Thesis

exploration

Winifrid Williams

a study of how the
human body's
interaction with
architecture

can influence design decisions
I want to thank Andrea for her support and design critique. Her critical and constructive insight were both constructive and encouraging throughout the design process. Andrea’s technique and style are both commendable and highly sought after by myself. Thank you so much. And for Rod, I would like to thank him for the dedication to all of his students throughout the whole process. Rod’s enthusiasm and detailed knowledge have been a continual inspiration and highlight in the thesis process.
Throughout history and into today, architecture has patterned itself from the most familiar of forms known, the human body. Maps of the human body can be seen in the architecture of ancient and modern civilizations. Renaissance architecture displays the human body by its construction as one of measurement through its proportioning. Vitruvius, Alberti, and Filarete all touch on different aspects of the body as being a dominant inspiration for built form. In the Enlightenment Era, designers use the simile of body parts (lungs, heart, arms and muscles) to coordinate buildings and city plans. This relationship is also evident in the 20th Century idea of architecture as an organism working "according to rules inherent in its internal construction" (Betsky). This continual study and exploration of the body in architectural history shows its influence on resulting architecture. Because of this, a clearer understanding of the body's influence and impact on architecture can help positively inform architectural design decisions.

The discovery of the impact that the human body has on architecture can manifest into many different avenues. Yet each avenue stem from further study of the somatic body, and its lasting impact on built form. The somatic body, by definition, is the physical make up of our corporeal, organic, and non-spiritual human body. An organic approach in viewing the body can be applied in architecture.
issues

This includes the traditional study of proportion and scale, but also includes the exploration of the physical impact the body may leave behind on architecture; the fingerprints and footprints of human touch. These imprints left behind are most visible on materials that the body comes in contact with, like a hand touching a window. The added sensory experiences a body has with its architectural surroundings, affects the amount of interaction that can take place. Not only seeing the built structure, but touching, smelling, listening to the building as well allows the human body to interact with architecture as opposed to just walking through. Placement of architectural elements also becomes very important in allowing maximum interaction with the building, such as positioning window heights that refer back to a human’s sight line for example. Also, how people interact by finding their way around a site can be revealed by the footprints and different paths created by people wandering. This allows the architecture to respond to how people navigate through a site. All of these considerations reflect how design decisions can be influenced by the impact and interaction the human body has on architecture.
Impact by Markings:

Traditionally elements such as interior walls have allowed and capitalized upon only limited human impact because materials used are unresponsive to human impact. Indeed, walls are traditionally conceived to eliminate the visual signs of human interaction. For example, semi gloss paints are used in high impact areas such as bathrooms, kitchens and kids’ bedrooms when the user desires to hide human interaction. Human interaction does not have to be thought of as a negative. In the Finnish Embassy in Washington, architects Heikkinen & Komonen place large copper surfaces which people touch leaving their fingerprint impressions on their presence. The fingerprints can only be left on the areas that the human body can reach. This creates a space in which the users can experience the presence of those before (and after) them.

The strategic positioning and arrangement of a range of textures and materials in areas in which the human body can have interaction and impact on them are design decisions that result from an understanding of how both the architecture and the body can work together to manipulate a space.
Materials

One way in which an understanding of the body along with the body's interaction with architecture can influence design decisions is through surfaces and materials. For the human body, the skin is where humans can have the most impact on the visible appearance of their bodies.

An understanding on how the human body impacts architectural surfaces influences design decisions regarding materials. There are materials that are more readily manipulated by human interaction; these are materials in which the body can leave fingerprints or 'marks' upon them. There are some materials the body can leave immediate and visible signs of occupation, such as a feather bed, or scratches on a painted surface. Then there are materials that human impact can only be seen though the passage of time, like the marble steps in the Washington's Capital Building where indents are seen where the users over the years have worn down paths along the steps.

markings left by bail state students
Impact by Scale:

Another way in which the body's interaction with architecture can influence design decisions is through scale and proportion. Many architects, seen in such examples as Michelangelo's marble sculpture "David" and more recently Le Corbusier's 'Modular Man' have studied human scale and proportion. For Corbu, design decisions were based heavily on the understanding of how the human body would interact with a particular space. Window heights were established at and around eye sight range, and hand rails were placed strategically where the hand would grasp on stairs and ramps.

