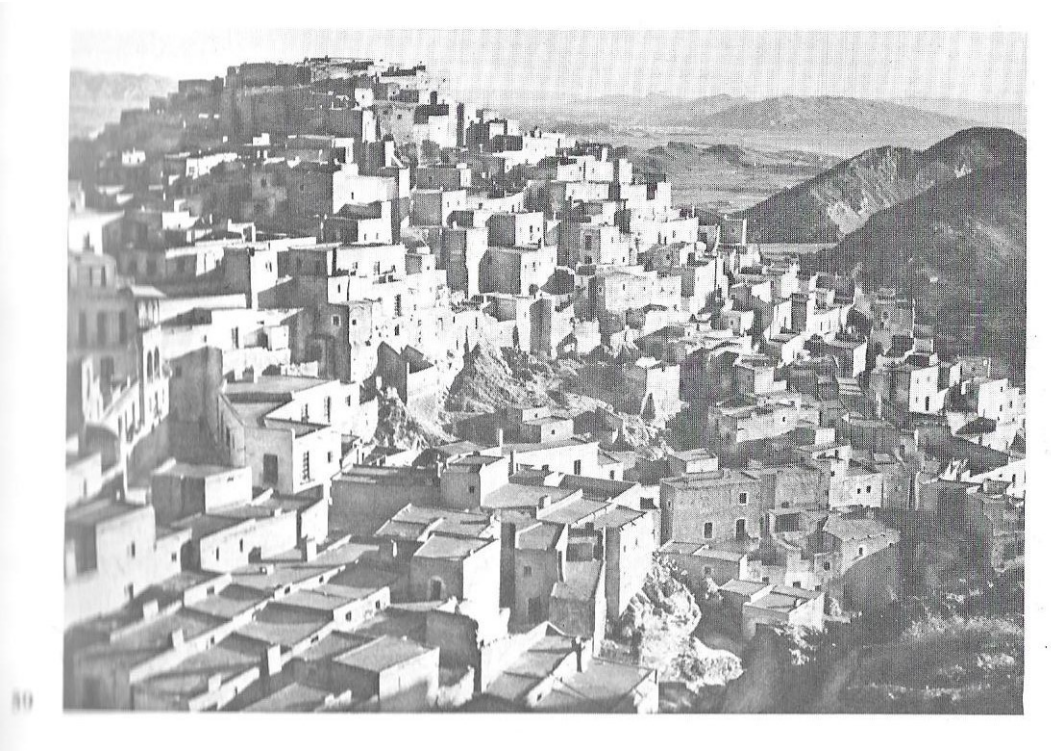

Image 8:Aerial View of Mojacar, Spain

Depicted is the town of Mojacar, Spain, designed in the 8th century CE, the town was built around a fortress at the top of the hill and laid out its streets to follow the natural topography of the area, making it easy to lay roads that could accommodate both foot and vehicle traffic easily without excess landscaping. Because it was specifically designed to facilitate foot traffic, these streets follow the topography in a way that makes them inherently walkable and accessible wherever low-tech solutions were possible.

Mace argues for simple, low-tech designs that are usable by everyone without compromising their aesthetics, including gently sloped ramps, door handles instead of door knobs, easily noticeable elevators buttons by the floor that could be kicked, and other solutions that made spaces universally accessible without compromising the a design's quality. Another key proponent of Universal Design is that creating accessible spaces doesn't just help people with the obvious physical disabilities that come to mind when someone thinks about a disabled person, but that those design principles aid a

wide array of people, and even help non-disabled people be more aware of the struggles that their disabled counterparts go through when they realize how many public buildings lack these accommodations. While only a relatively small number of people can relate to or cares for somebody in a wheelchair, but many people have or know somebody with arthritis, joint pain, or who struggle in their old age to navigate stairs simply because they've grown weaker. In my opinion, Universal Design principles enhance public spaces, and I believe modern design practices about environmental design can be incorporated or modified to Universal Design principles to remedy the discrimination still evident in many contemporary buildings.

Design Parallels

Before the technological revolutions that began in the early 1800s, one could not design a successful building without first considering the different environmental challenges the surrounding ecosystem would impose on it, and part of those challenges was ensuring the building was easy for people to reach and use. Evidence of this can be found when examining the different images from earlier chapters of this work. The amphitheater spaces shown in Image One had to be cut to allow people to access it easily or else its purpose as a gathering place cannot be fulfilled. Likewise, the city of Thera in Image Three follows the natural topography when constructing their roads to allow people and carts to navigate the terrain in a time before lifts and cranes could carry people or goods. Depicted below, a Göreme cone is conical rock in the Anatolian valley that was shape first by the elements, then hollowed out for human habitation. Cones as large as 16 floors were built in the seventh century CE and wide tread stairs (sometimes nearly a meter deep) were used to make the vertical ascent gentler on those climbing the staircases.[48] Before the widespread use of the automobile (early 1900s) and the elevator (late 1800s), part of designing a building for its environment was making a building people could get to and from easily, even if they were encumbered or otherwise handicapped. The fact that disability rights movements, as well as accessible design philosophies like Universal Design had to struggle for decades in the late 1900s to see any progress towards fixing what they identified as key problems with modern-day accessibility and inclusion in building design is evidence that the modern way of life has broken the link between natural and accessible design that has been present

[48] Rudofsky, Bernard. Architecture without Architects: a Short Introduction to Non-Pedigreed Architecture. Albuquerque: University of New Mexico Press, 1987. Pg. 23.

since humans first had to design space. And while environmental considerations are once more one key aspect in the design of many contemporary buildings, designing a building to be accessible is infrequently considered part of that process other than a series of minimum requirements mandated by national governments.

