CONNECTED BY NATURE

LINKING THE PUBLIC TO SCIENCE

EMERSON SMITH
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This Design Thesis was submitted to the Department of Architecture and Landscape Architecture of North Dakota State University. By Emerson Smith, in partial fulfillment of the requirements for the degree of Master of Architecture.

By Emerson Smith

PROLOGUE

May 2017 Fargo, North Dakota
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Figure Faulkner
Figure Gleye
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Figure 1  Ship in front of the Sleeping Giant
The impact that we as humans have on our surroundings is startling. Our environment faces numerous issues that, while not all have a basis in our blunders, but will pose an obstacle to be overcome. A hard reevaluation of how humans should react is needed and just as important, a way to increase the efficiency and success of these responses. By removing the barriers that the public has from the scientific process several outcomes will be improved. Bringing these into a single space will help to do this because people will be more aware and willing to assist with research and scientists will see a better realization of their work.

Employing qualitative research and logical argumentation will help to unearth the best routes to a successful design. Gathering interviews from appropriate individuals and looking at relevant case studies will inform how best to respond to the needs of the site and the client. Exploring what this means will challenge currently held conservation researcher’s and designer’s beliefs of the supposed right answer and result in a more responsive and successful space for experts in the environmental topics and those who seek out what they have discovered. The site’s prominent location, where the city meets the water, has an opportunity to demonstrate how development can act harmoniously with the environment it sits in. Through the research and design done for this thesis the issues that biologists face and a building that meets the demanding needs required to tackle their problems.
The way of life for most of Western human history has been to take what is needed from the land. Importance is placed on what needs have been satisfied, with little concern as to what has been affected. Resources are harvested, wilderness tamed, and nature is displaced. We see the impact that this has on the landscape, but our response has been slow and at times disparate. Attempts to mitigate what is deemed as negative in many cases is ineffective. Efforts that successfully remedy these problems are commonly sought out by only a select few experts with their results implemented by a society that remains separate from the process.

A stronger connection between the public and conservation research is needed to lessen humanity’s impact on the environment. This is especially true when dealing with the environmental issues, such as invasive species and habitat loss, that continually impact humanity. While there are many examples of this throughout the world, places that gain their identity and prosperity from the health of the land risk the most by not acting proactively. Lands, such as North West Ontario, as well as the people who inhabit it, deserve a more successful research initiative. To do so would create a society that is more aware of its issues and able to fix them.

Research and education are both part of the same act of discovery. Despite this, the two are commonly treated as separate endeavors, seeking parallel goals, to better understand the world around us. Combining education and research into a single space is mutually beneficial because it gives an opportunity for the public to give input to a scientific endeavor while learning about the issues of conservation around them. By bringing the initial discovery and public awareness together the results can be more far reaching and realized quicker.

Nature centers, such as aquariums and zoos, have long been known to support research on their display. While this has a sizable impact on the initiatives that seek to improve conservation, there is still a separation of this research from public. Removing this barrier results in a more successful space that still resembles a science center. The main differences surface when looking at how visitors not only see what is being researched, but have a hand in what is being presented.

This center for discovery creates a cohesive unit out of diverse elements. Exterior and interior activities, public and private, as well as education and research in a similar manner to the Monterey Bay Aquarium and Alaska SeaLife Center. Becoming embedded into the landscape without damaging it is a common desire shared with national park visitor centers, animal rehabilitation centers, and wildlife observation pavilions. Relationships with university research halls and government research facilities also acts to bring in a diverse crowd. Creating an environment that is comfortable for everyone to experience is a requirement for the building.
Thunder Bay has made it one of their goals to reintroduce the city to its waterfront. This means respecting this meeting point of water and land. The focus should be on the land and what opportunities it offers to users. Views need to be maintained for the rest of the city and the city at large must be able to freely use the space. Providing a place to interact with the water is necessary, whether this is within the structure or in its surroundings.

Currently, the public has delayed interaction with conservation research. Allowing an up front and personal exposure of how experts deal with and try to solve current issues will provide for a more enticing and unfiltered experience. This project aims to remove barriers and mediators that keep people from the direct source of innovation. In a visual and experimental field, such as research, it is fitting to present it with a similar teaching style.

Efforts to advance the field of conservation is commonly a closed affair, mainly dealing with a small number of researchers. By opening the process for the public into the research process there more resources will be available to draw from. In research efforts that deal with the surrounding environment engaging the people who interact with it from an early stage will be more willing to accept the findings.

PROJECT EMPHASIS

Education and Research

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Sustainability and Flexibility

When dealing with conservation research, a building should also provide a positive example of how to properly respond to what is being taught. While cutting edge opinions on how best to do so may change, providing a space that is open for future modification will allow this to be applied. Setting a standard of high efficiency and re-usability is a strong benchmark to this start from.

Connecting to the Water

Thunder Bay has made it one of their goals to reintroduce the city to its waterfront. This means respecting this meeting point of water and land. The focus should be on the land and what opportunities it offers to users. Views need to be maintained for the rest of the city and the city at large must be able to freely use the space. Providing a place to interact with the water is necessary, whether this is within the structure or in its surroundings.
GOALS OF PROJECT

By Design

The physical form of the structure will strive to be a poignant addition to the Thunder Bay waterfront while also taking away little from the natural beauty of the setting. The goal is to become synonymous with city as well as the natural resources that surround it. Doing so will create an icon that promotes the area.

Being aware of the aspects of the site that are sensitive to construction, such as water flora or archaeological sites, and responsibly acting upon them so as to not disturb them will be one criteria used to determine the success of the building. Knowing and acknowledging the preceding uses of the site in an appropriate and constructive manner will create a link to the land that is more than superficial while also mitigating any opposition the project might have from locals. By doing these things the building will be ensured to be respectful and evolve with the ever changing demands of the city and people that inhabit it.

A portion of meshing with the environment requires attention to be given to sustainable design. By placing this center on the site, the surrounding land shouldn’t be adversely affected. To this end, this project strives to make the waterfront healthier than it is currently. From this and other sustainable practices, including on site resource collection, high scores on sustainable architecture criteria should be attainable.

By Theory

In addition to providing a design that addresses all of the needs of the client and program, it also seeks to prove the theoretical research conducted to support it. I hope to prove that placing research and education into a single space will be mutually beneficial. Additional goals of this project are to prove that Thunder Bay’s waterfront redevelopment is a worthwhile endeavor. Revitalizing the Port Arthur commercial district has been an objective for years, manifesting in the Prince Arthur’s Waterfront District. Continuing the success of this project will reaffirm the citizen’s confidence in public works projects and the judgment of the city’s administration.

By Procedure

By the completion of this project I hope to gain an increased awareness of what skills are required to design a successful nature facility that the public can take ownership in. I seek to improve my knowledge of conservation topics, such as responsibly introducing new species to habitats and what can contribute to their remediation. Increased proficiency in how to deal with the diverse needs municipalities must satisfy when supporting public works projects is also sought. The observations, research, and synthesis of ideas that goes into this thesis will draw upon what I have learned throughout my time in the NDSU architecture program. It is my hope that these design procedures can be elaborated upon and strengthened as well.
As Thunder Bay’s waterfront continues to develop the trend started by previous projects, such as Prince Arthur’s Landing, to seek input from local organizations, institutions, and entrepreneurs will continue to be followed in this proposed science center. This is in addition to the range of government agencies from local to provincial that will inhabit and fund the space. Users of the facility include researchers, students, local organizations, and the general public.

The main user of this building is intended to be the Ontario Forest Research Institute. The institute has specific needs that the building’s program responds to, most of which revolve around their ability to conduct research on the surrounding boreal forest ecosystem. Partnership with the local university also means that there is an academic component. By opening to the public their research can be more successful and have a larger impact on the surrounding society.

Integrating the parks and tourism department into a waterfront building would connect them with what they seek to serve. By allowing the government to have a close connection with people and the geographic area it sits in will improve reaction times to societal problems. Many other organizations desire to have space on the Thunder Bay waterfront. Most are too small or don’t have the means to fund their own building. By bringing in several of these, the space will be more dynamic. Providing for the well-being of the public will benefit the city as well. Additional areas, such as a potential cafe, would offer opportunities for local individuals to provide a service for the public. This would foster growth in the community and pride in local companies.

The vast majority of the visitors would be local residents either interested in the conservation exhibits or those that enjoy using the surrounding waterfront. With the displays and prominence of the building possibly becoming a major draw for tourists, there will most likely be a large number of individuals that are unfamiliar with the area. Research students looking to become proficient in the topic will be a regular, but relatively small percentage of those who utilize the building. In addition to the permanent researchers that would use the building, it is specified that visiting experts that come use the space too. So as to accommodate their needs, space for research and desk work is to be provided.

The client

Providing for the masses

Clients

Users description

Fig. 7 Downtown Tower
RESEARCH DESIGN PLAN

PROJECT JUSTIFICATION

SOCITY

With the rate at which our natural environment is being impacted by human influence and naturally changing a renewed focus on what our role in its evolution is to be. A strong look must be taken at the current state of the environment. The need to research how humans should react has become increasingly clear. The loss of birch trees, introduction of invasive species, and moving habitats of many species will soon result in an outcome that our infrastructure and economic models are not able to handle.

Not only do solutions to these environmental problems need to be found, but their implementation must be quick and effective. One of the major barriers to this is commonly the lack of public support or knowledge for conservation issues. Exploring what this means will challenge currently held conservation researcher’s and designer’s beliefs of the supposed right answer and result in a more responsive and successful space for experts in the environmental topics and those who seek out what they have discovered.

The site’s prominent location, where the city meets the water, has an opportunity to demonstrate how development can act harmoniously with the environment it sits in.

PERSONAL

As a designer, I personally enjoy working on the type of project that this center entails. One that a community can take collective pride in, focuses on educating the visitors, and has a close relationship with the land. Because of the diverse requirements of the structure, creating a cohesive design will require applying what I have learned thus far in my architectural career. Building upon this to reach a more complex level of design will be necessary.

