Title: Can Digital Technologies Augment the Design of Site Specific Environmental Installations?

Location: [Mounds State Park] Anderson, Indiana

Project Type: Installation

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Can digital technologies augment the design of [site-specific] environmental installations?

[Sensory uploading]
Introduction:

The role of the architect relies on a diverse knowledge base and technical skill; therefore it is vital that contemporary architects have strong documentation and analytical capabilities that enable them to understand the complexities related to a given intervention. In addition, architects need a strong grasp of design media; as well as the ability to question the current applications of those media. For in the expanding age of automated reality, the architect needs to be proficient at navigating through a tremendous amount of data in order to understand the biological processes that govern natural systems. Additionally, this requires the knowledge of multiple interfaces; or digital languages. Similarly, the architect needs a strong understanding of not only material properties, as well as a firm comprehension of environmental resource management. Humanity is currently confronted with centuries of accumulated environmental neglect; consequently, current generations have no option but to solve these problems. We have the hindsight to understand the impacts of careless resource misuse, and we have the foresight to envision the consequences of continued neglect. It is of the utmost importance that architects understand how technological applications can work in symbiosis with natural systems. Thus, the most important role of the architect is being the provider of environmental interface-the interface which presents humanity with the required threshold permitting passage into a new paradigm.

This thesis examines the ability of digital technologies to augment the design of site-specific environmental responses through the employment of a digital datum. Like any datum, the digital datum serves a device for calibrating measurements. So, this thesis becomes an instrument for designers to undergo natural-technology calibrations; or Eco-Tec.
As diagram 1.1 explains, the engagement level of various digital technologies resulting from the dialog between design constraints and the designer's ability to interrogate the employed technology. Therefore, the manner in which a designer approaches the use of the tool leads to the manner in which they perceive the constraints of a project. As this thesis evolves, this diagram will serve as a framework to illustrate various application levels of digital technologies throughout the design process. As the projects encountered in this thesis deal with varying degrees of complexity, this diagram will be utilized to express the level of [digital technology] appropriateness related to a given design. Furthermore, this diagram can be used as a guideline - for it presents a framework to which designs of similar nature can refer.
The act of sensing is what enables us to understand our surroundings, and thus, allows us to engage our surroundings in a manner that will prolong our survival. Furthermore, as our surroundings are constantly shifting, so is our engagement of various environmental influences, such as technology, culture and nature. In short, as our horizons shift, so do our sensibilities.

[Overlapping philosophies]

It is well known that during the Enlightenment, there was a strong belief that the advancement of communication and technology would invoke an unlimited transfer of knowledge. For, it was thought that human activities would be free of laborious task, which would allow for an infinite expanse of intellect. However, as humanity progressed through the industrial revolution, it became apparent that the development of the tool was actually inhibiting the act of communication. As a result, humanity replaced adaptation with standard. Now, as we sit amidst the fetal years of a new millennium, communicational technologies offer unprecedented exchange rates, manufacturing technologies offer unmatched production efficiencies, and computer aided design offers unparalleled management of complexities. Yet, despite the perceived advantages of these new developments, communication is heavily compartmentalized, manufacturing has imposed unprecedented levels of stress on the natural environment, and computer-aided design has evacuated the philosophy and reasoning from the act of building. I would argue that one profoundly influential factor driving these problems is a distorted perception related to the manner in which we engage our surroundings.

Emmanuel Kant explains in "Analytic" that since knowledge is obtained through sensory uploading via a connection to physical [object-based] reality, then our understanding of that knowledge cannot be understood outside of the circumstances that gave rise to that uploading. Building on Kant's argument, George Wilhelm Friedrich Hegel explains that our understanding of a given circumstance is derived through associated histories; in other words, understanding is composed of fragments that are aggregated over time. Furthermore, this time-based aggregation is constantly shifting to accommodate environmental changes. Kant and Hegel establish the main philosophical foundations for the development of Phenomenology; a philosophy which places our understanding of reality within the framework of analyzing being. Phenomenology places emphasis on the manner in which we sense our surroundings; thus, our understanding of our surrounding is at the center of analysis.
"When the organs of perception vary, the objects of perception seem to vary."

—William Blake

Expanding on the work of Kant and Hegel, Gilles Deleuze and Felix Guattari describe the body without organs in their collaborative work entitled, A Thousand Plateaus. In this writing, Deleuze and Guattari describe a body as a system comprised of individual components, through which collective energy determine the outcome of the whole. In other words, our actions operate within a tight network of contextual relationships; and consequently, our behavior, experience and understanding are shaped around the manner in which these relationships exchange energy.

Building on the thinking of Deleuze and Guattari, Neil Denari, architect, educator and historian, explains that human interaction shifts with changes to the structure of society. Furthermore, as human interaction has mutated along with evolving technological capacities, the overall infrastructure of society has shifted to accommodate these changes. Essentially, our norms, cultural practices and understanding of nature have become formed by the various technologies we use.

William Mitchell adds that technology does not evolve to replace current methods of processes; rather, it adapts to better handle the shifting complexities produced by specific environmental conditions. Moreover, as this adaptation occurs, technology opens the door to new visions, such as the rise of abstract painting from the invention of the camera. Mitchell's point illustrates that technology often arises from new methods of analyzing the world; and therefore, technological evolution is directly related to human perception. Mitchell's theory is similar to the views of the Naturalists, like Ian McHarg, who view evolution as a creative process of fitting human behavior to environmental circumstances. The Naturalists view this process as continuous and dynamic; where equilibrium is constantly pursued, yet never achieved. This process persistently moves from a simplistic state to a more complex state; thus, human creativity is channeled into producing technology that promotes adaptation. Furthermore, the Naturalists view the adaptation of the tool as equivalent to genetically driven mutation. Hence, the tool is viewed as an extension of the human body. In short, humanity adopts innovative technologies to stay fit, involuntarily spawning new species, which in turn provokes future technological innovation.

Aldous Huxley, author and scientist, reminds us that our minds are complicated funneling valves which regulate the perceptual stream received by our nervous system. Huxley emphasizes that our minds are only ever focused on the immediate; a process that allows us to deal with the dominant influences, such as life-threatening events, before secondary influences. For this reason, it is clear how the technologies we engage on a daily basis can drastically shape the manner in which we perceive our surroundings. Take for example the use of the cell-phone.
when engaged in a cell phone conversation, a majority of our perceptual energy is channeled through the audible sense; thus, we are forced to limit the amount of perceptual energy channeled through our other sensory perceptions. As a result our degree of awareness obtained from other surrounding influences is limited. Within the field of architecture, digital modeling and analysis are emerging as effective ways of interpreting and informing formal design decisions. Since digital models are parametrically based, meaning they are interrelated through various control points, the entire model is updatable and receptive. In other words, they are capable of interpreting and thoroughly applying input. Branko Kolarevic points out, the input which we filter through these models can be based on site parameters or performance. This evolutionary capacity allows material constraints and environmental efficiencies an informative role during preliminary design stages. Thus, connectivity to cultural and environmental circumstances formulates intervention, opposed to stylistic or aesthetic subjectivity. More importantly, from a philosophical point of view, interpretive models have the ability [like humans] to understand the place in which they are situated through the active exchange of collective energies.

