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(im-print): A material investigation to encourage a haptic dialogue

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(im•print)
A Material Investigation to Encourage a Haptic Dialog

by

Julie Marie Vo

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Architecture
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Dedication

To my loving, supportive husband who has stuck with me even through the rigors of the Architecture program.
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and supporting committee members:
  Stanley Russell
  Josue Robles

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The word *impression* encompasses a dual meaning which desires to be more fully explored in the built realm. An (im•print) has a powerful impact because the message becomes an indelible mark embedded within the material. Physically, an impression is made by the pressure of one object on or into another, leaving behind a trace of this interaction on the surface. This process has the potential to create a vivid memory within the participant who comes into contact with it.

The idea of imprint can become a part of the process of design both physically and conceptually. As polished concrete can be marveled for its beauty in craftsmanship, so too can the manipulation of surface serve as a valuable haptic communicator for those who interact with it. Sight is a powerful sense, but it remains devoid of any physical relationship with the world surrounding us and provides a level of separation which discourages us to examine our environment on other sensorial levels.

By (im•print)ing a material it transforms from a purely visual statement into a haptic experience, engaging the user and introducing a visceral dialogue. Inspired by the process of letterpress print-making, surface can be explored to tactiley communicate narratives of craft, materiality, and process, and open a new haptic dialogue to the body; subtly but powerfully.

Through a tactile investigation of materials’ expression, we can gain a greater connection to that which envelops us and encourage a corporeal dialogue between user and built environment.

This process sets out to create an assembled space through the process of making, molds and prints, and to relay this education of process and materiality to the user haptically, engaging the senses and in turn (im•print)ing upon the user an indelible quality of experience which inevitably impacts further exploration within the built environment.
I. Expanded Narrative

im•print (im-print’)
• a mark, indentation, figure, etc., produced by pressure.¹
• to fix indelibly or permanently (as on the memory)²
• an effect, feeling, or image retained as a consequence of experience.³

Knowing the (im•print) as perceived by the senses

The depth of meaning of the word impression is of great importance. As we have the ability to leave an indelible mark on the world which surrounds us, so, too, does the world leave an impression on us.

² Miriam-Webster Dictionary, s.v. “imprint.”
³ American Heritage, s.v. “Imprint.”
“[The skin] is the oldest and the most sensitive of our organs, our first medium of communication, and our most efficient protector ... Even the transparent cornea of the eye is overlain by a layer of modified skin ... Touch is the parent of our eyes, ears, nose, and mouth. It is the sense which became differentiated into the others, a fact that seems to be recognised in the age-old evaluation of touch as "the mother of all the senses." 

All the senses, including vision, are extensions of the tactile sense; the senses are specialisations of skin tissue, and all sensory experiences are modes of touching and thus related to tactility. Our contact with the world takes place at the boundary line of the self through specialized parts of our enveloping membrane. Touch is a vital part of the body's comprehension of the world which surrounds it; however, it has become de-emphasized in current culture while a greater emphasis is placed on the senses of sight and hearing.

The purpose of all printing, whether of words or of pictures, is to communicate ideas, information, instructions or emotions. The printed message should be not merely read but understood; its purpose is to spark off ideas or activities.

The contemporary need for instant gratification has lead to the loss of other levels of understanding. Language is disseminated through all things visual and audible. Information from all over the world is at our fingertips but offered through a medium that requires no physical interaction, no human interface with the environment outside our body. The communication of ideas should be multi-layered; expressing themselves through the particular ideas being presented whether in the form of text or image but also through the materials chosen to convey these visual pieces. Within this realm of experience, the most intriguing prospect is the interaction between the two.

Figure I.2. Stefan Themerson Penrose (1965)

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The invention of Gutenberg’s mechanical printing press revolutionized communication and book production throughout Europe. The press along with the moveable type allowed unprecedented access to knowledge and information previously unavailable or hard to come by. This process revolutionized book-making and allowed rapid transmission of the new ideas of the period. Its invention is pivotal to our history. The process of letterpress still follows Gutenberg’s original intentions employing movable type but with the added modern flair of a self-inking mechanism and a foot treadle for continuous printing of an edition. It is a form of relief printing that is particularly beautiful because its intention is to leave an impression.

An image or text that is embedded within a material is a permanent statement; an intentional impression speaks of greater care in preparation and manufacture. The force of the platen upon the type set into the chase is visibly rendered onto the surface of the paper both by the ink gently rolled onto the letters, but more subtly by the indentation created in the fibers. This process is a rich method of rendering information onto a surface: it begs to be touched and understood tactiley in addition to visually. The impression is what makes this process particularly intriguing, the image becomes innately part of the receptor: the paper. Even without inking, one pass through the press would render the image on the surface, indelibly and unmistakably. The investigation of this technique of impression can provide an insight into a new understanding of materials and delivery of information.

The study of typography provides a unique view into the visual representation of language. It has been said that typography is the architecture of the printed word because it makes thoughts visible and understandable. As there are manifold ways of laying out a building, there are – nowadays more than ever – varied ways of formulating the typo/graphics of a book, a brochure, a poster, or any media in which print is used.7

To the general public, typography is utterly visual, but there is one language – or, more precisely, a system of alphabetical coding – which is meant to be explored and understood through the tips of ones fingers. Braille is dimensioned to the index finger, not the eye. It consists of six dots: two columns consisting of three rows each. Specific arrangements of dots relate to numbers, letters of the alphabet, and symbols. The creation of these texts are made using an engraving technique- by applying a stylus to the backside of a sheet of paper which pushes up the surface to a tactile height. To the eye, pages of Braille resemble a matrix of dots on a grid without easily

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imparting the message visually to the viewer—this is an alphabet which can only be understood by touch, through the fingertips. This method is relegated to text only and perhaps is missing a facet of understanding, but it grants the reader a chance to have a physical relationship with the information presented—an opportunity not generally afforded the sighted, as their vision is perhaps taken for granted.

Imperceptible measures of (im•print)

Generally, the visual and tactile are separate entities, but the goal should be to incorporate a visual message with a tactile one. Exploration through material usage and manipulation of surface can become a very strong public education tool. Depth can be examined both as a quantifiable distance from the viewer but also as a degree of psychological or intellectual profundity, perhaps one can lead to the other. The eye is the organ of distance and separation, whereas touch is the sense of nearness, intimacy and affection. The eye surveys, controls and investigates, whereas touch approaches and caresses. The eye draws the body to the surface and encourages the hand to reach out and feel. Light is that which draws the eye, the way it dances over a surface the interplay of light and dark provide information of texture but without the knowledge of the fingertips it is inaccurate. Additionally, the absence of light requires the body to see with its fingers, feeling its way through a space. Light and its presence or absence is pertinent to the making of surface and space.

It should also be noted that there exists a very distinct difference between a touch and a caress. Little information can be gathered by just placing one’s fingers upon a surface, but once the fingers begin to glide over the surface may we form a total memory of the experience. We stroke things that we are intimately involved with: the hand of a loved one, or the coat of a pet; whereas we touch out of necessity: to call an elevator or dial a phone number. Potential lies within surface to tactiley communicate narratives of craft, materiality, process, and message, subtly but powerfully. Through a tactile investigation, we can gain a greater connection to that which envelops us and create a corporeal dialogue between user and structure.

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II. Case Study Analysis

Case studies were chosen based upon their material sensitivities within an architectural frame. They provide a unique look at materials which both express themselves visually as well as tactiley. Also, they encourage users to interact with them and open up a dialogue expressing their materiality, construction, and care. The cases chosen all address a manipulated surface, each with a unique reason for doing so: structural, textural, or emotional. Real primacy belongs to the surface, which in the body is the medium of the senses that have the tightest grasp of spatial reality (the skin or the retina). The surface, like the skin, is capable of dividing regions, such as inside and outside, self and world.¹

Snøhetta. Oslo Opera House

Interior Detailing

The image at right is of the foyer of the Oslo Opera House designed by the firm Snøhetta. Upon entry to the Opera patrons are invited into the space by the Interior walls which are clad in vertical oak strips. These vertical strips provide multiple sensory experiences and enhance the body’s dialogue with the Opera House. Visually, the strips represent a staccato movement that the patrons follow from entry to seat allowing the movements of the body to follow with the tune. Auditorily, these slightly irregular strips also help with sound attenuation as they absorb and refract the sounds created by patrons in between acts. The smooth floor and ceiling provide a stark sensory contrast as they reflect cool, smooth surfaces. This warm interior creates a stark contrast to the exterior which exhibits a cool, iceberg-like appearance.
**Exterior Cladding**