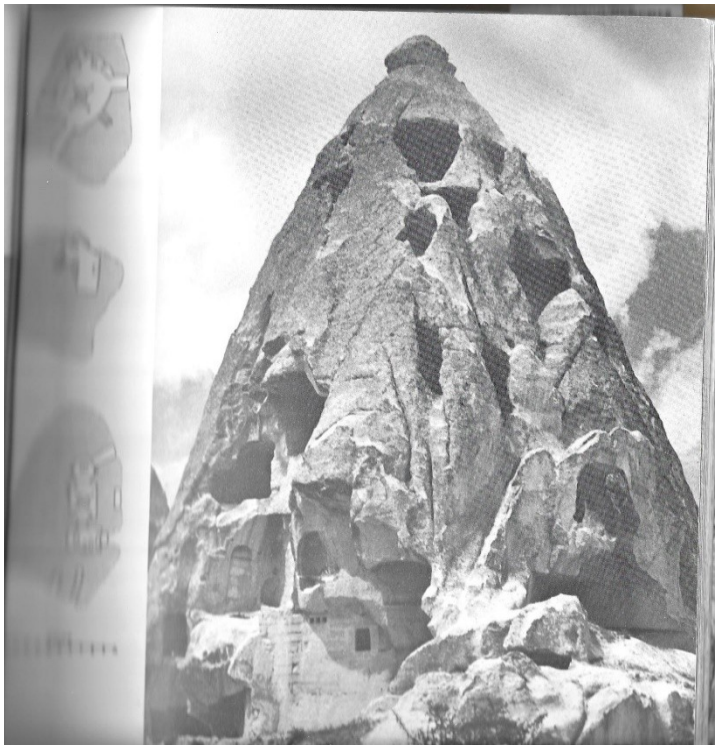

Image 9: Göreme Cone, Anatolian Valley, 7th century CE

Created around the year 600, this Göreme Cone makes spaces as accessible as possible for the technology available to its creators at the time. While something like a ramp for a wheelchair or an elevator was not possible, wide, shallow steps were carved between levels. With treads nearly a meter deep, this heavily reduces the strain of climbing on people with disabilities as well as the elderly and the sick while doubling as resting platforms for those climbing multiple stories.

The specific reasons for this are unclear, and it would be difficult to pinpoint a precise moment that Western culture decided that disability design should no longer be included in a building's response to its environment, but several defining factors can be identified. As described in previous chapters, the technological possibilities that became available in the 1800s suddenly offered mechanical solutions to environmental design problems humanity had struggled with for thousands of years. Simultaneously, similarly advanced technology made travel easier and faster, and as roadways replaced rail systems across the world, new social lifestyles valued travel, freedom, and the open

road, and those unable to participate in these lifestyles without special accommodations became targets for pity and were cast to the outskirts of society.

The way the Western world treated these two sets of solutions differently is what set the stage for the separation modern society has made between the environment and accessibility. While technology was held up as a solution to the "problems" posed by nature, the way those solutions were implemented into our societies is what matters. Very few people are disadvantaged when machines that regulate a building's climate are installed. Some people who are sensitive to fragrances might complain about a recycled air system, but for the most part things like interior heaters, air conditioners, and humidifiers benefit everyone equally. This "everyone benefits equally" scenario is not the case when matters of accessibility are addressed. While highways and automobiles have made moving goods and people around faster and easier than ever before, and electric elevators have vastly increased the amount of usable building height that can exist in any one space, these benefits are not shared remotely equally. While the average Western adult alive today can drive a car or take a bus to get somewhere, and is perfectly capable of walking a few flights of stairs if the elevator at their destination is under maintenance, a large number of people are unable to solve that problem so easily. According to the University of New Hampshire's Institute on Disability's 2017 Disability Statistics Annual Report, "the overall rate of people with disabilities in the US population in 2016 was 12.8%" and that "the percentage of those with a disability… slowly increased from 11.9% in 2010 to 12.8% in 2016,"[49] meaning that over one in ten people in the US would face some challenge over the steps of that trip. If they are still

[49] Kraus, L., Lauer, E., Coleman, R., and Houtenville, A. (2018). 2017 Disability Statistics Annual Report. Durham, NH: University of New Hampshire.

capable of operating an automobile, a disabled individual would need to first purchase one that is specially made to accommodate them. If they don't live somewhere that where that option is available, or they're experiencing car problems, they have to hope that their local public transportation is capable of accommodating them, which might not be a possibly depending on the extent of their disability. Finally, if they do manage to make it where they want to go, but the service elevator is out of order, there may be nothing for them to do but turn around and go back home. While contemporary technologies like magnetic or non-vertical travelling elevators now exist, the fact remains that the bounds of average building construction still constrain how people navigate built spaces. In this way, accessible design is not as simple and easy as the standard solutions implemented in regulating a building's interior climate.

Despite the efforts of decades of social reforms, the social stigma of the "invalid" seems to have persisted to the present, because if it had been abolished, accessibility accommodations would not be so rare. Accessible automobiles could be bought off the lot of a car dealer, accommodating public transit would be the norm, and accessible public spaces would incorporate design solutions that enable all visitors full access to the space. By perpetuating the perception that people with disabilities are incapable of participating fully in contemporary society, we are actually making it so. The same study by the University of New Hampshire in 2017 shows that "over half (51.0%) were people in the working ages of 18- 64, while 41.4% were 65 and older."[50] Of those working-age people, the highest employment percentage was for people who were classified as having hearing or visibility disability, but those percentages were as

[50] Ibid.

low as 51.7 and 43.5 percent respectively, and that a gap of $10,000 existing between the average earnings between people with disabilities and those without – a trend that has been existed since at least 2008, and has gotten worse since 2013.[51] While small discrepancies in employment rates and earning could be explained by people with disabilities struggling to find employment compared to people without disabilities, the fact that the most employed category of people with disabilities has an unemployment rate of nearly 49 percent is not one of those small discrepancies, and suggests that by treating people like they cannot contribute to society creates a mindset that discourages people from employing people with disabilities over people without, and may even discourage those with disabilities from even trying to be a part of their society in the first place.