The strategic placement of architectural elements is a design decision that results from the understanding of how the dimensional human body interacts with architecture. Location has a great effect on how much interaction a body can have within a space. In buildings today many different functional devices are placed within immediate relation to the human figure, such as a light switch that is located in direct position of the hand lifting up from the side of the body.

Photos of handrails and doorknobs taken around Ball State University
Proportioning

Sight-lines and views are also influenced by the interaction of the human body and architecture. For example, a person can be ‘allowed’ to see only a portion of an outside garden, or the whole back garden depending on the scale of the window, and how it relates proportionality to a persons’ eye level.

Finally, the human body relates subconsciously to the impression of a space to a human scale figure, depicting if a space is either too big or too small. Thus the proportioning of a space is ultimately measured in relation to the human body. If a person walks into a space that is referred to as “too small,” it can also be said that, the person’s body is actually “too big” for the space when using the human body as a scale reference. Whether a space is referenced as too big or too small, there is an underlying physiological effect on the body’s interaction with a space as well.
Impact by Senses:

Consideration of a body's interaction with architecture can also influence design decisions by the way the different senses and body positions are accommodated and addressed. As O'Neill writes in her paper, *Corporeal Experience: A Haptic way of knowing*, that architects today should be "taking into account a range of perceptual sensibilities as informants for design such as: sound, olfactory qualities, and movement of the body in space."

Another level of interaction with architecture can take place if the architectural design encourages multiple sensorial perceptions (in addition to visual). Touch, smell, and sound can also be capitalized upon in the design. Design decisions with sound can be influenced by the way a person interacts with architecture elements that manipulate a human's voice. For example, a large reflective space will echo a person's voice more than a closed-in, low ceiling place. Allowing for other senses to be used, such as hearing and smelling, a wide range of design opportunities will occur as the interaction of the human body and architecture also increases.
Positioning

Also allowing "movement of the body in space" and seeing how the human body interacts with architecture in the way it moves along paths and assumes different body positions can influence design decisions. From a previous project in an art pavilion, three different body positions were studied, standing, sitting and lying down when viewing art. Studying how the body interacts with the architecture differently in each body position allows for specific design decisions to be made that accommodate each of the positions. Design decisions as to where paths and accesses can be placed also influences the way the human body interacts and finds a natural and explorative routes through its architectural surroundings.
muncie center for the arts

Precedent

Interview with: Beth Turcotte, Executive Director
December 10th, 2001

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Mission:
Their mission is to reach and teach a culturally diverse population the joys and responsibilities of the arts.

Profile:
Center was established in 1999, and is devoted to providing diverse programs to the citizens of Delaware County involving all phases of arts and art education.

Observations:
The staff seemed excited to give the youth of Muncie the opportunity to experience performing arts. There exists a spirit of adaptation, using whatever rooms or hallways in the old Masonic Temple to fit the classroom needs. Meeting specific needs like lighting and sound equipment suffer as a result of using an adapted building.
Site Visit and observations
December, 2001

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Mission: to engage, enlighten and enhance our communities through art education, participation and observation.

Profile:
They are Central Indiana's premier non-for-profit visual art exhibition and education center located 1 block east of College Ave. and 5 blocks north of Broad Ripple Ave. Patrons are mostly adults who pay for each class.