The firm engaged artists Astrid Løvaas and Kirsten Wagle to design the meal cladding elements on the exterior of the building. The intention was to clad the structure in a material which would have a long lifespan in the cold Oslo climate, the answer was to re-evaluate and redesign a simple, modern metal cladding, which is usually associated with factories and workshops. After a consideration of aesthetics, longevity, and malleability aluminum was chosen as the most appropriate material. In all, eight panels were designed to produce a constantly changing visual experience as light and shadow play across the surfaces. The pattern decided upon was based on old weaving techniques and was created by punching convex spherical segments and concave conical forms. The hemi-spheres create a soft gradation of lighting while the embossed conical forms create a sharper contrast of dark to light. In the cold climate that Oslo experiences, the tactile experience of touching the panels might chill the viewer and perhaps enhance the memory of the experience.
Snøhetta wanted to integrate the new Opera House into the fabric of the city and they designed the structure so that it allowed easy and open access for all; creating a new landscape within the city. This idea then led to laying out a ‘carpet’ of horizontal and sloping surfaces on top of the building so that it may be interacted with on many different planes and levels creating a democratic use of the structure. The ‘carpet’ is made of an Italian marble: La Facciata which was chosen based upon its color and technical qualities. Upon this carpet artists Kristian Blystad, Kalle Grude and Jorunn Sannes designed a non repetitive pattern with integrated raised areas, special cuts, various surface textures, and specific details which were designed to articulate the main geometry. Although these moves were introduced to create a visual stimulation, the change in textures on the surface adds another layer to the understanding of the structure by the body. When walking and the surface beneath us changes so does the sound made when our soles contact it and this may even affect the ease with which one may maneuver across the surface. This attention to all the surfaces which interact with the body leave the user with a tactile memory of the space.
Maya Lin designed the Vietnam Veterans Memorial to be integrated into the landscape of the Constitution Gardens. The body of the visitor is taken up into the wall in a venatic and forensic movement – the visitor hunts for names; the wall hunts for the visitor – towards a dark centre. The visitor “gets cooked” by ending up further inside the wall than anticipated. The reflections, eventually encompassing the visual field of the site, overwhelm. The space on the virtual...
“other side” behind the names becomes more substantial than its “real” twin. The wall with etched names of soldiers was impressed into the landscape creating a subtly enclosed space which allows for personal interaction without feeling exposed. This thoughtful combination of vertical and horizontal elements envelops the viewer and encourages a personal connection with the soldiers who were lost.

**Etched Names**

Maya Lin chose to honor the soldiers who gave their lives in the war by displaying their names on a memorial wall. Their names were arranged in chronological order and etched into black marble. The smooth, shiny surface of the ebony marble engages the eye of the viewer and incorporates them into the experience by reflecting their appearance over the name of their loved one. Additionally, the etching of the names allows the mourner to have a haptic connection with the loss and experience of remembrance. It has also created the opportunity for mourners to make a rubbing from the etched letters and in turn take a small piece of the wall and their experience home with them. The memory keepers of those lost to war cherish the small pieces of paper which contain the names of their lost loves.

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Herzog & de Meuron. The de Young Museum

Copper Facade

Architects Jacques Herzog and Pierre de Meuron designed the facade of the de Young Museum to blend into the landscape of Golden Gate Park. The pattern became a combination of embossed and de-bossed shapes in conjunction with multi-diameter holes punched into the panels. The layout of these elements came from an abstracted image taken of the trees existing in the park. Copper was chosen so that it may be easily manipulated to allow light to play upon its surface but also because it would patina during its lifespan in the park and blend more seamlessly into the park scape.

Figure II.15. Diagram - Section through copper panel

Figure II.16. Image - Design for copper facade. Source: Darley, 2005.

Figure II.17. Image - Copper panel facade. Source: Darley, 2005.
Elemental Interaction

The shape of the embossed areas was decided after experimenting with the medium and the shape chose was that of a stunted cone. These shapes allow light to play upon the surface and entrance the eye as well as entice the fingertips. Additionally, it will encourage uneven patina on the surface further reinforcing the pattern created and enhancing the depth of the surface both physically and metaphorically.

de Young facade of steel is visually manipulated by the sun and water which encounters it. The pattern of patina is affected by the embossed and debossed areas creating a unique interplay on the structure.

Figure II.18. Image - Copper Facade. Source: McCown, 2006.

Figure II.19. Diagram - Lighting impact on manipulated facade
III. Planes of Experience

Site in Relation to the Body

The authenticity of architectural experience is grounded in the tectonic language of building and the comprehensibility of the act of construction to the senses. We behold, touch, listen and measure the world with our entire bodily existence, and the experiential world becomes organised and articulated around the centre of the body.¹

Site is relative to the human body, therefore spaces are defined by the body which inhabits them. Sites, then become planes relative to the body. We experience these planes on multiple sensory levels, however these planes are often most connected to the body’s sense of sight.

As a culture so dependant upon visual media, sight is the sense which so often regulates and informs the other senses.

It compels us to listen if we see someone speaking and draws us to interact with something that appears to have a desirable texture to caress. Frontality is what distinguishes architecture as such from the normative building. Take the case of the art work’s engagement of the individual as body. In building per se, without architecture, the body is accommodated by suiting its mechanical, biological, psychological, and symbolic needs. For the building to be present as architecture, the body must assume a different relationship to the building. Instead of being the building’s client, the body identifies with the formation of the building as a work of art. The body becomes the personal recipient of architecture, and the imagination establishes the site of reception. ² Within this exploration there are three distinct planes which envelop the body and form the spaces within which we lead our lives.

The first plane is that which exists beneath our bodies, it holds our body, it is the plane upon which we walk and sit and sleep. This plane is the only one within this discussion that we are in constant contact with although often tempered by shoes or clothes it is the only plane that we are reliant upon and are unable to flee from. Bodies detect the materials under them through touch; the crunch

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of pebbles depressing under the body's weight or detecting the un-evenness of surface on a cobblestone street. We gain knowledge of our surroundings imperceptibly. Gravity is measured by the bottom of the foot; we trace the density and texture of the ground through our soles.³

Visually, however, the body is most closely related to the surfaces which run parallel to the height of the body. These planes are not as closely physically related but they stimulate the eye and they echo the sounds of life into the ear, absorbed by the body. We use this plane as a reflection of our lives, we use it as decoration, for vanity, for memory. This plane exists as a representation of the vertical body and encloses space around the body.

The third plane hovers above the body. It exists, often, just out of our reach, it echoes the sounds of life, and is often only accessible by the sense of sight, and is outfitted to subdue acoustic exchange. It provides shelter for the body from the elements of the environment. This plane is

usually the furthest from the physical body and is generally subjugated to relative flatness or generic texture. An exploration of the surface of these various planes in relation to the human form can provide new insights and understanding into the way surfaces may interact and communicate with the body in addition to how these surface may enhance the users experience with the surfaces that surround it.

Primitive man used his body as the dimensioning and proportioning system of his constructions. The builders of traditional societies shaped their buildings with their own bodies in the same way that a bird molds its nest by its body. The essence of a tradition is the wisdom of the body stored in the haptic memory.⁴

Figure III.7. Sketch of the body in a space which integrates all three planes and their relation to each other and light entering the space

Figure III.8. Sketches of body in space with light interaction on planes
IV. Programmed Making

Molds + Prints

The hands are the sculptor’s eyes; but they are also organs for thought, as Heidegger suggests: ‘[the] hand’s essence can never be determined, or explained, by its being an organ which can grasp [...] Every motion of the hand in every one of its works carries itself through the element of thinking, every bearing of the hand bears itself in that element [...]’.¹ The act of making an (im-print) requires two main components: the mold and the surface. We must consider these two as equal opposites; the resulting (im-print) upon the surface is completely dependant upon the mold created.

The creation of the mold is paramount to the process. The design of the mold is opposite that of the result and therefore must be designed in reverse.

The mold is the pivotal piece that all other processes depend upon. The creation of the mold has infinite possibilities with two essential constraints for creating a coherent print:

One- it must be strong enough to resist the forces placed upon it during the (im•print)ing process, if it cannot handle these, the mold will fail and the print will not be created successfully.

Two- the print material must be able to release from the mold after it has received the image.

