"...The interplay between the world of our bodies and the world of our dwelling places is always in flux. We make places that are an expression of our haptic experiences even as these experiences are generated by the places we have already created. Whether we are conscious or innocent of this process, our bodies and our movement are in constant dialogue with our buildings."  -Charles W. Moore

Humans have the ability to move. We move to perform work. We move to play. We move to express ourselves. We move in our sleep. We even moved before we were born. There is a purpose for all these movements, whether it is a conscious one or not, and in that purpose one can find the character of the movement. There are precision movements, such as writing, drawing, and painting, which require amazing coordination between different senses - continual input and adjustment. There are repetitive movements, such as walking and running, which combine coordination and power. There are also explosive movements, such as jumping, tumbling, or a golf swing, where power dominates and after an intense burst of it, the body or projectile is at the mercy of the laws of physics.
INTRODUCTION

Architecture of movement

Architecture can be informed by considerations of the character of human movement in concept, form, material, etc. This thesis will produce a process for analyzing human movement. That analysis will illustrate the elements of the movement which provide its character, and will then serve as a metaphor for the nature of the space it inspired.

Thesis project

The project chosen to test this thesis will be an art museum, the Abstract Art Experience, a remote expansion to the Fort Wayne Museum of Art, in downtown Fort Wayne, Indiana. This expansion will house works of abstract art, adding a new dimension to the museum experience and freeing space in the existing FWMA. As abstract artists attempt to express feelings without necessarily any representation of physical reality, I believe it will function well as a conduit between the reality and physics of human movement and subjective interpretations of the character of that motion.

Tim Terman - 02
Site
The thesis project will be located in downtown Fort Wayne, Indiana, within walking distance of the Fort Wayne Museum of Art. Currently the site is a surface parking lot to the immediate south of Headwaters Park. Headwaters Park is a large and beautiful park added to the downtown within the last fifteen years. The heart of downtown Fort Wayne lies south of the site, providing an attractive skyline. To the east are several restaurants and the river, and to the west is the Allen County Justice building.

Design overview
The movement selected to direct the design process was wandering, a sequence of walking, exploring, and questioning. The spaces of the museum must then be highly interconnected, providing and concealing glimpses of art and people throughout. The design is also regulated by the mechanical requirements of the spaces. A high degree of control over lighting, temperature, humidity, and security are all critical. These factors, and others, came together to create the FWMA Abstract Art Experience.

Tim Terman - 03
BACKGROUND

Issues and positions
This thesis will deal primarily with the issues of character in human movement. Is there a character in movement? I take the position that there is an inherent character in all human movement. Aspects of architectural design can be informed based upon an analysis of that movement. The resulting spaces and forms will then be metaphors for the selected movements, and therefore very closely related to the subjects themselves. This method could be used in the design process for virtually any building type.

Wandering
Many movements were studied through a variety of media. The most interesting movements were found by observing people in the settings of different museums themselves. Movements identified in museum spaces were walking, leaning, pausing, sitting down, gesturing, and wandering. Analysis of the various movements lead to the selection of wandering as the movement to influence the design of the museum. Wandering is a form of enlightened walking.

When a person is wandering, they
Tim Terman - 04
are seeking nothing in particular, usually at random. Wandering is not about a destination, but rather is a series of waypoints along an undefined path. The senses are on high alert as the wanderer quickly switches focus between the distant and the close at hand.

The spaces and forms of the museum must then aid and draw from wandering both functionally and metaphorically. This is not a new concept. Architecture has been responding to the functional and metaphorical aspects of movement since man began building. Innovations in structure and material have helped designers address movement over the centuries. However, movement has only been a side effect of design for most of history. More recently architects like Mies van der Rohe, Eero Saarinen, and Frank Ghery have specifically addressed the functional and metaphorical aspects of movement. This will be discussed in more depth in the research section of the report.
SITE

Physical context

The site for the Abstract Art Experience is very near the existing FWMA. The very large and beautiful Headwaters Park is to the north and the mass of the downtown is to the south. Currently the site is a heavily utilized surface parking lot. A parking structure is recommended to be added to the block immediately east of the new site, but will not be developed in the course of this thesis project. The dominant material of site is concrete, suggesting a megalithic design vocabulary. Flooding is a concern to the Headwaters peninsula, so care must be taken to elevate the design above the danger. The plazas in Headwaters park represent the one hundred year flood level.
The downtown is also filled with cultural experiences including the Fort Wayne Museum of Art, the Lincoln Museum, and the Indiana Historical Museum. The addition of the Abstract Art Experience will help continue and extend this network of learning.