In addition to the social perceptions of disability holding people back in our society, the development of accessible design solutions that enable people with disabilities to interact with their communities seems to be trapped decades in the past; similar to how our environmental design solutions were in the early and mid-1900s. Back then, we realized our design solutions that removed us from our natural environments were just as harmful as they were helpful, we changed the way we designed space and looked to our past: we incorporated more natural elements into our buildings, we promoted biophilia, and we looked for solutions that struck a balance between the natural and the artificial. While accessibility guidelines like the Americans with Disabilities Act provide us with artificial guidelines to design problems, they do not draw from the knowledge of generations of accessible spaces humanity has

[51] Ibid

historically built upon. Towns like Mojacar, Spain aren't beautiful, accessible spaces because all of their slopes are a precise slope, or because every room has a proper turning radius, but because they designed beautiful streets that regulate their elevation by the slope of the hill it is built on, blending biophilia with Universal Design, and creating a powerful "spirit of place" that persists to the present day. Inhabited in prehistoric times, then again by the Romans and later by Arab armies in the 8th century, the city clings to the slope of a hill, the settlement circling a castle the Moors built atop it.[52] The city's old fashioned layout that follows the local topography has served it well even to the present day, where sloped roads that once served carts now serve automobiles and pedestrians. While some visitor reviews online mention that the slope is steep at times for people with significant mobility problems, there is also mention of lift transportation to notable locations in town.[53]

There is, however, an institutional aspect to why this change to accessible design hasn't changed as well as a social. Throughout the Western world, different systems exist to regulate environmental design, and awards and certification are given to the designers and buildings that embrace these ideals who in turn display these accomplishments publicly. While some awards do exist for buildings that embody the ideals of Universal Design, they do not exist on the same magnitude as major environmental design institutes, and therefore go unnoticed by the community at large. The magnitude of these institutes matters, as many designers and clients seek

[52] "History of Mojacar in the Almeria Province, Places of Interest, Andalucía, Southern Spain, Costa Almería." History of Mojacar in the Almeria province, Places of interest, Andalucía, Southern Spain, Costa Almería. Accessed April 15, 2020. https://www.andalucia.com/villages/mojacar/history.htm.
[53] "Plaza Nueva (Mojacar) - 2020 All You Need to Know BEFORE You Go (with Photos)." Tripadvisor. Accessed April 15, 2020. https://www.tripadvisor.com/Attraction_Review-g580270-d5992218-Reviews-Plaza_Nueva-Mojacar_Province_of_Almeria_Andalucia.html.

accreditation from major certifying bodies like Leadership in Energy and Environmental Design (LEED), who in 2016 registered over 700 new projects each month.[54] Even smaller, more exclusive certifications like the Living Building Challenge, which only counts 24 fully certified buildings globally, benefit from the attention these larger programs bring to the field of sustainable environmental design, giving them the exposure they need to run their programs and inspect buildings in ways that a similar institute focused on accessibility cannot.[55] For example, as an architecture student, I was able to name several regulatory bodies for sustainable design after only a few moments thought but had to turn to the internet to verify whether or not such a thing existed for accessible design. While I've conducted no formal interviews, the friends, family, and classmates that I've spoken to outside the field of architecture have heard about LEED and understand at least vaguely what role it plays in construction, while none have ever heard of a parallel for accessible design. While the opportunity exists for such a program to come about, or for an already existing program to absorb elements of Universal Design into itself, there is even reason to believe doing so would benefit both programs to an even greater extent. Stephen Kellert describes the formation of the "spirit of place" as occurring when people are exposed to "culturally and ecologically cherished" spaces where inhabitants experience biophilia: their connection to nature.[56]

There is another important reason for why the existence of an institute like LEED would benefit the field of accessible design: that as it pushes designers to create

[54] "LEED by the Numbers: 16 Years of Steady Growth." U.S. Green Building Council. Accessed March 25, 2020. https://www.usgbc.org/articles/leed-numbers-16-years-steady-growth.
[55] "Living Building Challenge Case Studies." International Living Future Institute, October 14, 2019. https://living-future.org/lbc-3_1/case-studies/?certs=living.
[56] Kellert, Stephen R. Building for Life: Designing and Understanding the Human-Nature Connection. Washington DC: Island Press, 2012. Pg. 46.

more accessible spaces, the baseline for what we as a society consider an accessible building will improve. Over its 20 years of existence, LEED has rating buildings using four different systems, each one being refined in small iterations until it has become so different from what it was originally that it is rebranded as a new system altogether. In this way, LEED versions one through four have come into being, and version four is presently called version 4.1, having undergone some redesign since its original implementation. The important thing about each of these implementations is that each one further refines LEEDs goal of encouraging sustainable design as well as pushing the envelope for what a building has to do to receive recognition for its sustainable practices. To give one example, when comparing the requirements a building had to meet in the year 2000 to receive points towards its certification in the category of Sustainable Sites, it was only required to reduce stormwater runoff from the site by 25 percent.[57] In present-day version 4.1, the same amount of credit is given to a building only after it demonstrates that it can reduce stormwater runoff from its site by 80 percent.[58] It is through constant refinement and the pursuit of creating sustainable building that LEED has pushed the field of sustainable design forward, and is proof of concept for how a similar foundation might do the same for the field of accessible design.

Having built accessible forms in nature for generations, our cherished spaces stand only to gain by learning to implement spaces with natural solutions to

[57] Malin, Nadav. “LEED: A Look at the Rating System That's Changing the Way America Builds.” BuildingGreen. BuildingGreen, April 29, 2016. https://www.buildinggreen.com/feature/leed-look-rating-system-thats-changing-way-america-builds.
[58] Required. “LEED Credit Library: U.S. Green Building Council.” LEED Credit library | U.S. Green Building Council. Accessed March 31, 2020. https://www.usgbc.org/credits.

accessibility. Because when a space is accessible to more people, it stands to become cherished further and be further embraced by its community. In this way, contemporary sustainable design practices like LEED are synergistic with the practices and beliefs of Universal Design, each one plays off the strengths of the other to enhance the value and experience of a place. The fact remains however, that this practice has not been widely implemented and that questions of how such a system might be created remain unanswered. It is clear however, that such a system would drive the field of accessible design forward and raise the baseline for accessible spaces everywhere as it strives to create spaces where everyone is equal. In pursuing this goal, humanity only stands to grow stronger and more diverse communities – communities where everyone is empowered to participate with their fellows on equal ground and people with disabilities are seen not as a weight on society, but as fully capable and participating members.

