The Architecture of Dependence: A Digital Entertainment Entrepreneurship Laboratory in the Network Economy

by

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Submitted to the Department of Architecture
in Partial Fulfillment of the Requirements for the Degree of
Master of Architecture

at the

Massachusetts Institute of Technology

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ABSTRACT

The dual phenomena of the information revolution and the rise of the network economy presents an interesting challenge to the architect. Architecture must shift away from the design of singular buildings, and more towards the design of instances (nodes) on a network – and indeed, the design of that network itself. This entails redefining the role of the architect, to introduce the profession into areas not traditionally though of as the architect's domain. It also demands an understanding of the unique social and economic characteristics of the informational society at the conceptual level, in order to define the correct priorities in physical design.

The project is a business incubator located at the Burbank-Pasadena-Glendale Airport, in Burbank, California. The incubator is a collective work space that nurtures start-up companies involved in high tech entertainment research and development – for example, digital compositing, robotic prototypes, and advanced visual effects. In addition to providing funding and facilities, the incubator also gives member firms access to local and regional social/information networks. Local entertainment companies, such as Disney and Warner Bros., sponsor the incubator in exchange for the first right to use any technologies developed there, and to contract incubator firms to work for them.

Five Organizing Principles

1: Collective action. The inclusive aspect heightens creative cross-pollination, and transforms the nature of work from a top-down, rational, domination-based hierarchy to a collaborative, serendipitous, cooperative venture.

2: Synchronicity. The juxtaposition of unrelated uses, an architecture that reinforces chance interactions.

3: Juxtaposition of material + speed. Visual overlaps and juxtapositions highlight the multiple velocities and rhythms that permeate our lives, from the eternal to the instantaneous, reflecting the contradictions in speed in our own lives.

4: Architecture as a device. The autonomy of a building/organization is inextricably linked with its absolute dependence on connections to other buildings/organizations, for context, purpose, meaning and productive capacity.

5: Mapping of digital space onto physical space. Architecture has the opportunity to reevaluate the relationship between technology and (human) nature, to recombine and negotiate new concepts of rights, privileges, and access based on the interplay of digital fluidity and physical solidity.

Thesis Advisor: Peter Testa
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OVERVIEW

• The program is an entertainment start-up incubator in Burbank, California.

The program is an entertainment start-up business incubator. The purpose of a business incubator is to provide newly started companies with the funding and facilities to support them through the critical first years of operation. Most often, the start-up firms are involved in high technology ventures, which are more at risk to failure due to the intense competition and fast-moving nature of the industry. In the case of my project, the incubator houses firms that employ advanced digital technologies in the entertainment industry - for example, digital actor creation (which involves artificial intelligence and digital representation), special effects techniques (such as those used for the rendering of digital water in Titanic), and completely computer generated entertainment environments (like those in the all-digital films Toy Story and A Bug's Life). The project supports these businesses directly, through ubiquitous data access and display surfaces, and indirectly, with common work spaces and access to a wider network of contacts, capital, information and knowledge. In a sense, the program can be thought of as a for-profit research and development lab much along the lines of the MIT Media Lab, where directed application of technology and a sense of common purpose help foster rapid innovation.

The site is located in Burbank, California, the home to many large entertainment studios, such as the Walt Disney Studios, Universal Pictures, Warner Brothers and NBC Studios, which will be involved in the set up of the incubator as partners and a source of capital. The building is located adjacent to the Burbank regional airport, on what is current a parking lot next to the terminal building. The decision to site the project next to the airport is directly related to the program's intense need for face to face meetings and constant travel to partner companies and clients. This reliance on connectivity arises from the nature of the industry, as well as the principles of the information revolution and the network economy - a new structure that society is forming itself around in the post-industrial world.

SITE AND PROGRAM

- Post Cold War industrial sites need to be shifted over to productive uses.
- Burbank has a high physical concentration of entertainment-related companies.
- The Burbank airport provides connection to the region and the world.

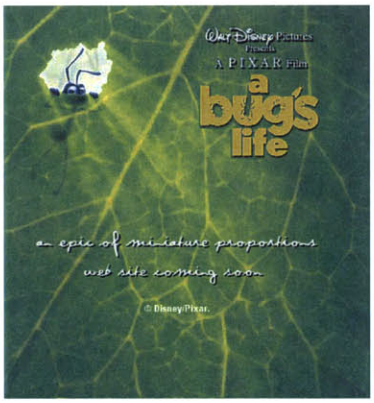
Burbank, California, grew explosively with the rise of the aerospace defense industry, beginning in the 1930's and peaking in the 1950's. Lockheed, among many smaller high-tech defense firms, located in Burbank, establishing the city as a leader in high technology production and research. (In fact, Lockheed's test flight airstrip became the runway for the Burbank-Pasadena-Glendale regional airport, the site of this thesis project.) At the same time, due to Southern California's sunny weather and the proximity of the Hollywood entertainment complex, various movie studios, such as Universal Studios and Warner Brothers Studios, set up studio spaces in Burbank.

With the end of the Cold War, and the subsequent cuts in defense spending, the high technology firms in Burbank slowly moved away. Most significantly, Lockheed sold off virtually all of its properties, including two massive factory/warehouse complexes, one of which is located directly next to the airport. Interestingly, however, the growth of the entertainment industry has accelerated, and continues to grow to this day - Disney Studios, NBC Studios, Nickelodeon and a multitude of small specialty companies, such as digital post production and costume suppliers, have all made their home in Burbank. DreamWorks SKG and Disney Animation are also located nearby.

As the defense-dominated economy gradually shifts to a more entertainment-driven one, the engine of high technology development in Burbank turns towards entertainment applications. Business Week claimed in its March 14, 1994 issue: "The entertainment industry is now the driving force for new technology, as defense used to be." Digital effects studios, supercomputer labs, and advanced prototyping facilities are busy producing movies and virtual worlds rather than fighter planes and missiles. For example, advanced computer technology that once was used to predict Navy ships' wake patterns were used to generate the digital water effects for "Titanic".

These small firms that specialize in high tech entertainment applications are especially likely to engage in network forms of organization, due to the sheer size of their projects. Online content production, feature films, and even video games require the interaction of

Examples of digital moviemaking (top to bottom): "Antz" (Dreamworks SKG), "A Bug's Life" (Pixar Studios), "Titanic" (20th Century Fox)



numerous disciplines. Frequently, a major studio will contract hundreds of smaller firms in the execution of a project. The contractual relationships establish a "network enterprise"; the project becomes the binding force that coordinates the work of this complex web of companies. Therefore, the network, and not the individual firm, becomes the basic unit of economic production. The more varied and plentiful the supply of talent becomes, the greater synergy can be achieved in their interactions.

Since Burbank is the home to a rich mix of large studios and small, "boutique" firms, it is an ideal location for an incubator of high tech, entertainment start-up companies. In addition, locating the project adjacent to the Burbank Airport provides an immediate connection to the wider regional network of businesses. Interactions are facilitated in time (no waiting in traffic) as well as space. The greater goal is to have similar projects built near other airports, establishing a regional network of talent readily accessible by air.

PROGRAM AREAS

The incubator is not comprehensive in its program. In fact, simplicity and an almost "no frills" approach to the physical space of a workplace is a competitive advantage. The network's interdependent logic necessitates "incomplete", yet highly productive, firms. Added to the minimum work environment, however, are necessary adjuncts to the business mission - elements that follow the needs of the logic of the network society.

Total Area: approximately 30,000 ft^2	
Office space	2,500 ft^2
Digital R&D lab workspaces, shared	7,500 ft^2
Support Spaces	1,200 ft^2
Entrance lobby; also serves as gallery	1,200 ft^2
reception area, 200 ft^2	
gallery, 1,000 ft^2	
Formal meeting areas/bridge to restaurant	12,000 ft^2
conference rooms/VC rooms, 6,000 ft^2	
presentation/seminar room 6,000 ft^2	
Restaurant/Dining Room	6,500 ft^2
general seating, 3,000 ft^2	
private/formal seating, 800 ft^2	
lounge & bar, 1,000 ft^2	
kitchen space, 1,500 ft^2	
prep area, 200 ft^2	
restrooms, 1,000 ft^2	
Nature spaces	1,000+ ft^2
Parking located in existing garage and lot	

THE NETWORK ECONOMY

- The structure of the informational society is based on destructive creativity.
- Flexibility and adaptability are inherent in the logic of the network.
- Change and growth is handled externally, on the network scale.

