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Sustainable Architecture:
Fostering a Culture of Community Engagement

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The Technological Shroud: Arch 6290

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Word Count: 6122

5/17/2019

"When we destroy a river, we increase our thirst, ruin the beauty of free-flowing water, forsake the meat and spirit of the salmon, and lose a little bit of our souls."

-Jim Dodge (Canizaro, 342)

Introduction

Architects design buildings that have the potential to synthesize the cultural ideals and demands of their time. Given the context of the current ecological crisis and the fact that the built environment is responsible for 40% of the average energy usage and waste created on an annual basis, architects have a responsibility to their clients and communities to design in ways that support ecologically healthy systems that go beyond mere LEED installation requirements, (Feireiss, 13). Rather than buildings that incorporate technology in a way that allows people to forget about climate change, sustainable architecture should foster dialogue about its contribution within the community. While a culture of consumerism has exacerbated the current climate crisis, architecture has the power to shift this culture towards a greater ecological awareness that will allow for a more sustainable response to environmental problems moving forward. In a system of truly sustainable architecture, architects must foster a culture of sustainability within communities, one where individuals are more conscious of the impact their choices will have for ecological health. Through the collaborative and synthetic nature of design, architects hold the key to bridging the efforts of different disciplines towards addressing the issue of sustainability. Indeed, given the scale and nuances of the current climate crisis, collective participation will be required for the problem to be properly managed. Local, collective, creative, environmentally informed action is arguably the only way that the effects of climate change will prove manageable. Design, far from being limited by constraints, often flourishes when it focuses on

the problem at hand and works to derive novel solutions through these parameters. By fostering sustainability and a collaborative culture across all of their projects, contemporary architects have the potential to usher in the next movement in architecture, one shaped by the pursuit of ecologically thriving cities and the collective, creative contributions of all of Earth's human inhabitants.

Defining Sustainability

The contemporary definition of sustainability was defined by the World Commission on Environment and Development in 1987 as development (construction, urban renewal, infrastructure, resource extraction, etc.) that meets the needs of today without compromising the needs of future generations, (Parr, 1). The World Commission's desire to provide a viable definition of sustainability stemmed from an increased recognition from a growing body of scientific evidence that pointed to unprecedented climate change around the world, an accelerated rate of species extinction, and worldwide diminishment of natural ecosystems due to mankind's extraction of natural resources. While some have denied that climate change is a problem, the growing body of scientific evidence has made it difficult (and arguably foolish) to deny climate change altogether, but still this definition leads to more questions. What is it that we are in fact sustaining and how do we interpret the inherent ambiguity of what will constitute the needs of future generations? Even if there was a universal recognition of a problem inherent to changing the climate (high rate of species extinction, declining resources, rising sea levels, increased frequency and magnitude of natural disasters), how do we agree upon a universal approach to ameliorating the global climate situation? (Hawken, 1-15).

While the definition admittedly has its limitations, the World Commission's definition of sustainability, rather than proving itself useless, instead provides a directional framework for reshaping how people perceive the problem related to mankind's consumption of natural

resources (including fossil fuels). Rather than being overly prescriptive, focusing the definition

of sustainability on the way that people utilize resources in the context of the health of the

natural ecosystems allows for individuals to question their habits and begin to modify their

behaviors. Additionally, this definition of sustainability suggests an important underlying ethical

underpinning behind sustainable actions, both for the collective wellbeing of humanity today and

tomorrow. Rather than nitpicking what this definition of sustainability fails to address, this paper

will explore how the ethical and ecological implications of sustainability as defined, climate

change and ecological science, and ethics demand a greater response from architects when

designing moving forward.