SYSTEM OF INQUIRY

Emancipatory

There are multiple realities, but they are overlapping. Developed through hist/social/cultural and empowerment identity.

This project is an attempt to let people apply science to their reality. Allowing multiple views leads to increased connection and trust.

STRATEGIES

Qualitative

Learning the needs of the clients and visitors leads to a space that satisfies the needs of all involved.

Logical Argument

Multiple iterations can lead to new forms that fit the site and program better.

Holistic Case Studies

Review multiples examples of existing structures can show what works and what doesn’t based on functioning buildings.

TACTICS

Literature Review

Contemporary or recognized books, articles, etc.

Personal Interviews

Groups or individuals experts, subjects, occupants.

Iterative Design

Learning from past attempts to find the best solution

PHILOSOPHY/THEORY

Eco-Social (Sustainable Design)

Respecting the site shows commitment to the ecological conservation that is being displayed and researched within the facility.

RESEARCH DESIGN PLAN

DESIGN METHODOLOGY

Research and design methodologies will include qualitative inquiry, logical arguments, and interpretation of historical precedents. If possible these will be supplemented with simulation based on models. Taking a close look at the site and context will begin to inform what is needed from this project. A building should be a further development of what already exists. To gather and compile information into a project, maps, drawings, and models will be to form the building. Case studies of existing similar buildings gives a base to begin my proposed design solution. The opinions and needs of those who interact with the building will be highly regarded, providing the bulk of the qualitative information, helping to mold and advance the theories that the design will be based upon.

Fig. 8 “Hockey Stick”
To complete the thesis project and delve in depth every aspect of the project a strict schedule is to be kept. The semester is to be divided into segments during which certain tasks are to be completed. The three main segments include; research, design, and presentation. These are to be followed in chronological order with the preceding reinforcing the following. Despite this strict stance the research will continue to be adjusted throughout the design phase which in turn will adapt to best fit new information. Both of which will take feedback by NDSU facility members, client feedback, and public sentiment to varying degrees into the final project form.

**IMPORTANT DATES**

- **10 Jan.**  
  First Full Day of Classes
- **6-10 Mar.**  
  Mid-semester Thesis Reviews
- **20 Apr.**  
  Thesis Project Final Exhibits due
- **1-4 May**  
  Final Thesis Reviews
- **8 May**  
  Digital Copy of Final Thesis Documentation Due
- **12 May**  
  Final Thesis Documentation Due

**DESIGN PROCESS PLAN DOCUMENTATION**

Documentation of both theoretical research and the design process will be continuous and as thorough as possible. This will reinforce my own work and give context to others. Any interactions with the client or experts will be documented using photography, text, or audio recording. Process work is to be documented by scanning paper and electronic files. Project segments will naturally be collected in chronological order which will be evident in the final compilation of their parts. All information that has been gathered for the project will be compiled in a categorized system of files to be referenced or submitted if necessary.

- Maps + Diagrams
- Interviews + First Hand Experience
- Sketches
- Ambiance Concept Art
- Photography
- Models (Physical + Computer)
- Computer Analysis
- Construction Documents
- Writing

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Figure 9  Pool 6 site from Spirit Garden
As humanity grows to realize the importance of the natural environment around us, we simultaneously see our impact on it. Our actions throughout history have created noticeable changes to our surroundings which are now seen as issues to be managed. While certain parts of the public have direct access to these changes or the work being done to mitigate them, others lack the ability or guidance to see things firsthand. This not only negatively affects the knowledge of the public, but also the success of those who research the subject. Outreach to these segments of the population is required to create a more knowledgeable public that understands the importance of scientific studies for the community.

Despite what researchers may discover, until their findings are supported by those who can implement it, such as the populace, many of its potential applications may be missed. In addition, casual viewers may be able to add to and improve on what experts have determined. Institutions face issues with gathering public support and resources for their research. Removing the barriers between research and the community can open opportunities for new discoveries to be used. Allowing interactions with material can increase what information is gained and get desired messages across to the audience. The public learning experience of current research projects can be improved by allowing direct interaction with the research problems it seeks to solve. Through effectively explaining to the community what issues scientists and society faces, giving unfiltered views into current efforts to study topics, and allowing a diverse selection of people to collectively provide their insight on topics under investigation, both education and research will improve. Integrating these two programs into a singular setting will be mutually beneficial and as a result, have greater success than if they were alone.
Despite the efforts made by educators and scientific journals, the public is still missing some of the major points of relevant research. Not only is giving information to the public important, but it must be provided in ways that are relatable and applicable. This makes it possible to truly say that the message has been learned. What people are shown in exhibits and how it’s presented to them has a profound influence on how they perceive topics. Without this tailored approach to education, individuals may be misled or undervalue the importance of what they are being shown. Efforts to gain insights into this have only begun in earnest within the recent history, providing proof as to what works and what doesn’t. A happy medium of what is displayed must be found so as to not be too overbearing, while still being explicit enough to get the point across.

One of the most acclaimed examples of how to successfully connect the public to nature while still imparting the importance of its message, is the Monterey Bay Aquarium. Founded in 1977 by biologists from Stanford University, its intention was to “expand the public interest in and enjoyment” of the surrounding marine environment (Ramberg, Rand, & Tomulonis, 2002). Over the years its focus adjusted to changing views on how to promote ocean conservation. Their current mission has shifted to: [I]nspire conservation of the oceans. Fulfilling this mission involves creating experiences where visitors can raise their awareness, increase their knowledge, build conservation values, and learn about conservation-related behaviors. In the most basic sense, we created exhibits that seek to inspire, engage, and empower visitors to join us in protecting the future health of the oceans. (Yalowitz, 2004, p. 284)

Despite this reform, there was concern that the central message was lost on guests. In fact, only ten percent of those visiting were able to express the main message when asked (Ramberg et al., 2002). To discover how strongly messages are communicated through displays, in house studies began in 1991. Their focus evaluated visitor retention of information, desire to learn more, and the impact that it has had on lifestyles. How people perceive the natural sciences has recently become a topic of importance to institutions. This inquiry, known as conservation psychology, is quickly changing the way information is considered to be successfully presented (Carol D. Saunders, 2003). As a result of this new concern, emphasis is being given to “reinforcing the message in different modes for visitors with different learning styles,” most notably active learning (Ramberg et al., 2002).

Based on the findings of their investigations, the aquarium came up with several conclusions. In addition to giving relevant information effectively to visitors, providing specific solutions to the issues being presented is also necessary. From surveys filled out by their visitors, the Monterey Bay Aquarium has found that “when a conservation exhibition presents problems without offering specific solutions, visitors leave more disillusioned and less confident that their actions make a difference” (Yalowitz, 2004). If we are to impart knowledge an effort must be made to explicitly provide solutions.

Society faces the dilemma of wading through an education system based on conformity. An even greater barrier to learning may be its separation from what is being taught. How individuals learn and new theories on this topic are constantly being introduced. A call to revolutionize the education system have been made for some time. The present way that students are taught has critical flaws, especially when dealing with current issues. Engaging the public to interact with problems causes a level of involvement that isn’t seen in passive description alone. This leads to improved enthusiasm and learning about the discussion. It is by giving individuals first hand access to issues and current research that interest can be increased on topics.

Current methods used for teaching are overly reliant on one learning style and altered versions of them are inadequate. Educational theorist David Kolb warns of
connecting learning styles with fixed traits, which might force individuals into stereotypes of what type of education is best for them (Kolb & Kolb, 2005). In his 2010 speech given on the TED stage, creativity expert Ken Robinson suggested that in the educational system reform only “improves a broken model” (Robinson, 2010). By removing the time delay between discovery and publication while also providing direct contact with the material, enthusiasm of the individual increases. This should be given with a discretionary statement. While information given this way is cutting edge, it does not have the benefit of retrospect or confirmation of its authenticity. Learning in this way can lead to a desire to participate in science as well, as a way in how these research sagas end by those who were merely observing before. Their learning of a topic can directly lead to a better result being reached and it is this interaction that improves interest.

In order to reach the largest audience, exhibits should cater to a diverse range of learning styles. Conservation psychology studies at the Monterey Bay Aquarium have led experts to surmise that, “the most effective way to convey [their] message was through a mix of media: reinforcing the message in different modes for visitors with different learning styles” (Ramberg et al., 2002). This opens up learning to the entire interested public, not just those who are obligated to learn.

While no learning style is necessarily wrong, some are better suited for certain subjects. Giving individuals first hand access of issues and current research can increase interest about topics. Students are often taught in ways that have no “relevance or connection” for them; leading to “inert knowledge – knowledge that cannot be applied to real problems and situations” (R. Scott Grabinger & Joanna C. Dunlap, 1995). By directly showing the reality of what researchers deal with and how they grapple with it, the public will be more engaged and be able to grasp what is being explained. To this point, studies undertaken by the Monterey Bay Aquarium have shown that “the best predictors of how visitors would remember, react to or act upon conservation-related material were their degree of involvement in and knowledge about conservation issues” (Yalowitz, 2004). This conclusion may not be suited for the general education system, but this serves as the basis from where we gain our opinions on how we should learn. Therefore, its shortcomings should be taken into account when dealing with any aspect of discovery.

Unfiltered access to the problems that researchers hope to solve and process of discovery can work to increase interest about an issue. This is more of a direct observation than active learning. This transparent explanation of research more trust can be garnered from the public. There is less doubt or incredulity in what or how research is ascertained. Discovering with others and interacting with experts create a fuller understanding of what has just been observed. Critical thinking, which leads to the conclusions of how one should react as a response as well as possible further investigations, is lost. By bringing evidence, exhibiting new ideas and interest are formed, leading to both a more complete learning experience and fruitful research. Forums not only clarify the information that has been presented, but also build connections between speakers and the audience, possibly leading to higher public contributions to citizen science.