Aside from the festival and the museum experiences, downtown Fort Wayne is a nine to five place. During the day the streets are filled with people conducting business and socializing. After hours, the downtown empties out. A few nightclubs and bars are all that remain open. It should be a function of the museum design to operate extended hours.

In addition to the nine to five livelihood of the downtown, Headwaters Park goes largely unused when no festivals are operating there. The design must work to link the park to the downtown.

Cultural context

Headwaters Park is home to the Three Rivers Festival, an annual event drawing hundreds of thousands to the area. The festival is kicked off with a parade through the downtown ending at the park. Tents are erected on the plazas, games and rides are located in the park, and an endless number of vendors set up shop on the small streets adjacent to the park. For ten days every July the entire city can be found within a block of the site.
PROGRAM INFORMATION

Building criteria

The facility's criteria can be broken down to three essential elements; the requirements of the display spaces, administrative spaces, and the visitor service spaces. Display spaces include interior and exterior permanent and temporary exhibition space. Administrative spaces include offices and areas for curators, security, and warding staff, as well as storage spaces and documentation spaces. Visitor service spaces include the entrance hall, information desk, cloakroom, film screening room, library, gift shop, restaurant, and restrooms. In the display spaces issues of environmental controls and security will be paramount, as well as issues of circulation and display flexibility. In the administrative spaces security will be the chief concern. In the visitor service spaces, circulation will be of primary importance.

Because the Abstract Art Experience is a satellite gallery to the existing Fort Wayne Museum of Art, some staff will be shared between the facilities.
Flexibility, in every meaning of the word, is very important to the museum. Lighting, temperature, and humidity are all chief concerns and must be able to be controlled on a fine scale. In addition, the spaces themselves must be able to be changed quickly either from one exhibition to the next or be able to change function completely. What may have been storage space yesterday may need to be a gallery tomorrow. The museum must also be able to operate extended hours for receptions. Food will be catered in to a kitchen / preparation space. To allow the museum to operate on a smaller staff during the extended hours, individual galleries and exhibits must be able to be sealed off independently of one another, allowing ultimate flexibility of display and economy of personnel.
Design objectives

First, the design of the museum must respond to the functional and metaphorical aspects of wandering. Spaces must leak into one another creating a network of experiences. Views into spaces close by and farther away should be made possible at some vantage points and screened in others aiding the sense of exploration and discovery. Formally, elements of the museum should be fragmentary. Wall and roof planes should slide past and around one another creating opportunities for lighting, niches for display, and capturing selective views of the surrounding context.

On a larger scale, the design must help to link the downtown to Headwaters Park. This should include entrances and exits to the north and the south, allowing visitors to the museum easy access to and from both directions.
Design process and methodologies
The qualities and spatial relationships of the spaces in the museum were most influenced by observing and free writing about the selected movement: wandering. The ideas generated in the writing helped create the overall framework of the museum. These ideas were illustrated in a series of sketches capturing the qualities and character of the spaces of the museum. Finally, the ideas were tested in computer generated models created at varying degrees of complexity. Form, lighting, spatial connections, and spatial sequencing could all be quickly manipulated in this manner.