Reuniting Environmental and Accessible Design

Having established a critical historic link between environmental and accessible design considerations, while also recognizing the relatively recent separation of the two, the forces that drove such a separation and the possible benefits from re-forging that old connection, we are now capable of addressing the underlying problems of this issue and proposing different solutions to solve them. To do so, we must consider similar problems that designers have faced in the past and draw from their solutions to form our own. Additionally, we must then tailor those solutions to our problems in such a way that they do not compromise the underlying goal of providing accessible spaces to all people. For example, a solution that provides for accessibility to people who need wheelchairs is well and good, but if it doesn't also address concerns held by the visually impaired or people without upper body mobility, then it is incomplete. Because of the sheer breadth of the problem and the impossibility to fully categorize all forms of disability, any attempt at a solution must be similarly broad, providing overall guidelines and suggestions without trying to regulate everything to a degree of precision that laws like the ADA specify.

I would offer that to be successful, a solution would borrow its form from pre-existing environmental design certification systems like LEED or the Living Building Challenge. These are systems that already exist to rate newly constructed projects and award them different levels of certification depending on how well they follow certain environmental design guidelines. Even if a proposed solution didn't recommend any cooperation between this new system and existing environmental design systems, a regulatory body that certified new construction and participated

heavily in a building's design process similar to LEED or the LBC would foster a new level of discourse around accessible design that would creep into the public consciousness and naturally encourage designers to find synergies between these two categories of design. By cooperating or even fully integrating into one of these existing, internationally recognized programs, I imagine the desired result of a more accessibility-conscious built environment would come about more quickly than if a program were to establish itself from scratch.

For example, LEED 4.0 (the current edition of LEED that new construction is scored by) breaks its requirements down into three categories: Prerequisites, Credits, and Points.[59] Prerequisites are requirements that a new building must meet before it can qualify to receive any evaluation for LEED certification. Even if the building utilized cutting-edge environmental controls and efficient energy-saving systems, if it fails to meet even one Prerequisite, it cannot receive even the lowest LEED certification. These Prerequisites are fairly simple however, and are in place to ensure that a building that applies for review is a complete, safe structure that is fully enclosed and compliant with local building laws for its state and/or country. Once a building confirms that it has fulfilled every Prerequisite, it may apply to receive Points for completing different LEED Credits. Credits are different systems or design requirements a building can incorporate in order to receive Points that improve its overall certification level. According to the LEED Credit Library, there are 10 Prerequisites and 2721 other credits divided into 29 categories like Water Efficiency, Quality of Life, and Green

[59] "LEED Credits, Prerequisites and Points: How Are They Different?" U.S. Green Building Council. Accessed March 25, 2020. https://www.usgbc.org/articles/whats-difference-between-leed-credit-leed-prerequisite-and-leed-point.

Infrastructure.[60] When a building demonstrates that it has fulfilled the requirements of a particular category, it is awarded a number of Points that are totaled into a final score that determines its eventual certification level. A building that has scored 40 or more points is LEED Certified, while a total of 50+ points is LEED Silver, 60+ is LEED Gold, and 80+ points earns a building the LEED Platinum Certification.[61] There are no LEED credits in any of the relevant categories that award any points to a design that address accessibility for disabled people other than the Prerequisite that requires a building to comply with the ADA or its local equivalent standard. Because of this, a new system styled on the LEED Certification system but with credits solely-focused on enhancing the accessibility of a building to all users could exist without directly competing with LEED while benefiting from the existing rating framework already understood by accredited architects and designers. Alternatively, incorporating those credits into the LEED system, perhaps through the implementation of a new LEED 5.0 edition, would immediately place the challenges of accessibility into a position where designers can easily find resources for their problems and receive accreditation for their solutions.

There are downsides to the LEED rating system as well, however. The main problem I see with the Credits and Points system is the way it allows buildings to receive Gold and Platinum accreditations without necessarily addressing the pressing issues of a building. With over 2000 Credits to receive Points for, a building could theoretically score over 80 points without doing anything more than the bare minimum

[60] Required. "LEED Credit Library: U.S. Green Building Council." LEED Credit library | U.S. Green Building Council. Accessed March 31, 2020. https://www.usgbc.org/credits.
[61] "LEED Rating System." LEED rating system | U.S. Green Building Council. Accessed March 31, 2020. https://www.usgbc.org/leed.

for accessibility by focusing its design efforts into environmental controls or energy-saving solutions. While scoring 60 or 80 points likely means a building would have to address multiple design categories in the building, it does not necessitate accessibility being one of those categories. If when incorporating accessibility credits into LEED a solution also tried to require certain accessible requirements, that solution would be faced with the task of determining which forms of accessibility and disability must be addressed as a Prerequisite, and which would become optional Credits. While theoretically possible, any choice made at this point would be inherently exclusionary and would not always allow designers to focus their efforts on accessible solutions they think best fit their building and its intended users. As stated above, this is a broad problem, and our proposed solution must be similarly broad. To find inspiration for such a solution, let us examine a different existing system.