Learning concurrently with others has numerous benefits, especially when a range of expertise is represented. Group settings provide a constructive context for sharing and debating information. Results from group collaboration tend to be more developed due to the benefit of having a larger pool of knowledge to pull from (Becker, Harris, McLaughlin, & Nielsen, 2003). Giving access to research at different levels of proficiency can increase the amount of resources in use and provide access to less restricted thoughts. Advantages to group work aren’t exclusive to the untrained populous. Experts can also gain more diverse solutions by interacting with individuals ranging from other research fields to the engaged public.

Dialog between various levels of expertise allows ideas to flow, spawing new advancements in research. Because of the positive effects to both research fields and learning experiences, situations that promote such interactions are given attention. TED Talks and other similar settings are investigated to discover what gives their kind of cooperation such a profound influence on audiences. Presenters there adopt at communicating abstract concepts in simple terms, a social process known as popularization. For the same reason that TED talks are successful, bringing experts to collaborate and share knowledge with one another, more cases like this could arise.
in direct contact with an audience establishes their ethos. By "breaching the typical 'scientist-mediator-audience' triangularization" scientists can build stronger connections with their audience, a concept referred to as proximity. The relationships formed through this interaction provides insight into the speaker’s connection to the topic. Fostering trust in this way helps to place speakers and the audience on the same level (Carlo, 2014).

As a result of increased engagement and confidence in their ability to provide aid, the public may find that they have a place in furthering research. Citizen science, defined as “a form of collaboration that involves the public in scientific research to address real world problems,” provides a platform from which amateurs can become involved (Sabou, Bontcheva, & Scharl, 2012). Crowdsourcing is a similar concept, but isn’t exclusive it to scientific endeavors. Some of the earliest examples of citizen science can be found in the natural sciences. Surveys, like the National Audubon Society’s Christmas Bird Count, which dates back to 1900, utilized citizens to make observations of birds in order to determine the status of avian species. To elicit a response from the public several methods are used including; paid-for mechanized labor, games, and volunteer contributions (Sabou et al., 2012). What drives the increased use of the public is “the increasing realization among professional scientists that the public represents a free source of labour, skills, computational power and even finance.” Additionally, citizen science is seen as a way to provide public accountability, especially in publicly funded projects (Jonathan Silvertown, 2009). Disadvantages do also exist. Due to the limited training that participants receive, tasks are usually simple and monitored by experts to provide validation (Jonathan Silvertown, 2009).

No research project exists in isolation. Interactions between researchers, backers, and the public are integral to any scientific work. Despite this knowledge, it is common to reinforce the other, creating outcomes that surpass what either would be singularly. Building off of the studies on the effectiveness of exhibits, a better outcome that fosters interest and a desire to act will become more commonplace among visitors. Their first hand, participatory views into how research is done is a major influence on how people will act upon what they have learned. Implementing what has been suggested during the joint research-public interactions is the next step in this process. Hearing directly from experts will inspire trust and increase participation in citizen science. The general public’s desire to learn more about the world around them should be the starting point to collaborations with experts and will lead to better outcomes for all.

In their article on about the impacts of “interactive community forum” Becker, Harris, McLaughlin, and Nielsen goes into depth on how various aspects of group learning impacts society. The main focus is on how bringing together a large and diverse group of people in a structured setting will produce more varied and advanced conclusions. By touching on the subjects of the use of citizen judgement, how individuals can use their local knowledge to identify community impacts in small groups, and how forums can be implicated in research.

The most useful parts of the article were references to how working in groups impacts “open dialog and discourse.” Descriptions of how working in groups will increase the quality of what is produced feeds into my article’s claim that learning with people is beneficial to all involved. Including facilitators with this will improve trust and provide background information. It is by informing the public that they can accurately judge how issues impact the community.


The article’s focus what specific characteristics help TED Talks become successful feeds into why having direct contact with experts is beneficial to learning. Terms such as proximity and popularization help to describe what audience-speaker interactions help to establish a relationship and build ethos. With presentations directly to people, the scientist-mediator-audience triangulization is removed from the equation. This happens during the live presentations and also online with transcripts. From placing speakers and listeners on the same plane, people are more willing to trust what is being said. Credibility, based on credentials is listed, after presenters have provided the background information to at topic and personal stories are given. Thus relationships are based on what is being described, not pre-existing conceptions of who someone is. Inclusive nouns are used to indicate that the project is jointly shared by everyone involved. Seeing the reasons behind why TED talks are so successful and have such an appeal to a diverse audience provided helpful insight. The data provided on what kind of structure is most prevalent, proved to be slightly too in depth to relate to theoretical aspect statements it did provide some physical evidence to support what Carlo claimed.


With interest growing as to what makes certain public outreaches in conservation settings successful there has been an increase in the use of psychology in the last couple of decades. Finding ways to connect people and nature as well as researchers and practitioners are two ways that this topic can improve the effectiveness of presentations. By bringing in a diverse group of people a fuller description of relationships will be created. Much of what Saunders talks about is given in terms of how people relate to environmental and sustainability issues, but this can easily be adjusted to fit learning about topic of research in general. Psychology can also be used in this context to identify what people already connect with and why they do so. This information can be then reapplied to exhibits in an attempt to get people to absorb as much information as possible.
In order to collect data and involve the public, scientists employ amateurs that are willing to contribute to an otherwise overwhelming task for researchers. Jonathan Silvertown explains that this process is not a new concept. While the internet has increased access and ease for the public to partake in science, the first formal use of this technique was used by the national Audubon Society in their Christmas Bird Count. This has since spawned similar studies using the public as contributors for a diverse range of research topics. Professional scientists are realizing that using a workforce like this can increase their access to labor, skills, and finances. When employing the work of amateurs there can always be a question of quality of work. This is solved by a validation process by trained individuals.


In the article Alice Kolb and David Kolb discuss the Experiential Learning Theory, a learning model that looks into the relationship between student learning and the institutional environment in which they learn. It is explained that there are several different styles to learning to which people can benefit from. David Kolb claims that using a learning style inventory (LSI) individuals can find out what makes them unique. What should be avoided is only interacting with people based on the style that they ascribe due to the fear that this would limit the individual. How people can best be educated can then be translated into the physical setting that they best do this in.


This journal article, written by Ramberg, Rand, and Tomulonis, describes the transformations that the Monterey Bay Aquarium has gone through to better reach its visitors with its message and to reorient itself so that the current need of the ecosystem it supports are met. From its creation, the renowned aquarium wanted to understand the people that would walk through its doors. The scientists behind the facility thought that the best way to communicate a message was to tell a story with their information. The authors describe how by 1991 concern began to grow that visitors were missing the main message of exhibits. In an attempt to remedy this, studies looking into what worked and what didn't formed crucial information on what visitors could respond to and react. This article provides strong evidence on what was successful in the Monterey Bay Aquarium, much of which is applicable to studying how best to display conservation information to the public. Being able to see the justification for each decision that the facility made gives good insight into what goes into the design of a wide range of exhibits. Because the paper is from the point of view of those involved information has a more personal tone that can be related to.


In this article, by Grabinger and Dunlap, the reasons for changes in the education system and possible solutions are provided. Many of the things that people are taught are not applicable to real life scenarios. This leads to inert knowledge, which students don’t realize that they can draw upon. Personalizing knowledge can help to alleviate this. By following the basics behind REAL strategy, learning through active participation is a better way to present information to some people. Explaining why active learning can provide benefits to students in ways that the current education system can validates a more firsthand experiential learning. Providing real world applications to knowledge, much like what is done in science centers, is a good justification to why exposing the public to the problems that society currently faces and
research being done on them spurs interest and a more educated population.


Ken Robinson, considered to be one of the TED Talks’ leading presenters on education related material, presents his views as to why the current education system is flawed. Schools focus too much on teaching everyone in the same manner and expecting the same results every time. This “industrial model of education” limits the potential of individuals.

The transcript format from the TED Talk gives a conversational tone to the piece. The stories and personal perspective puts the reader on the same plane as Ken and leads to easier acceptance of what is being suggested. Inclusion of responses from the audience, mainly laughter, not only gives the opinion of the presenter, but also the response to those that are listening, possibly also shaping opinions of the piece.


In their article, Sabou, Bontcheva, and Scharl describe how crowdsourcing can be applied and what advantages it has in science. The background of crowdsourcing begins in the citizen science of bird surveys, but has advanced to using the internet to reach a much larger base and diverse group of people. Crowdsourcing has multiple variations, including mechanized labor, which has compensation, games with a purpose, and altruism, also known as volunteering. Each form appeals to a different group of the public and could be more successful with certain projects. Issues such as preventing bias and motivating participants still exist and must be taken into account.

The background provided in the article is very in depth. The authors introduce terms to describe their message and define clearly. Many example of current, and some past uses of crowdsourcing provided in the article give a diverse view into how it can be used and what advantages it has in science.


Yalowitz’s paper brings to light how the Monterey Bay Aquarium has evolved over time to get its message across to visitors. The gradual process looked at who would be coming in, what interests them, and how they would remember what they saw. Providing specific examples is what the aquarium does: when in the aquarium gives a perspective into how best to cater to them. These descriptions justify what is constructive when dealing with the public. The reason by reason disassembly of every point is concise and gives clear ideas as to how to think about presenting material.
PRECEDENT ANALYSIS
Various buildings have been assessed in order to provide guidance on the proposed nature center. Typologies focused on consisted mainly of display spaces, such as museums, aquariums, and science centers, research facilities, and nature pavilions. These buildings house or enable organizations to present the world of science to the public. In an effort to see diverse responses to the same typology, an attempt was made to look for buildings that were geographically diverse. Trends of connections to the land, whether physically or visually, were noted. Large, flexible spaces that house active interaction exhibits were a common feature. So too were the inclusion of spaces that the public could freely wonder through. These precedents were then viewed to determine their successes and failures in order to learn and apply them to the theoretical research that has been done thus far.
Using the shell of a former cannery, the Monterey Bay Aquarium has a close connection to its context. Challenges, such as dealing with corrosion from sea water, forced the design to react uniquely. The result became a source of pride for the aquarium. Organizers originally desired a space that would provide close, intimate observations of sea life. To facilitate this, visitors are placed into the surrounding environment and vice versa, by way of large windows and water tanks.