RESEARCH
Precedent Analysis
Aspects of functional and metaphorical movement have been a part of architecture since man began building. At first, these were merely side effects of design. As time marched on, structural and material innovations have made it possible for architecture to be entirely dedicated to movement.
**Egyptian pyramids**
The Egyptians were very spiritual, which prompted many design decisions with more metaphorical intentions. First, the pyramid itself was intended to be a ladder for the pharaoh’s ascent to the heavens to join the sun god Amon-Ra. Earlier versions of the pyramid, such as the stepped pyramid of Zoser, were more literal examples of this intent. Second, the King’s Chamber location was revised over time to be in the center of the pyramid rather than underneath it. It was thought this set the pharaoh well on his journey to the heavens. Finally, to make the journey that much easier, air shafts issued from the King’s Chamber up to the surface of the pyramid allowing the pharaoh’s soul a more convenient passage.

**The Greek Acropolis**
The Greeks were attentive to detail, in particular those details which made their buildings appear “right”. The Parthenon’s design showcases the height of Greek optical refinements. First, the columns are spaced slightly closer together at the corners to make the construction appear more solid. In addition, there are scarcely any flat lines in the entire building due to the curvatures of entasis and echinus, a curving of the building upwards towards the middles of the sides and ends. This creates a sensation that the building is more buoyant, almost as though it came down from above and was placed upon the land. The building certainly could have functioned without these adjustments, but the visual refinements were important to the Greeks.

**Roman arch construction**
The Romans developed the arch, which lead to the vault and the dome. These were tremendous advances in construction beyond simple post and lintel assemblies, allowing longer spans from less material. The result was the ability to build structures of amazingly large scale. Arch spans approaching 150 feet were possible at the height of the Roman Empire. Enormous aqueducts like Pont du Gard in France were then possible, built to transport water throughout the empire. The Coliseum (72-80 A.D.) and the Circus Maximus were massive edifices of arch construction built for gladiator fights, chariot races, etc. for the amusement of the masses.
The Byzantine dome on pendentive

The Byzantine contribution to movement in architecture is the development of the dome on pendentive. By concentrating the structural forces to four corner piers, the four walls of the space are free to be whatever they want, including being completely open. This is a significant improvement on Roman dome construction allowing more access for movement into and out of the space.

The dome on pendentive was perfected in the church of Hagia Sofia (532 – 537 A.D.). The church is crowned with a Byzantine dome ringed with small windows at its base. This ring of windows make the dome appear to float above the space, almost unattached to the walls that hold it up, and they fill the church with a soft, sensuous light.

The Gothic arch and flying buttress

Gothic architecture brought another advance to the architecture of movement, the pointed arch. The pointed arch exerts less force than a similar span Roman arch due to its shape. The same curve which maximizes the structural benefits of the pointed arch give it its natural buoyancy, a quality of lightness due to its shape, and helps promote a visual verticality to the building.

Another advance came in the form of the flying buttress. The flying buttress takes up part of the load from the nave so thicker central piers aren’t necessary. The result is a higher possible nave with more allowable window area. More window area means more beautiful stained glass letting light fall into the church, making the interior glow.

The Baroque oval

The Baroque oval replaced the circles loved in the Renaissance for their ideal form, completeness, and purity. Where the Renaissance architect saw universal order in the circle, the Baroque architect saw only a static shape devoid of character. Thus the oval became the favored shape due to its dynamism. “Movement, accent, and energy replaced Renaissance balance....”

Bernini’s piazza at St. Peter’s (1656 A.D.) in Rome embraces visitors in the arms of the colonnade. While functioning for church processions, the piazza also welcomes the visitor, draws him in, and holds him. The colonnade is both literally and figuratively the arms of the church.

Dome on pendentive, Hagia Sofia

Diagram, flying buttress

Piazza at St. Peter’s, Bernini
The style of Gaudi

Antoni Gaudi felt strongly that there is no such thing as a straight line in nature. This belief is certainly reflected in his design of Casa Mila (1905 – 1910 A.D.), a large apartment building in Barcelona, Spain. An orthogonal line can scarcely be found in plan, section, or elevation. The irregular surfaces create likewise irregular spaces, though they function very well. Casa Mila's is also loaded with metaphors for movement. The whole building ripples and undulates, intending to symbolize the flowing waves of the sea and the towering cliffs of the mountains.

