Le Corbusier notes in Vers Une Architecture that, because we look at the creation of architecture with eyes which are 3 "d" from the ground, it is imperative to "deal with aims which the eye can appreciate, and intentions which take into account architectural elements." (Le Corbusier 1925) Architecture is a three-dimensional entity that we experience so much through movement or repair. Therefore, it is essential that the computer technology used to design architecture enables the consideration of both aspects of this experience. This paper presents several ways in which animation is used to enhance the design process. Architectural computing too often is disconnected from the central culture of architectural discourse and multidisciplinary means of making. This paper proposes that one way to bridge this gap is to introduce electronic media in the context of a process-oriented theory of architectural representation—one that is principally concerned with issues of conception, intention, and perception. This approach to the use of computers in the design process requires the introduction of a morphology of representational modes that are intrinsic to the musings of an Architect, and proposes a pedagogical emphasis on electronic media's ability to perform in conjunction with the design intentions of these various representational forms.
Introduction: signified and significance

The link of idea and human experience is fundamental to the perception and understanding of the two crucial points of architecture as noted by Vitruvius: “the thing signified, and that which gives it its significance.” (Vitruvius 1966) The relationship of computer technology and the design studio is an important component in linking these issues. Architectural design is directed toward the making of places for human habitation complete with issues of function, composition, content and technique. The integration of these disparate issues as a part of design development facilitates holistic design. Computer animations provide a means of visual expression and exploration which enable an understanding of these issues as the experience of an intended reality.

The means to signify, i.e. process and media, provide the opportunity to learn what gives architecture its significance. It is crucial that the means of exploration and visual expression in the studio reinforce a holistic understanding of the physical reality of architecture. The computer-based studio enables an understanding of the implications of an architectural design as a three-dimensional experience. The use of computer applications to create a virtual metaphor of the intended reality involves the relationship between visual expression and perception: the visualization of an idea as form and the representation of the form as experience. When computer animations are integrated as a part of the design process signified and significance are not treated as separate issues but rather as an interrelated approach to design. This enables the design process to address both issues and means.

Up the down staircase: inhabit the wall

The Vitruvian model of observation and experience as the underlying premise of developing the ability to distinguish know how from know why is essential to integrating computer technology in architectural design. (Bundy 1996) The human experience of architecture unfolds over time as an orchestrated composition of chromatic and physical elements. The creation of architecture, therefore, is dependent on an understanding of the forces that are engaged as the structure of space and architectural form are revealed simultaneously and relationally with the experience of the phenomena of color, light, material, sound, and movement. (Bruck & English 1993-96)

Animation encourages “becoming aware” of the implications of a design as a part of ideation and development. It enables the tangible reality of light, space, material, and time to generate architectural ideas as form based on an understanding of the human experience. Animation also facilitates a critical review of the creative process and enhances the designer’s ability to develop, as well as present, a project. Even mundane tasks such as climbing stairs take on a different level of reference when using animation to discover what people would normally do and see moving from Point A to Point B in different surroundings. Animations reveal the architectural implications of designing stairs. Where do we look when we climb stairs at the handrail, at the wall, at the landing? How does the view impact where we look? How do architectural elements such as windows, lights, wall and ceiling treatments affect the act of climbing stairs? What does the use of different materials reveal in terms of the sound of climbing stairs? Plans and sections document the relationship of physical elements as an abstract two-dimensional diagram. Animations convey the relationship of people and elements through movement and time as a three-dimensional experience. (Figure)

In response to these issues, I developed the Up the Down Staircase: Inhabit the Wall studio project, which incorporates human experience and perception as an architectural form giver. This project is a combination of video and animation
exercises that address the perceptual implications of design, with particular emphasis on the relationship of design intention and the experience of the built reality. It includes a series of design studies which combine the use of computer modeling, video and computer animation to explore the tangible reality of architectural form from the point of view of the inhabitant.

The first assignment is to use a video camera to document climbing two different types of stairs such as a grand staircase versus a fire stair, a straight versus a circular stair, an interior versus an exterior stair. The stairs must also be constructed from different types of materials, for instance wood, metal, stone or concrete. The video must capture climbing the stair during the day versus the night and going up as well as down the same stair at a normal versus fast pace. The point of this exercise is to capture the “natural” process of climbing stairs. In doing so, the videos also reveal the architectural implications of designing stairs. The camera not only captures the concrete information of light, sound and movement, but also the intuitive responses to the environment.