(im•print) attempt one

The initial printing project attempted in this study was simply an (im•print), the title of this Thesis study. A font was selected, a template was made and then characters were cut and attached to a hard surface. The release for this mold was a piece of fabric which had a satin sheen but with exposed woven threads, the purpose of the introduction of this material was to aid the release of the print from the mold. The print was then formed with a product called Sculptamold which is a fibrous modeling material. Upon release of the print from the mold, the combination of the fabric gently laid over the text created an illegible pillow-like image which did not accurately convey the idea or the title satisfactorily. This attempt did however inform me of qualities that the molds could produce and also the detail that was captured by the print material. The results are enticing to the fingers because visually one expects the surface to be soft and receptive but perhaps once one encounters this print they might be disappointed that the material is not as receptive to the users hand as it appears it might be.

Figure IV.2. (im•print) attempt one.
(im•print) attempt two

As the first attempt did not produce the final effect I was in search of I began attempt number two. The same text/font combination was chosen as before and placed onto a rigid background. Then the release agent- the fabric layer- was glued onto and around the text in order to form a tight replication of the word (im•print). As the fabric was pushed and arranged into all the crevices within and around the text, ripples formed emanating from the text and smoothing out to the edges of the mold. Upon printing from this mold, using the material mentioned earlier, the result provided the exact opposite effect as the previous. Where the first produced a print that was soft and billowy, this print was intense and rough; it was now legible but the ripples that had formed upon the adherence of the fabric layer created crevices and created a jarring visual experience and seemed to spurn inquisitive fingers. The results resembled a cracked pane of glass with the point of impact being the text. Perhaps this result conveyed a very vivid image but I felt that it was too jarring to convey the idea of (im•print). This attempt showed the pressure needed to make the print and the capacity of the material to accept a mold with a varied surface. Unsatisfied with the resulting print, I realized that I needed to adjust how the mold was created.
(im•print) attempt three

For the third attempt, the same font and text were chosen but instead of attaching them to a rigid backing I chose to place them atop the fabric release layer—rather than beneath it. This mold utilized a different fabric than before as I was desiring a more textured surface so canvas was substituted for the previous fabric. The moisture which accompanies the print-making process deterred this action previously but I decided that I could seal the letters to inhibit moisture penetration and try again. Despite sealing the text, moisture seeped in and delaminated the type from the fabric backing but once the print dried I was able to peel the letters out and it produced an accurate print. Finally this print successfully conveyed the text in the material and formed a definite (im•print) conveying both the message.
Figure IV.7. Detail of final print
and the text haptically. These studies were performed to provide a visual image of the intended study in this thesis. The intent of the project was initially to convey a word in a legible format, however it seems that an untainted haptic understanding might be achieved if the imagery became more abstract so that the eyes would not have an overt reference but that the result must be explored and understood through a physical connection with the material rather than a pre-conceived visual understanding of word or image. As mentioned earlier, braille is a written form but is not easily deciphered by the eyes and must be understood on the fingertips and is composed of a series of dots which I felt lead to an abstracted message which could be potentially rendered in this (im•print)ed form. To begin, I chose a quote from Juhani Pallasmaa:

*The tactile sense connects us with time and tradition; through marks of touch we shake the hands of countless generations.*[^2]

I converted the text into braille and it became the image for my first print.

This mold was created similarly to the last as I chose a piece of canvas as the backing and then attached small round dowel pieces in the place of the raised dots which correspond to the braille quote. The print was then made and while the mold was created in the spirit of how braille is actually rendered- with the dots forming the letters raised from the background- the resulting print which formed was the opposite where the dots composing the letters were indented and not easily read as braille text by the fingers. Visually this print resembled that which it was intended to but the small size of the dowels were not especially appropriate for fingers to understand. This print provided more visual stimulation than tactile because the interaction of light across the surface created dark voids where the fingers should be able to interact with what is usually raised areas.
Figure IV.11. Detail of canvas with dowels mold

Figure IV.12. Detail of canvas with dowels print
Phillips screws over vinyl

In the following mold I tried to create a shortened version of the quote using readily available building materials. This mold was composed in a similar manner but introducing different materials and combining them in a slightly different manner. In lieu of canvas I substituted vinyl, a marine grade version which is resistant to moisture penetration. As in the prints before the texture of the canvas was lightly rendered on the surface of the print but didn’t quite provide a pleasurable tactile experience so the substitution of the vinyl was intended to create a smoother surface experience for the fingertips. Atop the vinyl I placed #8 phillips head screws in the areas represented by dots in the braille quote. These were chosen because their rounded metal surface...
was resistant to sticking in the print material and they would create a perfect hemisphere, but also the print material would fill the void left for a Phillips head screwdriver atop the screw and create a more intricate tactile experience. Thick blocks were created to back the vinyl to accept the screws and provide a sturdy surface for applying pressure to create the print. These were created as strips rather than a solid back so that the material could easily be pulled and separated from the resulting print as it becomes rigid once dry.

The first print from this mold was not completely satisfying as the material bowed as it dried and did not accurately render the surface of the vinyl or the impression of the screw heads well, as represented in the print above. Therefore a second print was necessary to try to achieve a more accurate print from the mold. For this second attempt I used a different material in making the print. I used a combination of plaster and a fibrous material which was supposed to have a clay-like composition when wet. These two ingredients were combined because the plaster accepts surface textures well while the clay-crete allowed a fibrous component to negate the ‘heat shrinkage’ that occurs with plaster while it cures. I was aware that this movement would create an in-accurate and undesirable final print. With these new materials came a new method of how to

Figure IV.15. Phillips head mold and second print attempt
Figure IV.16. Detail of Phillips screw over vinyl mold

Figure IV.17. Detail of Phillips screw over vinyl print
apply the print material and also when to remove the print from the mold. In previous prints I would remove the mold prior to the print drying completely which created some rough areas around the protruding areas on the mold, but utilizing these new materials I thought that I would leave the print on the mold until it gained enough rigidity to be removed. However, in this instance, the print refused to be removed in one continuous piece and broke. A third of this print is still attached to the mold. The portion which was removed formed a clean print which partially accepted the phillips head areas of the screws. As in the previous mold this print garnered more attention of the eyes than of the fingers.
Vinyl over tacks

The object of the next mold was to provide a shape under the surface of the fabric so that the result might have a smooth appearance but with subtle raised areas. This effect was achieved by using thumb tacks placed into a thick backing underneath the vinyl top layer. I again used the shortened version of the original the braille quote. The vinyl was marked with the same pattern and slits were cut in a + formation where the domed areas of the tacks resided under the fabric. These +’s allowed the fabric to lay flat in the areas where it was to be flat but allow the tacks to protrude slightly as if they were bursting through. This mold when printed created recesses of approximately finger size with raised +’s in the center. The first print made

Figure IV.18. Detail of Vinyl over tacks print
Figure IV.19. Vinyl over tacks - first print
from this mold utilized the original materials and again provided an unacceptable result. I expected the result to have a smooth surface with raised ‘+’s but this material did not create the smooth continuous surface which I desired. A second print was then made using the afore mentioned combination of plaster and clay-crete. This combination was far more receptive to the surface texture of the mold and created a very successful print. It is very inviting to the senses; light plays well on the undulating surface creating subtle dark areas in the recesses while highlighting the ‘+’s and because of this light play the hand is attracted to the surface. Since the mold was made with a continuous top surface there are no abrupt changes across the surface and it is haptically delightful. The print also very subtly accepted the slight imperfections in the surface of the vinyl and created a smooth but slightly irregular surface.

With this pair -the mold and the resulting print- I find that the mold itself has a bit more allure. Perhaps it is because the ‘fabric bursts’ reveal a small amount of brass shine which contrasts well with the stark white appearance of the vinyl, that said the print has a better surface as perhaps the vinyl exhibits an unnatural quality which perhaps spurns fingers. Also, on the mold, the tactile portion lives above the surface rather than below it. This poses the question: Which is more tactiley exciting: something that lies above the surface or something that is depressed just below?