The Challenge of Discussing Sustainability as a Problem

While climate change and sustainability are often discussed along the lines of problems

and solutions, it is important to recognize that these terms are used functionally to make

decisions rather than to consider any solution as universally applicable. Indeed, any "solutions,"

architectural or otherwise, should not be misconstrued as the only or best solution or even as

lacking in their own problematic consequences. For example, the Bill Gates foundation has

worked with numerous research agencies to conduct malaria research and treatment efforts while

also distributing mosquito nets to millions of African families, (Gates). While malaria is

estimated as killing over 500,000 Africans each year, Bill Gates has estimated that these efforts

helped prevent 600 million cases of malaria and saved an estimated 6.8 million lives in the

period from 2000 to 2015, (Gates). However, in a New York Times article from 2015, journalist

Jeffrey Gettleman found that in many African countries where starvation is a major problem,

many families are using their mosquito nets to fish for food, making these nets useless in their

intended usage and possibly creating ecological destruction through damaged fisheries and the

possible introduction to waterways of the insecticide used in the mosquito netting treatment. It seems that, for these families, the current problem of starvation outweighs the consequences of being potentially infected with malaria in the future, (Gettleman).

The mosquito-net-intervention as a solution highlights the need for interventions to be locally derived, facilitated by education efforts on proper usage, but perhaps most importantly, highlights the limitations to which anyone might comfortably deem any "solution" as an actual ultimate solution. Sustainability problems are often interwoven with the problems of social injustice, economics, and public health, as much as they are about ecological health. The scale of the climate crisis means that solutions will have to be context specific, cognizant of cultural norms and potential social injustices, and continually revised and supported by novel innovations and interventions as scientists and the general public continue to arrive at a better understanding of the nature of the problems.

Rather than a one size fits all approach to solving the problem of the environmental crisis, the recognition must come about that the scale, nuances, and deeply integrative nature of the problem entails that any architectural "solution" is a specific, local answer limited to the program requirements and the scope of the project. A variety of solutions might be considered from new builds and restoration efforts that meet LEED requirements, to repurposed abandoned or underutilized urban spaces to cultivate community, and to completely novel clean energy solutions, (Feirreiss, 114-139). Indeed, part of the appeal of incorporating sustainability into architectural practice is that the innovation of designers often arrives at a variety of different solutions. Architects are deeply familiar with the challenges posed by architectural projects with shifting deadlines, budgetary constrictions, working in mediation with numerous parties, and unique client demands. Rather than being crippled by these logistical nuances and constraints,

architects often find innovation and new solutions to old problems by considering projects from a different perspective or in a different light. Just as the iterative process is a method for continually brainstorming and refining ideas in the closer and closer approximation of an appropriate solution (even while it is recognized that there will never be a single "solution"), so should sustainable architecture be perceived as the summation and continuous development of numerous efforts and approaches to the refine what constitutes a healthy balance between ourselves, the built environment, and the natural environment.

Identifying the Magnitude and Nuances of the Climate Crisis

In an initial investigation on sustainability in architecture, the search will often yield very disparate approaches to how architects should consider sustainability in practice. Some books try to make a case for sustainability by attempting to demonstrate finance-ability and potential return-on-investment as a mode for the architect to engage the client in the sustainability conversation (Pitts, 3-7; Kats, XV-XIX). Others advocate that, rather than LEED Platinum New Builds, sustainability might be considered as the act of green renovation on previously existing buildings, bringing old construction materials or implementations up to code with contemporary health and LEED standards, (Carroon, 17-20). Some books approach sustainability by analyzing different projects, weighing the merits of their sustainable efforts, and gathering interview information from different firms on how they would define sustainability (passive solar, water reclamation, recyclability of locally sourced construction materials, lightness of the buildings footprint, use of vernacular techniques and solutions, etc.), (Serrats, 49-154). Still others call for a dialogical sustainability model in architecture where architecture works to create a dialogue with or about nature as the main actor. Through this model, sustainable architecture "must satisfy simultaneously all architectural dimensions: logical (science, technical, functional),

ethical (security, low impact, protection, good use), and aesthetic (beauty, meaning, emotion) dimensions," (Broadbent and Brebbia, 28). These various approaches to sustainability make it difficult for the architect to know what the right approach to sustainability might look like, but perhaps it is in the very nature of climate change's scale and nuances that the integration of multiple approaches is indeed necessary.