The informational society has distinct characteristics, and can be contrasted to the previous socioeconomic paradigm, the industrial society. At the heart of the informational society is its fundamental structure of networked relationships. That individuals form networks of relationships is not new; however, what is new is the pervasiveness of the networks on a global scale, and our absolute dependence on them for productivity and economic growth.

Industrial Society (Industrial Economy)

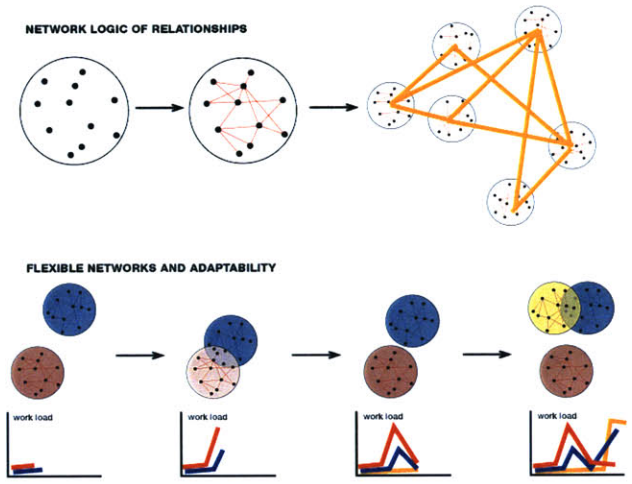
- Vertical hierarchy and command structure is the structural model
- Productivity is based on the ability to harness sources of energy
- Unit of economy is the individual corporation
- Companies are composed of functional units vertically integrated in a self-sufficient corporation
- Operates at a global scale

Informational Society (Network Economy)

- Horizontal network and interdependency is the structural model
- Productivity is based on the generation and transformation of knowledge and information
- Unit of economy is the network
- Individual companies are interdependent and are horizontally connected in network enterprises
- Operates at a global scale, in real time, all the time

The ethical principle underlying the informational society is one of destructive creativity. There is no one, permanent "Network" that governs the economic and social interactions of the informational society. Instead, networks form, dissolve and reform as projects are initiated and completed, and as individual firms band together for common purposes, or disband when those purposes are met. (By network, I refer to whole sets of social, economic, and informational relationships, rather than merely the Internet, or any single computer net-

work). Castells notes: "It is a culture, indeed, but a culture of the ephemeral, a culture of each strategic decision, a patchwork of experiences and interests, rather than a charter of rights and obligations. It is a multi-faceted, virtual culture, as in the visual experiences created by computers in cyberspace by rearranging reality.... The 'spirit of informationalism' is the culture of 'creative destruction'...." What characterizes this new mode of production is its constant state of dynamic equilibrium. It is a strange world where today's partners can be tomorrow's competitors, as the logic of informational (network) capitalism begins to supercede that of zero-sum (industrial) capitalism.



Diagrams of network relationships, and network dynamics through time

Each individual firm has great flexibility in the way it works, due to the inherent structural logic of the network. Castells states that this flexibility "needs not to internalize workers and suppliers, but to be able to access them when it fits, and in the time and quantities that are required in each particular instance. Flexibility and adaptability are better served by this combination between agglomeration of core networks, and global networking of these cores and of their dispersed, ancillary networks, via telecommunications and air transportation." However, with this flexibility comes absolute dependency on its connection to the social and economic network. A company reaps the benefits of integration into the global economic network, but at the same time must be able to actively participate in it or risk isolation and failure.

The logic of the network, however, is silent on many aspects of physical space, social well-being, and the psychological condition of the people who engage in the network society. For all the benefits that an informational society provides in terms of economic productivity and fluidity of relationships, there are social and human concerns that are not addressed. It is the responsibility of architecture to introduce another layer of logic that enhances the strengths of the net-

work structure, while integrating neglected aspects into the design of the network. The three aspects that should be included are:

- An emphasis on stasis as a counterpoint to constant mobility
- Leisure introduced into the work pattern, as both optimizing and distracting principle
- Nature as artificial/natural constructions to mediate the opposition of the connection to the net and the connection to the place. [The design of natural machines, rather than machine nature.]

ARCHITECTURE AND NETWORKS

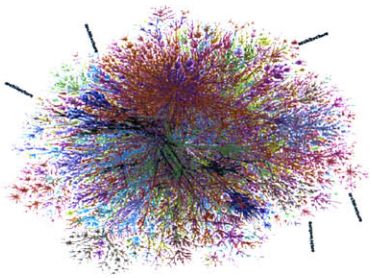
- An architectural strategy for change is based on the structure of the network.
- Physical space is where the network "touches down" onto the landscape.
- Knowledge transfer needs to be enhanced and encouraged.

With the dynamics of the network economy rewriting the rules of society and economics, the impact on architecture, and how architects should respond to the challenge, is just as great. For example, the traditional response to growth and change - simply to build more buildings to house more workers - must be re-evaluated in light of the adaptability of the network. If a growing company can shift increased production needs to a subcontractor, instead of hiring more workers and building a new building, it can deal with growth in a more efficient, effective and economic way.

This leads to an implication for architecture: the strategy to handle growth is really a strategy to handle change - the problem of rapid growth or contraction is handled at the network level, not at the individual building level. The relevance of the architect is to ensure that the nodes of the network - the office buildings, homes, workshops, think tanks, restaurants, etc. - support this structure. By designing the nodes with the wider network in mind, architecture can begin to design the network itself from the inside out.

As the character of the network is dictated by its nodes, physicality, and a sense of place, become even more important, as each physical structure is viewed not as isolated, but as where the network "touches down" onto the landscape. In this way, each node becomes more than just a symbol of the wider network of connections that usually remain invisible and intangible; it in fact is the network.

Finally, all this change and movement is not a property of the network itself, but a result of the creative activity of human beings. It is important to remember that the network economy is composed of its nodes, which are in turn composed of the numerous ideas and thoughts of people. The network paradigm is nothing but the latest configuration of productive capacity, and as such, its main goal is to enhance production, economic development and innovation. The fundamental capacity for innovation rests in the human brain. The fluid movement of human beings within a space, and from one location to another, facilitates rapid knowledge transfer - a necessary condition to keep up with quickly changing technology and shifting economic conditions.



Architecture is the "touch down" point of the cloud of intangible network relationships on the landscape

ARCHITECTURAL STRATEGY

- Program is reduced to essential components.
- The definition of "essential components" is derived from the logic of network economics.
- Flows of information and matter, and connections, are key criteria for design.

The approach I have taken, in researching the structure of the economy and the particular characteristics of the entrepreneurial venture, is part of the thesis. In other words, part of the role of the architect, I believe, should be to investigate and understand the workings of the network economy, and apply it to design.

The program is reduced down to the minimum necessary, to reflect the nodal quality of the project. Since the space the project inhabits extends beyond its physical borders to reach different firms and companies that provide services on demand, many activities occur off-site, and thus, reduces the need to house them on this particular site. Taking advantage of the availability of numerous specialty companies that provide services and products on a contract basis, a business is able to reduce its operations to its core competency, and thus, to a leaner and less cumbersome physical space. What cannot be housed in a building is not necessary; what is not necessary is not housed.

At the same time, the "minimum" program does not necessarily mean the space should be strictly used for nothing but desk space or cubicle offices. The operations of an informational society work space must include those social and leisure activities that support the work mission. Such activities may not have been included in the typology of an office in an industrial society, in which individual worker productivity (measured in hours at a desk) was maximized. For example, eating areas, informal socializing spaces, and room for leisurely contemplation have been proven to be important to the success of high technology innovation. As Castells notes, the success of Silicon Valley's decentralized firms depended on informal knowledge transfer in leisure settings: "Late-evening conversations at the Walker's Wagon Wheel Bar and Grill in Mountain View did more for the diffusion of technological innovation than most seminars in Stanford." A redefinition of what the "minimum" operational unit of space becomes necessary.