Figure IV.20. Vinyl over tacks print (above) and mold (below)
Figure IV.21. Detail of Vinyl over tacks mold

Figure IV.22. Detail of Vinyl over tacks print
Vinyl over voids

In light of the results of the last print and the juxtaposition of the print versus the mold, the logical next move is then to create a mold which provides a surface which comes to the user rather than lying below the surface. The same pattern for the braille quote was used as before but rather than add to the surface of the mold I took a reductive approach and built blocks for the backing and then carved into them. Squares were cut into the backing and the same vinyl was used on top. The fabric was sliced from corner to corner on each of the areas where a recess had been cut. The fabric was then pushed into the void creating a similar effect to the fabric over tacks but in reverse. The idea was that the resulting print would resemble the mold made in the previous trial. The first attempt at making this print was a failure because I tried to remove the mold when the print was only partially dry and this attempt left the portions which were still moist stuck in the mold. Portions did emerge unscathed but this print was clearly meant to be a learning experience. The second attempt at making the print was more positive but still resulted with issues. The portions which formed raised areas on the print still refused to release cleanly and I attribute this to mold failure. In the case of the tacks over vinyl there was no dead space - as the vinyl was always in contact with either the tack or the

Figure IV.23. Print (above) and mold (below) of Vinyl over voids
Figure IV.24. Detail of Vinyl over voids mold

Figure IV.25. Detail of Vinyl over voids print
backing. However, with this mold when the vinyl was pushed into the voids there was space where the vinyl and backing were not fully in contact with one another and this allowed material seepage into these excess areas. When the print material fills these voids it has the opportunity to spread and the shape is not guaranteed which has the potential to be interesting but more often it looks like a mistake. So, the resulting print was not exactly as I had suspected it would be. This error did inform me that an adjustment needed to be made so that material may not be allowed into the void. Perhaps because the print was not ‘clean’ I didn’t feel that it was fully successful as a print but it was informative about the materials and the process.
Vinyl over tacks and voids

After the results of the last attempt it seemed as if the logical next step was to create a mold which moved in both directions; one which allows for both raised and recessed areas. This mold combines the aspects mentioned earlier which use tacks as a backing with fabric cut to burst over the top in addition to cutting voids behind the fabric and depressing the vinyl into the hole. As the results for the previous print were not entirely optimal I needed a different solution for the void areas. As proven previously the tack/vinyl combination proved successful and tactilely delightful but a new approach was needed in filling the voids. My remedy for this problem was to cut small pieces of the same vinyl and sink them into the voids sealing the triangular shapes cut from the overlying vinyl to the sides of the void while the square of fabric covers the bottom portion; this should also aid in the release of the print from the mold.

Surely the product of this mold was more dynamic than the previous results; the surface undulated over the raised and recessed areas and the introduction of the bonus vinyl squares in the voids created a continuous surface for the print material to fill while producing a unique bursting shape. The resulting print was not as smooth and cohesive as I have created in past attempts, certainly attributed to user error in the combination of ingredients but perhaps
Figure IV.28. Detail of Vinyl over tacks and voids

Figure IV.29. Detail of mold made with Vinyl over tacks and depressions
this error informs users in the material qualities for the process of making?

**Linoleum**

In search of a new material to make molds I turned to something which is often used in print-making: linoleum. It is a carve-able material that allows a reductive method of mold making. It is dense but thin so it is restrictive in the depth of impression it can ultimately make. Accuracy of the mold created is completely dependant upon the skill of the carver. To edit the surface of the material I used V shaped cutters and U shaped gouges to remove the unwanted linoleum. The intention with this new material was to use the same pattern but remove the opposite areas on two different molds so that I may compare the results and decipher a better usage of the material from the two. The pattern chosen was based upon the word *touch* in braille but the proportions were stretched vertically to elongate and fill the form of the linoleum piece with the image. The object was to create something which was subtle but drawing to the sense of touch and the braille word was the vehicle. The results of these dueling linoleum cuts were interestingly informative. With the first mold I tried to take the image and blur the edges by extending the cuts past the pre-determined cutting area (drawn on with colored pencil) in hopes that the resulting print would appear as if the carved
area was protruding from the surface. For mold II I carved the opposite area as the first in a more methodical manner allowing each stroke of the cutting tool to have its own area and identity. When comparing the two, the second mold felt more cohesive in its totality as it more subtly conveyed the message and integrated it with the surface. The material which receives the print wasn’t particularly fond of the minimal depth of the fine details created and thus was a bit crumbly upon completion. In my opinion the more successful print was the one where the image was carved out as it seems more inviting to the fingers. In the pursuit of this project linoleum does not seem like the optimal mold material as it is restrictive in the depth that is carve-able as well as the fact that it is purely reductive and not additive. Also, the surface of the linoleum was not optimal in allowing an easy release of the final print from the mold. As visible in the accompanying images some of the print material remained in the mold after its completion. I wish to note one unique occurrence regarding the use of linoleum: before carving I drew a grid onto the surface with a colored pencil and upon making the print some of the color was released onto the surface of the print. I like this added information as I feel like it speaks of its process of making.
Figure IV.32. Linoleum mold II (below) and print (above)
Figure IV.33. Detail of Linoleum mold one

Figure IV.34. Detail of print from Linoleum mold one
Figure IV.35. Detail of Linoleum mold two

Figure IV.36. Detail of print from Linoleum mold two
Paraffin

To further expand the materials for making molds I chose to attempt using paraffin wax because I was able to control many of the variables including size and depth as well as surface and it also allows the potential for either an additive or reductive process. First, I wanted to understand the qualities of the material: how to melt it, how long it took to become completely liquid and then at what stages of curing can it be manipulated successfully. I made a make-shift double boiler so that I could slowly melt the wax without burning it and I took note of the time required to fully melt the cubes for further reference. After melting and pouring the wax into a pan to form the basic block I allowed it to cure and harden but it refused to separate from the pan so I tried to cool it in the freezer in the hopes that it would shrink and release more easily but in trying to cool the block too quickly it broke into multiple pieces. Easy remedy: re-melt and try again. After pouring the second attempt into the pan I allowed it to cool completely before refrigerating for only five minutes to remove the form-pan. Then, I attempted to carve it in the same manner used with the linoleum. The blade moved easily through the wax removing portions and creating a wake of wax pushed up by pressure around the edges of the slice. It was delightful to carve into, very receptive and the depth was satisfying.
until I cut a hole through the material which caused the re-melting and re-pouring and a new approach in manipulating the wax. In attempt three I chose to manipulate the surface while it was still warm and malleable. I set up a grid using thread which informed where I was to manipulate the surface and I used the same braille imagery of the word touch but modified the size to fit the shape of the block. At 15 minutes of cure time the top layer has congealed and the interior portions are starting to become the same way. For this mold I used my fingers to create the recesses and it was an extremely satisfying process. The wax was warm and it moved and stayed easily and it received the touch of my finger extremely well, even leaving remnants...
Figure IV.41. Detail of Paraffin wax mold one

Figure IV.42. Detail of print from Paraffin wax mold one
of my fingerprints in the manipulated areas. I continued to indent the areas with my fingers until I felt it was no longer receptive. I let mold cure fully and then chilled it slightly to remove the pan from the block. The resulting print was very exciting. The continuous surface allowed by the wax was reflected in the resulting print and it appeared as if the finger prints leapt from the surface. The light plays across the surface and highlights the areas created by my fingers, almost as if the user is touching my fingers as they interact with the surface.

The fourth wax attempt followed a similar process as the last: melted, poured, slightly cured and then I manipulated the surface with the rounded tip of a spoon. Rather than setting up the relatively elaborate thread grid I used a template made from a sheet of paper which had the areas I wanted to manipulate cut out. I was trying to push wax from one point and have it gather at another but it resisted and instead created a uniform crevice down the area manipulated. Visually I don’t find this print as alluring as the last but I did find that it taught me more about the medium. Since the wax is in a liquid state it has the tendency to arrange itself equally over the surface. I also made the error of trying to speed up the print drying process to the detriment of the mold as it unfortunately melted a bit.
Figure IV.45. Detail of Paraffin wax mold two

Figure IV.46. Detail of print from Paraffin wax mold two
Balsa

The next material I attacked was balsa wood which I used in a manner similar to the linoleum - I used the same tools and I carved into the surface of the wood block. The material was resistant to carving across the grain as it would not allow a clean swipe of the gouge across the surface. As in the linoleum molds I drew a grid on the surface to inform where to carve. The carved sections are irregular as I penetrated the layers of grain, but otherwise the balsa was receptive to the cutter. However, in trying to make a print from the material I encountered problems as the print would not release from the mold in one piece after it had cured. I presume that this was because of the absorbing capacity of the balsa, perhaps if the mold were covered in some sort of release agent it would produce better results. This method did not, however, provide a better print than the linoleum using the same method.
Figure IV.49. Detail from Balsa mold

Figure IV.50. Detail of print from Balsa mold
Inspired by seasonal temperatures the next molds were created using a skein of yarn, needles and my hands. In keeping with the -- of the previous molds a pattern was created using a combination of knits and purls to create the braille word ‘touch’ in the mold. The pattern used is as follows:

Cast on stitches in multiples of 14 using long tail method.
row 1: purl all sts
row 2: *k1,p1,k1,p2,k2,p1,k2,p1,k1,p1,k1* repeat desired number of times for width of piece
row 3: purl all sts.
row 4: *p2,k7,p1,k2,p2* repeat same number of times as row 1.
row 5: purl all sts.
row 6: *k6,p2,k2,p1,k2,p1* repeat same number of times as row 1.
row 7 on - repeat rows 1-6 until desired length is achieved, bind off.