Observations:
The classroom/studios were large with high ceilings. Their blank walls were ready to hold ceramic and wood art pieces along them. The windows on the doors allowed some viewing of the creativity inside, but more was needed especially in the glass blowing section. Classrooms had plenty of natural light (oriented North & South), while the art work was protected within interior hallways, or in separate gallery areas.
ball state's art department

Precedent

Site Visit and observations:
Arts and Journalism building on Ball State’s Campus
Spring, 2002

Contact Information:
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Profile:
There are a wide variety of specialized classrooms for college students. The 3-D studios were located off a main hallway with storage areas in the rear. It is also important to note that the 3-D studios are located specifically on the first floor, with access in the rear with large garage-like doors to aide in the transport and storage of heavy equipment and art materials. Located in-between the studios there are areas for display of student art work as well as offices for professors. The spacious classrooms allow for both equipment and art work to not compete with each other. Here, as well as the Indy center, the classrooms have high ceilings to locate air handling equipment. In some cases, such as the metals studio, overhead tracks are located above to move heavy equipment and pieces of stone/metal.
Fifth year studio project:
Fall Semester, 2001

Profile:
Three activities of the body when viewing art organize the space. I chose standing up, (the most common when thought of viewing art), then sitting down, (which often can be found in art showings), and finally the activity of laying down, (pushing a more nontraditional form of viewing art) with traffic alongside the sidewalk, the most accessible activity or ‘standing’ is located in the more semiprivate areas. The progression then flows naturally to the ‘sitting’ area to the most private activity when viewing are, ‘lying down’. The heights of the walls are influenced by the proportion of the human body. also the scale of these concrete walls are used to enforce the progression of the different activities within the pavilion. This leads to the opportunity for appropriately placed or staged openings along the walls enabled people to sneak views of only portions of people on the other side. Materials are also used to show how the pavilion is to function. For example, wood is strategically placed in the areas in which the body touches the pavilion.

Observations:
The testing of these same issues of scale, material and view were helpful in organizing the art center's positions towards the human body.
Thesis Objectives:

- The art that will be on display will consist mostly of three dimensional art or sculpture. This medium of art is chosen so that people can be able to actively look at the art at many different angles and sides.
- There is to be a wide range of interpretive and unique exhibits, that allow the viewer to actively interact with them. This includes interior and exterior display of art along the canal.
- The art center will also be a work facility for guest artists to work in a state-of-the-art studio. This allows the center's visitors to see 'works in progress'. This gives visitors opportunities to understanding the processes of making art.
- The art center also functions as an office for those who run the facility. These offices will have minimal contact with the visitors, allowing the offices more privacy and closer proximity to other adjacent areas such as storage and workshop areas.
- The spaces between the galleries/studios become important for emphasizing an added sensory experience to the visitor and for the human body to be on display or made visible from the exterior.
- Offices for the appropriate staff will be provided along with the necessary functions of storage, shipment and security of the art pieces. A gift shop and kitchen/lounge space will serve the visitors of the center.
Strategies:

Impact by Markings: Traces Left by the Body on materials
- Material surfaces and textures that invite human touch or impact.
- Careful consideration of the positioning of materials which come in contact with the human body.
- Markings left by the human body are controlled by surface manipulation and strategic placement within or out of reach of human impact.
- Use of conventional materials in unconventional ways.

Impact by scale: proportioning
- Placement of architectural elements, such as windows, handrails and doors along a human scale. Therefore each space within the building convey the human scale as a guiding template.
- Sightlines and Views to be captured through carefully extracted openings referring to human proportioning.

Positions and Senses:
- Allowing the human body the heightened experience of a wide variety of senses (such as touch, sight, auditory, and smell). Withdrawing normal architectural boundaries that stop the sensory experience such as walls and sound proofing allow for added sensory experience.
- Design with an awareness of specific body positions in either the creation or observation of art.

Key Points
Context:

Site: the physical site located downtown Indianapolis near the IPUI campus and along the canal.