The Living Building Challenge (LBC) is much smaller than LEED, and only has 24 fully certified buildings across the globe in its database. Unlike LEED, where designers may score points from a variety of categories after meeting a baseline set of requirements, the LBC requires buildings to meet rigorous requirements in seven different categories, called “Petals,” in order to receive full certification. These seven Petals are titled: Place, Water, Energy, Health + Happiness, Materials, Equity, and Beauty.[62] The requirements for each Petal are far more demanding than any individual LEED Credit, requiring a new building to contribute positively to the local ecology of a place, use at least 50% less water and 70% less energy than a similar building constructed with standard practices, provide positive Air Quality results from an

[62] “Living Building Challenge Certification.” International Living Future Institute, March 10, 2020. https://living-future.org/lbc-3_1/certification/.

approved system, and reduce waste from the project by 80-100% in different categories, among other requirements in order to receive the full Living Building Certification. With all of those requirements put together, it is easy to understand why so few buildings have received the full certification of the LBC, that being said however, the LBC does offer lower certifications to buildings that fulfill only a few Petals, or meet 100% of its energy needs on-site with its Petal and Zero Energy Certifications.[63] A major difference between the LBC rating system and LEED is how Petals and Credits are written, and the resources each offers to its users. The LEED Credit system is significantly more specific than the LBC's Petal requirements, stating a specific goal for a project to accomplish while providing the intent behind that Credit, as well as offering resources on the same webpage in the credit library where users can find more information about how to achieve that goal. The LBC Petals also explain intent, but requirements are listed mostly as broader goals, with specific and challenging requirements and the tools that will analyze a project to determine if those requirements have been met. As they stand, the broad but demanding form of the LBC Petal system would likely serve as a better framework for a new certification program, but also incorporating the design intent and resources systems from LEED Credits would further help define the new organization's goals and make it more accessible to designers.

When examining the LBC Standard's for its Equity Petal however, its primary concerns about access are to prevent discrimination "regardless of background, age, and socioeconomic class."[64] In this way the LBC is comparable to LEED in regards to disability and design, requiring only that a building complies with the ADA or its

[63] *Living Building Challenge 4.0*. Seattle, WA: International Living Future Institute, 2019.
[64] Ibid. pg. 62.

international equivalent.[65] Both LEED and LBC Standard already recognizes the principles of biophilia for human health and wellbeing, and encourages solutions that integrate multiple Credits or Petal requirements respectively into their designs. As such, integrating practices for human accessibility into the LBC Equity Petal seems like a possible solution that would encourage designers to connect environmental design and wellbeing to human accessibility and wellbeing as well. Alternatively, a new system designed in the LBC's model of Petal categories could theoretically tackle solutions to each category of human disability and require design solutions that promote access and equity for each, creating a rigorous and broad system that could award certifications for each category a building addresses.

There are problems inherent in both of these proposed solutions as well, and chief among them is the LBC's focus and its philosophy. According to statements in their standard, the LBC seeks to "[reestablish] ourselves as not separate from, but part of nature."[66] While at a glance this statement resonates with the proposed goal of reuniting human accessibility and disability design with environmental design, the Living Building Institute's philosophy aligns more with ideas about environmental design after the it was split from accessible design philosophy. It concerns itself with the wellbeing of people through connection to nature and the protection of nature through careful and responsible design and construction, not promoting equality for disabled peoples through careful design solutions. Integrating these requirements into one of the LBC Petals or through creating an eighth Petal would first require a fundamental shift in the Living Building Institute's core values.

[65] Ibid. pg. 62.
[66] Ibid. pg. 10.

This does not mean however, that a new institute modelled on the LBC would not be successful. Instead of the seven Petals that earn a new building a Living Building Certification, a new group could model a similar system based on different types of disability and accessibility. The University of New Hampshire's Institute on Disability sorts them into six categories: Hearing, Vision, Cognitive, Ambulatory, Self-Care, and Independent Living, and I would argue that for the sake of this system, a "Severe Allergen/Air Sensitivity" category be added as well, as air quality sensitivity has come up several times in my research, even if the University of New Hampshire's study does not recognize it in their data. Additionally, I propose that the "Independent Living" category only apply to residential buildings, as it would not apply to other types of buildings. By sorting the problem into broad categories, a comprehensive, rigorous rating system could be implemented that draws inspiration from both LEED and the LBC. If a newly constructed building was seeking certification from this new institutional body, it would first have to ensure that it meets a set of essential prerequisites that raises the building to a baseline of accessibility that is measurably more inclusive than standard construction practices. These prerequisites might require wider circulation corridors, a vigorous air quality control system, alternative vertical circulation systems, and any number of solutions that ensure people of all levels of ability can enjoy the space. To give this explanation an example, let us examine the Ed Rogers Campus building at the University of Berkeley, California. In the image below of the building's floorplan, we can make out large easy-to-navigate spaces, centrally located elevators by the entrance plaza (labelled "12"), and that the main vertical circulation of the space (labelled "9") is a sloped circular ramp that hangs in the entry

space, visible both as a way up but also as a space-defining element in the room that Bess Williamson argues in *Accessible America* is deliberately exaggerated to "[provide] a discursive space to consider the many less-visible form of accessible design in the building."[67] When combined with the automatic doors, accessible restrooms placed evenly throughout the building, and air quality control systems to aid people with chemical sensitivities,[68] the Ed Rogers Campus building would qualify to at least receive the baseline certification from this new system.

[67] Williamson, Bess. *Accessible America: a History of Disability and Design*. S.l.: New York University Press, 2019. pg.187.
[68] "Universal Design Ed Roberts Campus." Ed Roberts Campus. Accessed April 24, 2020. https://www.edrobertscampus.org/design/.