The same method was used to create all three molds in this knit series with slight variations due to yarn used and proportionate needle size. The potential of this variety of mold was extremely intriguing to me as the end result would be pliable which has proven to be a beneficial quality in previous prints. Also, I admired the fact that these were purely made by my hand and the shape ultimately mirrored abilities, or lack there of. These molds were ultimately the most inviting to the touch because of their referential qualities to life. Knits, especially bulky ones, are introduced in the fall and winter months and create warmth for the wearer and these ‘cozy’ feelings are experienced when a viewer feels or touches these molds.
Bulky weight

The first mold was created using yarn at my immediate disposal which was an acrylic and wool blend in a bulky size. As the yarn size is large, it required large diameter knitting needles, and it knit up quickly. I then had a soft, malleable mold. The loft in the yarn created a fluffy, fuzzy mold which resembled cotton candy. In order to make this mold “printable” it needed to be stiffened to accept the pressures placed upon it during the printing process without flattening and giving way underneath. I chose to stiffen this first mold using a homemade recipe of glue and water: two parts glue to one part water. The solution was poured onto the knit piece pressed into all the crevices to ensure saturation and was left to dry. After 48 hours the piece was fully hardened and ready to print.

The mold produced a very successful print imparting much of its texture and pattern. As I suspected, the release was easy as the moisture in the print softened the stiffener and the mold was fully pliable. The intentional texture was less obvious but created areas of shadow which play across the print.

Figure IV.51. Image of bulky knit mold (above) and print (below)
Figure IV.52. Detail image of bulky weight knit mold

Figure IV.53. Detail image of print made from bulky weight knit mold
Acrylic

For the second mold in this series I decided to use a different yarn, one with less loft, a purely acrylic skein was chosen as it seemed more dense and able to resist the forces of pressure before adding stiffener. This mold was created using the same pattern as before on smaller needles repeated more times across the width as the yarn has a smaller diameter. Upon completion of this knit piece had a heavier feel and weight and seemed to have a greater density. For the sake of experimentation, I chose to stiffen this mold using a commercial stiffening product called Stiffy. It was poured on in a similar manner to the glue + water concoction, however, unlike the homemade recipe the Stiffy took more than a week to dry fully and never became as stiff as the glue + water. Despite stiffening issues a print was made which was also successful. The texture created was finer than the previous attempt and the shadow play across the surface of the print was less pronounced but still delightful.

Figure IV.54. Image of acrylic knit mold (above) and print (below)
Figure IV.55. Detail image of knit acrylic mold

Figure IV.56. Detail image of print made from knit acrylic mold
Cotton + Paraffin

In mold three I chose to combine this new material, yarn, with one used previously, Paraffin wax, to create a hardened mold for printing. The yarn chosen for this mold was pure cotton which I presumed would be most absorptive of the melted wax and therefore most easily hardened. As this yarn was the smallest diameter I chose to knit two skeins together to create a greater density, also the overall shape was smaller as it was sized to the Paraffin molds already created. Upon completion of the knit piece I melted the wax in the same method as before, using a double boiler, the knit piece laid in a pan and the hot wax was slowly poured over the surface, allowing some pooling to occur under the knit piece to increase the overall strength. The cotton drank up the Paraffin without distorting the shape of the fibers and created the most perfectly hardened knit mold yet. The print process was similar to the previous attempts with the paraffin molds. Despite the wax, fibers from the cotton yarn were captured by the print and separation of the two was more difficult than the previous attempts. The texture of this print was the most pronounced while at the same time being the most delicate.
Figure IV.58. Detail image of Knit cotton + Paraffin mold

Figure IV.59. Detail image of print from Knit cotton + Paraffin mold
V. Exploring the Print

Haptic evaluation and potential in a built environment

The prints in the previous section provide the details and final product of their making but now I wish to explore their potential use in creating a dialogue within a built context. As discussed earlier these prints exist in relation to the human form and should therefore be used where the body may come into contact with them physically as well as visually and aurally. As discussed earlier these prints may be considered to integrate or form the ‘Planes of Experience’ and their intention is to engage users and inform materiality and process.

When creating the molds I unconsciously developed them at a scale which was desirable to myself: my eyes, my hands, and my body; perhaps, because I began the process by making molds by layering multiple layers of materials. My fingertips examined the pleasantness or aversion created by each of the materials upon adding them to the other elements to form the mold. The vinyl entranced my eye as I hoped it would create a smooth contoured surface which would be reflected in the print. Tacks were shiny and smooth with a subtle contour of surface. Linoleum was smooth and easy to manipulate with the proper tools. Paraffin allowed manipulation in multiple states and was warm and receptive to my fingers. I reasoned that if the materials used to create the mold were delightful to my fingertips then the resulting print would also be encouraging and receptive to touch.

If I am the creator of the mold, and the print is the resulting opposite of the mold, do the users upon touching the surface of the final print become the ‘mold’ or, once the print and the mold become separate entities and the print is introduced to an environment outside itself does it then become the mold which inevitably (im•print)s the users who come into contact with it? In either view I feel like I am creating a direct connection from myself to the eventual user and inhabiter of these surfaces.

The intent of these prints was always to create a three dimensional product which they are in reality, but within this format, such qualities are difficult to convey in only two dimensions. However, I feel like detail views of the prints are able to convey a certain allure that would be felt in
Figure V.1. Detail of print from canvas with dowels
person. When images are taken close-up but at an angle depth is created from foreground to background and the eyes may survey the image and inform the fingertips of perceived tactile qualities. I also enlarged the images to the constraints of this document so that the eye may gather as much viable information about the print as possible in this format. As before the prints are arranged chronologically because in the process of making each mold and print informs the next.

The first print in this discussion is from the canvas with dowels mold. This print is from the original braille mold and it is visually pleasing but not necessarily the most tactiley delightful (see image on previous page). The surface as imparted by the canvas mold is not particularly smooth, and the areas which surround the voids -created by the dowels- appear as if they are erupting onto the surface. Although the dark areas created by the voids tell a visual story, the surface does not call to the fingers. Since this mold was made of a quote translated into braille it should attract the sense of touch but it fails in imparting the story once physical contact is made. Perhaps this method could be viable if placed outside the tactile sense and visual understanding was the only desired outcome.

The second print in this discussion is from the Phillips screws over vinyl mold (see image on following page). This print is one of the more rhythmic in the series but, as in the previous print, it does not convey the same emotive quality that exists in others. Perhaps because the indented areas are manufactured pieces which I did not alter in any way. This lends a mechanical quality rather than being handmade. It does, however, capture light well as shadow plays within the domed recesses and catches the phillips +’s. The recesses are smaller than the fingertips of an adult and the forms do not allow access to their interior surface so the only accessible area is the surface. This alienation from entrance to the voids discourages interaction. It seems as if the voids have situated themselves to not be touched, this print does not draw the hand in as others do and although the light play is enticing fingers are not invited. This could mean that this surface would be better situated either above or below the body but not parallel to. On a rainy day, it could capture drops of water and produce a glimmering surface with the integration of light.
Figure V.2. Detail of Phillips screws over vinyl
Figure V.3. Detail of Vinyl over tacks print
The print created from the vinyl over tacks is one that is extremely inviting to both the eyes and fingers (as seen on previous page). The surface undulates due to the layering of vinyl over the domes created by the tacks. The +’s resemble slashes and exclaim the deepest dips of the surface, they are patterned landmarks which create a captivating contrast of light and dark. The allure also spurns from the cracked desert plain that the surface of the vinyl creates in the plaster. The surface has an underlying sense of comfort, the soft flow seems as if it is receptive to the fingers, perhaps as if the tips of someone’s fingers created these soft divots and then when the viewer has a physical interface with the print perhaps they are also have a connection to the maker and materials used. Light also dances across the surface only creating an exclaimed contrast where the bursts occur. This surface allows the fingers to caress the surface reading the smooth with the abrupt and it combines these two sensations to great effect. Although the bursts might be a bit fragile to exist under the body, it is well to be parallel to the human form where it may garner the attention of the sight.