The downtown site is appropriate for a modern art center due to the fact that most existing museums or art centers tend to depend on the support of an urban population. Accessibility for buses and large moving trucks is another key factor in the center's location. Parking for school buses used for fieldtrips is an example. Accessibility to the public is another concern for the center. The building must be visible enough to draw onlookers from the street as well as those looking down on the building from large office structures. Drawing people from the canal itself is another important factor that the building on this site begins to address.
Physical & Cultural
Thesis Project:

Preliminary plan drawings, up facing east
This art center was designed as a process in which different human senses, scales and viewing take place, therefore, building is elongated taking up most of the site to incorporate all of these experiences. This allows for an ordered progression of spaces to occur as one experiences through visual, material and scaled interaction the studio/classrooms, and galleries, as well as other human beings. After bridging over from the office and entry area, the patrons enter the studio/gallery portion of the art center dividing the building functionally into two. As this 'process' or circulation pathway evolved from a pure sine curve, more flexibility was found in shaping a curved circulation around the studio and gallery spaces along the canal. The different needs of these spaces dictate the length and proximity to the canal. With this in mind, galleries are closer to the canal, and the studios are located near the alleyway, where access to trucks to drop off material is available.
Materials and their interaction with the human body was a key factor that influenced design decisions within the art center. The focus surrounded the materials of wood, metal, glass and stone, all directly relating to the different studios and galleries in the program.

The material of the flooring was a very important influence on interior design decisions. Special flooring was placed in the circulation pathways and along the balcony areas that reflected the studio area in which it was located. For example, wood flooring was used within the wood studio/gallery zone. Different variations of each material was used displaying a wide range of impact or markings left by the human body. In a previous study of material, specifically on wood, varying levels of interaction such as pounding, scraping and burning were applied to several different species of woods to observe how the wood responded. This study gave insight as to which species of wood would reveal the most impact from the human body on each surface.

The focus remains within the studio and gallery areas when dealing with materiality because the visitors can receive a visual and sensorial experience of each material. The office area is separated from the studios for office convenience and because many of the guest do not use the office area. Guest frequent the entrance lobby and gift shop in the Northern part of the building, where they then enter into a unique material experience as they circulate through the art center.
Materials were also influenced by the human bodies sensory experience of space. Careful consideration went into elements such as handrails along the balconies which were representative of each material in the studio. Patrons experience not only the viewing of the material but the touch, and smell of the material properties as they travel from one studio/material zone to another. Touching the handrails, and smelling the sawdust from the classroom, are examples of how the visitors truly experience material and thus architecture.
Materials

Wood, metal, glass and stone are the materials of focused on the exterior. These four materials are coupled with the dominant alternating façade materials of concrete and glass. Previous models indicate the exploration of using each studio material as the major facade element, but the whole building became disunified. Instead the four materials act as a connecting band along the bottom edge of the concrete and glass structures. These alternating material references give a hint as to what activity is happening in the interior, for example, the copper band on the exterior refers to the metal classroom and galleries that are located directly within. This subtle expression on the exterior also is meant to draw people from the canal walkway up a progressive material pathway to the entrance of the building. The four material accents are also areas in which the human body can interact with the building on the canal side.

As patrons and visitors experience the building from the exterior, they are drawn first to the accent of materials along the lower portions of the façade. With the alternating materials
located only where the human body can touch and see the material first hand, the human body is able to interact with this surface by leaving marks such as handprints through touch. Interaction also begins to occur on the flooring of these areas in which the material elements can be found in the concrete structure. This added experience of standing on a weathered material reflects the impact that human body, along with outdoor forces such as rain and sun have on materials. Because the most frontal facade was facing west, sunshading for the art work within was a major concern. Along the punched opening in the concrete facades, sunshading devices were placed in the form of vertical panels that doubled as the art centers advertisement panels. These panels also act as an interactive piece, engaging people as they walk along the canal as images come into focus.
Scale

Scale was a deciding figure in many different parts of the art center, including the façade and interior logic. The human figure acted as the point of reference in deciding proportions and scales of architecture elements.