Corbusier's domino house

By using columns for the sole means of support and large reinforced concrete slabs for the floor and roof, Corbusier's domino house construction system (1914 A.D.) completed the journey started thousands of years before in inventions like the arch and dome on pendentive. Corbusier had achieved the complete removal of all walls. The possibilities for freedom of motion were now endless. Corbusier developed the domino house concept in his Villa Savoye (1928 – 1929 A.D.) in Poissy, France. A strong characteristic of the Villa Savoye, the ribbon window, was a strip of glass that wrapped almost completely around the façade revealing that the wall has nothing to do with structure, giving the house a sense of weightlessness.

Mies van der Rohe's planes

In his Barcelona Pavilion (1928 – 1929 A.D.) in Barcelona, Spain, and later in his Farnsworth House (1949 – 1951 A.D.) in Plano, Illinois, Mies van der Rohe continued to develop what Corbusier had started with his domino house concept. By handling all the structural needs with columns, Mies was free to create and architecture of planar elements in the Barcelona Pavilion. Each glossy wall of marble, onyx, or glass seem to slip around and by each other, floating free in the space defined by the floor and ceiling planes. Even the columns themselves exude energy by appearing far too slender to support the roof; Mies was unequalled in his detailing.
Eero Saarinen and concrete

Few architects have exploited the plastic nature of reinforced concrete as well as Eero Saarinen. Functionally, reinforced concrete can span significant distances due to its steel. Also, due to the nature of concrete as a poured medium, it can take almost any shape given by its formwork. Saarinen used reinforced concrete dominantly yet gracefully in his Trans World Airlines Terminal (1962 A.D.) at John F. Kennedy Airport in New York. Vast concrete wings spread themselves over the terminal, soaring into the air with such a force as they seem as though they will break free and fly off the ground. Thin sheets of glass enclose the spaces underneath and seem to tether the structure to the earth, holding it there to function for the airport passengers.

The bridges of Santiago Calatrava

Bridges, by definition, make movement possible. They transfer people over otherwise impassable water and deep gorges. In the distant past bridges were very heavy forms that were more engineered than they were designed. More recently suspension bridge technology made creations like Roebling’s Brooklyn Bridge possible, a considerably more graceful solution. Santiago Calatrava has taken bridge design to a new level of grace and elegance. Calatrava sculpts bridges. His bridges defy gravity as they sail through space. They draw the eye across so strongly that they themselves seem to be crossing the river and have simply paused at one moment in time.

The architecture of Frank Ghery

Frank Ghery is perhaps the king of movement among modern day architects. He addresses issues of both functional and metaphorical movement in his work, as is evident in his Guggenheim Museum (1993 – 1997 A.D.) in Bilbao, Spain. Functionally, Ghery made great efforts to provide patrons with fluid spaces which leak into each other via walkways and strategic massing. This allows visitors to catch quick glimpses of art and of people moving about. Ghery used the exterior of the museum for the more metaphorical aspects of movement, that of the flowing, rolling waves of the ocean. The Guggenheim Bilbao has such a sense of movement that one imagines if they avert their gaze only for a moment it will change its configuration entirely.
Design studies

In its earliest form, the Abstract Art Experience was little more than a vague idea about opposing orthogonal and curvilinear geometries. Once the movement wandering was identified, the fragmented quality of the design was established. This maximized the possibilities for exploration and discovery.

In time, a form was developed for the museum fragments. The form was characterized by heavy, megalithic walls enclosing a flexible space that could be nearly any programmatic requirement. A large, low arching roof form floated above the walls, held up by a series of giant frames. A thin membrane of glass stretched between the wall and roof forms.
The next significant issue was the orientation of the facility. Originally created in an east-west orientation, the facility faced Clinton Street to the west. The alternative was to orient the museum north-south. This would increase the connection to the park by addressing it with the design's dominant frames and provide museum visitors with a series of views of the park in the narrow spaces between spatial fragments. A north-south and east-west combination was developed, but created a very linear situation requiring the visitor to walk long distances to view the entire museum, then walk back past it all again to exit. The closed circuit of the original solution was preferable.