The exterior of the structure provides multiple vistas to the surrounding views of the environment. Despite modifications and additions the original, industrial appearance remains. This was intentional. The designers wanted the aquarium to limit contrast and fit with its surroundings.
CONCLUSION

Connection to the land or sea, as the Monterey Bay Aquarium has done, is important to any building that wishes to put emphasis on nature. This extends to the human surroundings as well. By paying homage to what previously existed on its site the structure reduces its impact on the environment and doesn’t contrast with its surroundings. Accepting the ephemeral nature of the structure has led to a building that will continually evolve with the information it wishes to display. Based on its popularity and many awards it has proven to be inspirational to interpretive centers yet to be built.

ORGANIZATION

Placing the exhibition halls closer to the exterior, as done here, helps to show connections between what is being displayed and the natural environment. This leaves many of the service and small scale spaces to be clustered near the entry. From here, the main circulation path divides the structure diagonally, with secondary routes branching off into exhibits.

High ceilings, especially in presentation spaces allows for light to come in through upper clerestories and gives a space for overhead displays. By being free from obstructions, spaces flow more smoothly and encourages visitors to move as they will to whatever gains their attention.

APPLICABLE FEATURES

The similar context of a seaside former industrial site, draws parallels to my thesis. I wish to utilize similar connections to the surroundings in my own design. Mitigating brash forms and materials is also interesting because the focus should be on what is being presented. The building should be a frame, not the centerpiece when dealing with learning. This is especially true when dealing with ecological topics of research.
Relocated from its former space in the Palace of Fine Arts, the Exploratorium moved to its much larger new location. Now in century old warehouses on San Francisco’s eastern waterfront, the structure was designed to be net zero and LEED gold. While the old building held sentimental value to its visitors, the new structure has four times the square footage and room for future expansion. Many people originally believed that this space would be ill-suited to the needs of the museum, but this sentiment has changed since it has opened to the public.

Utilizing the existing buildings of Pier 15 and 17 allowed for an open plan, high ceilings, and an uncluttered sense. The original large windows provide fantastic views out to the bay from inside and of the displays from the public boardwalk that encircles the building. By being able to glimpse the interior, it is hoped that more attendance will be amplified.

Fig. 22  Waterfront addition to Exploratorium

Fig. 23  Exploratorium Front

Fig. 24  Exploratorium Side
CONCLUSION

This new facility for San Francisco’s Exploratorium provides a much more suitable place to display science. Its location, on the highly pedestrian friendly Embarcadero, allows people to easily stumble upon the space. Providing a boardwalk for people to enjoy San Francisco Bay provides valuable public space for people to walk. In the thesis project under development, it will be important to give amenities to people who aren’t there necessarily to learn about science. Due to its similar site, boardwalks may also be a good inclusion.

The use of visibility and transparency was followed closely in the design of the building. This led to giving the general public glimpses of what exists inside, enticing more people to enter and increasing attendance. Giving adequate space for people to enjoy displays, as done here, is a good tactic to let visitors feel more comfortable. Strict regulations on signage forced the Exploratorium to rely on the appearance of the building itself to act as an icon for the museum it houses.

Sustainable strategies are also influenced the design. The net zero and LEED gold rating is an inspiration for all future science centers. Photo voltaic panels producing a total of 1.3 megawatts of power and a sea water heat exchange system are two progressive tactics utilized.

ORGANIZATION

The existing warehouses on Pier 15 and 17 stretch out into San Francisco Bay in largely open plan single story structures. In order to provide as much natural light to the display spaces as possible, these are located around the exterior of the building with the vast majority of services and small scale presentation spaces being assembled in the center. Spaces are high and airy, allowing for large amounts of natural light to enter. Large open floor plans also help to accommodate the ever changing space requirements for exhibits. Areas, especially those outside, are separated into areas meant for paying individuals and the public at large. This provides much needed public space for San Francisco and help to give the site a purpose which can be enjoyed by people who may not be interested in science museums. In addition to this, the building’s cafe is located at one of the furthest points from the main entry, causing people to be drawn deeper into the building.
Opened in 2000, the Lake Superior Center is the home to the Great Lakes Aquarium. The regional focus of this center’s exhibits are also expressed in the design. Not only are local fresh water fish on display, but materials and color pallets from the region prominently shown. Links are metaphorically created to the region’s landscape and culture through symbols and forms. Located along the Duluth harbor waterfront, the structure has a commanding stance that demands attention and overlooks its surroundings. Numerous complaints that its modern appearance failed to match the structures in the surrounding have been made. Three distinct forms, each with their own color pallet, make up the structure. Orientation of these are focused on waypoints and views; most notably Lake Superior. Cantilevers reach out to create visual connections to these and provide panoramic views to the landscape. Despite being elevated above the rest of the site, ramps link the center to major boardwalks. HGA made an effort to think of the user’s experience while designing. Immediately after entering visitors are greeted with an enormous water wall, meant to show the overwhelming scale of water. The simple, uncluttered interior places focus on the exhibits, not the building itself.
CONCLUSION

The use of local materials and forms would be a good idea for future science centers. This creates a connection to the local people and landscape, fostering acceptance visually. Connecting to existing pedestrian routes improves attendance and the relationship between it and the rest of the city. Elevating main spaces to a height that gives good views to the surroundings is exemplary, but studies must be done to mitigate what sight lines might be blocked by doing this. Removing service areas to lower floors is a good natural segregation between public and private areas and makes the space seem to focus more on its tenants. A simple interior, like what has been created in the Lake Superior Center, places emphasis on what is being displayed. A museum building should be a vessel that enhances what is being taught inside. Visitor should use a building to improve their experience and be only vaguely aware of their physical limitations while inside.

ORGANIZATION

To begin with, the three forms point to landmarks, framing them in the large windows. Visitors enter on an elevated first floor. Service, mechanical, and administration spaces are located below this in a pediment, leaving the rest of the building open for exhibits and public spaces. When entering, circulation is concentrated to a long escalator that has little views to the outside or displays. This is meant to “cleanse the visual palat” of visitors, preparing them for the rest of the building. From this point on circulation is free and open, with multiple paths winding through the various exhibits. Being on the second floor, there are sweeping views of the lake and hillside, connecting what is inside to what is outside.

Open plans and high ceilings allow for a high level of flexibility for administrators to arrange the various displays. Exterior walls are easily accessed with few obstructions. This leads to a high degree of natural light reaching the interior as well as strong sight lines to multiple exhibits.
When designing this new facility, Morphosis aimed to overcome two common trends in museum architecture. First, the structure was to be as environmentally sustainable as possible for a building of its type. Secondly, they rejected “the idea that museum architecture is a neutral background for exhibits.” The building itself is meant to actively teach science education. Rolling landscapes lead from ground level and meets with the block form, reflecting in the form of the lobby’s roof. The central atrium flows to the top of the imposing cube containing the majority of the facility’s.

The Perot recognizes that as the environment faces increased pressure from man the understanding of our the influence we have will be informed by museums display. This new, iconic facility embraces sustainability and aims to appeal to a broad audience.

By showing that innovative design can work in harmony with nature the museum demonstrates what it the sustainability that it preaches and stimulates curiosity.
CONCLUSION

Museums play a crucial role in the understanding of our impact on the environment. Its design is meant to stimulate memorable experiences throughout a diverse audience with the hope that it will lead to a greater understanding of science. Starting with the surrounding landscaping, the facility is designed to make visitors interact with nature. Circulation is skillfully based around the central atrium, which not only ties the floors together, but connects the visitors with the surrounding environment. While the structure does present a pristine, new face for the Perot to the city, it does so at a the cost of being too imposing on the visitors.

VISITOR EXPERIENCE

Visitor experience begins upon the approach. Guests walk through landscapes of native ecosystems that lead up to an entry plaza, which provides a public outdoor space for the city. Sloping to meet this is a rippled green roof that acts as a pedestal for the main block form which comprises of the majority of the structure.

Visitors experience the compression and release of space as they enter. Upon entering, visitors are guided to the top via escalators. This high elevation is taken full advantage of. From here, patrons are given a broad view of downtown Dallas. From here the path spirals downwards through the large concrete block mass. This procession allows visitors to strengthen their connection with the building. The path taken "weaves in and out" of the main atrium and galleries. This constantly shows visitors views of the city in contrast with the intimate environment of exhibits.

Education and children’s spaces are contained in the plinth of the structure, where there seems to be organized into clusters of rooms that happen to butt up against each other instead of a unified whole.
Snehetta has provided a simple yet elegant structure for the Wild Reindeer Pavilion educational program on the remote edge of the Dovrefjell National Park, Norway. The surrounding mountains, commonly a fixture in Norwegian cultural myths and history, provided much of the design inspiration. The wooden interior takes its form from the idea of nature eroding the ice or stone of the landscape. In contrast to this, the steel frame takes cues from local building techniques and materials. In order to resist weathering, a focus was placed upon quality and durability. The abstract inspiration from the surrounding environment provides a stark, but unobtrusive shelter from the elements revolves around one determining factor, to “reflect upon the landscape.”
CONCLUSION

Iconic architecture doesn’t need to stand in opposition to nature. The use of traditional materials and implementation of an organic form makes the building noticeable and yet still appropriate for the setting. With the simple form and minimal material pallet the reindeer pavilion provides a unobtrusive view to the surrounding landscape. This building, and observation pavilions in general, do very much what a viewing platform does in any large aquarium. The only difference is that the observation area is contained and the exhibit is not. This reversed state of being places emphasis in what is truly important. Interacting with the real world has more of an impact on the visitor than a diorama.