On the exterior, proportioning to a human scale was difficult as the facades became more massive in size. The need to force the building upwards to coincide with its urban fabric was accomplished by a gradual increase in the volumes as the patron moved through the building. As a guest would enter into the building, the scale starts off more intimate, then increases continually as they move into the 2 volume studio and galleries areas. Because this scale can be inhuman in proportion, the ceiling height is brought down in areas such as hallways and in the glass intermediate areas. Because the human body is able to be seen throughout the intermediate glass areas, the body itself brings down the scale on the facade.
The human body also acts a generator for the scale and positioning of architectural elements within the art center. From the actual positioning of art within the galleries to the scale of the handrails and seating along the hallways, the human body acts as a premier guidance in design decisions. The diagram below shows the level of detail in which design decisions can reference the human body. The green area dictates the area in which art is to be viewed in relation to the human body. Also scaled to the human body, elements such as lighting heights and labeling areas become integral to understanding the design rational within this art center.

proportioned
This section is cut between the two areas of the studios (in blue) and the gallery areas (in red). The galleries and studios take up a two-story volume for functional needs. The double space also allows for balconies to occur along the upper levels, giving the opportunity to view people either making art in the studios or observing art in the gallery spaces. This sequence of spaces continue throughout the building occurring with libraries, classrooms or galleries.

Capturing views of the human body was a major generator in the process of designing the art center. Not only does the façade reflect the process of viewing people, but interior decisions were made to interact the human body through the placement of windows and viewing opportunities. Along the circulation pathway in the interior, design decisions such having open balconies allow the human body to be on display as patrons can view into either gallery or studio spaces. As a patron walks along the curved path, they have the ability to experience viewing finished art in the galleries, while also having the ability to view the creators in the studio areas. This combination of viewing the art alternates as the patrons walks along the building, with the balconies looking into either the studio or the gallery areas. This exciting combination is reinforced by controlled views along the explorative pathway. By capturing views of different parts of the body, such as a cut opening that focuses directly on the hands of a person working at a table within a studio, the guest gain a alternate awareness of the human body.

Strategically placed opening along the pathway into the adjacent spaces are also meant to capture various views of the people occupy different areas. For example as a patron looks down into a balcony of a gallery, they can also look into a punched opening capturing a view of a person reading a book or drinking a latte.
The punched openings on the concrete exterior directly correlate to points of interest on the outside, such as sculpture or a gathering spaces. From within the studio/gallery spaces these controlled openings are meant to focus the patron onto an alternate look at different sculpture located outside. (see concept drawing below) With these specified and controlled openings, an exciting exchange of views occur to reinforce the awareness of the interaction the human body has in occupying a space.

**capturing people**
Positioning of views was another important factor that influences design decisions on the exterior of the art center. Along the length of the building, there exists an alternating level of viewing people within the building from a controlled punched opening in the concrete facades to the very visible human body in the glass portions of the facade.

This alternating between solid and opaque surfaces occurs along the building due to the functionality of the spaces within. The solid concrete surfaces with select punched openings occur within the light sensitive gallery areas. These spaces take up a larger volume of space than the intermediate areas zoned as both people and mechanical/storage zones. As seen in the diagram to the left, the people zone is located directly adjacent to the canal. Cafes and small book reading areas for people to gather are located in these spaces. These spaces allow people to look out into the canal and for the human body to be on display within these intermediate areas as one looks into the building.

While views are positioned to occur inwardly in the studio/gallery spaces, the outward focus in the glass facades also occur in a reversal of volumes as the larger spaces of the entryway and giftshop hold a glass facade and the smaller intermediate areas adjacent to them become a solid purely functional concrete facade at the northern edge of the building.
The diagram below indicates several factors of positioning elements along a human scale. Located in yellow and orange are zones of interaction. The hands and feet having the most contact with a building, elements such as handrails and shelves for resting elbows, seats and art work are located in these zones. Here a representation of a punched opening along an adjacent space captures portions of a person's body. Another important concept in the diagram is the operations of the glass facade facing the canal. The double pained wall system is constructed to allow excess western heat gain to be extracted through louvered vents. Visibility of the people within is not compromised by the structure elements and heat gain is easily controlled.
The reflection of this thesis project begins with an assessment of the topic itself. The human body in architecture has a long history of exploration among architects and artists alike. In the beginning of the projects issues more in tune with the somatic character of the human body were explored, such as analyzing human bone structure as an architectural metaphor.