For any architect in the contemporary context, understanding sustainability starts by understanding the scientific findings on how climate change is undeniably connected to the built environment. Construction and cities are responsible for the usage of considerable natural resources, nearly 40% of worldwide emissions, and 60% of physical waste production, (Feireiss, 13). Additionally, mankind has burned more fossil fuels in the last 25 years than in all of human history, (Broadbent and Brebbia, 4). While the desire to facilitate the happiness and health of people may have been the driving factor behind the use of fossil fuels to improve upon Western civilization's surroundings and standard of life, the desire for convenience has been taken too far in the contemporary, technological era when people have integrated climate-controlled, artificial environments at the cost the natural environment, (Broadbent and Brebbia, 4). Indeed, the average United States citizen produces twice her weight in household, industrial, and gas waste per day and a half ton per week, (Hawkins, 15). Given the degree of mankind's impact on the environment, it is important to understand what the consequences of our overuse of natural resources might have for the ecosystems where they are derived, and part of this heightened awareness comes from reexamining how business practices do and should relate to the environment.

Businesses that look to ecological systems' health for guidance can find that rules which govern nature can inform how their company should operate. "Waste" in nature is not trash as

typically imagine it but food that gets reintegrated into the ecological system of its origin and decomposed by organisms that use it for sustenance. Additionally, nature works within a closed system of solar input, within a fixed degree of natural resources, and relies on biodiversity rather than mass production. Importantly, Hawkins notes that even naturally renewable resources when overconsumed or exploited can become no longer renewable. Specifically, he states that the energy consumed worldwide today on average took 13,000 days for the planet to create, a daily global consumption practice that immediately reveals itself to be unsustainable. Ultimately, the planet can only support a given amount of organisms due to its currently available resources and the limited energy input from the sun, and the current exacerbated rate of species extinction combined with rising global temperatures is a sign that human beings are operating well beyond the Earth's carrying capacity. While companies are not legally required to incorporate sustainability into their business model or practices, continuing to operate corporations without greater ecological conscientiousness as guide will assuredly exacerbate the current environmental crisis to the ultimate detriment of the availability and increased cost of materials for the company in the future, (Hawkins, 7-90).

Companies that recognize these ecological realities should operate differently, by reconsidering the full costs associated with using toxic or harmful chemicals or products that will require much longer time to decompose than that required by their consumer use (plastic grocery bags, single-use. Styrofoam drink cups, etc.). For the architect, this might translate to a greater responsibility for the selection of materials, creating a plan for the proper recycling of the building at the end of its life, etc. By reexamining their company values, engaging in discussions with biologists, ecologists, and the general public, and accounting for the real costs that reflect the full lifecycle of their product, companies can ensure that their products not only deliver

profits today but will continue to be available and affordable in the future. Hawkins' argument is that rather than sustainability leading to profit loss, a business that truly accounts for the sustainability of its production practices and its products can actually lead to not only greater profits but improvement upon the health of ecosystems and human communities through the way the business is conducted, (Hawkins 12 - 45). For the architect, addressing sustainability comes from a qualitative understanding of the local cultural and geopolitical context in which we build, in addition to quantitatively tracking emissions and resource use, (Feireiss, 13). As Feireiss notes, the role of the architect is "to translate scientific and technological revolutions into approachable environments that can change people's lives" and ultimately to engage the community in the ongoing dialogue around sustainability that will eventually lead to improved solutions, (Feireiss, 17). By understanding the nature of the problem and creating spaces that engage the public in sustainable discourse, the architect makes strides towards ensuring that their building is relevant and responsive in the context of the climate crisis.

Ethics

If the thought of the destructive ramifications that the environmental crisis might have for countless species, ecosystems, and human health were not enough, a discussion of the need for ethics in a discussion of the environment might persuade the skeptical architect of the imperative of incorporating sustainability into their work. While Earth's history has experienced previous large-scale species extinctions (for example, as a result the meteor that led to the extinction of the dinosaurs), biologists speculate that the current environmental crisis might mark the 6th major species extinction for our planet, and the first in Earth's history to result as a consequence of a single species' actions, (Jamieson, 6-10). While those who advocate for the resiliency of Earth believe that the planet will arrive at a homeostasis of its own accord, research suggests that this

"stability" might only be arrived at with a measurable, universal rise in the Earth's temperature and its consequences, (Jamieson, 6-18). The ethical implications for these environmental changes stem from the fact that "it is non-human nature and the descendants of today's poor people who will suffer most from this problem," a problem that has been exacerbated primarily by the actions, past and present, of industrialized nations, (Jamieson, 10).