ORGANIZATION

Glazing faces the south to provide a panoramic view of the surrounding area. The opposite side consists of a full height bench form, meant to provide a stark contrast to the dark frame, is oriented for visitors to admire the exterior exhibit. A small fireplace hovers above the ground plane, providing warmth to visitors. At one time the horizontal lines of the floor and roof emphasizes the vastness of the surrounding land and yet the rolling horizon is emulated by the carved wooden form. Both of which can be seen through the glazing.
Designed to research and exhibit the surrounding ecosystem, this research center by Ennead melds with the surrounding landscape in an attempt to evoke the form of nearby landforms and reduce the impact upon them. Spaces are arranged into three “pavilions” connected by an atrium oriented to maximize solar exposure. In this facility, researchers, artists, and locals are given a space to collaborate on ecological and cultural conservation. Focus was placed upon durability of the structure because the remoteness limits materials for repair.
CONCLUSION

The Cape Horn Sub-arctic Center aims to sit as lightly upon the site as possible, following the advice that it seeks to impart. Spaces are flexible and have multiple uses, even those outside of the walls. Inspiration from the landscape is obvious and well placed. Taking cues from the land that it seeks to research is an appropriate direction to go. Integrating local building techniques also allows the population to relate. To provide a space for such a wide variety of the public to interact is a noble thing to do. It is not just scientists that would benefit from partaking in ecological research. Natives have a vested interest in the health of the land that they identify with.

ORGANIZATION

The facility is divided into three sections or pavilions. All three are connected via a central hall that is embedded in a bluff. The more public spaces are located near the main entry and with the largest expanses of exterior wall. As spaces become more private they retreat into the hill and are further from the main halls. A café is located partway into the building for easy of access by all who utilize it. Between each section and on the roofs are outdoor classrooms.

![Figure 60](image1)

![Figure 57](image2)

![Figure 58](image3)

![Figure 59](image4)
Ennead designed this museum to sit upon the landscape without disturbing the preexisting forms. Jagged edges mimic the surrounding mountains abstractly and the path to the front door winds around like a hiking trail. The design began with an “expedition” across Utah to discover an identity that the state’s citizens identified and location that they cherished. To best fit into the site, the distinction between what is engineered and what was originally on the sit is left intentionally vague. LEED Gold also adds to the notion of stewardship to the site. Visitors are allowed to look into lab space where researchers are currently working.
CONCLUSION

The building does a good job of meshing with the site. The extensive efforts that Ennead has done to take inspirations in form and material have paid off. The ideas of collaborating with local universities and letting the public view the laboratories is similar to what I intend to design. I do worry about how linear the design is. With all of the exhibit halls facing the south and all breakout spaces are towards the north. The large surface area of the gallery edge allows for a long line of interactive points, but spaces are not scattered throughout.

The building is a good study in section, and is remarkably terraced into the hillside in its five stories.
PROJECT ELEMENTS

RESEARCH
Monitor and support the ecosystems in the Thunder Bay Region. By doing so the land will remain health and an economic asset for the people who live there.

CITIZEN SCIENCE
Provide an outreach to visitors, both locals and tourists. Expose them to what ecological researchers do to reach logical conclusions about the state of the ecosystem.

EXHIBIT
Inform visitors of the issues that the local landscapes face and provide suggested solutions to them. Take pride in the natural features in the area.
The needs of the clients and the requirements set forth for the Thunder Bay waterfront redevelopment will define what is required from this proposed environmental science center. The major functions of the structure are research, academic, and exhibition. Spaces will remain flexible so as to easily adapt to the changing needs of the exhibits. Main unifying ideas include keeping the visual impacts minimal for the rest of the city so that the views to the water will be intact. Layout and materiality should place emphasis on what is being exhibited as well as the surrounding landscape. Varying degrees of public accessibility will be provided ranging from those that are fully available to passersby, sections that are only open to paying visitors, all the way up to private spaces for researchers to retreat to.
# SPACE LIST

## SPACE BREAKDOWN

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<th>Net Areas</th>
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### CIRCULATION

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### TOTAL AREA

- General: 7300
- Office: 1000
- Equipment Rental Room: 200
- Reception: 100
- Break Room: 100
- Display: 250

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- Office: 1000
- Equipment Rental Room: 200
- Reception: 100
- Break Room: 100
- Display: 250

**TOTAL AREA: 87300**
SPACE LIST

QUALITATIVE STATEMENTS

RESEARCH
The research portion of the laboratory is one of the main emphases of the facility. While it should maintain a close proximity to the storage and receiving areas, a link to the public portion of the building should remain. Work areas, including the labs and group work areas should be spacious and be along exterior walls whenever possible. This section is to be allow for ease of work and circulation should be minimized with a reasonably compact layout.

ADMINISTRATION
The administration area seeks to serve the research and academic areas. Offices for researchers and their assistants are to be included. This would require the space to be in close proximity to the research laboratories. A barrier between this area and the public portion should be clear to give privacy to workers. This is likely to be the most secluded portion of the structure.

ACADEMIC
There is to be overlaps between the academic, display, and public spaces so that presentation areas can be shared. Main users would be students from local universities, professors, researchers, and visiting science experts. Areas are to be relaxed and open. Areas for private study and group interactions should be provided.

EXHIBITION SPACE
Large and open, the exhibition spaces are the greatest portion of the science center. The main halls should be free from obstructions and have sweeping views of the surrounding landscape. Most likely they would all be multiple stories, up to three. Color pallets and details should be tasteful, but not take away from what is on display. Focus is to also focus on exterior views. Display halls should be linked visually and specially so as to promote movement between them.

DISPLAY SUPPORT
The display support spaces are to be integral with the exhibition spaces. They should be located between display galleries or along their perimeter for ease of access. The cafe in particular needs to be located so as to be easily accessed by all parts of the building, have a good view of the surrounding site, and be in a place to draw in visitors as far as possible into the structure, past displays. The gift shop would have a similar location. Storage must be spacious to provide space to store exhibits not in use and in construction.

RECEIVING
The receiving area is to be away from the public eye. Links to research and exhibition space would limit the distance that large objects would be moved through. This area doesn’t need views and needs to be screened.

The city of Thunder Bay also requires space on the site to support activities done on the waterfront. These spaces should be given their own entrance so as to not force users to go through display areas.

GROUP FACILITIES
Local groups are to be provided with areas to hold meetings and public events. By combining these groups with a science center a more diverse group of the public that can use the building. Presentation spaces can overlap with academic areas.

PUBLIC SPACE
Large and open, the exhibition spaces are the greatest portion of the science center. The main halls should be free from obstructions and have sweeping views of the surrounding landscape. Most likely they would all be multiple stories, up to three. Color pallets and details should be tasteful, but not take away from what is on display. Focus is to also focus on exterior views. Display halls should be linked visually and specially so as to promote movement between them.

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### Building Area Summary

<table>
<thead>
<tr>
<th>SPACE NAME</th>
<th>PEOPLE</th>
<th>SPACE NAME</th>
<th>PEOPLE</th>
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<td><strong>Subtotal</strong></td>
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Eight separate areas make up the design in addition to circulation and utilities. The largest of these by far is the exhibit hall, taking up 60% of program square footage. Within it large displays and dioramas will be shown to the public in large interactive formats. Research and academic spaces, also important to the program, are the next largest. These three together make up the main spaces of the center. Additional support spaces make the building function and add additional reasons for people to visit the center.

### Land Use Requirements

<table>
<thead>
<tr>
<th>RESEARCH/SCIENCE CENTER</th>
<th>PEOPLE</th>
<th>GROSS BUILDING AREA</th>
<th>FLOORS</th>
<th>BUILDING FOOTPRINT</th>
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<td>38000</td>
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<tr>
<td>VISITORS</td>
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<td><strong>1</strong></td>
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</tr>
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</table>

The land surrounding the science center is a reclaimed brown field site on the edge of Thunder Bay. The city is planning on using much of this old industrial site as a waterfront park. As such, much of the land is to be kept open to the public and able to host a variety of activities. The building and parking areas are to be downplayed by using the contours of the land and adding plantings. Researchers, students, and visitors of the building require parking on site. Also, individuals that partake in waterfront recreation also need a place to park. Permeable parking is preferred and all runoff is to be mitigated before it leaves the site. A high amount of care need to be taken to ensure that nothing from the site disturbs the water nearby.
Ecological research should not just be set aside for experts. A range of individuals should be present and take part in the science that affects the ecosystem that they live in. By doing this more people will take responsibility for finding solutions to science problems. The design should work to mix individuals from multiple disciplines.

Adding additional functions that bring in a diverse range of people will help to ensure that the building is lively. This building is there to make people want to get involved in science. Exhibits should be highlighted, not overshadowed by the design of the building. Many spaces need to be flexible so as to house a variety of functions.

The building is specified to have a high level of craft and polish. It is to be a space that the city takes pride in and people enjoy inhabiting. The thought is that this is some what of a living room for the city. Federal and local funds provide portions of the financing, but other private enterprises will be included. This public-private partnership follows what Thunder Bay strives for as it develops its waterfront. Higher cost due to sustainability and energy efficiency must also be factored in. These should pay for themselves over the lifespan of the building.

EDUCATION AND RESEARCH CENTER
SCHEMATIC DESIGN
FALL 2016

FUNCTION
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ECONOMY

Local residents want waterfront buildings to blend in with the surrounding landscape so as to not ruin views of the bay. A modern design should remove unnecessary ornamentation as required. Inspiration should come from existing and planned buildings in the surroundings, many of which are designed by Brooke McKillroy. The industrial heritage of the site can be paid homage to.

Because the building’s design will be finished in early 2017 occupants are expected to move in by mid 2019. This leaves two years for construction. Because much of the surrounding area is currently being developed, infrastructure and area master planning should be completed well in advance.
Located within the bounds of the Pool 6 development area, the site is in a prime location to aid in Thunder Bay’s waterfront redevelopment. Formerly a flour elevator, the brown field is within walking distance of the Prince Arthur’s Landing and the Port Arthur downtown. Thunder Bay originally began to bring commercial and civic development to its waterfront in 2011 with the completion of Prince Arthur’s Landing. Based on the success found there, additional building is being done on the land to the south, known as Pool 6.