Yet, in my efforts to delve into this wide expanse of knowledge and extract principles of interests my focus became, material, proportions/scale and views that dealt with the human body. Even just these three main issues were challenging to grasp while making them unique to my own focus in an art center. Exploration of each topic made it clear that these principles in relation to the human body could be applied to any type of architecture. Choosing the building type and function became only a working construct through which demonstration of the principles could be applied. My early attempts at fusing the human body in relation to material, scale and body positioning in an art pavilion also proves the diversity of this subject matter. But the choice to focus the thesis around an art center melded together quite well with my ideas of the human body. Because the center not only dealt with creating or working
with the hands, giving the chance for various materials to be used, it also was a place of viewing of art, making viewing people a tangible element. One area that proved to be difficult was formulating an overall idea that was not strictly metaphoric of the human body. Many ideas were formulated that could be read as only an “interior application”, as opposed to an overall thrusting force

**art center**

in the design on the building. For instance the use of flooring as an application to a materials study could be classified as strictly an application not a driving force to the construct of the whole building. Though the issues of material, views and scale were generative in ideas in the design process, none are obvious design thrusters of a whole idea. Even though the principles of material, scale and view have their generative downfalls, the ability to link the three ideas together was surprisingly easy. For example, to simply look at the positioning of a window based solely on views would not work, the evaluation of scale and material of that window had to be considered as well. It was evident as the construct of the building began to fuse together in design, the diversity of each issue.
The profound impact that the human body has on architecture was exposed as a result of this thesis exploration. The discovery of just how fine-tuned and detailed a building can become based on the very user of all structure, the human body, is intense. Not only can the small detail of a seating surface and placement be considered in relation to the human body, but an overall driving force behind a building can be identified as well. But more importantly, the profound realization that many buildings today are missing these very core issues of scale, material and views in relation to the human body was discovered through this exploration. As architecture moves into an era of high-tech computer renderings and grandiose scaled structures, the very presence of people are not even present in the renderings. Nor is it desired for designers today to show how this building may look after 20 years of people walking on steps and wearing away the paint on the floor. Instead we build with impenetrable surfaces with lifelong guarantees, when it is the scrapes, scuffles and markings left behind by users that are part of the very character of architecture. We visit old European structures to see how the people actually used the building, we look for the indents left behind on the marble staircases, and we cherish the marking on the stone walls that indicate traces of our ancestors.

Reflection

By pulling away from the human character of a building, by not considering the size, shape and impact that the human body has on a building, and by making cold, sterile (yet pristine) environments for people, don’t we loose something as architects and users? My conclusion finds that the very people in which we design for must be considered on various levels, principles such as material, scale and views are at the very least of what designers should consider in design. It is the realization and recognition of the importance the human body has on architecture that must be evaluated always.
sketches of human model

art center

looking north at sculpture

looking at stairs
References


abstract

This thesis is an in-depth look at how the human body interacts and impacts an architectural surrounding through different means such as materials, scale, proportion, views, and body positions. The use of materials in making design decisions is heavily influenced by the results of human interaction on their surfaces. The ability to control and position materials to reveal and celebrate these interactions stems from understanding the influence people have on materials. This thesis also takes a look at how proportion and scale of the human body have an important role in design decisions such as placement and positions of architectural elements. Another level of interaction with architecture takes place when architectural design encourages multiple sensorial perceptions as well as careful consideration to how people navigate through a site. These considerations reflect how design decisions are influenced by the impact and interaction between architecture and the human body.