The ethical responsibility of the architect to design with environment and general public in mind extends to her responsibility towards the client in practice. While architectural projects might require that the architect meet the needs of a client living in a different country and abiding by different cultural norms, the architect has a responsibility through their accreditation through AIA, to the reputation of their practice, and ultimately to themselves to ensure that they are upholding their own moral code of conduct throughout their contract. As Graham Owen points out, if our client's intention is to design an authoritarian building meant to suppress the public or offers more money to the architect for turning a blind eye on questionable practices, it becomes the ethical imperative of the architect to say no (Owen, 121-125). Despite the obligations of the architect towards client, the AIA requires that the architect not engage in business that would compromise their practice or reputation. With the integration of an environmental ethic into this system, it becomes the responsibility of the architect to advocate on behalf of more sustainable building methods to their client. Again, if the responsibility of the architect is to build communities that allow people to thrive, then it becomes the architects' responsibility to advocate on behalf of sustainable efforts for the long-term health and well-being of future generations, (Owen, 121-125; Feireiss, 146-149).

As Haji et al. maintain, the decision to act morally often requires that we first morally perceive the situation fully, and in many ways, architecture fosters rather than necessitates this

moral perception for us, (Haji et al., 7). Through how it frames the same context, architecture

may highlight pronounced poverty or invoke a spirit of hope, the separate treatment of which

will elicit a pronouncedly different response from the individuals who live there, (Haji, et al., 8).

Studies in urban environments have demonstrated that while violence and crime were at

increased levels in stark, large-scale public housing projects, thoughtful public planning

initiatives and interventions mitigated the violence in these areas, (Haji, et al., 9). Research has

also revealed that large open spaces foster community dialogue, contact with nature serves as a

restorative need on cognitive functioning, and that crimes were more likely to happen in graffiti-

ridden neighborhoods (e.g. locations where norm violations were perceived as already occurring)

(Haji, et al., 7-19). These research findings highlight the need for continued architectural

research and synthesis to identify what works architecturally to support the health and well-being

of the general public, but more than this, they make a strong case for the moral and experiential

consequences underlying the built environment, regardless of the designer's intention for the

project. Ultimately, Haji et al. argue that architecture impacts our moral perceptions which in

turn impact our moral responsibility, calling upon architects to build with a higher degree of

intention. Architecture can define lifestyles which subsequently shape cultural identity, a reality

that should shape the degree of moral responsibility for the general public that an architect feels

when they consider any new build, (Haji et. al., 7-19).

Social Parameters of Sustainability

While the concern over the climate crisis can often establish a tunnel-vision focus in

people towards identifying future solutions, it is important to acknowledge both past and current

injustices before planning for the future to ensure that social inequalities are not perpetuated in

the future. As stated earlier, those most impacted by the environmental ravishes of climate

change (increased food and water insecurity, more deadly natural disasters, etc.) will in most cases be the most impoverished and least equipped for ensuring the safety of their families, (Jamieson, 10). While architects and city planners often point to urban sprawl as a primary factor contributing to city problems and high CO2 emissions, cities are currently witnessing incredible growth in their populations. It is also important to note that 98% of home loans distributed from 1934 to 1962 went to white families, (Parr, 52). Far from unrelated, white families at the time were seeking to separate themselves from African American neighborhoods in the city, a phenomenon known as white flight, and the lenders were disproportionately facilitating this only for white families. With the current return of Americans to cities, gentrification of minority city neighborhoods is increasingly a problem, not only for the established communities themselves but also because as these neighborhoods change, the burden of burning gas to get to work each day will be transferred to those who can no longer afford to live in the cities any longer. Similarly, it is not acceptable to criticize third world countries for burning fossil fuels to meet their basic needs when alternative energy may not be an accessible or reliable option for them. Ultimately, it is important to recognize the relevance of social injustice within the context of sustainability before determining future courses of action in order to ensure that they do not simply get ignored or perpetuated. Additionally, if the scale of the climate crisis requires active and collective participation of everyone in a sustainable cultural effort, then architects will need the participation and inclusion of everyone's voice from the community in order for the implemented solutions to be truly relevant to the public, (Parr, 1-53).