The flow of information and matter - both in quality and quantity

- is also important. The circulation, communication and conveyance routes to, from and within the building are what allow the space and business, in its molecular status, to survive. The component parts of a networked economy are dependent on smooth and uninterrupted flow of people, information and things, and the siting, program and spatial strategies must take this into account. Access to information flows and transportation becomes vital.

Use of artificial nature allows for the expression of the relationship between local and global, self and net. The particularities of a certain location become important devices to signal 1) the connection to a wider network, and 2) the specificity of the local physical condition. Both are important for "locating" one's self within the organization, as well as in space. Where the network "touches the ground" is where there is an opportunity to ground the ephemeral - not to codify the mutable, but to relate the abstract to physicality.

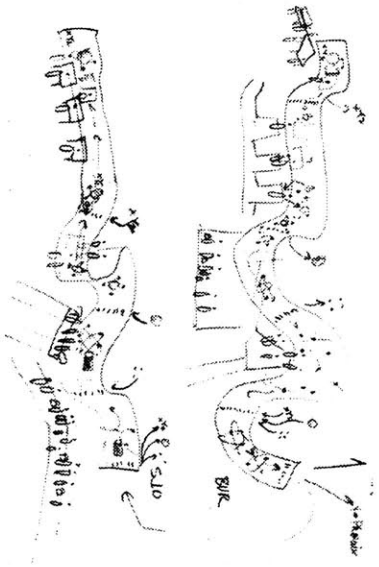
Finally, supporting the informational, network society does not necessarily mean creation ex novo; rather, reevaluation and recombination of existing forms should yield new, more flexible, and more robust forms.

THE FIVE PRINCIPLES

- Mapping of digital space onto physical space
- Architecture as a device
- Collective action
- Synchronicity of activity
- Juxtaposition of materials and speeds

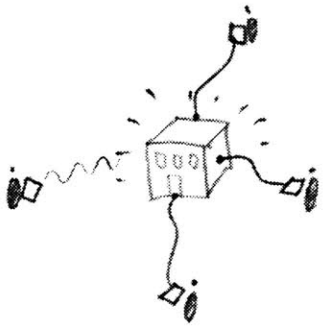
From the implications of network economics, and the architectural strategy they imply, I derived five working principles that guided the design of the project. The spaces within the incubator result from the combinations and interactions of these principles:

Mapping of digital space onto physical space



Architecture exists in multiple worlds, passing through public territory, private territory, and ambiguous territory. The more digital the world becomes, the more our human needs for territorial definition are expressed. Currently, the digital data we work with inhabits a different world than architecture does – a world where digitally private information can be accessed in a physically public arena. But as the movement of knowledge in the form of human expertise becomes more vital in the network economy, an opportunity arises to link human interaction with data access. We can challenge the independence of data privacy from physical privacy, of digital technology from the physical world. Architecture can reevaluate the relationship between technology and (human) nature, to bring the two worlds together as an expression of their common foundation - interaction and knowledge. The goal is not to re-establish traditional hierarchies of public versus private, but to recombine and negotiate new concepts of rights, privileges, and access based on the interplay of digital fluidity and physical presence.

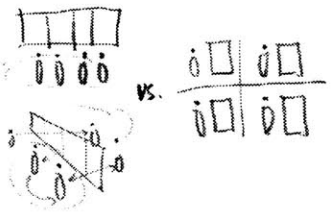
Architecture as a device



To support new, more flexible forms of interaction and work, architecture should begin to behave more as a device than a neutral space for devices. For example, the outer shell element in the project can be used as a display that you can send images to, or computing power that someone can utilize remotely. This happens both ways, so that one node on the network can drive all the other nodes when the activity requires it. Each node then can equally be a device and

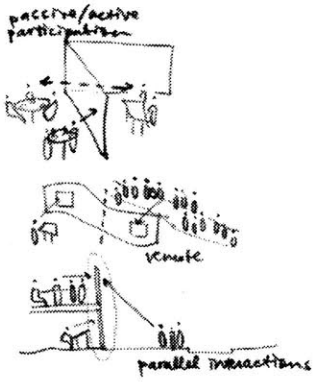
driver at the same time. On a higher level, the autonomy of each node is infused with its absolute dependence on its connections to other nodes, for context, purpose, meaning and productive capacity.

Collective action



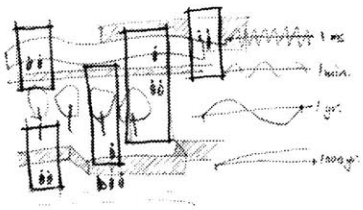
Collective action means the simultaneous work of multiple parties in a single space and time. How it differs from traditional modes of production is in its collective nature – there are no visual barriers, no private offices. Work, even if not related, occurs in the same space, and is visually fused into a single whole. The inclusive aspect heightens creative cross-pollination, and transforms the nature of work from a top-down, rational hierarchy to a collaborative, serendipitous, cooperative venture.

Synchronicity of activity



Synchronicity is a Jungian term that describes the causal connections of isolated, unrelated events that occur simultaneously. I am borrowing the term to describe the juxtaposition of unrelated uses, and an architecture that reinforces that connection. Synchronicity in this sense could occur at the same time in the same space (simultaneity), at the same time in different spaces (synchronous), at different times in the same space (delayed action), or at different times in different spaces (delayed action at a distance).

Juxtaposition of materials and speeds



Juxtaposition of different materials that have different speeds highlights the multiple velocities and rhythms that permeate our lives, from the eternal to the instantaneous. The palette of materials ranges from concrete (centuries), to trees (years), to water (minutes, seconds), to digital display walls (instantaneous). Visual overlaps and juxtapositions relate one to another, reflecting on the contradictions in speed in our own lives.

THE KNOWLEDGE STREAM

- The knowledge stream weaves through the project, integrating the spaces with a common element.
- Information flows that occur in the building are made visible.
- The stream's behavior depends on physical location, identity and presence of people, and personal preference.

One emergent property of the five principles is a set of active display and work surfaces that collectively I've called the Knowledge Stream. The stream acts in it most basic function as a computer display. However, the information it displays is visible, to varying degrees and clarity, to everyone in the building. Also, it can take on any orientation other than the familiar vertical screen - parts of the stream are located on the ceiling, and even underfoot. Further, all the information being worked on in the building, as well as all the data flowing into and out of it, appears on its surface, and physically moves across it over time. Since the physical surface of the stream weaves in and out of the different spaces of the project, eventually making its way out to the surface of the shell, the data that moves along it also permeates all the spaces along the way. In this way, serendipitous discovery, informal collaboration, and shared work interactions are supported, recognizing that much is often learned in the course of distraction.

The outer shell elements, as well as the interior folding screens and digital walls, are the components of the Knowledge Stream.

Actual access to the data on the stream, and ability to interact with it, depends on a number of factors. First, the local character of a space attenuates the behavior of the stream. For example, the outer shell facing the airport terminal would never display confidential data, no matter who was standing next to it at that point. Private data is restricted to private space.

Second, the display of information reacts to a person's physical proximity to the surface, as well as that person's identity. Identity is primarily determined by wireless tags printed in the business cards of those who work at the incubator. Also, using voice recognition technology, each person can gain access to the stream simply by speaking at the surface. One's identity determines what level of information can be shown at that section of the stream. When data flows along uninhabited parts of the building, or past those who have no access privileges to it, it is seen as a blurred image or text, constantly shifting shape based on how it flows across the surfaces, breaking up and reforming. As soon as the information enters the work zone of a person that has access to it, it sharpens and stabilizes, slowing

down to let the person take a look at it. At that point, the person can choose to stop the flow of that piece of information, copy it and send it along again, or let it pass unchanged.