Image 10: Floor Plan of Ed Roberts Campus, Berkeley CA, 2010

Shown above is the Ed Roberts Campus building's first floor plan. Designed to send "a powerful message of inclusiveness to the diverse groups of people who work in and use it," the building features a wide array of systems specifically designed to not only aid people at all levels of ability, but to also call those systems to mind in others and encourage them to consider the prevalence (or lack thereof) of these systems in their day-to-day lives. (Image taken from architecturalrecord.com)[69]

After qualifying for the base certification, designers would receive different categories of certification for meeting further, more stringent requirements in any particular category. These categories would be divided to address different forms of impairment as described above, and would also include stipulations that ensure these solutions are implemented as the main design solutions in the building and benefit from the connection to natural spaces that Stephen Kellert observed to be beneficial to human health and the LBC already promotes in its buildings. This means that the system would

[69] Pearson, Clifford A. "Ed Roberts Campus." Architectural Record RSS. Architectural Record, March 16, 2016. https://www.architecturalrecord.com/articles/7868-ed-roberts-campus.

encourage that sloped vertical circulation systems would serve as design centerpieces in entryways instead being hidden elsewhere in the building, or that navigational signs or paths along hallways and floors encourage human connection to their surroundings as well as to each other, rather than locating them out of the way without regard for making them easy to find or use. This example of the Ed Roberts Campus makes use of solutions like these, with additional elevator call buttons located by the floor for people without upper body coordination, audiovisual aid tools in every meeting room, and a simple and unified typeface for all building signage to reduce overstimulation.[70] The designers of the building even sourced its construction products to meet LEED air quality standards and eliminated materials that emit anything harmful from both their building construction and the cleaning products used when the building is operated.[71] Once fully evaluated under these criteria, this building would receive a certification that is more nuanced than the systems used by LEED and the LBC. Instead of a certification that awards a building for completing a certain number of requirements, this new regulatory system would award a building like the Ed Rogers Campus with a certification that calls out what it accomplished by awarding certification for the categories it excelled in. This method of certification is inspired by the LBC Petal Certification and solves the main problem I have found with the LEED certification system: the fact that a building can receive a highly rated certification by focusing on just a few categories. With this new style of certification, visitors can see at a glance when they look at a building's award plaque what problems it prioritized and

[70] Williamson, Bess. *Accessible America: a History of Disability and Design*. S.l.: New York University Press, 2019. pg.187.
[71] "Universal Design Ed Roberts Campus." Ed Roberts Campus. Accessed April 24, 2020. https://www.edrobertscampus.org/design/.

accomplished, and a building that might capitalize on a LEED system and exploit it for a Platinum Certification will only ever receive accreditation for the categories it addressed in a system like the one I have proposed here.

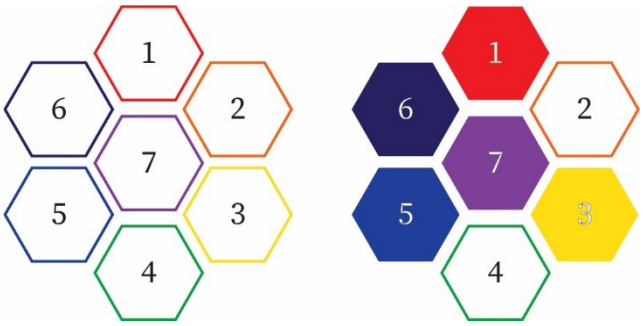

Image 11: Example Design for an accessibility certification system award

A proposal for what this solution's certification might look like for a residential building. This system would grade building for their performance at accompanying people with disabilities in the 6 categories outlines in the University of New Hampshire Disability Statistics Annual Report, as well as Air Sensitivity. A non-residential construction would look the same but with the 7th category (Independent Living) removed from the center. A building that receives a baseline certification would receive a plaque or certificate with each hex (representing different categories in the system) outlined, but not filled in. If a building exceeds the baseline requirements to become fully certified for that category (similar to LBC Petal Certification), that category would instead be filled in, not outlined. In the example above, the certification on the left indicated that there are seven categories this body analyzes a building for, and that a building with this award has earned a base certification in all categories. The certification on the right indicated that a building with this certification has earned full certifications in categories 1,3, 5, 6, and 7, and baseline certification in categories 2 and 4. It would be possible to receive baseline certification in some but not all categories, which would result in an incomplete hexagon shaped award, but to receive a full certification in any category a building would first be required to meet the baseline requirements for each category.

Alongside this proposed certification system, I have designed a building in my capstone design studio at the University of Oregon that aimed to accomplish the goals set out by such a system and would receive full certification for the solutions it has

implemented to enhance its spaces to unite accessible design and the principles of sustainable design and biophilia.