[Ceremonial interface]

Archeological remains and the scientific and cultural analyses of those remains, explain various ways past cultures have connected to place through processing significant natural phenomenon. For instance, as I witnessed on a recent trip to South-East Asia, Buddhist monks in Sri Lanka placed shrines at profound natural phenomenon, such as caves and waterfalls. Similarly, the Adena people, who occupied the present-day lands of Indiana and Ohio from 500 B.C.-1500 A.D., constructed large earthworks that mapped astrological events. These and other cultures demonstrate the influential role regional resources play in formulation of reality. Take for instance, the Native-American tribes throughout the southwest who utilize the root of the cactus plant in ceremony to achieve a heightened mental connectivity to spiritual influences. As the ethnographer Carlos Casaneda explains, various ceremonial activities arise due to the manner in which cultures root themselves in the landscape, thus cultural identity is dependent on place. Carl Sagan, a well respected astronomer, points out that ceremonies rooted in specific astrological alignments offered ancient cultures a more reliable way of predicting when to hunt, harvest and gather; thus, through harmonization with natural occurrences their well-being of life increased. Christian Norberg-Schulz also offers the impression that culture arises from intimate relations with their landscape.
Norberg-Schulz proposes that cultures construct their entire realities based on the manner in which environmental perception is filtered through the lens of technology. Adding, for thousands of years architecture has served as the interface between humans and nature. Consequently, this view places the architect as primary environmental mediator; and, designer of the connective tissue between human and place.
[Evoking response] drawing lines between empty spaces

Perception is influenced by the technology we engage

Use of technology is influenced by environmental sensibilities

Environmental sensibilities are in [form]ed by perception of environment

Perception evokes technological response
[Nature of Installation]

Rising out of the 1920's, primarily with the work of Marcel Duchamp, installation art presents society with contradictions inherent to expanding technological advances, such as the homogeneity derived from mass-production. Continually, installation art rides on the edge of the latest developments in attempts to steer humanity into sensible applications of technological innovation. Artistically, installation art redefines the role of the individual; provoking awareness through the confrontation of the profound. For example, as a response to modernization, installation art rose to address the sublime qualities of place; aiming to refocusing societies' perceptual energy on specific and regional circumstances. Furthermore, installation art continues to evolve with shifting cultural behaviors. In many ways, installation art demarcates the technological mutations humanity undergoes, revealing these mutations through the active engagement of perceptual frames.33

[Robert Irwin]

Irwin refers to an "operative-response", in describing the process an individual experiences while tracing the steps that derive his work. Irwin stresses the importance of having the individual arrive at his intended experience via their own means. Irwin makes it clear that within the installed framework individual's experiences are derived from their own history as much as the frame itself. Additionally, he clarifies that installation art feeds from, as much as feeds into, the place it exists. Thus, installation art allows those engaged to see far beyond the impact of their own actions through the framework's ability to interrelate energies. For this reason, individuals engaged in an installation art undergo a calibration of sorts; thus, they are much better suited to accurately perceive the realities inherent to their surrounding environments.43

[Andy Goldsworthy]

Goldsworthy's interventions are extremely temporal, and much like the work of Robert Irwin, they are profoundly rooted in the specificities of place. His studies are deeply dependent on the flows of energy within those specific places, drawing off the manner in which time distributes energies through natural material. Additionally, Goldsworthy's work is highly formulated through the process of site interrogation. They are fragile improvisations, yet powerful in their ability to solidify the sublime.
The creative act is not performed by the artist alone; the spectator brings the work in contact with the external world by deciphering and interpreting its inner qualifications and thus adds his contribution to the creative act.

—Marcel Duchamp
Goldsworthy’s work relies on documentation and re-interpretation; and for this reason, he often aims at presenting the surrounding contextual influences that fed into his work. In his documentary entitled "Rivers and Tides" Goldsworthy focuses on the energy of water, explaining that it can’t be isolated to a single river or ocean; rather it permeates through all organisms and matter. Moreover, he views creation and destruction upon a continuum of constantly exchanging flows.\textsuperscript{15}

[Diller + Scorfido _ Blur _ Swiss Expo 2002]

Diller + Scorfido’s site specific installation plugs into the existing features of Lake Neuchatetl, Switzerland; the intervention forces the human engagement of place through the applications of innovative technologies. Through a design-guided narrative that hovers above the lake, individuals are confronted with a natural obstacle in the form of a dense cloud. This obstacle triggers an intuitive response within the minds of the participants. This psycho-analytical response is revealed on the surface of the participant through the completion of a personal survey, which is fed into a “smart raincoat” the participant wears. This data is then transferred into a chemical response, exposed as a specific hue within the skin of the “smart raincoat”. The installation utilizes the shifting qualities of place to depict the collective mood of those engaged; and as a result, frames the natural phenomenon.\textsuperscript{16}

[Carsten Nicolai + Marko Peljhan _ Polar 2000]

These collaborators aspired to create an interface between technology and humans through the mapping of a real-time network. As individuals passed through a museum-like environment, their movements were mapped in the form of digital data. Furthermore, this data was translated into the visible spectrum through projected waves. These projections became the traces of human interaction with technology; thus, allowed the individuals to behave simultaneously as spectator and activist. The installation confronted the challenges of mediating between the constraints of human sensory behavior and a virtual world, highlighting tactility, transparency and transference.\textsuperscript{17}
[Analysis]

Analyzing is the intrinsic act of questioning what one perceives; a process that allows internal and external energies to unite through the engagement of the physical environment. As the identification of a point in three dimensional space depends on the accurate reading of three sets of coordinates [x,y,z], analysis from multiple vantage points becomes vital in the grounding sensory input in physical reality. Only when our foundations are rooted in the specific principles that govern place will we be able to relate our physical environments to our cognitive interpretations. Furthermore, this highlights the importance of interrogating place with our bodies. The greatest life-lessons we learn come from experiences rooted in the act of engagement; we confront our existence, temperance and interconnectivity. Thus, the lessons we learn from active engagement provoke us to adapt and evolve.

[Stacking Stones]

I had been studying the work of Chris Drury and Andy Goldsworthy for some time, and as a result of my expanding understanding of their work, it became increasingly important to initiate a relationship with my place through the act processing my local materials. This instigated a collection and cataloging of several dozen stones that occupied the immediate surroundings of my rental home. Through indexing these stones I was confronted with a wide range of typologies, from concrete blocks to granite boulders. Each stone presented a series of unique circumstances, all of which were eventually discovered through the balancing of these stones into cairns. [The cairn has been utilized for hundreds of years as a marker, and generally results from processing local stones into various structures of stability]. The cairns I constructed eventually evolved into dynamic sculptural elements; working with each other compositionally, as well as depending on each other for strength. In some situations, these structures deviated from sculpture, and became functional, such as a place to rest. Through my engagement of these stones I became more aware of the unique characteristics inherent to each. Equally, I became increasingly aware of the slight shifts amidst the fabric that comprised my home. For instance, the manner in which the autumn leaves fell, or the winter snow drifted across the earth. Consequently, I found that in focusing my energy on stacking stone, I more clearly perceived the natural occurrences permeating through my place. Thus, it became clear that an individual gains a greater knowledge of place through the active engagement of site.
[Construction vs. Craft:

As modernization swept over the world, it paid little regard to the specificities of regional climates and cultures. Like a disease, modernization suffocated the smallest systems, collapsing and consuming them. Moreover, it allowed larger systems to absorb and homogenize, while it harvested the energies of collapsed systems. Accordingly, as entire cultures died off, local environmental responses to local climates also disappeared. These techniques of adaptation, which had been passed down through hundreds of generations, were replaced with universal standards. At the turn of the 20th century few craftspeople remained, and ever fewer questioned what little tradition was left. As a result, industries in developed countries have aligned to the standards established by dominant powers. As Felix Guattari points out in his essay, *Eco-sophy*, the survival of society depends on research, innovation and creativity; in other words, adaptation in the Naturalists’ sense. Fittingly, a small number of architects embrace both technological innovation and craft; yet, they continue to remind us that craft emerges from a negotiated relationship between material and tool. Technique evolves with knowledge, experience and interrogation.]^{18}

[Carlo Scarpa

"Throughout his work, the joint is treated as a kind of tectonic condensation; as an intersection embodying the whole in the part, irrespective of whether the connection in question is an articulation or a bearing or even an altogether larger linking component such as a stair or a bridge."

—Kenneth Frampton

As Frampton highlights, Scarpa’s work bridges the human and site through the careful establishment of relationships. Thus, the joint becomes the medium in which the energy of the project moves; and consequently becomes the instance in which the human is capable of engaging place.]^{14} Scarpa had a profound ability to find opportunity within the ordinary, utilizing each detail to bridge between scales. Essentially, through the act of craft, Scarpa enhanced the connection between individual and culture. Embracing local building traditions and innovative technologies, Scarpa allowed shifting cultural and material properties an informative role in the evolution of a project.
[Peter Zumthor]

For Zumthor, the connection between material and space bridges personal experience and place; for this reason, architecture according to Zumthor is tangible and present. Yet, through carefully composed relationships established between material and environment, architecture has the power to reach the intangible. Zumthor utilizes the frame as a method of channeling, harmonizing and engaging site. Essentially, sun, wind, earth and water all represent the tactile. The manner in which architecture filters these elements becomes purely spiritual. For Zumthor, the craft of a framework is the result of methodical labor and intensive care; for it is intended to create melodies, harmonies and rhythms that speak to the human condition. For this reason, the joint reinforces the nature of the concept; and much like the work of Carlo Scapa, each bridge offers an opportunity to encourage the trajectory of the overall experience. Therefore, connectivity to the particularities of the site are established through rigorous site analysis informed by profound personal experience.20

[SHoP _ Sharples Holden Pasquarelli]

The cathedrals of the Middle-Ages were produced by master architects, yet it was through the actions of the craftsmen and masons that the projects came to fruition. In recent decades, architects and builders have lost touch with techniques that govern building, leaving little innovation left for those constructing. However, as Branko Kolarevic clarifies, the complexity associated with innovative digital designs are forcing architects to get back into the construction once again. SHoP architects utilize computer-aided design to handle the complexities of customized design solutions, establishing specific rules for the exchange of information. Instead of relying on conventions, SHoP develops construction documents that are diagrammatic and instructional. Additionally, SHoP utilizes the computer’s rapid feed-back capabilities to test multiple iterations, or versions of a single design. Versioning becomes the physical manifestation of parametric models, allowing for various tests to be administered at different phases of formal evolution. Furthermore, SHoP views the architecture firm as a cell in which the computer becomes the nucleus that exchanges information between various sources, such as fabricators and clients. Within this model, constraints are perceived purely by way of one’s ability to handle complexity.21
William Massie

Within the act of digital fabrication there exists a relatively untouched field of craft. For William Massie, digital craft presents a significant opportunity to embrace the building process. Massie has completed several projects that have pioneered digital fabrication techniques; such as, "Big Belt House", which utilized PVC piping to achieve the complex curvilinear geometry of computer-modeled nurbs. Massie leads the way when it comes to translation and interpretation of computer-generated designs; he allows the process behind the making to bleed through into the final product. For instance, in the "Big Belt House", he exposed the cut marks from the CNC drilling operation on a cast concrete sink, which eventually became the manner in which water flowed over the surface. Massie draws clear distinctions between physical and virtual realities, explaining that in the moving between the two, architects gain significant understanding of the building process.\textsuperscript{22}
Introduction

Philosophy

Installation Art

Craft

Streams explanation

Preparation

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Mounds

Conclusion

Streams

Streams is a semester long collaborative exploration in which this thesis is based. Utilizing digital technologies, various year level students of architecture and a Tele-communication student are challenged to document and analyze several sites along the Indiana White River. The intent is to produce a series of digitally fabricated installations, which will serve as the experimental testing grounds for ecological-technological [Eco-Tec] design; as well as provide nature-based psycho-analytical places for individuals to engage the river.

My personal role in Streams is to bring nature-based thinking into a heavily rationalized environment where I could juxtapose digital instruments with intuitive organic reflexes.

[Edge Dwellers _ 2006]

Muncie Banks 02.25.06

Beautifully indistinguishable, yet distressed
Like an ancient warrior charging into inevitability
Facing adversary

The roots adapt nevertheless
The soil erodes as the smell of fresh sewage climbs
Fault-like fractures rip parallel to the river’s pace
Demarcating the root systems of edge-dwellers
Informative_scape

In preparation for Streams, and in attempts to understand how the act of building could be augmented through the use of digital technologies, Christopher Peli [classmate] and me, worked together on the design of an informative_scape. This informative_scape would serve as an interface between campus students and current information pertaining to sustainability. The design of the interface was based on the following framework:

What are the various perceptual states college students exist?
[ Capacities for seeing, touching, hearing, etc. ]
What are the concentrations of these various states?
[ Percentage of students engaged in these acts ]
What technological influences correlate to these various states?
[ Cell phone, head phone, car, bike, etc. ]
What environmental influences correlate to these various states?
[ Overhead coverage, privacy, visual clearance, sunlight, trees, etc. ]

Chris and I utilized this framework during all stages of the design process; thus, the framework behaved as a datum for design decisions. These preliminary design intentions served as a reference, which re-aligned our shifting trajectories as we passed through various design media and philosophical discussions. Furthermore, this act of calibration allowed us to relate the knowledge we gathered to the knowledge we were processing; so eventually, we were capable of grounding our knowledge in the realities of the specific place. Ultimately, the design of the informative_scape led us to understand the influential role of the horizon. The informative_scape also allowed the recognition of the potential compounding of error associated with operating any design project from a single vantage point.

As we recorded the various devices college students utilized while engaging the site, we recognized the potential for successful transference of sustainable information through the utilization of similar technologies. Thus, our intention became incorporation of these privileged technologies in a manner that would encourage reassessment of their use. Digital site mapping through photography [2-dimensional analysis], digital modeling [3-dimensional analysis] and video [time-space analysis] informed and evolved the tectonics of our proposed interface. As a result, the final form of the informative_scape was heavily informed by existing energy flows. For instance, circulation was mapped as an artery opposed to a line; eventually, this encouraged the formal generation of limestone-clad digital interface spines that snaked through the campus corridor.
These spines offered multiple ways of engaging passing students. Some examples were casings for student artwork, digital projection casings, and web-based interface hoods. The various interfaces required different modes of engagement; thus the form mutated to accommodate the student perceptions.