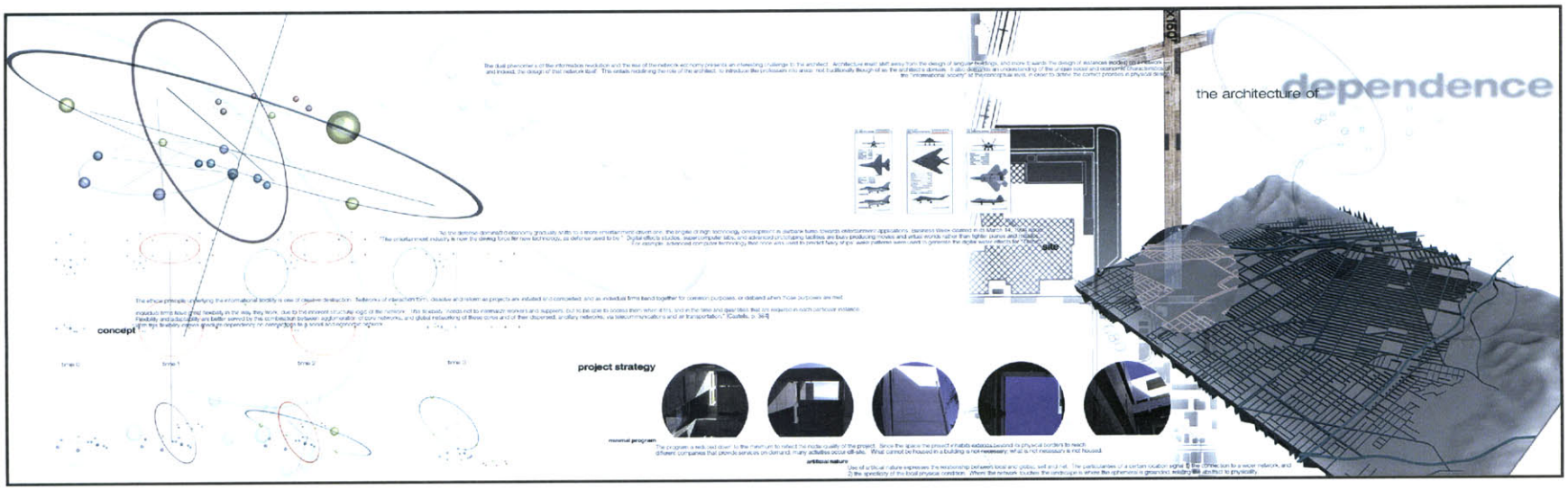
Third, personal preferences can alter, or completely override the default behaviors of the stream. If a programmer within the building writes a little program that is not useful to him but might be to others, he might send it along the flow of the stream with it accessible at all time, that is, not blurred out. Or a team's members can set their preferences so that only when all team members assemble can data be accessed. Or in the extreme case of an intensely confidential project, someone may set their access to be correlated only with certain, private spaces, or only when no other people are in visual line of sight.

Finally, although the stream is meant to be as visually transparent as the work allows to enhance the visual layering and connection of the spaces within the building, the opacity of each segment of the stream can be adjusted, from completely clear to white translucent. This allows the level and type of usage of each space to vary according to time, making privacy a negotiated and variable condition. The Stream adjusts its filtering and flows to the shifting requirements of the inhabitants.