Working Towards a Sustainable Culture from an Integrative Approach

Over the past two hundred years, our reliance on fossil fuels has ultimately led to the establishment of a culture of waste, convenience, and recklessness with our natural resources,

our ecological systems, and our atmosphere. A culture that places greater value in restraint will have to come about, and architects can take a critical role in shaping this outcome as cultural teachers of ecological consciousness. Rather than building for ourselves, contemporary architects are called upon to reengage community in dialogue, to create spaces that not only provide for people's needs but allow them to thrive, fostering ecological health and a cultural change in how people live. By reengaging with the community, architects will not only ensure that architecture maintains its relevance by being designed in response to public needs and educational efforts, but also will ensure that ecological health is always considered before decisions are made. While clients who are funding the project will play an undeniable role in the shape that the project takes, architects who engage clients in discussions of sustainability not only are making the matter relevant to a larger audience but also are working to paint a better picture even for themselves of what sustainability might look like within a given project, (Feiress, 85-149).

In a return to ethics, it is out of a recognition of our reliance upon ecological systems health for not only biodiversity but for nature's ability to meet our natural resource needs that architects must prudently design with the local ecology as well as the general public in mind. While the built environment will always be necessary as human habitat, an understanding of the impact of the built environment should challenge contemporary architects to consider whether the building might be able to reduce its negative impact (scale, placement, degree of disruption, etc.) on the local ecosystem, (Drake, 6). Ecology and environmental philosophy recognize that while mankind is undeniably a part of nature, the current environmental crisis is disproportionately a product of *our* interactions with the environment and will have much more pronounced consequences for other species within the ecosystem. By understanding ecological

interdependence and the unavoidable impact a building will have for physically altering the environment, the designer can begin to approach architectural projects more holistically, accounting for material and building lifecycle as well as tracking ecological health after the building is built to determine future directions for architecture. Rather than requiring that architects become ecological experts, an awareness of ecological dynamism and sophisticated interdependence requires architects to acquaint themselves with the knowledge of biologists and ecologists familiar with the local ecology in order to build sustainably moving forward, (Yeang, 11-20).

Sustainability requires collaborative brain power across industries, variously sized companies, areas of study, and governments if it is to be tackled. While this paper advocates for a local prerogative to effectively combating climate change, this strategy results from an immediate need for a cultural value shift, for an accountability system, and a prompt response from the public that would make the adoption of an ecological consciousness more readily achievable for the individual. Given the scale and nuances of sustainability on a global level, it can quickly become difficult for the individual to feel like she can make a difference or know where exactly to start. What is most important for the pursuit of a sustainable culture: eradication of poverty, access to resources, accountability of corporations, etc.? As Lim et al. acknowledge through their analysis, even the educated and well-intentioned politicians of the United Nations struggled to be prescriptive enough in their identification of sustainable development goals, and as the authors acknowledge, failure to identify gaps could come at the cost of the goals' ultimately being realized. As the authors acknowledge, an integrative, systematic approach is required to tackle the problem; however, for the sake of the individual attempting to be an active advocate for change, the local forum will help keep the problem

manageable and relevant while ideally carrying the change up the political ladder and simultaneously help fostering a local culture of community, (Lim et al., 1-3).