The tactility of the informative_scape arose from questioning current uses of local materials, such as Indiana limestone and aluminum. Our intentions were to provoke students into questioning the current methodologies of surrounding technologies; therefore, suggesting that sustainability will ultimately become effective through the continual re-shaping of perceptions. Additionally, digital fabrication techniques were explored in attempts to question traditional methods. In conclusion, the informative_scape redefined the manner in which we approach the formation and manifestation of a site-specific intervention, and presented us with a base framework in which future designs could align.
Ethnographic in objective, our investigations in Daleville initiated our understanding of site materials, as well as environmental influences. Additionally, it became the forum in which a semester-long relationship was forged with the White River; leading to the interrogation of local ecology, history and culture. Furthermore, the project in Daleville allowed us to establish the methodology in which future river installations would be based. In short, Daleville served as a calibration device for site analysis and fabrication techniques; which consequentially adjusted our horizons to a river-centric position.
[Site]

The site was defined by two large horizontal masses that sliced through the river: a turn-of-the-century iron bridge, and a recently constructed concrete bridge. Encompassing a series of small bends in the river, the site contained powerful traces of the destructive power of both man and nature. Several deposition and erosion zones occurred beneath the bridges, which marked the effects of global influences on local ecology. Large root systems pierced the banks, while fallen limbs aggregated debris; simultaneously, traces of wildlife were confronted as common as the synthetic deposits of man. The overhead canopy stretched over the river, which allowed for a wide variety of mussels and other crustaceans to accumulate; and, the density of vegetation was sufficient to support many species of birds, including the blue heron.

[Analysis]

In combination with a third year architecture studio, the total student investment in this ten day charrette was around twenty, which was split into three groups of roughly seven. On arrival at the site, my group dispersed in attempt to calibrate our minds through contemplation and intuitive writing exercises. We later congregated and discussed why the place resonated with our individual sensibilities. During discussion we identified various overlapping responses and distinguished three main spaces to focus our energy. These spaces were linked together through an arbitrary line drawn through the site, as a result, this line served as a datum for the other two groups to calibrate design decisions.

[Pebble Beach]

Light reflected off the stagnant pools of river water onto the underside of the expanding concrete bridge. A log reached outward towards the river's center, fallen from an upstream sky-climber, it stood tangled and twisted upon a massive concrete pier. The log became the river as it revealed flowing energy through the stirrations of time: as water rushed over the surface, it collected and released pockets of pressure. Nearby, zebra shells and bed pebbles comprised a small peninsula beach. Scattered across this beach were the bending lines of debris, which we called, "strand lines".
Andy Goldsworthy's installation in Dumfriesshire, Scotland demonstrates the ability for an environmental intervention to serve as a calibration device for humans to understand tidal activity. Similar to Goldsworthy's work, our proposed installation at Pebble Beach aimed at demarcating the fluctuation of the river level so that the human can better understand the tidal behavior. As the river's level shifts with climatic and social influences, such as heavy rainfall, the deposition zones along the banks produce corresponding strand lines; or lines of deposit. These strand lines reveal the distribution of energy over a period of time; thus, they offered the potential for engagement of river energy. Our investigation was based on devising a method of demarcating these strand lines. Each day's strand line was highlighted through the placement of multiple reed stalks into the pebbles, cut to a standardized height of six feet and staggered at an interval of one foot. Eventually, each day's strand line merged with other days', ultimately composing a field. This field, based on time, began to reveal the subtle shifts of the river's level. As the installation progressed, our methodology for beach-reed insertion adapted to better accommodate the forces of the river. Through our dialog with the river, we gained a heightened appreciation for the unpredictability of a dynamic system. Moreover, as weeks advanced the river's level shifted dramatically; at times only the top 6 inches of the strand field was exposed. During times of suppression, the river revealed the broken stalks of several lines. The fragility of the installation emphasized its temperance; additionally, all the components used in construction of the installation safely decomposed.
[Reed Forest]

Moving south from Pebble Beach is the primary deposition zone of the site, we called this place, Reed Forest. In the dense reeds there was a strong sense of vertical climbing, as riparian reed plants fold amongst the occasional oak. Walking through the Reed Forest felt much like standing in an empty swimming pool; in the sense that there was a strong absence, as though a massive amount of water was missing. At times, the reeds towered over our heads; softly waving in the gentle winter breeze, they filtered the sunlight. The river's edge was close, yet the churning was muffled through the density of twisted stalk. Representing passage to the east bank, the massive iron bridge peered down upon the reeds.
Richard Long, another land-based artist, often marks a passageway through the landscape by drawing a line. In his works, "dusty boots line" and "a line in the Himalayas", Long speaks to the nature of the human footprint as he pays deliberate sensitivity to marking his presence on the natural system. Similarly, our main objective for the Reed Forest was to connect the occurrence at the underside of the concrete bridge [Pebble Beach] with the occurrence on topside of the iron bridge [Mediation Loft]. In the spirit of Long's work, our passageway moved through the reed bed taking great care to mark the pathway; this was achieved through the horizontal layering of reeds. As a result, this pathway served as a gauge for our ecological footprint on the site and offered us a manner of harvesting material that would leave minimal impact. Since components for both the Mediation Loft and Pebble Beach relied on reeds, we took cautious steps to limit our imposition on the riparian zone; this included maintaining the active root of any harvested plant and harvesting only reeds adjacent to the pathway. In the end, the Reed Forest installation revealed the topographical undulations beneath the dense riparian plants, while providing a connection between events that further enhanced the understanding of the place.
[Mediation Loft]

Attempting to mediate between the super scale of the bridge and the small scale of the human, the positioning of the mediation-loft oriented itself on the line drawn between Pebble Beach and another group’s installment entitled, “the sixth elder”. This location was on the edge of the east bank, which was situated above an intense pocket of sound spilling upward from the river. Chris Drury often places a chamber adjacent to a fluctuating force, such as the tide; as such, these spaces oftentimes provide a place for contemplation and investigation. Equally, our installation on the Iron Bridge was greatly informed by the work of Herman De Vries, who catalogs local material in a highly processed manner that allows for the aggregation of time to emphasize the diversity found within a single species.

The Mediation Loft incorporated donated hardwood, a low grade by-product of the quarter-sawn process. As a result, this hardwood became the foreign agent in our experiment, providing a manner in which to rationally striate the locally harvested natural material. Thus, much in the spirit of De Vries’ work, the Mediation Loft behaved as a device for calibrating the irregularities of the reeds. This was achieved by assembling the hardwood into a horizontal grid into which reeds were woven. Building layer upon layer the density of reeds eventually established a container. This contained space, which was based on human proportions, became a place of contemplation. Throughout the day, the space becomes saturated with natural light, which highlights the variance between the woven reeds. Sound rhythmically pulses in through the openings, and the verticality of the woven reeds visually connects to the shifting dynamics of the sky. As a result, in exiting the Mediation Loft an individual is more aware of the surrounding materials and sounds.