DATA ACCESS AS FUNCTION OF PROXIMITY

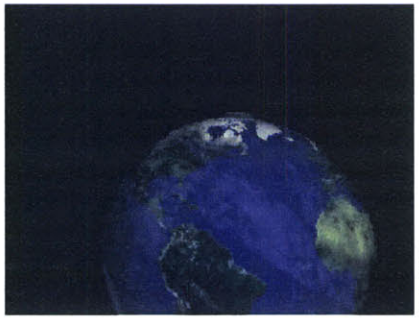
VARIABLE VISUAL PRIVACY

COLLABORATIVE ACTIVE SURFACE



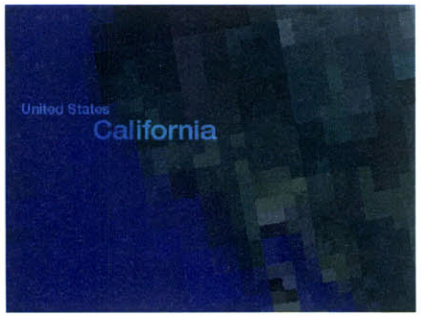
INTRODUCTION MEMO

1
Earth



2
Western
Hemisphere

3
United
States



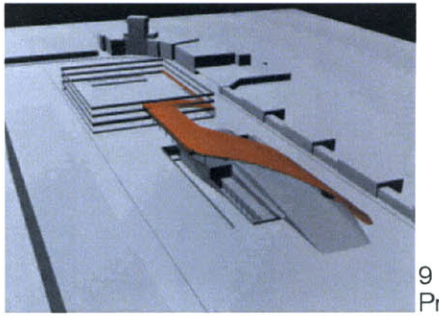
4
California

5
Los Angeles
County

6
Burbank

7
Burbank
Airport

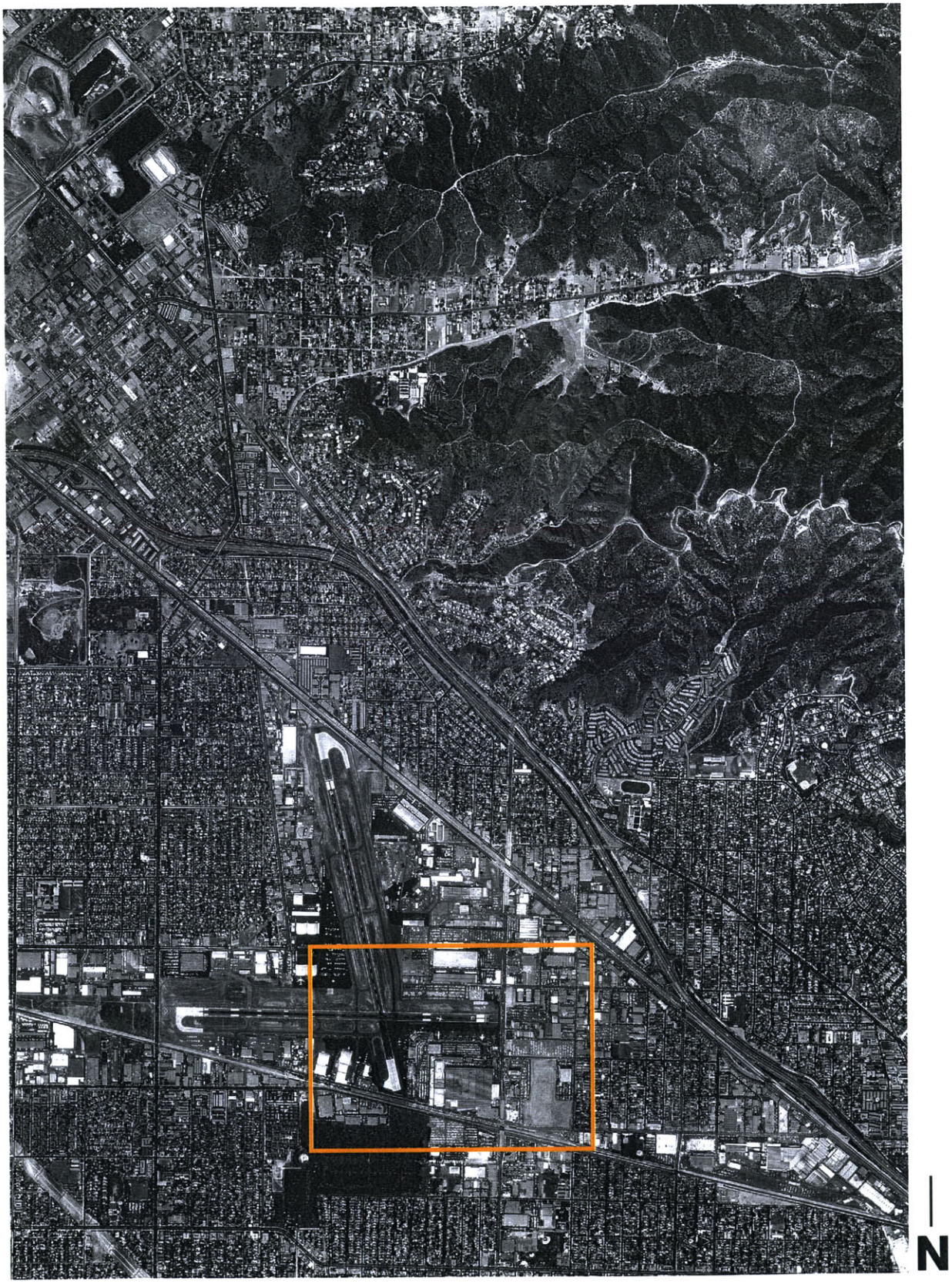
8
Terminal



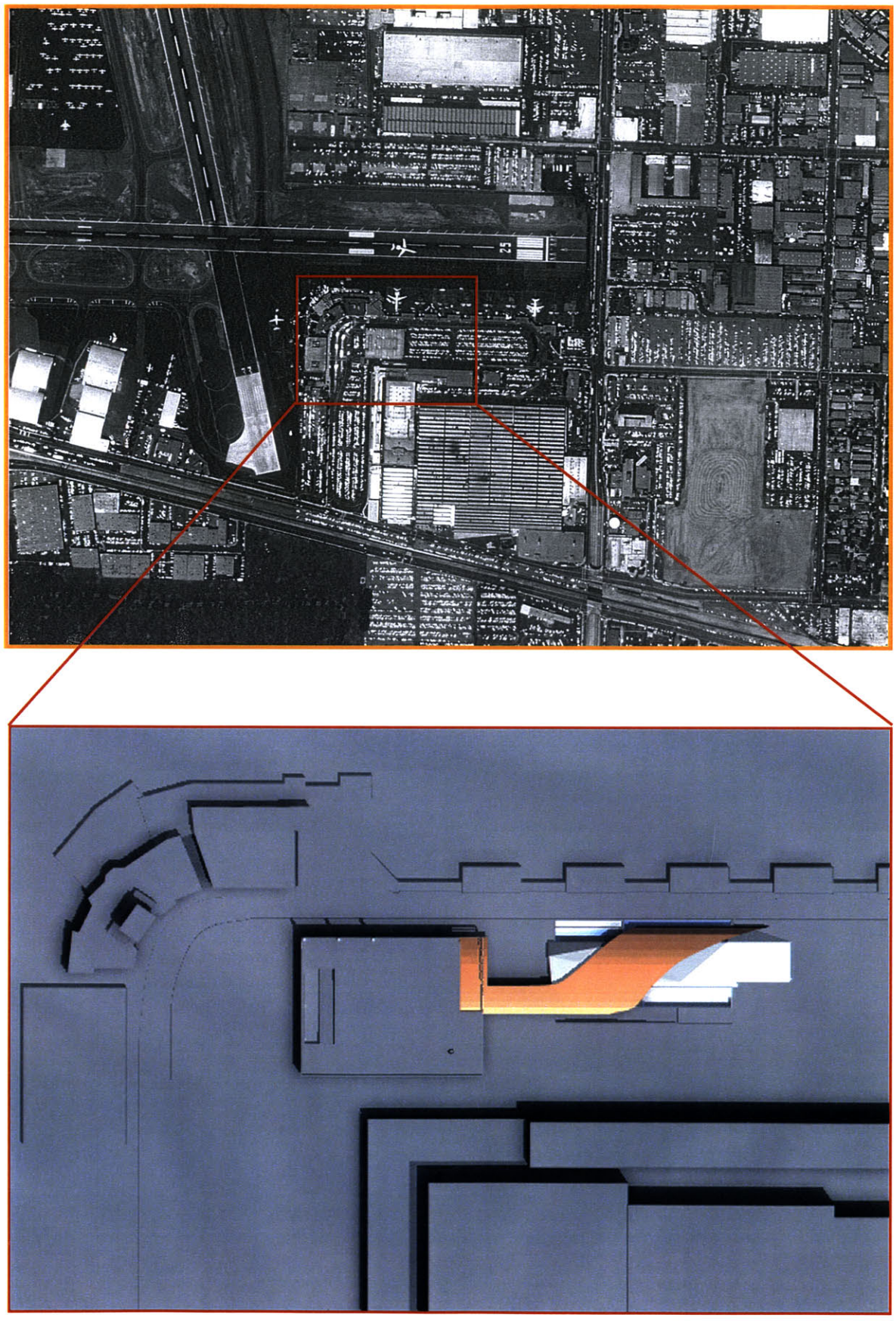
9
Project

SITE IN GLOBAL CONTEXT

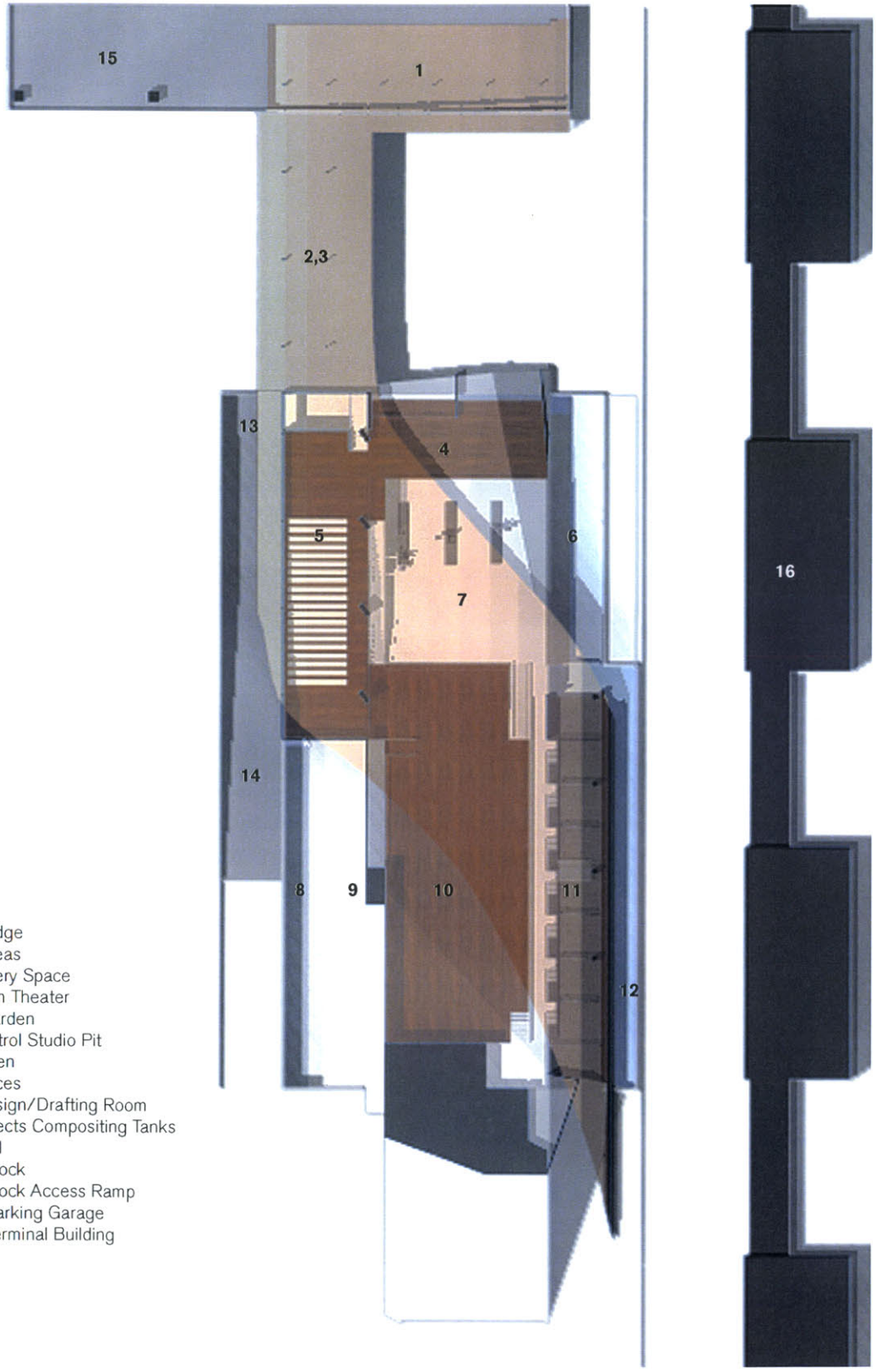
SITE



N



PROGRAM AREA KEY



1 Restaurant
2 Lounge Bridge
3 Meeting Areas
4 Lobby/Gallery Space
5 Presentation Theater
6 Bamboo Garden
7 Motion Control Studio Pit
8 Water Garden
9 Private Offices
10 Digital Design/Drafting Room
11 Digital Effects Compositing Tanks
12 Water Pool
13 Loading Dock
14 Loading Dock Access Ramp
15 Existing Parking Garage
16 Existing Terminal Building