In order to address the scale of the environmental problem, change might be most within reach if it occurs at a local level. Jim Dodge calls for anarchy at the local level, not in a zealous, out-of-control manner, but as a sense of "interdependent self-reliance, the conviction that we as a community…can make decisions regarding our individual and communal lives and gladly accept the responsibilities and consequences of those decisions," (Canizaro, 344). Importantly, local action allows for direct engagement by the individual, accountability of the costs for decision or indecision, and avoids having to escalate relevant topics through a difficult bureaucratic matrix in order for decisions to be made. Critizing American culture directly, Dodge states that "American culture has become increasingly gutless and barren in our lifetimes, and the political system little more than a cover for an economics that ravages the planet and its people for the financial gain of a few," (Canizaro, 345). The current American economy continues to grow by advertising that continued consumerism is the key to our human happiness and health, all while ignoring (or perhaps being indifferent to) the real cost to the environment or the lack of actual happiness derived from making continual miscellaneous purchases. By bringing about local attention to the consequences of consumption practices while also keeping the environmental crisis in mind, people can begin to make more well-informed, sustainability-driven decisions as consumers.

In addition to helping to combat the environmental crisis, buildings that effectively foster dialogue around sustainability can help close gaps in the system that educational efforts must fulfill. In reviewing recycling practices in Denver, the Denver Post found that not only is Colorado well below the national averages for state recycling efforts, but that many of the items

incorrectly recycled by residents run the risk of contaminating other materials, damaging the expensive sorting equipment, and through incurred repair costs, harming the ability of recycling efforts to continue (The Denver Post). Despite the passion with which residents might feel they are positively contributing to sustainability efforts by recycling, what good is expensive recycling technology and expenditure of governmental resources if lack of knowledge ends up doing more harm than good? Rather than buildings that produce zero emissions through the use of technology that allows people to conveniently go about their day to day lives without considering sustainability, buildings would arguably be more effective at achieving sustainability by informing the general public in how they achieve sustainability and by providing spaces that contribute to the development of a sustainable culture. By making sustainability actively salient rather than passive within their design systems, the architect can ensure that their building contributes in a more substantial way in engaging the public.

If people are able to realize that their health, success, and happiness are inherently tied to that of the ecosystems around them, a culture will naturally develop where people are more ecologically conscious. Additionally, by focusing architectural efforts on fostering a sustainable community that is actively aware and engaged in sustainable efforts, the public will be allowed to explore ways in their own lives to incorporate sustainability more fully. As Parr acknowledges in *Hijacking Sustainability*, "culture not only promotes social awareness of environmental issues; as a practice it has the power to also put sustainable living to work…It is one that can potentially improve the health and well-being of community as it promotes principles of equality, stewardship, compassion, renewal and sustenance," (Parr, 5). This dialogue not only works to empower the movement towards greater ecological consciousness, but reengages the individual in a rewarding community of connection with their fellow human

being. To return to the earlier definition of architecture as establishing spaces that allow for

human beings to thrive, perhaps by facilitating greater appreciation for environmentally

conscious habits, sustainability will allow individuals to connect not only to the natural

environment around them but also in more rewarding relationships within their community.

Exemplar Project

Given that this paper strives to highlight the need for sustainable architecture that goes

beyond LEED requirements towards fostering community engagement in the creation of a

culture and dialogue surrounding sustainability, the project selected as a demonstration of this is

the California Academy of Science in San Francisco, completed in 2008. While the previously

existing museum buildings on site were from 1916 onwards, the project brief taken up by Renzo

Piano Building Workshop was to create a contemporary, green building whose design aligned

itself with the mission of the California Academy of Sciences: "To explore, explain, and sustain

life on Earth," (California Academy of Sciences). A fundamental component of the California

Academy of Sciences is conducting inhouse scientific research that gets directly transmitted into

events and programs that are on display for the general public. Additionally, the California

Academy of Sciences proudly maintains an environment that actively supports engaged learning

from the public through its programmatic spaces, including an indoor rainhouse exhibit,

aquarium, and planetarium to name a few. In taking up the project proposal, the Renzo Piano

Building Workshop wanted to ensure that the building not only incorporated sustainable

technology in its design, but actively engaged and informed the public on these efforts, (Feireiss,

72-79).