As illustrated in diagram 1.3, the projects in Daleville engaged varying degrees of digital technologies. Though a majority of the digital technology was absorbed during site analysis, digital modeling and versioning was utilized in the design of the Mediation Loft, which proved extremely effective in handling a significant level of complexity during a short period of time. Additionally, time lapse photography and short film allowed for analytical study of the installations for the next two months, revealing a significant level of information about the river’s behavior during the heavy spring floods.
data flow (engagement)

- digital datum (transference)
  - constraint
  - interrogation

- finding site
- site analysis [absorption]_intuitive
- analysis post-processing [interpretation]_rational
- formal generation [influence]_performance
- prototyping [versioning]_feedback_loop
- fabrication preparation [sequencing]_schedule
- fabrication [extrapolation]_physical output
- installation [diagramming]_assembly

Diagram 1.3
As our interventions in Daleville clarify, the act of craft evolves from a sensitive knowledge of local material properties, as well as a continuous interrogation of those properties in order to produce appropriate techniques.
At this point, we began our investigation at Mounds State Park, on the edge of Anderson, Indiana, the park lies nested between a scrap yard, an airport and major interstate. Additionally, the park is a place of great historical significance. It is one of the few places residents of the surrounding area can engage a degree of naturalization. Our interventions at Mounds offered us grounds for further testing of our knowledge of the river, as well as offered significant opportunity to assess our design sensibilities through the construction of a moderately-sized installation. For these reasons, it became appropriate to separate the design into several phases: analysis, formal generation and fabrication; moreover, it is important to note that despite being separate frames, these phases continually overlap and inform one another.

[Finding Site]

The Great Mound was constructed around 500 B.C by the Adena Culture, and served as a site for astrologically-based ceremonies. As I walked around the Great Mound on a chilly winter morning, I repeated to myself, “The sun does not move around me, I move around the sun.” As I circumnavigated the earthwork I felt a strange transformation of my perceptual energy away from the linear motion of tracing a path, and into a gravitational influence of the center. As a result of this exercise, I recognized that my physical energy was being absorbed by the earthwork, which consequentially was absorbed by the core of the earth. Furthermore, as this planet revolves around the sun there is a similar transfer of energy between the celestial bodies. Thus, I found myself connecting to the Sun, through the Earth. Although this explanation is not what an archeologist would describe as the mound’s cultural use by the Adena, the exercise demonstrates how contextual understanding leads to reinterpretation and reuse. Our design at Mounds aimed at engaging the river, much as the mound engages the sun, utilizing technology to construct a threshold between human and place.

[Design Constraints]

The design must provide functional space for various users; guests and park officials; the design should serve as a platform-catalyst for educational activities. In addition, the design cannot penetrate the ground plane in any manner, since the entirety of Mound State Park is a registered historic site. Lastly, the design must acknowledge and respect any park service route, as well as established trails.
[Design Schedule]

This time-line diagram illustrates the relationships between design phases across the medium of time; depicting the amount of time spent within each design frame and the zones of overlap [deposition and erosion].

WEEK9  WEEK10  WEEK11  WEEK12  WEEK13  WEEK14  WEEK15
[Being at Mounds]

Moving from the Great Mound towards the river, the formality of the park shifts from pure [platonic] geometries to irregular [organic] geometries. Since the disappearance of the Adena, the Great Mound has undergone a drastic transformation from clear plain to moderate old-growth forest. This entropy suggests a close similarity to the drastic shifts of the landscape surrounding the park. Both of these changes have close relations to the manner in which human beings have utilized technology to control nature. For this reason, initial site analysis generated the conceptual idea of a steady transitional element that would calibrate park users to the phenomenological particularities of the river. This steady calibration aimed at isolating user's perceptual energy through the use of a frame. This frame would isolate a particular sense and upload site energy; thus, on exiting the frame users are forced to realign their perceptions to accommodate the newly aquired sensory stimulation.
Mounds Group Members:
Robert Beach
Jorie Garcia
Katie Marinaro
Chelsea Wait
Mounds

Finding site
Analysis
Formal generation
Prototyping
Fabrication Preparation
Fabrication
Installation

[Platform]

One site of initial interest was that of an old boat launch dating back to the amusement park days of Mounds, which occurred around the turn of the 20th century. The surviving stem wall, which was completely covered in moss, measured roughly 30' x 14' and was perched on a setback along the east bank of the White River. When standing within the foundation footprint, I experienced a particular increase in river acoustics, this was primarily caused by the remains of a human-built rock dam thought to date to the same time period.

This site sparked ideas of a platform which hovered above the foundation stem, which would come to rest on fabricated limestone feet. In the spirit of Peter Zumthor, this gesture respected the historic guidelines, yet also established a relationship between new and old material through the tension of space. The platform aimed at providing various spaces through the morphology of single plane. Metaphorically, the platform behaved like a leaf; resting gently on the forest ground, as well as as staging a surface for inhabitants to occupy. Vertical folds of the surface rose to provide educational display space, while the surface rippled in other locations to offer various seating positions. These seating positions were based on obtaining a heightened awareness of surrounding circumstances, such as obtaining a provocative canopy view. The design was formally modeled in MAYA, then, the surface was exported to Rhino in which it was sectioned into structural members. These sections became the hardwood ribs of which the platform was comprised. These ribs plugged into cross-support beams that tied back to the limestone footers at strategic locations, thus the structure distributed stresses much like the distributive qualities of a tree.

The manner in which the foundation was mapped also utilized digital technology. Moving around the foundation, a series of images was captured moving at a set interval of 1'; this was then montaged in Adobe Photoshop. By digitally tracing and scaling the digital montage in Adobe Illustrator i was capable of aligning the digital image with accurate on-site measurements. Hence, I established an exact footprint of the existing foundation stones.

[Chamber]

Another proposal for this site was an acoustic-chamber which absorbed the river sound and concentrated it onto an individual. This scheme occurred simultaneously with another chamber at an old drinking well, also dating back to the amusement park era. The well-chamber filtered
[Circling downward]
Dripping water traversing gravel
Westward falling away from the great mound

[Sliding Southward]
Gliding upon edge cohesion
Pursuing gravitational discharge

[Climbing Eastward]
Side-stepping the bluff
Inhaling the eroded exposure

[Crossing North]
Along the flat forgotten tracks
Of coal burning mound circlers

rainwater through an oculus-funnel, which connected the individual to the river through the associated shifts in water movement. Both chambers paid a great deal of respect to the works of Chris Drury; in the sense that both aimed at isolating a specific site feature, in attempts to further exemplify the interconnectivity of specific site features.

[Official dialog .1]

As the design of these installations evolved, there were several correspondences with park officials, mainly the property manager, James Davis. During one of these initial correspondences with Davis, it was made evident that the schemes for the foundation site and the well were too much of a risk to be approved through his jurisdiction; as a result, we were given the choice to wait approval from the board of park officials, or propose alternative sites that did not run this risk. Since the next board meeting was scheduled beyond the time frame of the project, we decided to brainstorm alternative sites. The major principles extrapolated from the initial schemes were:

- Sensitivity was given to existing site conditions, both in a material and immaterial manner.
- Forms were derived through the carefully identification and isolation of a natural phenomenon.
- Consideration was paid to multiple users types
- All schemes maintained a delicate balance between intervention and investigation.
- The joining of materials aimed at emphasizing the design concept.
- Designs were informed by up-front site analysis, such as, writing, sketching, digital montage, video documentation and mapping.