Formed from the merger Port Arthur and Fort William, Thunder Bay is a hub for North West Ontario. While originally focused on transportation and industry, medicine and tourism are fast becoming the main commerce.
Figure 78 Pool 6 wildlife rehabilitation pond

Figure 79 Port Arthur Shore Areas

Figure 80 Traffic Patterns
Connecting people to the land is a major focus for the continued waterfront development. Major structures are to be focused within Prince Arthur’s Landing while the landscape has been promoted as the draw for Pool 6. Providing the city with access to its waterfront has been the desire. Balancing the built environment with open sits is a major need for anything built along the shore.

Paying homage to past industrial uses is also important. Thunder Bay came to prominence because of its strategic location at the head of the lake.

Winds vary based on the season. Summer often has both east and west winds. Winter has predominantly west winds. Climate is humid continental with short summers and long cold summers. Weather is often influenced by Lake Superior.

Thunder Bay is located on a hill, gently sloping towards the lake. Most water runoff from the city is diverted to the north and south of the Pool 6 site into wetlands and streams.
Figure 91 Side view of Pool 6 trestle
PLAN FOR PROCEEDING

DEFINITION OF RESEARCH DIRECTIONS

To build upon what is already accepted in the design community, extensive research to prove that both public education and research endeavors will be benefited through increased interaction must be done. This begins by first looking broadly at what is required for the typology of the thesis, conservation science center. Questions that need to be answered through research include: how people best learn about conservation and how ecological research is conducted. From here, a more detailed look into the individual aspects of the design problem can be undertaken. One of the most crucial for this project is to discover how to best explain to the public what conservation issues currently exist, a process heavily scrutinized by the Monterey Bay Aquarium, known as conservation psychology. How best to mitigate the impact of this center on the land is also required for a successful project.

A PLAN FOR DESIGN METHODOLOGY

Throughout the research and design phases of this thesis, methodologies will be used to determine how information will be collected and applied. The methods used to research will include qualitative inquiry, consisting of looking at the needs of the users, and logical arguments, formed by creating iterations of possible solutions to the thesis question and judging them on appropriateness. Additionally, these may be bolstered by interpretive research, that is looking at historical precedents and simulations. Collecting the initial information to inform the project will include viewing case studies, conducting interviews, and reading literature on the theoretical topic.

A PLAN OF DOCUMENTING THE DESIGN PROCESS

In order to properly record the design process will be continuous throughout the semester. The information compiled will provide context for the work that is completed and provide a way to judge the direction of the project. The medium of this work varies greatly: from audio recordings to digital images to physical models. All of this will be compiled into a final digital format to be archived based on topic. This digital file will be kept for reference or submittal if necessary. Additionally, the chronological order of the material will be noted for referencing. Physical copies will be kept if applicable.
### PROJECT SCHEDULE

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<td>4/11</td>
<td>5/01</td>
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<td>5/09</td>
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**Figure 95**

### Project Documentation
- Site/Landscape Boards
- Environmental Inspiration
- Project Schedule
- Presentation

### Context Analysis
- Literature Research
- Interviews

### Precendent Analysis
- Program
- Plan Design

### Program
- Form
- Section Design

### Section Design
- Structure
- Materials

### Structure
- Modern Preservation
- Design Revision

### Materials
- Site/Landscape
- Renderings/Drawings

### Modern Preservation
- Models
- Models

### Designs
- Project Revision

Figure 95
Figure 96: Northern shore of Sibley Peninsula, Thunder Bay, ON
Exhaustive research in numerous fields for this thesis has led to a greater understanding of what is required from architecture in order to provide a complete answer to my thesis question. Providing a solid foundation of research to a design creates a known constant that any decision can be judged by. Not just based in theoretics, a design takes on a new level of authenticity than that which is based on guesswork. With the prominent place that architecture takes in defining our society it is comforting to know that an aspect of our life was tailored to fit our needs and not just based upon the monetary factor.

Relying on multiple research methods was also beneficial to creating a network of reinforcing data. For example, the literature that I found commonly referenced the Monterey Bay Aquarium as an important point in the evolution of ecological museums. This in turn lead to case studies that analyzed what worked and what didn’t in that particular design. While designing to fit the perceived needs of the site and evolving the design through iterations can lead to a better understanding of what works, the ability to base that up with objective research about the requirements of the architecture from experts or their reports elevates this design to a calculated response, not just a conjecture.

Because this project is limited in conducting independent research of the needs of the general public, articles and papers have been referenced in order to inform how the general public learns, retains, and becomes engaged in information. This applies specifically to ecological conservation settings and topics. General theories from psychological studies are referenced in order to inform this aspect. Literature also forms that backbone of knowledge on how interpretive ecological centers have evolved over time to best inform their intended audience.

In order to determine the best way to help foster as stronger connection between the public and ecological researchers several methods of research has been employed. Three different approaches have been taken in order to understand the theoretical premise of the project. It should be noted that additional research is also done to explore the needs of the building on the site.

Directly speaking to individuals that work in the organizations that this thesis seeks to serve. A sample of experts in designing, researching, and managing ecological conservation centers from across the continent have been interviewed. Their insight both confirmed and expanded what I originally thought. By hearing directly from individuals involved in my typology I have evidence that has been tailored specifically for this thesis to rationalize my design.
PROJECT JUSTIFICATION

WHERE INTERPRETIVE CENTERS FIT IN SOCIETY

As human development increasingly puts pressure on the natural environment, research into how to mitigate damage will be more vital than ever. It is not that humans have created all ecological issues, but as we realize the true potential of our global influence, we will attempt to engineer a solution to perceived problems. Despite this, society chooses to ignore the advice of experts and disregard the remedies that are proposed. This has become so widespread that it has been termed the “War on Science.” This is not just at an individual or regional issue, but one of international proportions. Lawmakers threaten to defund the programs that were designed to monitor the environment that we identify with and depend upon. In order to tackle problems that will continue to appear a unified tactic must be taken that involves not just experts informing policymakers, but all of society.

95

96
The ways in which nature centers and museums in general present information the public has changed dramatically to better involve visitors. Originally, displays were passive, providing information in literature and static displays. A period of change was signaled with the opening of the Monterey Bay Aquarium. Here, guests are encouraged to be active with exhibits and live demonstrations, leading to what analysis revealed to be a greater understanding and engagement of the content material. Many of these organizations now serve to advance our collective knowledge of what's on display. Interpretive centers have taken a place in our society of not just informing, but entertaining. By doing so a wider range of people can be exposed to the subject. The role of science centers thus changes from one that solely focuses on education, to something that is more accessible. From here, the next step for interpretive center to take is to embed their visitors in the research process itself.

Societies are bound by water. For transportation, resources, or rituals it is the fabric that hold people. Following this, the waterfront of Thunder Bay is what lead to its initial and continued development. The industry of the Nineteenth Century covered up the sacred sites of earlier inhabitants, much of which is just now being rediscovered. As economies shift, so to does the waterfront. The voids left by vacant grain elevators are being filled by public spaces that once again connect the people to their lifeblood. On the Pool 6 site itself this stays true. Art features and monuments now represent the former uses.
This thesis explores how architecture can foster a stronger connection between the public and researchers. This will be based on research into what helps both groups learn and research respectively. Information on what would best serve the general public (visitors) will be based upon general theories of how the brain learns and retains information. Interviews will provide the first hand viewpoints of what kind of facility that work best for scientists.

All interviewees were asked the same questions (that may have been tailored to them) to remove a variable in their responses. Some questions were not asked due to overlap with previous responses. The questions were open ended so as to provide an opportunity to tell analogies and tangents. The interviews were either done over the phone or over Skype. Interviews ranged in length from 30 minutes to 1 hour and 20 minutes. Transcripts can be found in the appendix.

The Question Categories

How do you interact with the public?

How do you work?

How well does your facility affect the institution’s ability to complete its mission?

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RESEARCH: PRECEDENT ANALYSIS

With the large swath of precedents that were researched there was a good glimpse at a variety of ways to create an ecological interpretive center. This seeks to reduce any assumptions that this typology must be presented in a certain manner. The variety of precedents also allows for the ability to compare what elements seem to remain constant and which were added at the discretion of the architect. Average space allotted for various tasks were noted to remain within acceptable bounds.

Special attention was paid to where in these case studies interactions between the public and researchers were most likely to happen. The floor plan analysis worked to differentiate what was perceived as publicly accessible space and areas that were more restricted to visitors. In doing so, “points of interaction” were identified. These were believed to be areas of education, circulation, and the border between public/private. Because the purpose of this project was to bring ecologists in contact with a larger percentage of society, the more of these that a case study had, the more successful and valuable to this thesis it was deemed.

REVIEWS OF MODERN METHODS

As with any museum or nature center, control of lighting is viewed as important for the successful display of exhibits. At the same time, the public is often benefited from natural lighting or views to the exterior. Because of this a rhythm is developed where visitors alternate between spaces that are enclosed inward facing galleries to exterior oriented atrium.

As is to be expected, gallery and presentation spaces are commonly viewed as the crucial space in a museum or interpretive center. This is also because they usually hold after hour events such as dinners and meetings. In order to be able to accommodate a wide range of uses these spaces must be highly flexible, allowing for space for moving irregular sized displays. The short lifespan of displays, approximately five years, also reinforces the need for these spaces to be able to change as needed.
MONTEREY BAY AQUARIUM

Because of its site is partially located on a pier over water, the entry and service spaces are placed on the same side of the facility where it can be accessed by land. This might make it difficult to hide some less attractive areas from the public’s view, but it also allows for everything beyond this band of dense spaces to be open plan display space. To access the main exhibits all visitors must walk past many of the spaces reserved for researchers. This does have some negative impacts as well. Once in the exhibit galleries it is less likely to interact with research areas. Having a greater mix might increase the duality of learning the context of why research is important and then immediately viewing the research being done, thus improving how much is imparted on the public. There is a variety of presentation spaces. Some are laid out like traditional classrooms, but other less restrictive areas are also present. Sunken seating areas that are open to live environments allow presentations to include more engaging demonstrations.