Video provides a wonderful vehicle for sharing observations and discussing the architectural implications of stairs and by extension the issues of entrance and circulation. Some of the insights gained from this exercise are the importance of view, detail and light. For example, videos of stairs without a view tended to look at the handrail on the nearest wall. Videos of stairs with a view tended to look in the direction of the view: the light on a landing, a window to the outside, a view of an interior room. There were also design implications to the use of material as well. Some people reacted negatively to the “ping” sound of metal stairs. The sound gave the impression, regardless of whether it was true, that the metal stair was not as solid or stable as a stair constructed of stone or wood. The use of natural light, or windows, in a stairwell was generally observed as a positive element. The primary reason for this response is that a view of the outside created a secure and safe feeling for the occupant. In other words, if the occupant can see out, others can see the occupant; an issue of special importance for stairwells in apartment blocks and academic buildings. Color is also an issue; the use of red carpeted treads with pale lighting in a theatre lobby softens the sound and adds visual drama to the act of “entrance,” a bright yellow stair rail against a blue wall, like the sun against the sky, draws the attention of the eyes and makes a person forget that they are in the fire-rated stairwell of an engineering library.
At the same time that the students are documenting stairs in buildings, they are also designing a simple construct; a wall or vertical plane that can be inhabited via a series of different types of stairs, one of which must lead to an overlook. The project must include both interior and exterior stairs that run parallel, perpendicular and through the plane in order to include a variety of architectural issues and experiences. The last exercise is the creation of a computer animation that captures the different experiences of inhabiting the wall including entering, moving through and beside the wall as well as passing at the overlook. (Figures 2 and 3.)

The knowledge gained from this use of computer animation allows the designer to evaluate a design; to visualize the implications of placement, view, color, light, and tectonics as virtual metaphors of the experience of the intended built reality. This approach to design impacts the process and the presentation of a project. For example, if an animation of climbing the stairs is boring because of the design, then the issue is what can be done architecturally to animate the experience; if it is boring, however, because the animation is an unrealistic presentation, then the issue is what can be done to capture the perceptual experience of the architecture. Up the Down Staircase: Inhabit the Wall is a simple project that introduces students to architectural issues as they are learning how to use a computer program. It is also a good basis for establishing pedagogical issues to inform a more complex architectural design project in the studio.

metaphor studio: formgivers

The final design project in the Metaphor Studio is an extension of the issues explored in the Up the Down Staircase: Inhabit the Wall exercises. The Metaphor Studio is a graduate course which is run as a mini-thesis in that the program for each project is developed by the student. The studio explores the issue of content, or essential idea, in architecture. Each project

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Figure 3: Animation: "Up the Down Staircase: Inhabit the Wall" by Fawzi Makhl.
identifies a form giver as a means of addressing and focusing the design issues. In this type of studio, I often use a work of literature as a starting point for generating concepts that have architectural implications. For the spring studio, the '57 Graphisoft/AIAA International Student Case competition provided the texts and format for the final design project. My computer-based studios include three components: a seminar, computer instruction and the final design project. The seminar and computer instruction occur during the first five weeks of the term. The final design project is a ten week project; design development during the second five week session and design revision/final presentation during the third five-week session. Design reviews emphasize architectural experience; the context of color, light and movement.

CAD is used to develop and present design projects as 3D massing studies, rendered stills and animations. Desk-top publishing applications are used to create project boards and a design journal. In addition to exploring design issues, the Up the Down Staircase: Inhabit the Wall exercises are the vehicles for teaching the computer applications during the first five-week session. In this studio, the students used ArchiCAD 5.0 to design the projects and create animations; and PageMaker 6.5, Photoshop 4.0 and PhotoEnhancer 2.8 to compose printed layouts. The studio was equipped with 5 Power MACs (5600/550, 3G HD, 160Mgb RAM), a ratio of one computer per three students. In addition, my personal computer (PowerMAC 8600/550, 3G HD, 160Mgb RAM) was also used as a back-up to generate some of the more complex QuickTime VRs (QTVR). All of the CPUs in the studio were networked via EtherTalk and TCP/IP to the internet which enabled the students to use the Netscape Navigator browser to research topics and download samples of materials for their projects.

The seminar component to the studio introduces students to issues related to the projects; in this case, we discussed the architectural implications of the texts for the competition. From a list of ten works, the students chose Italo Calvino’s Invisible Cities, Isabelle Allende’s House of the Spirits and the Animal’s version of the song “The House of the Rising Sun” for their projects. Based on the seminar readings and discussions, students develop the program for their projects by writing essays and doing ideational studies. The students also use desk-top publishing applications and digital cameras to create a computer-based journal which documents the design process. It includes essays and studies, in conjunction with images of the design project. The documentation in the computer journal is also used to create a booklet and the project boards for design reviews. In this way, the journal is used to guide the development of the design project and to provide a valuable context for evaluating the final design.