[.2]

Moving through the Mounds State Park with these outlined principals fresh in mind, we came across two distinguishably different sites, both offered uniquely specific connections to the river, and both occurred on the trail five.
[Retaining]

Moving along the furthest eastward extend of Mounds, we confronted a 18' long vertical plane, roughly four foot in height, which was retaining the path from collapsing into an adjacent stream. This retaining wall had been constructed by park officials, comprised of treated lumber and steel straps. Human activity, mainly pedestrians and the park's service vehicular traffic was the cause of the initial erosion. This erosion coincided with a particular bend in the small stream that ran down from the north, winding back around westward it eventually deposited in the White River. This particular event presented a unique vista of the surrounding bluffs resulting from the rise of topography up towards the Great Mound. For us, this site represented an opportunity to enhance an existing park feature while providing an educational platform for engaging the surrounding landscape.

Our main intentions were to clamp to the retaining wall, anchoring it with additional support, while providing a platform. The design initiated through extensive site documentation, including: multiple montage compilations, surrounding textural mapping studies, topographical modeling and detailed measurements of the retaining wall relating to the path. This data was then fed into the computer, providing the basis for digital site modeling. As the design began to root itself in the particularities of the site, we realize that any intervention would have to respect the variety of existing traffic along the path. To reconcile this, we proposed a tunnel-like fold that would allow thru-traffic to pass, while warping back down and morphing into a seating platform that slightly cantilevered beyond the retaining wall. The tunnel-like passageway would provide shelter during rainfall, while simultaneously serving as a display space for artwork derived from the textures of the immediate landscape. This led to further site analysis, such as solar mapping, which allowed the design to engage specific natural phenomena. The seating was envisioned as a warped surface that would provide multiple resting positions of various ergonomic intent. Like previous schemes, this platform came to rest on limestone footers, which would provide the required weight to strengthen the retaining wall. This also allowed for a suitable base to which the super-structure could adhere. The entire surface was comprised of hardwood ribs that tied back to the limestone feet through a threaded steel rod, which unified the components by weaving through a series of feed-holes. The concept for the retaining wall provided a functional space, while also framing several instances within the surrounding landscape.
[Acoustic Shell]

Perched on top of the trail's edge, sat a wood bench fit roughly eight feet long. Though it was relatively recent in the history of the park, it steadily rot away. This was a result of contact between the earth and the supports. As gravel was dispersed through the park to control irrigation, the flow of water was diverted into channels that traced topographical low points. Unfortunately, these low points led directly to the bench. As a result, the current use of the bench was in jeopardy. We were drawn to this site because it was an existing circumstance that could be improved; and thus, it provided the greatest chance for positively impacting the existing social energies. In the spirit of Timothy Gray's sculpture, "arrested decay," this concept literally plugged into the existing bench, respectfully wrapping around the existing structure; simultaneously, it provided a more ergonomic condition for the human. Limestone feet rose upward from the gravel path, allowing the shifting ground tectonics to merge with the structure above. A warped overhead acoustic shell caught, channeled, and projected River melodies upon the human. Resting within the shell, the flapping sounds of the river's smooth surface colliding with a century old rock dam encompassed the individual.

[Official Dialog 2]

With these new schemes developed, we once again met with James Davis to discuss the realities of such proposals. It was during this presentation that it was made evident the need to maintain an eight foot clearance of all trails for service equipment; which meant that the platform proposal would have to morph beyond the limitations of the buildable area. Despite this major confliction, James was impressed with both scheme's intentions and attention paid to the enhancement of existing park conditions. More so, he was drawn to the idea of enhancing the existing bench site, and revealed more clearly to the group the realities associated with proceeding with such a project; this included abilities of park services to provide assistance, access for construction and a defined project timeframe. As a result of these discussions, we were further challenged to present a revised design; one that possibly incorporating some of the powerful ideas behind earlier proposals.
Diagram 2.1 illustrates the coupling action of rational and intuitive cognitive processes during the engagement of various digital technologies. Intuitive processes are most apparent during the physical engagement of instruments that embody a rational frame, such as the camera; and rational processes are more dominant through the engagement of various softwares, such as digital modeling interfaces.
Mounds

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Fabrication
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[Calibration Channel _ final design for Mounds State Park]

Given the challenge of revising the initial acoustic shell design, our first objective was to re-measure and re-model the entire bench site. This necessitated accurate measurements, new montages and further analysis of natural phenomena. During our on-site collection of this data, we recognized that the sound coming from the river traveled a peculiar path towards the bench. Opposed to intuition, the sound actually made a bend around a grouping of trees and traveled up the ridge of the adjacent bluff. This was measured by cupping my ear and pivoting in steady increments. In addition, we also noticed an increase in the buildable area of the site. This took into consideration the eight foot parameter for service vehicles and existing trails. Furthermore, new site lines were established that connected to the northward bound trail along the river's edge and a large oak tree, which bordered the bench to the south. The oak served as a visual stabilizer in moving down the south-west bound trail from the Great Mound.

The main objective of our final proposal was to provide a seating-platform that would channel the river sounds in a manner that small groups and individuals could undergo sensory calibration. This led to several versions that were modeled in the computer, which evolved as access, buildable zone limitations and scale were considered. Much as the Mediation Loft mediated between human and bridge, the Calibration Channel mediates between the scale of human and the surrounding forest. Furthermore, the Calibration Channel incorporates many of the characteristics from earlier investigations, which emphasize that the design arose from a generational evolution. For instance, in early proposals, the hardwood ribs served as both structure and surface, yet through physical modeling it became apparent that this would require a significantly larger amount of material. As a result, the skin strength was increased to behave as a secondary structural element. Evidently, this modification also allowed for a smoother surface that would better accommodate acoustics. The skin catches, channels and focuses sound; additionally, it filters the breaking sunlight as it permeates through the forest's canopy.
[Performance-Driven Formulation]

As the specific role of the architectural intervention clarified, so did the form. The classification of the platform as a sound chamber lead to specific design moves that encouraged the capturing, directing and filtering of sound waves. The form was not generated on a purely aesthetic basis. On the contrary, the beauty of the form comes from the structure’s ability to express exactly what it is, exactly where it is and exactly where it came from. The formulation of the Calibration Channel was also heavily influenced by the manner in which the concept was conceived. It is obvious that the Calibration Channel formally mimics the human ear canal. Both are constrained by performance criteria, and both are environmentally driven mutations permitting the passage of concentrated sound energy onto the human psyche.
Mounds

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[Prototyping]

As the Calibration Channel solidified in a major reality, it was reviewed and approved by James Davis. It was also at this time we received notification of multiple donations from surrounding Indiana industries. These donations allowed us to obtain over 95% of the material required for construction. The Indiana Hardwood + Lumbermen's Association in partnership with Frank Miller Lumber of Union City, Indiana, donated over 6,000 lbs of red oak and ash. In addition, Indiana Limestone Fabricators donated the use of their large CNC mill, plus the production time necessary to fabricate the limestone footers; this was in partnership with Big Creek Quarry, whom donated the 150 cubic feet of limestone needed for the footers. These collaborations also broadened our capabilities to fine-tune the material appropriations; for instance, Indiana Limestone fabricators were capable of uploading the digital model of the footers via the internet, which allowed for modifications based on their knowledge of the material. Likewise, the Indiana Hardwood + Lumbermen's Association informed us on species characteristics and harvesting methods, which allowed for sustainable consideration to be given to the materials specified.