In order to explore the use of these prints in a built context I began a series of conceptual perspectives to begin to visualize these surfaces in space. I started with images of the finished prints and used the existing geometric perspective points to draw planes to create a perceived space. As spoken of in the ‘Planes of Experience’ section of this document I arranged the images in each construct as relative to the human body: above, parallel to, or beneath. The resulting image of the print with a drawn imagined space sparks an understanding of the capacity of this method and also where this study should move next. I utilized this surface in a conceptual perspective imagining a loosely constructed environment in relation to the print which can be seen on the following page. These sketches allowed me to think about these prints in a different manner than they presented themselves during the process of making. Their success rests in the ability to expand my view of their usage and potential of expression to the viewer. Of the two perspectives which utilize this particular surface, I feel like first (Figure V.4) is better suited to real life application in conveying a visual and haptic language.
Figure V.4. Conceptual Perspective of Vinyl over tacks print as ‘wall’
Figure V.5. Conceptual Perspective of Vinyl over tacks print as ‘ground’
The print seen on the previous page was created by combining two previous methods into one new mold creating both raised and depressed areas on one surface which allowed me to see the two in direct opposition to one another. This succeeded in perhaps being the most visually stimulating as it has more surface manipulation in addition to directionality of manipulation than any of the previous prints. The surface undulates but also bulges erratically, it reads as smooth with surface eruptions. This print walks the line between inviting and a bit jarring but this juxtaposition on the surface encourages tactile exploration to understand its contrast within itself. I feel the viewer may be conflicted when approaching the print but the two levels of manipulation ultimately compliment one another. It reads as if the indented areas produced the eruptions when pressure was applied. This print feels as if it could be interactive, as if despite being formed and hardened the surface would be receptive and reactive to the user’s touch. Light is also clearly attracted to this surface as it resides within the indents and beneath the eruptions. The contrast of the surface is exclaimed by the light play over it. This print is rich in sensorial experience because of the push and pull, light and dark, seen and unseen of this print. I utilized the image of this print in another ‘conceptual perspective’ creating a wall form with the print. This surface is clearly not suited to exist beneath the body and yearns to be relative to the vision.
Figure V.7. Conceptual Perspective of Vinyl over tacks and voids print as ‘wall’
Figure V.8. Detail of print from Linoleum mold one
Prints from linoleum molds are the next topic for discussion. The print featured on the previous page is a detailed photo of the print from the first linoleum mold. In my opinion, this print emotes a slightly frantic feeling. The texture resembles areas which have been gouged out, forcefully. When I look at this an photograph, an image forms in my head of fingernails peeling away surface, as if someone were trying to claw their way through. These lumps rise from the flat matte surface, gradually increasing to a bulbous height and just as quickly dissipate back into the blank matte surface. These ‘lumps’ exist as isolated incidents across the plane, rather than covering the surface and becoming integrated with one another. Perhaps this is due to the constraints I set up prior to the formation of the mold, as I wished to contain the affected areas within a drawn grid, which, incidentally, transferred onto the resulting print. They drag in a up and down, I imagine this print would create an unappealing nails-on-chalkboard type of sound, perhaps initially visually intriguing by their energetic bursts, but spurned upon closer physical contact.

The second print created from a linoleum mold is pictured on the following page. Just as before the areas which beg to be caressed rise from the blank background surface, however, this print lies in stark contrast to the previous linoleum print. Although the same implements were used to create the texture, this one has a calm, ordered effect across the surface. Rather than a gouging feeling, these emote a landform feeling created by elongated hurdles which exist so close together they seem unified in their consumption of area and tend to read as one entity rather than separate instances as before. As it is more ordered than the last, it feels calm and emotes this sense of calm to the user. Light embraces the vertical movement and imbues a hatched pattern across the print.

Again, the masses travel in a vertical motion which asks the viewer to first run their hand vertically in relation to the movement of the print and then to investigate the bumpy horizontal experience across the surface. This print was created in a figure/ground sort of manner where the textured emphasis is placed on the ground. When comparing the two, the second is more effective in utilizing light to entrance the eye and request the caress of fingers.

On the page following the detail image resides a ‘conceptual perspective’ utilizing the print from linoleum mold one as a potential wall plane, it becomes particularly frightening once expanded to such great size. At this scale, these bulbous surface interruptions could be cocoons just waiting to hatch. Admittedly, this is not the most successful/effective print created to be used in a built space.
Figure V.9. Detail of print from Linoleum mold two
Figure V.10. Conceptual Perspective of Linoleum print I as 'wall'
Figure V.11. Detail of Paraffin mold print one
The next pair of prints come from the wax molds. The first to be discussed is the print from Paraffin mold one and can be seen on the previous page. This mold was the most direct representation of my involvement in the creation of making the molds and prints. The raised areas seen in the photo were created by my forefinger depressed into warm paraffin, just before it cured. The wax accepted my fingerprints accurately and the print which formed from that mold re-creates that action as if I am on the other side trying to push through to the viewer-fingertip to fingertip. The surface creates a unified area gathering only at specific points, where I, on the other side, am trying to reach out and communicate. The light announces the raised areas subtly as the print rises where the impact of the initial touch resides and then gradually fades as the finger is drawn downward and again joins the flat surface residing beneath. This one feels most personal, perhaps because I know that my fingers are being represented on the surface and therefore the connection between myself and the viewer is purest.

The second print was created in a manner similar to the previous but instead of purely pressing my finger into the mold material, I dragged it (see following page). It almost appears as if it is a simplification of the second linoleum print with vertical movements across the surface. In contrast to the linoleum print the forms are less precise and they undulate over the surface. Perhaps because these forms are simplified they are not as visually stimulating as the last print, the light play also becomes more subtle. I relate the resulting print to that of piano keys: each looks as if they could be depressed and produce a note, they are situated so that the fingers could easily access each and one pair of hands could play a lovely tune, even if the only sound produced lives in the viewers head. I think it would be a light melody, not sullen or sad. This print does not carry the strong physical connection to the maker that the previous did although the same implements- fingers - were used and perhaps because of this it is less emotive but still provides a positive tactile experience that is delightful to the fingertips.

The image following (V.13) utilized the print from Paraffin mold one as a ceiling plane, in this instance I can also imagine the image rotated 180 degrees as a floor plane and the raised areas of the print become seating. As discussed earlier the proportion presented in this image is skewed as I feel this print is most successful at its true scale so that it is relative to the fingertips.
Figure V.12. Detail of Paraffin print two
Figure V.13. Conceptual Perspective of Paraffin print as an overhead plane.
Figure V.14. Conceptual Perspective of Vinyl over void print as 'floor'
The previous page features a conceptual perspective utilizing the print created from the vinyl over voids mold. I did not deem this print to be particularly successful, a result I deem the mold responsible. As it was part of my drawn investigation I felt it was necessary to inform the process. The following pages contain images which are meant to evoke a sense of personal communication with surface. As the detail images seem pertinent to the previous discussion, a layer of human interaction may inform the reader of potential before these prints are applied to a constructed three-dimensional form. After completion of these two-dimensional studies, my next step in this process is to create sectional models of sorts, where the mold and print are scaled to the user who would inhabit this space and the print and built construct become a unified experience.

I am still searching for the best manner in which to present these images of the made prints so that they may be haptically understood via the sight.
Figure V.16. Image which utilizes the vinyl over tacks and voids as an overhead plane
Figure V.17. Image depicting human interaction with the print produced from the Phillips screws over vinyl
Figure V.18. Image of man gazing upon a wall created from prints made from linoleum mold one
Figure V.19. Image of woman traversing a floor surface created by prints from Paraffin mold two
Figure V.20. Image relating the body during different states of development and their relation to the surface of the print made from Paraffin mold one
Figure V.21. Images of prints taken at different times of day to examine the shadow and light play across the surfaces.
After pursuing unfettered experimentation I began yearning for a more directed approach in my creation of surface. Rather than contrive a set of rules or imagine a location, I sought given conditions with defined restrictions. Therefore, I chose to pursue a design competition. The one selected was created by the Atlantic City Boardwalk Holocaust Memorial corporation (ACBHM). The competition provided a site along the Atlantic City Boardwalk adjacent to the Atlantic Ocean, on a pre-existing platform measuring 40’ by 60’. Participants were asked to stay within the existing platform and build no higher than 60 feet above the planked surface without blocking views from the Boardwalk businesses towards the Ocean. Activities to be considered were reflection, conversation, contemplation, discussion, and education.
Site

The Atlantic City Boardwalk is a vibrant heavily travelled destination. Although I wouldn’t consider this area to be ripe for reverence, this site will clearly access millions of people each year. While on the boardwalk, the Atlantic Ocean is not visible as it is blocked by sand dunes covered in sea grasses, but one can smell the salt and hear the ebb of waves. Lining the Boardwalk are Casinos, hotels, shops and restaurants providing countless hours of entertainment.