N

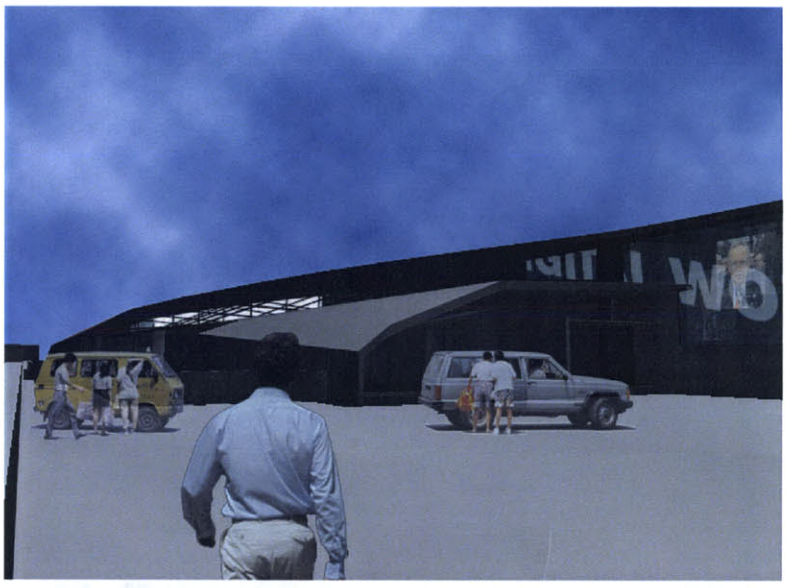
RENDERED VIEWS

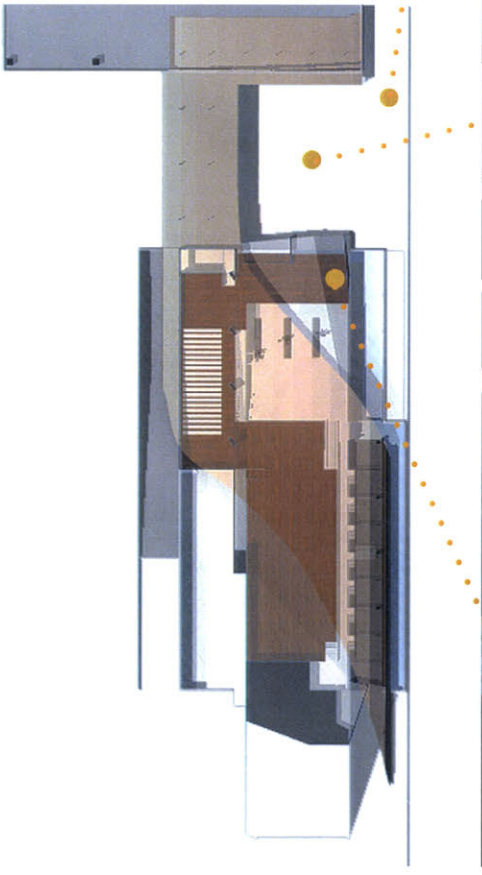
This page, top to bottom:

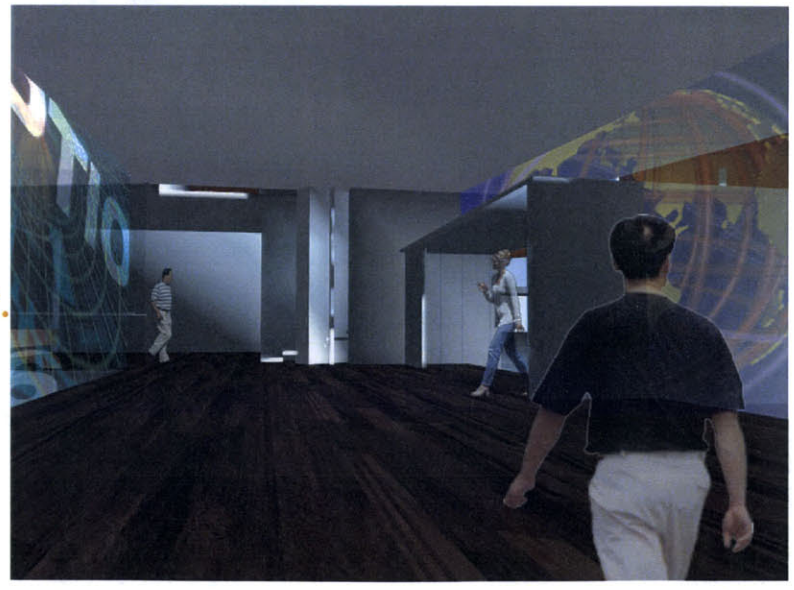
1 The entrance to the building is located across from the main baggage claim area of the airport. The first thing arriving passengers will see is the active surface of the shell, displaying local information, images of Burbank and its industry, as well as the internal goings-on of the building.

2 Another view of the exterior of the project, as seen from the airport side.

3 The lobby to the building also serves as a gallery space promoting the start-up lab's productions, and educating visitors about the activities that are going on in the building. As the display walls are active, this space constantly shifts in light quality and ambience.