An animation was created to test the effects of the two different orientations. It was decided that while the east-west solution was very dynamic when passing by on Clinton Street, the north-south solution provided a more attractive northern facade and engaged Headwaters Park in a far more substantial way.
The now north facing frames were subject to refinement throughout the design process. Initially, every bay of the museum was represented by a frame, including the entrance hall on the west end and mechanical space on the east end. Eventually, the end frames were removed. The only frames were then the ones actually holding up the arching roof forms. The frames were further adjusted in size and scale, and ultimately one frame was made bright red to reflect the unique quality of the interior space it represented, the visiting exhibition space.

The museum space fragments were originally all waving and undulating on both the north and south sides. This created a high degree of change and variety in the interior of the museum. Later, however, the southern line of spaces were rearranged to follow a strict grid. This reflected the influence of the regularized city blocks to the south, and helped add a sense of regularity to the interior spaces which allows visitors to better predict some of the events in their movement.
The space that changed the most throughout the design process was the atrium. The atrium was originally a circulation corridor linking all the individual spaces of the museum around a single, large reflecting pool intended to display sculpture. The reflecting pool was an exterior space in the middle of the design. Visitors saw the sculptures, their reflections, and the reflections of the other visitors in the circulation space through the glass that wrapped the corridor. Later, the single reflecting pool was divided into three smaller pools with north-south connections at intervals between them. This increased the visitors' ability to move at random through the interior of the museum. Ultimately, the reflecting pools were completely removed and the entire atrium was roofed over. The southern line of museum spaces were moved north, greatly reducing the size of the atrium space. The result is a large, yet manageable central space that houses the work of local and lesser known artists. Visitors now have the highest ability to circulate as they please throughout the museum.
Collecting Art
Due to the power of today's computer software, it is possible to collect and hang virtual works of art. The suggestion to add actual works of art to the museum model may have been only a partially serious one, but it turned out to be one of the most successful and rewarding elements of the finished product. Although not professionally done, and not entirely economically realistic, selecting and collecting works of art for this project was a very enjoyable experience.

The art used in this project came from internet and text sources. The result is an art collection that is highly manageable and infinitely flexible. Reproduction of sculpture is also possible, though far more labor intensive.
Hanging Art

Fort Wayne Museum of Art curators Bob Schroeder and Mary Schroeder contributed a vast amount of information on the technical issues associated with hanging art, as well as assisting in the hanging concept for the museum’s galleries.

The artwork of the Abstract Art Experience is organized into three categories. The museum's permanent collection is displayed in three galleries. The art here is categorized by intent into a figurative gallery, an abstract gallery, and a narrative gallery. The museum’s temporary collection is displayed in the visiting exhibition space. Finally, work by local and lesser known artists are displayed in the atrium space.

Due to the incredible flexibility a virtual art collection affords, it is likely that a museum could save significant time and money by arranging and hanging their collections digitally. Where a curator might have needed a week or more to supervise installation in a gallery, it might be accomplished in much less time by doing it on the computer first, then handing the instructions to the installers.
RESULTS

Final arrangement

Ultimately, the spatial fragments, the atrium, and the flanking entrance hall and mechanical spaces came together to form the finished Fort Wayne Museum of Art: Abstract Art Experience. To the north of the museum is the large and beautiful Headwaters Park. To the south is the mass of downtown Fort Wayne.

Visitors enter through the entrance hall on the west side of the facility. From there they are directed into the atrium space. To the north are the galleries, library, and auditorium space. To the south are the administration and storage spaces. The atrium binds all the spaces together.
Stretching northwards, the large, low arching roof forms reach out to Headwaters Park. They are held up by the massive frames which capture views of the park from inside the museum. The museum forms modulate in a rolling wave, reflecting the nature of the park.

The southern arrangement of forms is more orthogonal. The museum spaces here are lined up in a row from east to west reflecting the machinelike grid of the city. Parking is available for visitors and staff, as well as considerations for the neighboring restaurant.
The north-south division is most appreciable in section. The atrium clearly acts as the binding that holds the museums many spaces together. The narrow gaps between spaces which serve to keep visitors in visual contact with the surroundings are also very prominent in section.
The museum was carefully scaled to its context to provide a transition from the very tall city to the low terrain and vegetation of Headwaters Park.