Computational technologies allowed the possibility for multiple iterations of similar designs; in addition, they aided with the transference of fabrication information, directly feeding into the flow of communication, which resultantly lead to the further evolution of the project. Consequently, digital communication made it possible to craft relationships with surrounding industries and institutions, as well as further exemplified our own capacity for detail. Through the engagement of multiple modes of fabrication, the design was inherently informed by a great degree of constraints.

Prototyping lead to the isolation of three distinct systems, which was reinforced through the articulation of joining these three systems. Much as Carlo Scarpa's work embraces the connection between components, the calibrating channel calls attention to the fastening of structural ribs to limestone feet and structural ribs to skin. It also aims at harmonizing with the surrounding landscape through the reinforcement of existing rhythms. Specifically, the structural ribs shift ever so slightly as they accommodate the warped acoustic shell, which allows them to merge with surrounding trees. The detailing of the Calibration Channel came from the several prototypes created on the laser cutter.
As the work of SHoP and William Massie clearly demonstrate, the digital model contains all the information needed to fabricate the physical structure. This information provides unprecedented precision and detailing; furthermore, it emphasizes how the navigation of digital software offers the architect-designer heightened capacities for handling high levels of complexity. This is mainly augmented through the use of vector-based programs and CNC-driven devices, such as the 3-D milling machine. These devices are capable of interpreting all the data stored within the digital mode, yet strictly rely on the architect-designer’s capability of navigating multiple programs. With instruments such as the milling machine and the laser cutter, the architect has the ability to quickly and accurately model various versions of a single design. As the information necessary to fabricate was being extrapolated from the digital models, the design was continually informed during the fabrication of various details. We began to utilize the laser cutter to produce various scales of models, which was achieved through the isolation of the various systems and breaking them down into nestable components; or 2-D layouts that maximize material sheets. In the case of the laser cutter, this constraint was 16 x 24 inches and < 1/4 inch in thickness. The isolated systems were: the main structural ribs, the limestone footers and the acoustic skin. Since the limestone footers were being fabricated by Indiana Limestone Fabricators, our main concerns were the main structural ribs and the acoustic shell; both of which would be milled in the architecture building’s fabrication lab. All components were constrained by the following:
All fabrication was limited to 4’ x 8’; the dimensions of the CNC milling surface, all components must nest within 12” – 3” width, with a majority nesting in widths 8” – 6” [the dimensions of the donated lumber], and all components must be tagged for tracking and construction purposes.

Net constraint = boards < 12” width x 8’ Length

In order to maximize usage of the donated red oak and ash, a digital index was established in order to catalog and represent every board. As a result, width, thickness and length were measured by hand, documented, and transferred into digital data. Priority was given to the largest components; thus we were capable of accurately nesting all rib and skin components. To imagine a similar exercise outside of the computer, we would have had to lay each board out flat, a feat which would have covered an area 100’ long and 10’ wide. Then, we would have needed to cut multiple templates for each component; finally, those templates would have needed to be rearranged manually upon the boards in a manner which maximized the available resource. It is evident in this instance, that the computer offered far superior capability than traditional methods. However, beyond just allowing a more efficient manner for nesting components, this process also dovetailed directly into fabrication-prep files. Since each component had been digitally nested upon a digitized board, slight adjustments in data allowed us to directly output that information to the CNC mill. As a result of such proficient data transference, we were able to focus in on variations of details.
Plan of nested rib components
[Rib manufacturing]

As we began to mill components, we stratified into work stations; some prepared code, while others milled and worked on finishing. Using the internet, we managed to source an environmental-friendly protective sealant; and we were able to source and estimate the costs of all other components; such as angles, bolts and conduit (for spacing the ribs).

While the majority of the fabrication was happening in the shop, we were simultaneously leveling the site; which required elevation measurement and surface area calculations for limestone gravel. The limestone footers were being shipped from Spencer, Indiana, so it was important to project a foundation plan on the site for accurate reception. Again, this information was extrapolated from the digital model, and thus, allowed for precise calculations to be made.

Fabricating the project ourselves allowed us to understand the complexity associated with manufacturing architecture. Beyond the translation of data, there is a mental capacity required to operate the machinery. Often, architects out-source components fabrication; thus, they are disconnected from the processes. The fabrication of the rib components took over 180 hours of continuous milling, sanding, carving, straightening and finishing. This activity made a drastic impact in our awareness of energy required to produce a project of this scale. Additionally, this allowed us to estimate the economic resource required.

Digital Model and Extraction Files:
Robert Homer

Fabrication Code for the Ribs:
Robert Beach
Christopher Peli
Lissa Funkey
Katie Marinaro

Nesting of the Ribs Components and Skin Boards:
Robert Beach
[Estimated Costs]

[Rib Manufacturing]

Machine time at $20 / hour [conservative price]
$20 / hour x 180 hours = $3,600
Machine maintenance and operation 10% = $360
Net = $3,960

[Entire Project]

Design development $20 / hour x 120 hours = $2,400
Construction documents $20 / hour x 80 hours = $1,600
Machine time $3,960
Limestone footers machine time [$40 / hour] and material costs = $4,600
Hardwood material cost = $5,000
Misc. material cost = $1,000
Installation $20 / hour x 80 hours = $1,600
Net project cost = $20,160
The yellow grasses fold across the earth
Frozen waves moving over mud boulders

Out of the shifting surface gray arms reach to the sky
Crowned with spiked cones and curled fingers

The horizon is defined by a band of twisted dark roots
Crisp in the scattered overcast

Unperceived jog of elevation
Carving homes for Heron

Lying at the bend nobody visits
The down spiral glides with little acknowledgement

The autopsy of the great oak extends beyond equinox
Industrial Collaboration

Since the limestone footers were being fabricated by Indiana Limestone Fabricators, I had to ensure that all of the design specifications were embedded in the translated data. Typically, they had only received CAD files or paper rolls from architects. As a result, they housed their own translating team with the specific task of making the architect’s information capable of being fabricated with their methods and equipment.

Part of the collaboration was to test innovative methods of transferring such data; as a result, I transferred a three-dimensional RHINO model to the Indiana Limestone Fabricators. Consequently, this model had such sufficient data embedded within it that there was no need for an in-house translation process. From the fabricator’s point of view, this was a drastic improvement over current methods; evidently, they are going to start requiring all architects to produce digital models for fabrication.