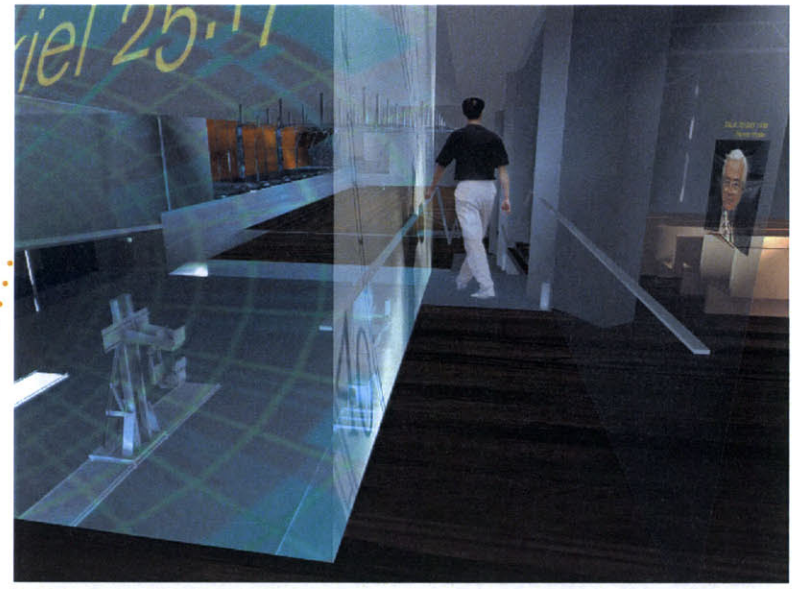


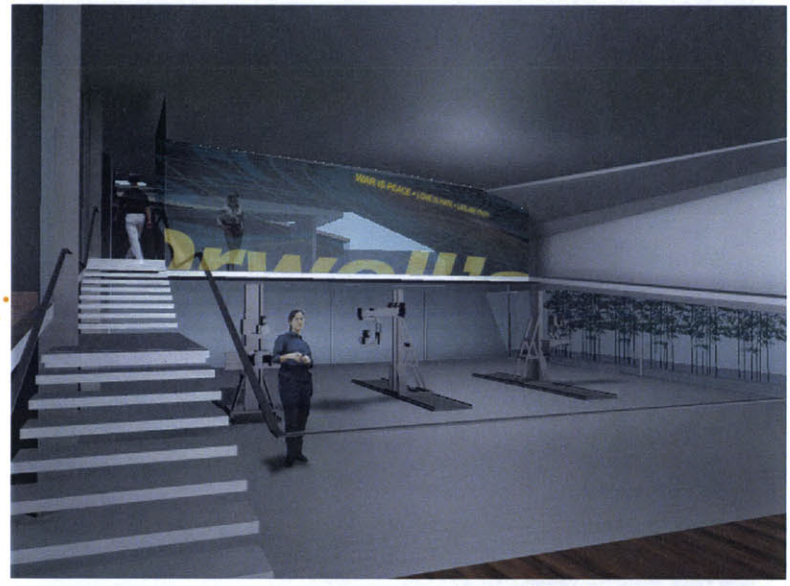


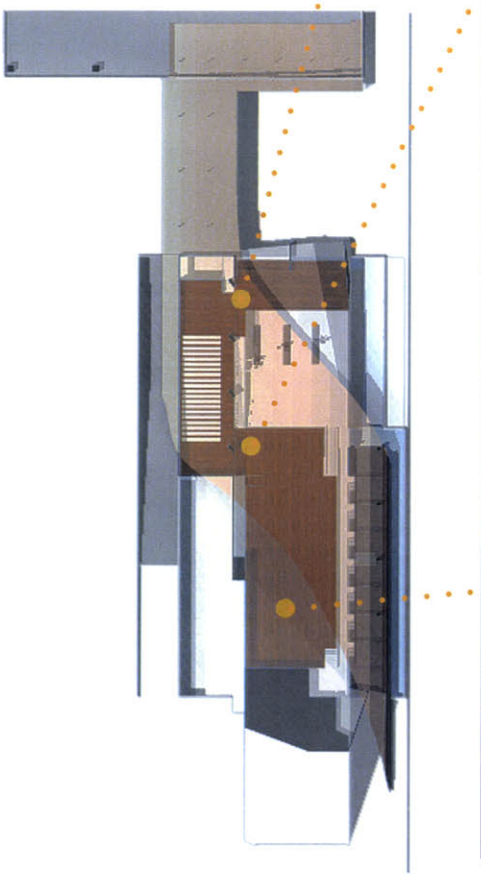
1 A view from the lobby area, past the entrance to the theater, into the heart of the building, a double space that comprises the motion control studio pit and the digital design and drafting room. The active display walls of the lobby/ gallery wrap around the central void space, creating a double shell around the interior.

2 A view up the stairs back towards the lobby/gallery area.

3 The drafting room, the heart of the building, and the central area of creative production in the project. This is where dreams are built.



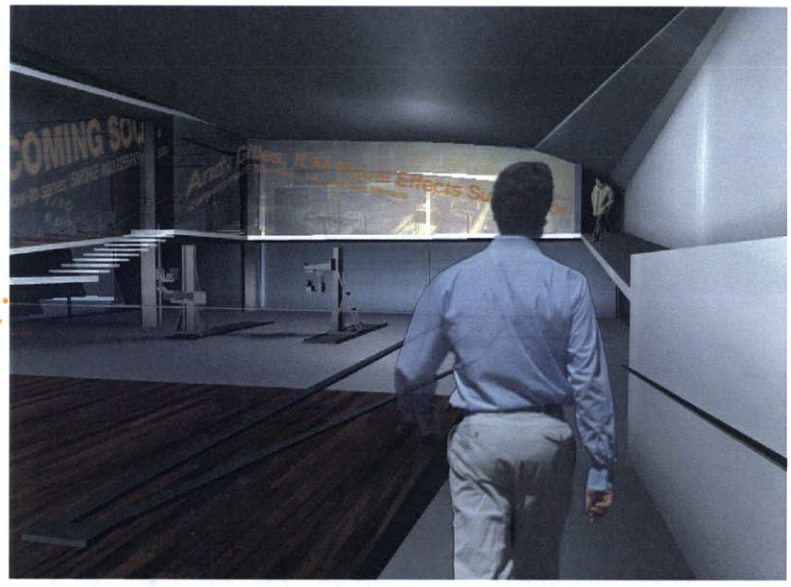


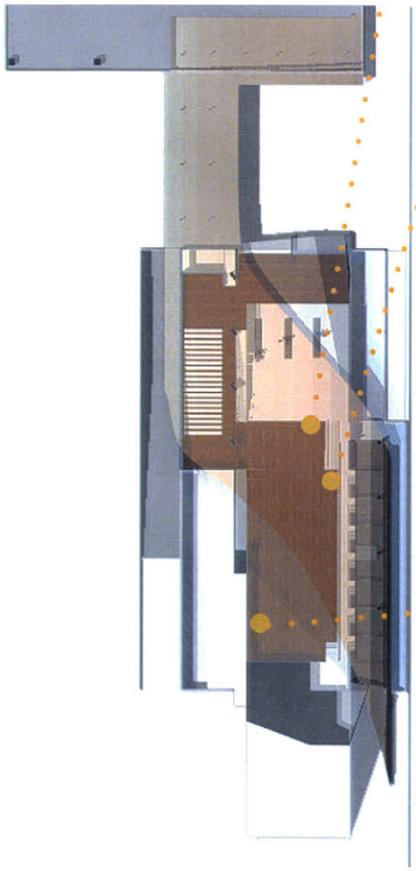


1 The digital design and drafting room is where computer models of characters and objects are designed and made. Using a combination of physical drawing and computer drafting, modelers and animators are responsible for the creation of these digital movie actors. The ceiling panels shown can be folded down to form active display walls and even tables (see detail page 32).

2 A view back from the drafting room to the motion control pit area. The openness of the two areas stems from the need for close communication and coordination between the two programmatic areas. Direct visual contact promotes idea sharing and a collaborative work feeling.