Through their efforts to incorporate sustainable technology and planning through the new building's execution, the Renzo Piano Building Workshop was able to achieve a platinum LEED rating for the building's execution. In its construction, the new California Academy of Sciences recycled 90% of demolition materials, used 95% reclaimed steel, and 50% sustainably sourced lumber. The building uses recycled blue jean denim as insulation, high efficiency heating and cooling equipment, and radiant floor heating to supply heat directly to the occupants who it services during the winter months. The building incorporates solar panels to offset 10% of its electricity usage. The building's rolling-hill roof surface helps keep the building cooler not only by its stretched hemisphere shape that directs hot air up and out of the building but also through the incorporated green roof that spreads across its artificial knolls (Figure 1). The green roof utilizes drought tolerant, native plants to reclaim rain water, and any remaining rain water is harvested passively by the roof to be utilized for watering plants on the building's interior as well as for flushing toilets. The green roof is estimated to reclaim 3.6 million gallons of rainwater a year. In addition to reducing indoor temperatures by an average of 10 degrees, the green roof provides an educational exhibit for the museum's visitors to inspect, discuss, and compare as a stark alternative to the San Francisco skyline full of traditionally constructed buildings surrounding it (Feireiss, 72-79).

Fig. 1. WolfmanSF. "California Academy of Sciences Viewed from De Young Museum Tower." Wikipedia, 2010, en.wikipedia.org/wiki/California_Academy_of_Sciences.

      While the building accomplishes much through its intentional construction methods and technological interventions as an effort towards sustainability, it is through its effort to directly engage the public in education efforts regarding its sustainable construction and ongoing research that sets the project apart. By allowing tenants to access the roof and directly observe the native life and habitat that the green roof supports, the building allows the museum visitor to engage with sustainability in a whole new way (Figure 2). Additionally, exhibits such as the rainforest display in the building's interior allow for the visitor to engage in sustainability-focused educational displays and discussions related to the health of ecosystems that are far removed from San Francisco but to also continually be reminded by the overhead condition of the structure of their true physical presence in San Francisco (Figure 3). Far from making the problems seem far removed from its context in San Francisco, the high degree of integration within the building's program and structure encourage visitors of the California Academy of Sciences to consider how their actions might impact not only their home community but the larger biotic community of the world. Through educating and engaging the public in experiential programing inside an environmentally responsive building, the California Academy of Sciences

is able to forward its mission through the integration of program with an architecture that lends itself to community discourse. If sustainability truly requires the participation of well-informed, actively engaged citizens in the effort to reduce human beings' contributions to climate change, then the California Academy of Sciences is making considerable leaps towards contributing to the development of a culture of sustainability, (Feireiss, 72-79).

Fig. 2. Torbakhopper. "The Academy of Sciences." *Wikipedia*, 16 July 2011, commons.wikimedia.org/wiki/File:The_Academy_of_Sciences_(5956927082).jpg.

Fig. 3. Fastily. "California Academy of Sciences - Rainforests of the World." *Wikipedia*, 28 Mar. 2013, commons.wikimedia.org/wiki/File:Rainforests_of_the_World_201_2013-03-28.jpg.

Conclusion

While there will never be a single building that definitively encapsulates everything that sustainability strives to accomplish, particularly because the term itself can be interpreted differently by different people, the California Academy of Sciences provides an informative approach for how architecture might go further to facilitate a culture of sustainability. Given the environmental destruction created by humanity's rapid use of resources and its effect on ecosystem health, it is clear that a changing course of action is needed. While LEED standards encourage practitioners to review the impact of their building on the environment, receiving a high rating will not be enough to change Western consumption habits. Through shifting the priorities of Western culture towards a less consumeristic, more environmentally conscious

attitude, the world stands a much greater chance of reducing our negative impact on the

environment. Architects are called upon to educate themselves about the problem, to engage

other disciplines and community in the discussion, and ultimately to design with sustainable

culture in mind. By designing spaces that allow for humanity and ecosystems to thrive,

architects are able to ensure that their work is not just relevant to the well-being of people today

but also fulfilling the needs of people tomorrow.

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