CRITICAL SPACES

Great Tide Pool

This exterior space allows visitors to get a first hand experience with the environment. Nestled in an alcove, the protected area is still connected to the sea. Being able to have a personal connection with the land, or sea in this case, leading to increased memory and empathy to this area.

EXPLORATORIUM

The Exploratorium is an adaptive reuse of a century old pier. The exterior form is mostly an existing facade, but a few additions have been added. Due to the nature of a pier, only one side of the structure can be accessed from the land. It is here that the service spaces and some of the public entries are located. A deck that surrounds the structure allows the public to enter from several other points. The plan is essentially open and flexible gallery space that is spotted with more private areas of offices and classrooms. This allows visitors to move freely from one display to another. By moving the small cluster of rooms from the exterior walls there are many opportunities to view the surrounding context. The ease of being able to quickly transition from the large scale exhibits to smaller intimate breakout spaces.

CRITICAL SPACES

Central Gallery

This flexible space not only holds the largest collection of exhibits, but can be rearranged so as to host galas after hours.

Observatory

Located at the end of the pier, this space houses the cafe and a room for people to work in groups in hands on activities to come to their own conclusion on presented problems.

Figure 114

MIXED

Research spaces are in multiple groups around the exterior of the building.

Figure 115

FULLY INTEGRATED

Research spaces are fully dispersed within the building.
LAKE SUPERIOR CENTER

Perched on a hill above the Duluth harbor, the Lake Superior Center provides a spectacular view of the iconic lift bridge and the waterways that surround it. Visitors start in an entry hall and are quickly ushered upward by an escalator directly opposite of the front doors. The second floor circulation weaves in and out of displays, letting people choose from a limited number of routes. Large windows bathe the exhibit hall in natural light and draw people to the southern wall. Lower floors locate the education spaces in a tight cluster that can easily be avoided. Spaces for researchers and directors are notably absent from the first two floors.

CRITICAL SPACES

Classrooms:
These rooms allow for seminars and events to be hosted within the aquarium.
Main Gallery:
Open and flexible, the main gallery provides a wide variety of interactive displays, meant to
SEPARATED

Research and interaction spaces are pushed off to the side or are located on different floors.

PEROT

Placing the block form on a flowing plinth creates a smooth transition from the site to the vertically arranged gallery spaces. These exhibit halls provide a cascade of spaces that visitors travel through in a sequence. By including brief views of the atrium and surrounding landscape visitors are constantly reminded that what they are seeing in displays relates to their own life. Offices placed at the top and bottom may help to clear out an uninterrupted space for galleries, but deter interactions between the public and researchers.

This modernist approach to museum design provides a perch from which the landscape can be viewed, which is only taken advantage of in the atrium. It is questionable as to why gallery spaces, that are required to have few windows, would be placed in an arrangement best suited for observing the surrounding landscape.

CRITICAL SPACES

Central Atrium:
This space links the majority of spaces with a vertical void. It provides not only an entryway into the building, but a main path of circulation for every floor. In this predominantly vertical museum public movement between floors is accessed here. Windows bathe the interior with natural light and provides views to the nearby Dallas downtown.

SEPARATED

While some floors are integrated, entire other floors are devoted to public or research uses.
TVERRFJELIHYTTA

Two major features are provided within Tverrfjellhytta. A full wall window provides views to the surrounding landscape where visitors would likely gather. Forming the opposite wall is an integrated wooden bench. While providing both of these the pavilion provides a pleasant space to stand, protected from the environment. Seating is oriented towards the glazing, but also includes a shape in its rolling form that evoke thoughts of an amphitheater.

CRITICAL SPACES

Interior Space:

It’s all one area so you are either inside or outside. If there is a member of the public and a scientific expert located within the structure there is no place for them to avoid each other.

FULLY INTEGRATED

With only one space, researchers and the public share the entire structure.

CAPE HORN SUB-ANTARCTIC CENTER

Placing a row of spaces along a central hall does allow for ease of orientation and provides an independent identity for each of them, but this may restrict interactions. People will only bump up against other disciplines when in transit. Integrating the facility into the hillside and using adjacent exterior spaces as classrooms is a wise decision. This increases a connection to the land that is being highlighted in the research, education, and exhibits which inhabit the building.

CRITICAL SPACES

Auditorium

The auditorium is centrally located and is a major space to educate to students, scientists, and the public. Forms of this space recall traditional local boats.

Research Lab

The laboratory give the facility a purpose. Without the information discovered here this would be a much more passive space that described unconnected work.
OVERALL APPLICATIONS TO ARCHITECTURE

1. Surround main public entries with smaller spaces for interacting with experts or the laboratories themselves. Creates compression-release, removes the choice element from viewing the laboratories. Also puts people in a frame of mind that they WILL be interacting with scientists here.

2. Have presentation spaces somewhat open to exhibit halls. Allows opportunity to view what is being described and for spontaneous enthralment of passing visitors.

3. Have courtyards for a manageable approach to interacting directly with nature that is still in control of the facility. Courtyards also increase commonality of spaces using outdoor classrooms.

4. Surround the facility with walkways open to the public. Allows for multiple entries and exits, thus increasing user’s choice of pathway. Also cause recreational people to increase interest in the facility.

5. Make sure that the main gallery is flexible for both displays and after-hour functions. People will want to rent out the rooms that are the most eye catching and comforting.

6. Place breakout spaces, education spaces, or spaces with high value to researchers (offices, circulation, etc.) between the galleries. This should increase interactions with the public, provide small spaces for visitors to step aside and apply what they just learned to hands workshops, and increase the number of circulation options.

7. Show visitors where to go right as they enter. Place staircases or expansive glazing opposite the main entry. Give them an adventure as they step inside that they are intrigued with.

8. Remind visitors that what they are viewing can be applied to Thunder Bay. Give people panoramic views to the surrounding landscape.

9. Take form inspiration from the surrounding landscape and local crafts. It is these things that people already identify with. If a building reminds them of then they will already feel comfortable and more importantly, like this building is a part of them and their heritage.

10. Embed the facility into the land so that it is one with it. Make it appear to emerge from a hillside, sprout from a field, continue a mountain range. Take note of the environment so that it effortlessly harnesses what nature has already provided (solar heat, etc.)

11. Locate gathering spaces somewhere where they are convenient to everyone.

12. Utilize the areas just outside or just above the facility as outdoor classrooms. Make the transition between the outside easy and continuous.

13. The eating area can bring everyone together.

14. Even if spaces that are directly above or below can feel removed. Remember to think vertically and not just horizontally.

Based on the spatial analysis performed on all case studies a basic idea as to what was required from the layout was acquired. Open plan galleries ensure that the layout can be changed as needed for new exhibits and special events. Research areas were gathered into one area, but share frontage with some of the most public spaces. Additionally, galleries have little direct lighting. It is only provided indirectly through circulation spaces. Scientific areas flank both sides of galleries to help set the frame of mind for all who enter. Many spaces also maintain a relationship with the exterior. This could be done by orienting to natural features of the landscape or orienting in similar directions as the shore line. Viewing areas for the laboratories are along major circulation routes, but are given insets so as to not block the flow of traffic. Spaces that typically draw in the most people are placed at a distance from the entries so as to draw people further into the facility.
This thesis explores how architecture can foster a stronger connection between the public and researchers. This will be based on research into what helps both groups learn and research respectively. Information on what would best serve the general public (visitors) will be based upon general theories of how the brain learns and retains information. Interviews will provide the first hand viewpoints of what kind of facility that work best for scientists.

Literature also provides thoughtful analysis of what methods are considered successful with imparting information to the public and what isn’t. Over time this can show an evolution from early passive methods to ones that are hands on and interactive, allowing visitors to partake in live experiences. The periodical “The Curator”, has proven to be a useful source for this information. More generic versions of this, found in the book Learning from Museums provided insight into what settings are best to impart information. Social situations where people are able to personalize their experience tend to yield the best results. It is the goal to not just present the material, but transform it into something that an individual can relate to their own life.

“Museums should strive neither to entertain nor to teach, but to engage people in educational enjoyable experiences from which they can take their own personal meaning.”

(Falk, 2000)

1. Place the entry next to exhibit or make it beg enough to house an exhibit.
2. Theater: integrate with the rest of the facility. Have it be easily accessible. I see it as being kind of an intimate space, but not necessarily completely closed off! Possibly open up the stage or one of the walls to the main exhibit floor. Seating for 100-200 people. Gentle sloped floor that starts at ground level and depresses.
3. Discovery Room: approx 2,000 sf Good views to the exterior and the rest of the facility. A space that people can rearrange at their leisure.
4. Classrooms: think of large scale science rooms. Need more space for flexibility and large groups. Approx. 1,200 sf
5. Main Exhibit Hall: Large scale, don’t be right next to the entry, force people to go through other spaces to get there. Have multiple entrances and exits. Central space for that everything else is arranged around.
6. Gallery: A passageway that provides circulation between exhibit halls. Large windows onto the landscape. at ground level. This is where visitors get natural light.
7. Cafe. Opposite the main entry
8. Resource Desk/Room: a desk and room that is accessible without going into the exhibits. Think of it as a community room for people to gather. Near the laboratories and scientist offices.
9. Main entry should shield the visitors from the view to the bay.
The site is located on the waterfront of Thunder Bay, Ontario, CA. This is the only major metropolitan area between Greater Sudbury (east) and Winnipeg (west). Much of the raw goods from the western plains of Canada are shipped internationally from this point as it is the furthest any ship can go in Canada on the Great Lakes. Being in such a remote location leads to an independent culture, but also alienation from governing bodies.