History

To begin this project I gathered some Holocaust imagery which mostly featured Concentration Camps. These images are haunting, bleak, composites of textures. They provide a tactile memory of the atrocities which occurred. Also, extremely prevalent in these images are the electrified barbed wire fences. These images remained with me while designing this Memorial and provided a stark reminder of the awful events which took place not so long ago.
Figure VI.4. Image from a concentration camp in Auschwitz, Poland.
**Kriah**

Kriah, a Hebrew word meaning “tearing,” is an ancient tradition which refers to the act of tearing one’s clothes or cutting a black ribbon worn on one’s clothes. This rending is a striking expression of grief and anger at the loss of a loved one.

The child, parent, spouse, and sibling of the deceased perform the act of Kriah. The act is always performed standing because it shows strength at a time of grief. A cut is made on the left side of the clothing for parents—over the heart—and on the right side for all other relatives. As the tear or cut is made, the family recites the following blessing:

Barukh atah Adonai Eloheinu melekh ha’olam dayan ha’emet.

Blessed are You, Adonai Our God, Ruler of the Universe, the True Judge.

This rending is a striking expression of grief and anger at the loss of a loved one.¹

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Ancient Inspiration

Since my focus thus far has been on surface my vision of this memorial was extraordinarily textural and haptic, perhaps even interactive. As I began contemplating how to create a surface which held memory I recalled an article I read some years ago entitled Untangling the Mystery of the Inca by Gareth Cook. It was about the ancient Andean empire which built great cities and was extremely sophisticated but left no written records. This fact baffled scientists for ages until in 1923, an anthropologist named Leland Locke provided an answer: The khipu, bundles of knotted strings worn around the neck, were files.\(^1\) Locke presumed that each knot represented a different number, arranged in a decimal system, and each bundle likely held census data or summarized the contents of storehouses. Roughly a third of the existing khipu don’t follow the rules Locke identified, but he speculated that these “anomalous” khipu served some ceremonial or other function. The mystery was considered more or less solved. Then, in the early 1990s, Gary Urton, one of the world’s leading Inca scholars, spotted several details that convinced him the khipu contained much more than mere tallies. He theorized that the khipu contained names of people or places as well as numbers.

\(^1\) Gareth Cook, “Untangling the Mystery of the Inca,” WIRED, January 2007, 1.

In a sense, any written text is just a record of physical actions. You put a pen to paper and then choose from a prescribed set of options how to move and when to lift up. Each decision is preserved in ink. The same can be done with string. The writer makes a series of decisions, recorded as a knot that can then be read by anyone who knows the rules.\(^2\) This notion fascinated me and I was utterly inspired by these strings of knots.

Khipu 101

The Numbers in the Knots
Researchers have known since 1923 that some khipu can be read as accounting ledgers. A figure-eight knot translates to numeral 1; long knots with two to nine turns represent those numerals; single knots represent tens, hundreds, or thousands. When a khipu is placed flat on the ground, the ones place is at the bottom.

The Newly Discovered Details
Gary Urton has noted additional details in the construction of the khipu—a series of either-or choices—that might encode higher-level information, like place names or dates. Here are four examples of those binary decisions.

<table>
<thead>
<tr>
<th>Attachment to the Primary Cord</th>
<th>Knot Direction</th>
<th>Twist Direction</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="attachment.png" alt="Attachment to the Primary Cord" /></td>
<td><img src="knotdirection.png" alt="Knot Direction" /></td>
<td><img src="twistdirection.png" alt="Twist Direction" /></td>
<td><img src="color.png" alt="Color" /></td>
</tr>
</tbody>
</table>

Figure VI.7. Image of Khipu. Source: WIRED, © Craig Cutler, 2007.

Figure VI.8. Image of Khipu. Source: WIRED, © Craig Cutler, 2007.

Figure VI.9. (left) Diagram of Khipu knots. Source: WIRED, © Craig Cutler, 2007.
Assemblage

However unrelated the Incas and the Holocaust may seem, I feel like the idea of knots as holders of memory could be especially powerful. Knots are visually intriguing, haptically inviting and conceptually rich. My design then began with an assemblage of sorts. Using yarn I tied strings of knots and then wove them through hardware cloth. I liked the juxtaposition of the soft and hard, restrained and organic, and the gridded shine against the muted wool. These knots also provided a referential quality to the barbed wire fences which still serve as a grim memory.

Once the weaving of the yarn was complete I started snipping away portions of the grid and severing strings to create a tear in the piece. The knotted strings represent a continuum, a timeline of sorts which links one knot to the next and represents that all events and people are linked.

As my initial design impulse this was meant to combine the aforementioned ideas and then became the design catalyst providing inspiration for textures, surfaces, molds, prints and ultimately the formation of the memorial on the site.

Figure VI.10. Multiple views of assemblage
Figure VI.11. Image of assemblage used as design catalyst
Process

The design as generated by the assemblage then became about the ‘walls’ which contain the memorial area. The images below are of small parti models used to generate a form for the walls and to see how light affects the form and shape of the memorial and then also the people who visit the site. With these walls I was looking to create a series of spaces where I choreograph the users movement through the spaces and thereby affect the experience of the users. I wanted to draw viewers by having the walls point toward one another in a V shaped fashion and then compress the viewers as they pass from the boardwalk space into the memorial space. This motion was meant to exaggerate the experience of threshold. The remainder of the platform space was then separated into two spaces: a small sunrise area and a larger sunset area. I reasoned that the sunrise experience would be more individual as fewer visitors would be inhabiting the site at that time of day, I would expect larger crowds at the sunset hour and also this allowed for a gradual progression of spaces- a tight compressed space into a small intimate space and then to a wider gathering space before opening back onto the large boardwalk area. 

The following page contains the scheme chosen to pursue the design process.

Figure VI.12. Series of Sketch models used to determine formation of memorial on site
Figure VI.13. (above) Aerial view of process model

Figure VI.14. (right) Perspective views of process model
After deciding upon the position of the walls I began manipulating the floor to enhance the sense of the differing spaces. The idea began with the upward slope to create a sense of ascension into the memorial. From there I wanted the required seating to become integrated with the flooring and began manipulating around this notion. After multiple iterations I found that the most pleasing scheme ascended in the entry, descended in the small sunrise space and then moved upward toward the main platform with a depressed area placed directly next to the main wall which created a seating area facing the wall allowing for reflection and then ending with a slow sloping ramp back onto the boardwalk allowing viewers to reflect on their experience.
Yarn + hardware cloth

After designing a general scheme I returned to the (imprint). I began by revisiting the materials I used in the assemblage. I again created strings of knots using three different types of yarn to see which created the best impression. The knotted strings were then dipped into the glue + water mixture used in previous molds and then woven through the hardware cloth and left to cure. I acknowledged that there were large voids between the strings and the wire so I attached a piece of cotton muslin to the back of the piece to keep the print material from becoming caught in the crevices. The resulting print was quite successful imparting both the grid of the hardware cloth as well as recesses where knots exist. However, the string portion connecting each knot was not visible which was not desirable.
Figure VI.17. Detail image of knotted yard + hardware cloth mold
Figure VI.18. Detail image of print made from knotted yarn + hardware cloth mold
**Jute + hardware cloth**

The next mold was created in the same manner as before but using new ingredients. As the final product of the knotted wall was intended to be a natural fiber I chose jute as the yarn portion of this mold. The jute was treated the same way as before, where strings are knotted, hardened and then woven through a piece of hardware cloth. The result of this new natural material was less defined than the yarn and was also larger in diameter than the yarn used previously. This fact made the weaving through the hardware cloth more difficult but the resulting print was rather successful. As before, the strings which connect the knots are not visible but the grid and deep depressions of the knots create a delightful play of light across the surface.

Figure VI.19. Image of knotted jute woven through hardware cloth mold (above) and print (below)
Figure VI.20. Detail image of jute + hardware cloth mold

Figure VI.21. Detail image of print made from jute + hardware cloth mold
Yarn + Paraffin wax

This design was created to try and accentuate the string portion which attached each knot to the other. The hardware cloth was not included in this mold. Instead, each string was individually hardened by dipping it into the melted Paraffin. Once all had been dipped the remaining Paraffin was poured into a tray and allowed to cool slightly before placing the hardened strings atop. I tried to be careful about the placement depressing the strings only halfway to enable a successful print.