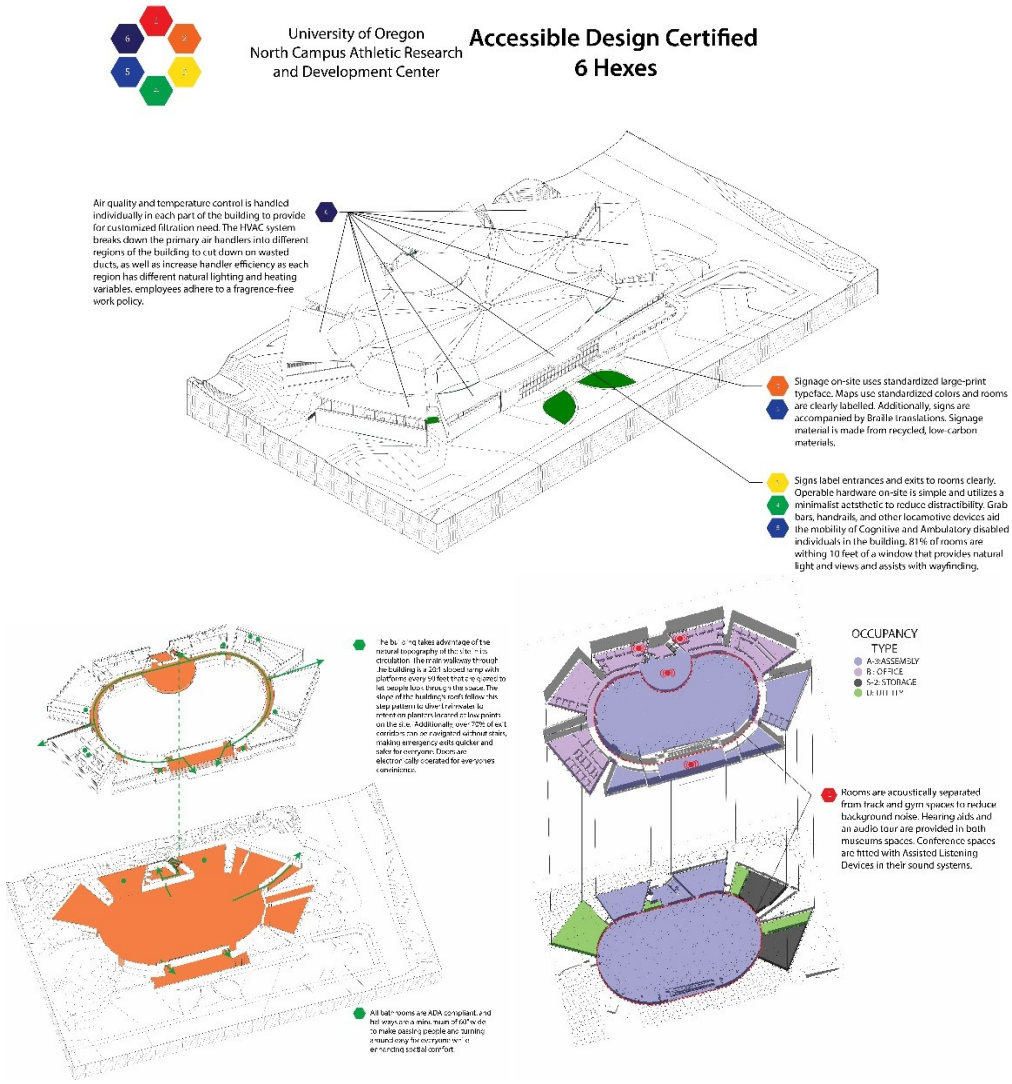

Image 12: A series of diagrams detailing several design aspects of my capstone studio: The University of Oregon North Campus Athletic Research and Development Center.

Shown in the diagrams above, as well as several others designed for the studio, different hexagons call out solutions the building implements to accommodate peoples with any of the categories of disability that the system I have proposed looks at. Also mentioned in these diagrams are how these solutions implement sustainable practices or connect people to their environment to enhance their experience, further linking the building's connections between accessibility and sustainability.

Designed around a central running track, the building draws inspiration from the Ed Roberts Campus and its goal bringing the issues of accessibility in construction to the forefront of a visitor's attention and making them consider the state of accessible design in other contemporary buildings.

Designed on a sloped site, the building takes advantage of the natural topography to place its programmatic elements around the outer ring of the track at different heights to impact the natural topography of the site as little as possible and to encourage stormwater runoff to dedicated low areas on site where the water can be captured and managed. Around the outer edge of the track, the building circulates visitors along a wide, gently sloping glass ramp space, where the low five percent slope and resting platforms every fifty feet makes navigating the space easy for all visitors, even those with ambulatory disabilities, and brings the other accessibility features of the space to the forefront of everyone's attention. Around the ramped space and at every egress point, the building features large, simple handrails and door handles that are easy to grip for those who need them and provide simple means of egress to those entering and exiting. Alongside those rails, simple door switches are placed at both hand and foot height so those people can open doors easily and automatically with any part of their body. Additionally, because the building spreads laterally across the site instead of vertically upwards, over 75% of the building's exits are fully navigable to people without having to traverse any stairways. Conference spaces are equipped with assistive hearing devices for those who might need them, and large print signs with corresponding Braille text are posted at the entry to each programmatic space on both sides to make wayfinding easy even to those who suffer from short term memory loss or

other cognitive disabilities, as well as making it much easier for those with any kind of independent living disability to navigate the space themselves without having to rely on another. The shape of the building and length of the circulation ramp also allows for the different program elements to be separated from each other so that light and views of the natural site outside can permeate through the entire building while at the same time acoustically isolating each program element from the other to reduce background noise for those with auditory disabilities or cognitive ones that prevent them from focusing in noisy environments. To improve the efficiency and cut down on unnecessary energy usage, the HVAC and water systems in the building are separated into the different wings of the building, giving each space finer control over its temperature needs at the day progresses and allowing for a very fine level of air quality control to protect people with air sensitivity. Once again, the slope of the ramp in the building plays a role in sustainable, accessible space as all primary ductwork and plumbing runs under the length of the ramp on either side of the building, taking advantage of the slope to remove waste possible from the building and keeping headspaces clear of any mechanical hazards.

In the southernmost wings of the building, by the entry, two gallery spaces inform users about both the history of track and field that is prevalent in the region, as well as the history of disability rights and the origin of the movement in the 1980s that came from the west coast. In these gallery spaces, and at appropriate locations in the building and on the building site, small placards inform visitors about the strategies at work in the building to make it sustainable and accessible, and to educate them about the advantages of the design techniques used in the building's construction. In this way,

the building both demonstrates and teaches the principles of accessible, sustainable design, and would receive full certification in all categories for its work in furthering this field of design.

Despite having drawn on two very different means of certifying a built space to recreate the link between accessibility and nature, I still do not claim to have solved this problem definitively. I do believe however, that I have laid out a framework that circumvents the major problems that would arise from adopting an existing certification system wholesale from the field of sustainable design. While taking advantage of the level of rigor offered by the LBC Petal system and the flexibility of LEED Certification, any newly imposed system will still have drawbacks. Even though I have tried here to propose a system that checks against what I have deemed the most problematic parts of this existing systems, a core problem remains: the problem of publicity. While encouraging designers and the public to embrace this new system might eventually foster a new design mindset where solutions for accessibility are incorporated into a project as readily as solutions for sustainability and where the standards of accessible design steadily improve over time, a similar result would likely come about faster if parts of my proposal were incorporated into a new edition of an existing organization's criteria (a LEED 5.0, for example). That latter solution would mean however that many of the problems I have identified in those existing organizations would not be addressed – be it LEEDs low prerequisite standards or the LBC's comparatively small public presence. As such, I cannot claim that one method is definitively better than the other, but that the former offers what would likely be a more comprehensive solution over an extended period of time, while the latter offers a quicker integration into commonplace

design practice at the cost of continuing some practices I have identified as problematic in this proposal. As such, I think the best way to implement these changes into the contemporary design environment would be the short-term adaptation of these principles into an existing certifying body like LEED (the latter solution), while simultaneously founding an organization dedicated to evaluating any new construction on its accessibility (the former solution). Through this approach, these solutions enter the mainstream built environment more quickly while also encouraging a new building mindset that pushes the envelope of accessible design while also supporting the creation of a new certifying body free of the flaws found in existing systems so that the systems of design might finally be relinked in the present day.