Regionally, Thunder Bay quickly changes over to wilderness at its borders. This closeness to nature helps to form the identity of the city. Recently, new development in the neighborhood of Port Arthur has led to improved outlook for the future of the area. Waterfront developments, replacing industrial structures, has led to a turn around of downtown vacancy rates and has been one of the factors that is bringing in a diverse new workforce. While Thunder Bay may have developed from industry, it is unafraid to reinvent itself and innovate to reinvigorate the economy.
SITE AND CONTEXT ANALYSIS

THE SLEEPING GIANT

The City of Thunder Bay owes a major part of its identity to the looming figure on its horizon. The Sleeping Giant bluffs defines the horizon opposite of the city on the Thunder Bay. It is steeped in local legend and culture. The Ojibwe people of the area incorporate the feature in their culture. In more recent times, residents of the region take pride in the spectacular cliffs that greet them every day. The wilderness that sits on the haunches of the giant is representative of the vast undeveloped land that sustains the area in the form of natural resource extraction and outdoor activity. With it being such a dominant feature of the city the Sleeping Giant must be taken into account when designing any new architecture that sits opposite it, especially those that act to celebrate its existence. Because of this, there is not only a visual link to it, but it serves as a n inspiration for the form as well. The characteristic organic geometries cascade from inside to out, inspiring the sense of familiarity to a new structure on the water.
Because of the importance of connecting people to nature through the exhibits, it will be important to create visual and metaphoric connections between the interpretive center and nearby natural features. This is most obviously to be done with the Sleeping Giant. A seventeen degree angle has been cut into the eastern hillside to provide a visual connection between the two. Permits to access the provincial parks will also be sold at the facility. On a closer scale, the building is to provide for those who wish to use the surrounding trails and other outdoor facilities. Public restrooms and a place to eat are both easily accessible from the main entry and can be sealed off from the exhibit halls.

The facility is to be of comparable size to similar conservation centers. At 72,000 ft² it will be a prominent feature on the site, taking up the majority of the Pool 6 peninsula northern half. Most of the building is embedded in the hills on the first floor. This mitigates any blocked views that have been so far prevented by waterfront development.

Because this thesis is promoting sustainability and stewardship of the land it is understandable that the building would be as energy efficient as possible. This is also beneficial because of the regionally high electricity costs. LEED Platinum should be an attainable goal by integrating community outreach, reusing a brown field, and making use of renewable energy such as geothermal or photo-voltaic panels.
Interactions with the Public: How do you try to teach?
How often do you interact with members of the public for your work?
Do you think that ecological research would accomplish more with or without public input?
Do you find that a certain teaching style is most effective with getting information across in an interpretive center?
Do you find that a certain learning style benefits most from going to an interpretive center?
Did you get into the profession wanting to teach others or to advance science?
Is there some facet of science that your building limits you from doing?
Your Work: How much can you work with the public?
Would prolonged contact with the public positively or negatively affect the quality of your institution’s work?
Do you find that your research is most efficiently communicated with others?
Or What part of public interactions that your institution does are you most proud of?
Your Institution: How does your message get communicated to the public?
How do you view the visitors to your facility? Students? Partners? Skeptics? Other?
What barriers keep you from effectively communicating your work to the public?
How can you best ensure that your message will influence the public?
What is the most essential space in your facility to ensuring that the mission of your institute is met?
What space in your facility do you consider to be the heart? (where everyone wants to be)
What part of your research institution are you most proud of?
Are you for natural lighting natural lighting in an interpretive center?
What is the next step for interpretive centers?
Any comments?
Figure 132: Sleeping Giant in fog
PROCESS

METHOD OF DESIGN

The design process was a variety of methods used to best determine the constraints of the site, needs of the client, and overall form. By integrating these into one process and keeping all three in mind throughout the design the result was a building that can be both beautiful in design and functional for all occupants.

Form models helped to inform how best to lay out the building on the site. Several different options were studied with various styles examined. Forms quickly progressed from sketches to basic 3D representations. From these studies it was determined that a building that related strongly to the northern shore of the Pool 6 peninsula and a connection to the Sleeping Giant across the bay through the hills of the site. Instead of assuming that the hills will be flattened they will be integrated into the design. Though the small changes in elevation the site will appear more natural, aiding in removing people from the distractions of the urban and industrial landscape. Form studies were developed much further for the final product. Form studies were kept simple so as to mitigate influence on the final design.

PARALLEL THE NORTH SHORE
FORM 1

BRING VISITORS INLAND
FORM 2

PROVIDE ACCESS TO THE WATER
FORM 3

A CAMPUS OF STRUCTURES
FORM 4

FORM STUDIES

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FORM STUDIES
INSPIRATION FROM NATURE

Natural features surrounding the site, specifically the Sleeping Giant bluffs, helped to inspire appearance of both the exterior and interior of the building. By providing the community something that they could relate to it is believed that visitors will be more accepting of this new obstruction to their water view. Materials remain beg comparison to that which can be found naturally in the region. Wooden accents warm the space and are reminiscent of scattered stick throughout a forest. Irregular organic geometric shapes form along the main corridors increasing the surface area between public and private space. At the same time parallels can be drawn to the chimney rock formation found on the Sleeping Giant. Respect is also paid to former industry through heavy concrete forms and industrial grade structure. The color pallet also follows similar reasoning.

LABORATORY DESIGN

The base requirements that the laboratories are based around are from the Ontario Ministry of Natural Resources and Forestry facility. The square footage and equipment has remained constant, but the interaction with neighboring spaces differs greatly. Some consider the laboratories to be the most essential spaces in a nature center. This theses embraces the idea that the majority of these spaces are not solely for scientist to perform their research as some may believe. Collaboration with the public through citizen science can be done within these walls. They can also be one of the most effective techniques to informing the public. Accessibility to the labs and those working inside is enhanced by dividing the spaces up with public circulation areas. When crossing through these areas scientists are more likely to interact with the visitors. Extra square footage is provided for the most accessible areas so as to accommodate public tour groups. Dedicated citizen science spaces are placed adjacent so as to reaffirm that they are linked.
RESPONSE TO GOALS

This project meant to address the issue of disconnect between ecological conservation research and the public. Through exhaustive research and design work the desired final result has been met. Based on research collected through interviews and literature a set of building requirements were created and then met to better promote interaction between experts and visitors and a better learning environment to retain information.

By taking design inspiration and creating spatial paths to these features the final form was able to establish a connection to these elements. Materials and form allowed people locals to feel familiar to the facility. Had time permitted more studies would have been done on the layout of exterior classrooms and landscaping.
Figure 161: Close up of final site model
As humanity continues to expand the built environment, the pressure placed upon the natural world needs to be addressed as we forge into the next era of the Anthropocene. Despite this, society has not fully grasped the importance of ecological conservation. How can architecture foster a stronger connection between ecological conservation research and the public?

**INTERPRETIVE SCIENCE CENTER**

Thunder Bay, Ontario, CA

*Peninsula. From here, views that capture the land being managed are prominent.*

*Organic material pallet.*

*Providing a space for conservation ecologists to monitor the landscape and the public to learn about it, interpretive science centers serve as both a place of education and discovery.*

*The two main galleries take cues from the site. Oriented so as to respect the shoreline and provide captivating views of the landscape, they include areas to gather along the edges while directing movement down their length. Laboratories are included within the building, but act as visual focal points.*

**CUES FROM CONTEXT**

*ARCH 772 DESIGN THESIS*  
*EMERSON H. SMITH DAVID CRUTCHFIELD*

*Thunder Bay, Ontario has long had a connection to the environment. Without the natural resources in the surrounding landscape, the city would not have developed. Dominating the horizon is the most beautiful city in the world, a city defined not just by its geography, but by its people.*

*Proceeding through the facility provides a syncopated rhythm of compressed, interior oriented spaces to expansive, outward facing canyons. Views that were withheld upon approach are revealed spectacularly from the interior.*

*Vistas to the shoreline and distant city are emphasized. They are the heart and soul of the interpretive science center.*

*To provide insight into the needs and views of experts, a variety of interviews were conducted. Directors and scientists from some of the country’s leading interpretive science centers participated. The questions asked varied from what they perceived to be essential to their work to how they interacted with the public. The responses gathered added to the literature better articulation of information that was in some cases absent from articles.*

*Perceived successes of outreach initiatives from those that perform them removed the idealized review process. Research is built upon the naturally discouraging view of the public.*

*By showing the public live experiments they will be more engaged and inspired to take direct steps to interact with locals.*

*Much of what the ministry does is report public perception that scientists may have.*

*Entertainment of visitors is secondary. The main goal of an interpretive science center is to educate and engage people with the local environment.*

*Visitors come to learn, but they can also inform the ministry of methods to ensure that the greatest range of publics is reached.*

*This creates points of spontaneous interactions between curious visitors and educated experts.*

*Galleries have been placed next to the Pool 6 peninsula was constructed. The final form was also printed at the same scale and model to better understand how the building relates to the site features.*

**MODEL**

*In order to fully understand how the topography of the site can impact the design, a topographic model of the entire Pool 6 peninsula was constructed. The final form was also printed at the same scale and model to better understand how the building relates to the site features.*

*Form studies were 3D printed to scale and placed on the model to better understand how the building relates to the site features.*
PROJECT INSTALLATION

Figure 166  Thesis presentation from left

Figure 167  Thesis presentation from right


From an early age I had a tendency to do design related activities. Drawing, designing, and building were all things that I did to pass the time. I wanted to know how things worked and what made them possible. I found that I could apply this to architecture and this led me to NDSU’s architecture program. In a desire to know exactly what is required for every project I try to find out as much as I can about a typology before beginning the work of meticulously crafting the most perfect project that I can. In the end I hope to make something that not only looks good, but has a personality. In addition to my academic work I spend a lot of time in the nature of the North Shore, which is why I usually gravitate towards sustainable design. I believe that it is my job as an architect to create something that can do the least damage possible if construction is necessary.