When printing from this mold, I found that the strings were not placed halfway nor were they particularly attached to the paraffin base. Once the mold and print were separated the knotted strings were attached to the print rather than the mold. Despite this perceived set-back I was able to pull each string from the print which left both the knot and connecting string in the print. The print was successful but without the grid from the hardware cloth something seemed to be visually missing.
Figure VI.23. Detail image of Paraffin mold which held strings of cotton knots

Figure VI.24. Detail image of print made from Paraffin + cotton yarn knotted strings
Jute + Paraffin wax

Using the same method as before I substituted the yarn with Jute and Macrame cord. I used the Jute because it is a natural fiber and is desirable as the final mold, however, the Macrame cord is solid and consistent in its diameter which produces a knot where each round is visible - not a feature produced by the unwound natural fiber. Rather than place the strings into a Paraffin base I chose to pour the melted wax over the strings in the pan. This procedure created a more successful mold but resulted in a less successful print. Once cured, the print refused to release from the mold and broke into multiple pieces. Additionally, the print pieces which did release were rather vague.

Figure VI.25. Image of knotted Jute + Macrame cord in paraffin wax mold (above) and print (below)
Another mold was created in the same manner using larger strings of natural fibers. Again laid in a tray with Paraffin poured over the top. As before, the print refused to release from the mold and rather than break the print I chose to destroy the mold to reveal the (im•print) beneath. The wax was willing to be broken and the knotted Jute pulled away easily. Again the print seemed to be vague so rather than destroy the mold completely I chose to reveal a portion of the print and allow portions of the wax and strings to remain to show the process in one piece.
Design - Finalizing a Scheme

The model seen to the right was created at the midterm portion of the project and conveys the design at that point. The white shown represents the ‘print’ portion which would be (im•print)ed with the knotted strings. After critiques with my chair and committee members this scheme did not best resolve the design of the memorial. However, upon re-evaluation of the assemblage it was suggested that the site employ both the mold and print in the design. The memorial walls then shifted from being a solid ‘print’ to being a more permeable ‘mold.’ The knotted mold was clearly more tactile than the resulting print and it had the capacity to morph into something more unique over time. The new direction of the design continued to incorporate the general form of the current scheme in a slightly different manner.

In addition to changing the wall type, the scheme was flipped horizontally on the site because it was better suited to the movement of light across the site. Also, the second smaller wall was eliminated to create one bold wall which defined the space. The platform was manipulated in the same manner allowing an ascension into the space via a ramp upward and a chevron shaped depression adjacent to the wall on the interior portion of the space. The final scheme is seen on the pages following the detail shots of this model.
Figure VI.28. Image of modelled memorial as seen from sand dunes

Figure VI.29. Image of modelled memorial as viewed from the boardwalk

Figure VI.30. Detail image of entrance condition in the model
Materiality + Formation

A natural fiber rope was chosen as the knotted material because of its weathering abilities and potential relation to ‘nautical’ elements. Also, this material will ultimately change color and erode over time and I felt time is an important element in this memorial. While I feel that memorials should be participatory in nature I also felt that the erection of this memorial could also become a group effort, lending the piece and process greater meaning. Perhaps when the walls are being formed, survivors or family members of those who were lost could tie a knot and impart their personal memories into the construction. As knots clearly speak of the hands which tied them, this memorial should speak of those hands involved in its creation and encourage hands to continue interaction with it.
Figure VI.33. Image of model made of knotted jute strings woven through hardware cloth.
Participatory Monument

In my research of memorials, there emerged two distinct types: overt sculptural like an emaciated body and repetitive as in lists of those lost. Each is powerful in its own right, however I feel like the overt memorials don’t actually convey the sorrow of loss because they can be jarring. Also, the repetitive memorials leave space for participation by the living. Whether it be in fingerprints left on etched glass or flowers left by a soldier’s name, these memorials allow the living to connect with something physical and embrace the memory of their lost loves.

Whether by design or occurrence, memorials which allow visitors to interact allow a cathartic connection.

The imagery on this page and the next shows how participation may take form. To the right are images of the Western Wall in Jerusalem. This site is venerated as the sole remnant of the Holy Temple. It has become a place of pilgrimage for Jews, as it is the closest permitted accessible site to the holiest spot in Judaism. While praying at the wall some visitors leave notes in the cracks of the walls. “The notes are a way to pray if you don’t know how. After all, if you want to receive, you have to ask,” said Rabinowitz from his office in the Old City of Jerusalem.¹ This participation

enhances the experience of prayer and connection to a higher power.

This practice of leaving notes is also seen in Japan. Most Shinto shrines in Japan sell fortunes called “OMIKUJI.” If you draw a good fortune, keep it, take it home with you. However, if the fortune is bad, leave it at the shrine, don’t take it home. These bad fortunes are tied to a bamboo rack on the site, the concept is: leave the bad luck at the shrine, were the divine spirit can exorcise it.\(^2\)

These precedents inspired me to create a memorial where the visitors may leave their mark, their memories, their prayers. The memorial will change over time with these additions and create a unique experience for each person who visits the site.

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Shadow play

In an attempt to understand how the knotted rope wall could manifest itself at full scale I created a section out of 3/8 inch Manila rope woven through hardware cloth which has a 1 inch grid. This grid size was required because once the knots were formed their diameter tripled but were able to be twisted through the open holes to weave the two components together. As permeability was valued in the competition brief, this manifestation created a richly haptic surface which created an even more intriguing shadow play.
Figure VI.39. Image of shadows projected from mid-scale model of wall.
Figure VI.40. Image of shadows projected from mid-scale model of wall
Competition Submission

The first stage of the ACBHM competition was purely digital and requested rendered perspective views of the memorial. Each image was created to accentuate different times of the day to acknowledge the changing conditions of light interacting with the memorial. The following pages contain the images created for this purpose.

The first image depicts the interior portion of the memorial in afternoon light. At this time of the day the sunlight projects through the wall and (im•print)s the visitors with the shadow cast onto them. The floor section directly adjacent to the wall is the ‘print’ portion of the scheme created from poured cement printed with a portion of the wall. The printed area is also depressed into the ‘deck’ on the interior which creates a more private space for connection with the wall. The depression creates a plane change which then becomes a seat upon which visitors may rest and reflect. At the apex, where the tear occurs the floor level is the lowest creating the greatest drama between self and memorial. Habitation between the wall ‘mold’ and floor ‘print’ is pivotal to one’s understand of their place in the world and their relation to the tragic events which occurred.

The second image is an interior view of the memorial at sunset. It shows the whole wall and the tear at the fold in addition to the ramp which leads back to the boardwalk. The site of the memorial provides an optimal area to view the sunset and the metaphor of the day coming to a close in relation to a memorial remembering those lost seemed quite powerful.

The third image is the memorial as viewed from the boardwalk. It showcases the permeability of the memorial and how it allows site views through towards the Atlantic Ocean. This permeability also allows human interaction between the wall, across the boardwalk to the interior mourning space. This permeable wall allows for the greatest amount of human interaction with the wall and through the wall with others who are on the site. The tear is quite visible from the boardwalk and should act to entice visitors around the wall and into the interior space. Morning light will cast the shadow of the knots onto the boardwalk but once noon approaches the shadows move to the interior of the space heightening the experience within.
Figure VI.41. Rendering of interior experience with knotted wall
Figure VI.42. Rendering of Memorial experience at sunset
At the beginning, this project was purely in search of producing haptically appealing surfaces, relatively without direction. While the unadulterated process of experimental design allowed for multiple delightful iterations I yearned for a greater meaning to be imbued into the process.

As the project progressed, and a context was introduced, the emphasis became less about a physical (imprint) and shifted to an emotional (imprint) on those who interact with my surface. I resisted having a 'site' for the majority of this project, but once I had a direction for the creation of surface, all of the elements became more rich within their relation to one another and with the concept.

At the completion of this document, the Jury was still deliberating on the schemes entered in the competition. Clearly I am hopeful to be chosen to participate in the second stage and ultimately build my scheme, however if this does not come to fruition, I am satisfied with the outcome of this pursuit.

VII. Postlude

At the beginning, this project was purely in search of producing haptically appealing surfaces, relatively without direction. While the unadulterated process of experimental design allowed for multiple delightful iterations I yearned for a greater meaning to be imbued into the process.

As the project progressed, and a context was introduced, the emphasis became less about a physical (imprint) and shifted to an emotional (imprint) on those who interact with my surface. I resisted having a 'site' for the majority of this project, but once I had a direction for the creation of surface, all of the elements became more rich within their relation to one another and with the concept.

At the completion of this document, the Jury was still
Literature Cited


Images Cited