Conclusion

Based on the examples given in this thesis it is clear that for the majority of human history there was a link between sustainable ecological design and accessible design. Before our technology was capable of so thoroughly overcoming the challenges of a building's environment, the solution that worked in harmony with its surroundings to take advantage of what they offered were often the same as the solution that was most accessible for its users. This is because it was often that the accessible way was also the easiest way to take advantage of one's natural surroundings. Examples from classical history in the form of Thera, Greece demonstrate how builders would utilize natural high ground for security while still transporting goods to the settlement along low sloped, easily walkable roads instead of trying to lift the goods into the city with something like a pulley system. This phenomena repeats itself again in the 8th century CE with the Göreme cones in Anatolia: the natural formations provided shelter and security, but humans carved low, wide stairs into these shelters because regular, narrow staircases would make moving large amounts of goods through the many floors of the cones nearly impossible, and these same accessible stairs made traveling much easier for the old or weak, who benefitted from the gentle ascent and wide stairs to rest on.

It is also evident from examples in this writing that the link between sustainable and accessible design was broken when introduction of industrial technology was introduced to building systems. It was technologies like the mechanical elevator and climate control systems that changed the scale of control humanity could exert over their built environment. People no longer had to consider the natural ventilation of their buildings when mechanical systems took care of it automatically, and large goods could

be transported vertically quickly and efficiently inside service elevators. With this new threshold of control, the solution that worked in harmony with its surroundings was no longer necessarily the easiest, cheapest, or most efficient way to construct a building, and technology was capable of completely separating the interior conditions of a structure from its exterior environment. With this change, solutions that by design were more universally accessible were no longer the kinds of designs being built, as traits like efficiency and progress became highly valued both for buildings as well as the human race, and many people with disabilities found themselves living in a society that had cast them to the outskirts.

Over the last few decades however, people have begun to reconnect their buildings to their surrounding environments. Describing the term “biophilia” as “innate desire to connect with nature,” Stephan Kellert describes how even a minimal connection to nature, even something as small as a window looking out onto a park, can be deeply beneficial for a person’s health and performance ability. Seeking to incorporate nature and ecological considerations into their built environments, organizations like LEED and the Living Building Challenge were founded to evaluate and certify buildings based on how well they connect to, cooperate with, and stimulate their natural environment; and judging by the fact that thousands of buildings are registered with LEED every month, these values have become popular enough to be a major consideration in building design.

Accessible design on the other hand, still suffers from its disassociation from natural design caused by modern design technology. Having suffered as targets for social stigma from organizations like eugenics committees in the late 1800s and early

1900s, it is only recently that communities of people with disabilities have begun to regain the prevalence it once held in the design process. With disability rights protests in the late 1900s, the coinage of the term “Universal Design” by Ron Mace in 1985, and the passing of legislation that culminated in the Americans with Disabilities Act of 1990 that basic accessible design considerations became required by law in all public buildings. Despite this, no certifying body like LEED has arisen to evaluate buildings on exceptional accessibility design and the requirements are still added to buildings late in the design process in out-of-the-way places as a means of compliance that does not interact or change the design intent of those buildings.

It is this shortcoming that this thesis ultimately tries to address. Drawing from the evident popularity of certifications systems in the field of sustainable natural design, this thesis examined the pros and cons of two major regulatory bodies (LEED and the LBC) to devise a system that I believe could be implemented to help re-establish the link between natural and accessible design. By encouraging the integration of biophilic design practices with accessible spatial design, I have attempted to lay out the groundwork for a system that can evaluate both existing and new construction for both residential and commercial use and issue certification that recognizes and praises exemplary work in the field of accessibility while avoiding the pitfalls of being too loose with its requirements like LEED or too demanding to achieve like the higher levels of LBC Certification. To demonstrate the effectiveness of such a system, and to showcase different solutions that might be implemented to account for different types of disability, I examined the building that I designed alongside this thesis for my capstone architecture studio a the University of Oregon. In doing so, I not only gave examples of

how different design solutions can link accessibility, sustainability, and biophilia into a system, but I also demonstrated that those spaces can be elegant and powerful, with different elements solving multiple problems of design while simultaneously creating interesting, accommodating spaces where people of any ability can interact together as equals. I think this is important because it demonstrates that we do not have to give up our industrial technology and return to the solutions that served us when Thera or the Göreme cones were built if we want to create beautiful spaces that are both sustainable and accessible. Rather, I think that with a creative approach to design, our powerful technologies can re-forge that link in a contemporary context. I'm not saying that every building can follow the same checklist to be become accessible: I imagine an accessible two-story building would use very different methods from an accessible skyscraper, for example. I think this argument also goes to show that our standards for accessible design need to be flexible the way our standards for sustainable design are: with clear goals laid out for a designer to achieve, and not a set of required features to be added into a building the way codes like the ADA maintain things like ramps or elevators should be. If done properly, designs that link sustainability and accessibility back together will create a more powerful sense of community and spirit of place. Those spaces will find ways to highlight the beauty of their natural surroundings alongside the beauty of human accomplishment, and they will become the new standard of construction for a world where our building are not sustainable and accessibility out of a practical need to build them, but out of a communal need as stewards of our planet and community members of the same human race.

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