The museum's frames stand in reflecting pools of water that flow around the north side of the museum, mimicking the way the three rivers wrap around the edge of the city. Concrete planters filled with shrubs and trees play a similar role on the southern side of the museum, reflecting and adding to an already green downtown.
Entrance

Entrance is available from both the north and south, helping link the city and the park. The long, box-like entrance hall stands apart from the mass of the museum on the west collecting and directing visitors into the atrium space.
Inside the entrance hall, visitors are greeted at the reception desk. Admission is paid, coats and bags are removed to the cloakroom. Visitors are then introduced to the atrium via a large portal in the east wall.

The atrium
The atrium space is the most open, dynamic space in the museum. Here the artwork of local and lesser known artists is displayed. This is due in part to the incredible flexibility of the space, making it possible to display many works of art of different styles, and the very large size of the space, making it difficult to maintain the environmental control necessary of exhibit spaces displaying more demanding professional work.
The temporary and permanent galleries flank the atrium, sometimes butting into it and sometimes pulling away. The result is a space that encourages wandering by both providing glimpses of people and art and concealing others at the same time. A sense of exploration and discovery is generated by moving about the atrium.

The hardness of the steel and concrete in the atrium is softened by the canvas clouds that float above, diffusing the light in the space and helping hide the mechanical systems that run above.
Display spaces

The atrium’s display flexibility comes from large, mobile display units that can be quickly and easily moved into an infinite number of arrangements to suite any exhibition need. The mobile displays are weighted in their bottoms to resist tipping when being moved or when displaying large, heavy works of art.

Smaller display cubes are also employed. These are ideal for displaying sculpture and also function well as highly mobile seating, offering visitors an opportunity for rest and repose.
The gallery spaces themselves are more traditional venues for the display of art. Lighting, temperature, humidity, and security are all much easier to control and adjust in the galleries than they are in the atrium.

Lighting is accomplished via spotlights hung from a suspended ceiling grid. Each can be finely adjusted to create the proper viewing environment.

Security is maintained in the spaces flanking the atrium (galleries, library, auditorium, administration, storage) by sets of large sliding glass pocket doors. They are built into the north - south walls of the spaces and run on tracks between there and the end walls. Closing the doors makes climate control easier, and also allows for portions of the museum to be closed while others remain open during extended evening hours, reducing the number of staff needed during receptions and other special events.
The FWMA Abstract Art Experience maintains two types of galleries: one for visiting exhibitions, and one for the permanent collection.

The museum's permanent collection is displayed in three galleries. The art here is categorized by intent into a figurative gallery, an abstract gallery, and a narrative gallery.

The museum's temporary collection is displayed in the visiting exhibition space.
The same mobile display units used in the atrium may be moved into the gallery spaces for increased capacity in the event of a large amount of smaller artwork or a photographic display / collection.

Seating may also be introduced into the gallery space to provide visitors with an opportunity to sit and enjoy the work for longer periods of time.
For a higher degree of control over the light in the galleries, interchangeable translucent light shades may be installed over the clerestories formed by the gap between the walls and roof. An opaque system can also be employed if desired, or if an artist's contract stipulates it.

Permanent collection gallery three looking south

Permanent collection gallery three looking north
Educational spaces
To promote art education in Fort Wayne, the Abstract Art Experience provides an auditorium space for presentations and the screening of art films, and an art library dedicated to abstract art.

The library space houses media such as books and magazines, as well as video booths and internet stations.
REFLECTIONS
If I could do this thesis again, I would like to have spoken with the people of the Fort Wayne Museum of Art sooner in the process. I learned as much about museum design during a two hour meeting as I did the rest of the semester. I learned mostly about the great significance of environmental control, and I was unable to completely update my design to reflect all that I had learned. I encourage anyone currently involved in their thesis who might be reading this to get out and talk with people in fields related to their design as soon as possible.

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It's all about the people
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