Shipping

Shipping from Spence, Indiana, was made possible by the donation of time and resource by Rowe, Transport Inc. of Indianapolis. Delivery was made directly to the service area of Mounds State Park. From the service are the limestone footers were transported to site with prk equipment.
Skin Boards

The 180 skin boards were cut from the remaining red oak and ash. This process consisted of planing the various thicknesses of boards [8/4 and 8/4] down to 1.25". They were then joined and cut into their respective shape. Although the boards themselves were machined with conventional tools, the manner in which we organized, sequenced, nested and tagged the boards was unconventional.

The boards were separated into 4 skins [AB,BC,CD,DE], which were the spans between ribs. Next, these skins were digitally exploded in order dimension. The dimensioned boards were then printed out into schedules which were utilized in the shop for diagrammatic purposes. These schedules were used to nest the skin boards onto the boards as they were being planed. This sequencing saved an enormous amount of time, and allowed us to track our progress through this phase of the fabrication process. In the end, these schedules also aided in the tagging and organization of the skin boards, which would eventually expedite the installation process at the site.

Skin nesting diagram: Robert Beach
Tagging

Tagging became our way of tracking progress, as well as allowing for a heightened level of organization through the fabrication of nearly 200 components. We utilized the laser cutter to generate a template and screen, which we painted. This method allowed a uniform consistency across all of the skin boards, yet embraced the act of post-processing each skin piece through an individual stain. Furthermore, the tags aided in reorganizing the components on site; allowing for quick positioning during construction. In the end, the tags became a visible trace of the design process, allowing for individuals to understand part of the process behind the making.
Mounds

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As a result of my active-engagement during the fabrication phase of the Calibration Channel, I was afforded the opportunity to mediate more effectively between the digitally fabricated components and the site. Essentially, the components of the Calibration Channel represented a potential, which could have been realized in a multitude of ways. Evidently, the particular configuration of the Calibration Channel took was heavily influenced by my engagement of the fabrication and physical construction. Furthermore, spending time away from the installation site served as a very powerful method of readjusting my design horizons; so when installation actually occurred there was a wave of innovative creativity derived from seeing the site in a new light. Hence, the design evolved through the influences of technology and nature, but not as a result of sacrificing sensibility. In other words, as I mediated between technology and nature, via the design process, the installation became a by-product of the dialog.

Laying Gravel

The installation site was relatively level, yet did required a ton and a half of limestone gravel, which was donated by IMI (Irving Material Inc.) of Pendleton, Indiana. This was distributed according to the foundation plan to properly receive the fabricated limestone footers. During the distribution of the gravel multiple park users passed by and inquired about the project. Mixed enthusiasm was expressed; nevertheless, I felt a heightened sense of reality through the engagement of the people that would eventually utilize the project. In addition to park users, being on site re-established a profound connection to the forces that inspired the project, such as the fluttering sound of the rock dam. Furthermore, it became clear that by having the design details resolved to a significant level before hand, allowed for the ease of modifications and fine-tuning during construction.

The distribution of the gravel overlapped with the fabrication of the acoustic shell, which took roughly two weeks. Both the structural ribs and the skin were coated in an environmentally safe wood treatment shipped Canada, which required three days of curing after application. As the components cured, they were taken to the site to be assembled. The curing of the red oak components dove-tailed within a few hours of the arrival of the Limestone Footers from Spencer, Indiana.
[Digital Datum]

Diagram 1.5 illustrates the relationship to the digital datum through the design process of the Calibration Channel. Digital technologies served as an effective measure to organize various design phases; additionally, each phase utilized different aspects of digital technology. This point emphasizes the role of digital technologies to transition between phases, as well as mediate between various input and output methods.
[Calibration Channel Reflection]

The design of the Calibration Channel resulted from a constant dialog between digital technologies and environmental circumstances. Technology was viewed as an instrument for studying nature. During site analysis technology was utilized for photographic and video analysis. Those images and streams then directly fed into graphic representations that incorporated intuitive writing. During the early stages of the design it was apparent that technology was becoming the various phases of design; acting as a medium to transition between modes of analysis. During the design formulation these graphic representations directly informed the performance criteria that environmental amplification was centered.

Working with digital modeling software, the site was understood from various perspectives, as well as provided a precise framework to test various interventions. Digital modeling also allowed for the extraction of specific fabrication information; which allowed for further testing and precise customization of components in relation to material limitations and constraints. Furthermore, the digital model provided all the information needed to organize, track and assemble the fabricated components, which saved an enormous amount of time, material and energy.

In the end, the design and fabrication of the Calibration Channel established a framework for other digital projects, with an emphasis on environmentally-based interventions. In addition to testing the capabilities of digital technologies during the design process, the Calibration Channel also provides a place for the contemplation of technology and nature.

Finally, the Calibration Channel provided an amplification of existing environmental circumstances; bridging between human and place, as well as technology and human.

[Eco-Tec Futures]

This thesis put forth the question, “Can digital technologies augment the design of [site-specific] environmental installations?” In examining this question, I have explored the realms of art, architecture, philosophy and craft; establishing that these realms operate within a tight web of interconnectivity. Additionally, I examined the manner in which our minds regulate perceptual energy through sensory filtration; and similarly, I discussed how architecture regulates our perception of the natural environment through the filtration of technological and cultural influences. I examined how installation art engages human sensory energy; applying these principles to various installations along the White River, exploring the role of craft in augmenting the success of these architectural projects of environmental amplification.
"The New Education has to take the form of training of perception instead of learning lists of concepts, so that we equip our young to navigate through entire fields of information. This is to train explorers and innovators, intellectual and cultural nomads rather than sedentary bureaucrats."\textsuperscript{26}

_David Carson

I have come to the conclusion that digital technologies offer increased capacities for our understanding the entirety of a design problem, proposing solutions to that design problem and interrelating various phases of the design process. Furthermore, digital technologies offer the capability to generate and fabricate complex formal solutions for the sake of environmental amplification. Digital technologies allow a more responsible use of materials; limiting the waste, while increasing the precision. Digital technologies allow for a drastic reduction in the energy required from the standpoint of the architect; yet, they require more energy during the customization of components. For this reason, I would argue that the knowledge and technical skill required by all parties increases greatly. With that being said, I feel that the digitally-augmented interventions could benefit from more performance-based research during early design development; however, this requires additional skill and energy. Since [Eco-Tec] designs promote the conservation of time and economic resource, they allow for heightened concentration of customization and craft. Therefore, I would encourage further exploration of the application of digital technologies in combination with sustainable building materials, such as adobe, straw bale, rammed-earth and recycled composites.

As demonstrated in the Calibration Channel, [Eco-Tec] designs offer humanity the potential for more natural harmonious interventions with place. But this depends on the designers ability to recognize the principles that are governing the forms found in nature, which means they must understand the processes governing those forms. The recognition of such processes will only come through the active engagement of natural systems. In short, we must listen before we build, and continually interrogate that which we build. Additionally, we must allocate sufficient time in our daily cycles for the contemplation of nature, technology and our environmental impact. So accordingly, we can shift away from shaping nature for the sake of humanity, and begin to shape humanity for the sake of nature.

"A Renaissance is a shift in perspective, the shift from living within a model to moving outside of it...As long as we can maintain our renaissance sensibilities and our awareness of the implications of the open-source reality in which we live, we have access to enormous opportunity for cultural progress.\textsuperscript{27}"

_D Douglas Rushkoff_
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