The students work in groups of three which allows a computer to be dedicated to one project. After reading and discussing the texts, the students sign up for a group based on the text they want to use for their design. One of the stipulations of the studio is that the projects must incorporate animations as a part of the design process as a vehicle to generate, develop and present a design. Perhaps as a result of this stipulation and the influence of the initial stair studies, the path is a strong element in developing the concept and architecture of each project. Movement and time, or sequence, are concepts that are inherent in animations. The examples of the student projects document the different ways in which these issues guide the development and presentation of a design. I based the layouts for the paper on the students’ boards/handlets in order to indicate how they use text and images to convey the design concept.

The underlying premise of “choices made in life’s journey” in the HOUSE OF THE RISING SUN project is initially explored in the ideational studies. (Figure 4) The themes of
drunkenness and a vagabond existence generate forms that suggest a circuitous circulation. The ideational studies guide the development of the project; not only the design of the circulation but also the experience of being in the architecture. The path is a journey through life, in which the options and choices taken result in a descent into self-chosen ruin. The journey winds through cavernous spaces in which the darkness is broken sporadically by a mysterious glowing light. The experience evokes imprisonment and doom, another identical concept. However, depending on chance and choice, the journey can lead to a pristine redemption space filled with light; the rising sun.

The House of the Spirits project (Figure 5) also uses the path as an architectural metaphor for a journey of self-realization. Instead of ruin and redemption, this project explores the discovery of the dual nature of body and soul. The design juxtaposes the themes of the tangible and the spiritual world; the essence of the two protagonists Esteban and Clara in the novel. The tangible world of Esteban’s life and the intangible nature of Clara’s spirit is interpreted architecturally through both sequence and form.
in which heavy, dark, linear elements and rooms give way to slender curvilinear elements and luminous space.

In these two projects, the concept of sequence as a life’s journey is the form generator. In another project, structure is the concept that generates the path. Scale and sequence are the vehicles for capturing the impression of a city from the tales of Marco Polo in the Invisible Cities project. (Figure 6) However, in this project a numerical pattern derived from Calvino’s book is the basis for creating the path. A grid of incrementally different line weights creates a rhythmic pattern of lines which is used to develop the general massing of the city; the solids and voids of the urban fabric, the proportions of the structures and elements. Impressions of time, events, space, scale and moods organize the design of the city and give form to the sequence.

Animations are created throughout the design process. The iterative use of animations serves a dual purpose. The repetitious process not only develops the ability to know how to create computer animations; but also to know why something is an issue as a design is being developed. Animations incorporate movement and time. This provides a context for understanding if the concepts are being realized as an architectural experience; something that a few isolated images do not capture. Moving around and through a project enables students to evaluate the implications of a design; to determine what needs to be resolved and what is successful. As an example, a second project that uses Calvino’s book focuses on the description of Despina, a city of two distinctly different impressions depending on whether the traveller approaches from the sea or the desert. From the desert, the city evokes the shape of a ship and the sea beyond. From the sea, Despina is a solid mass, like the hump of the camel, which promises the stability of land. However, the animation of the project during the mid-design review reveals that the project effectively evokes the impression of the ship, but not the second face; the solid mass is barely visible above the sand. (Figure 7) This revelation guides the design revision of the project so that the two distinctly different faces of the city are integrated in the final design. From the desert, Despina is a tall ship with masts stretching skyward. From the sea, the concept of a heavy solid mass is realized as the form of an inhabitable city wall projecting from the sand; a face that is seemingly impermeable, except for the lights which shine through the openings as beacons to the seafarer that land is near. (Figure 8)
Conclusion: Expression and Understanding

The design of architecture is concerned with the expression of ideas through culturally significant and relevant form. This requires the ability to distinguish know how from know why as a part of the larger context. It is important to not only understand the relationship of the parts to the whole, but also to understand the implications from different points of view and in different contexts; the process of “what if” that is integral to meaningful design.

Design as a making in the mind uses our rational and imaginative faculties. It demands energy, creativity, and speculation. The Oxford English Dictionary defines design as an activity concerned with making: to form a plan or scheme; to conceive and arrange in the mind; to originate mentally; plan out, contrive. (OED 1971) The studio is an opportunity to understand the design of the built environment through a series of exercises which explore a diverse range of approaches in theory, methods and techniques. It is a forum for students to explore ideas and issues, gain knowledge about the discipline of design and the profession of architecture, develop skills in design process and techniques, and foster the capacity for judgment by making appropriate choices for resolving design issues.

The design studio is an intensive course which raises questions rather than provides facile answers. Integrating computer animations as part of the design process enables an understanding of the relationship of the disparate
aspects of an architectural project in different contexts and with different constraints. The computer-based studio offers the opportunity to explore and examine the implications of diverse approaches from different points of view, which prepares students to deal with the complexities of design. Animation offers the opportunity to visualize the implications of the rational and imaginative aspects of architecture as a construct complete with color, texture, space, and movement as an integral part of the design process. It is in this arena that the use of computer-based animation in the studio experience is especially potent.

references