3 A view of an ad hoc drafting space formed by pulling down ceiling panels

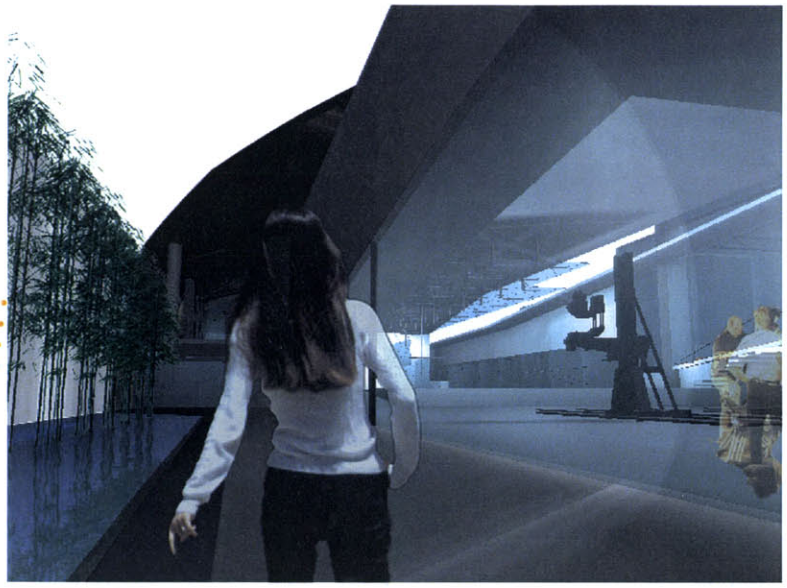


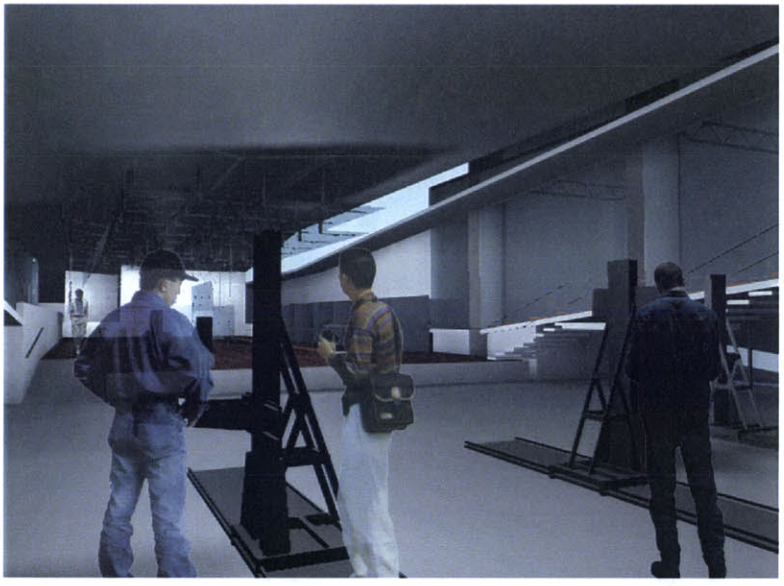


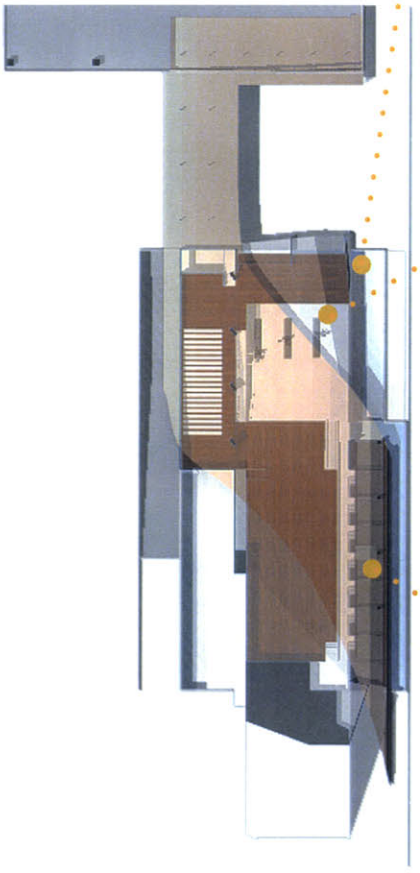
1 One of the two garden features in the project, the bamboo garden provides a serene backdrop that contrasts with the internal activity of the motion control pit. By juxtaposing these different speeds of materials and motion, people can begin to regain the sense of the passage of time that is so easily lost in our digital age.

2 The motion control pit is where computer-controlled cameras film physical models in repeatable sequences. Such precision makes it possible to make several, identical camera passes of an object, a background and other scenographic elements, and have each sequence perfectly match and layer on top of each other. These scenes are then sent to the digital compositing tanks for further processing.

3 The digital compositing tanks are where the footage from the motion control studio is digitally combined with the computer rendered objects and special effects created in the drafting room. The walls can flip down to become display surfaces, combining multiple tanks into a larger tank if necessary.



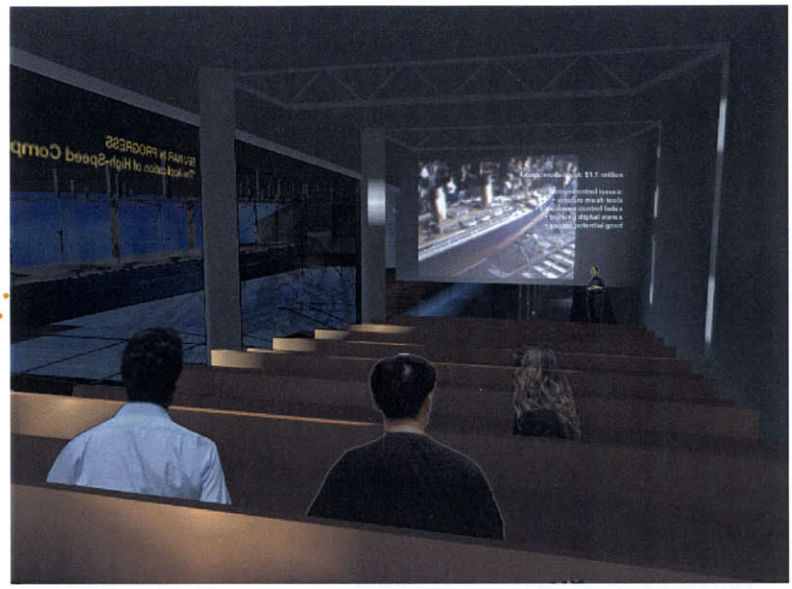


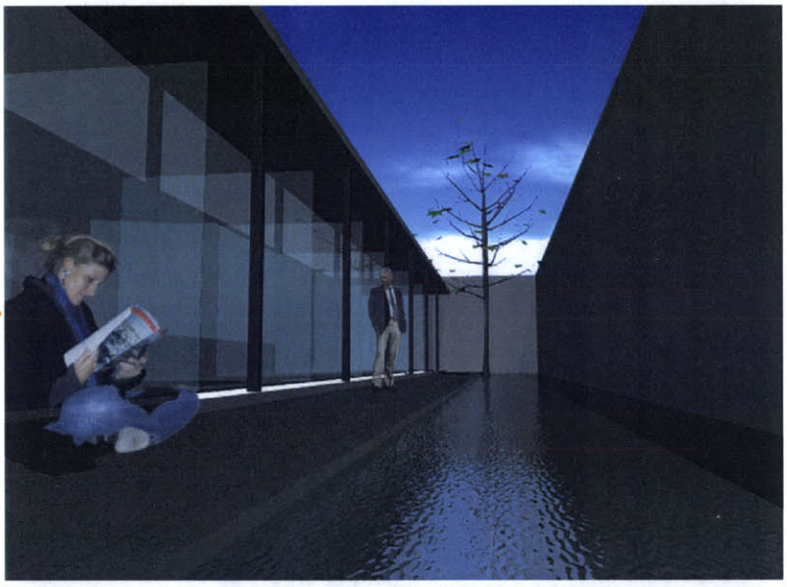


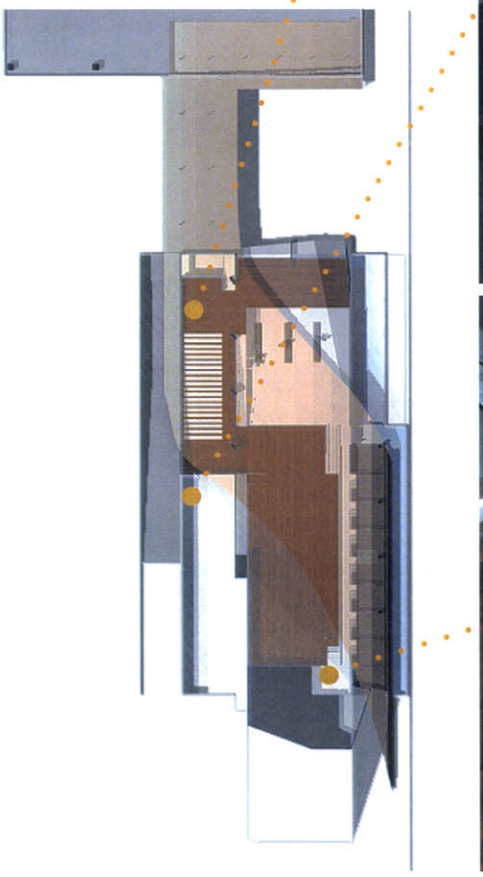
1 Informal lectures and presentations occur in the presentation theater, providing a venue for internal cross-communication, as well as a place for experts from around the world to present their work.

2 The water garden outside of the private office spaces provide a welcome break from the hustle of the drafting room. Reflection and an area where one can slow down the pace of thought are essential for fostering creativity.

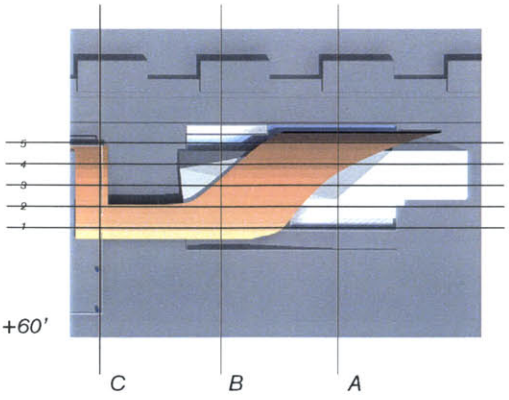
3 A view across the drafting room and into the digital compositing tanks.



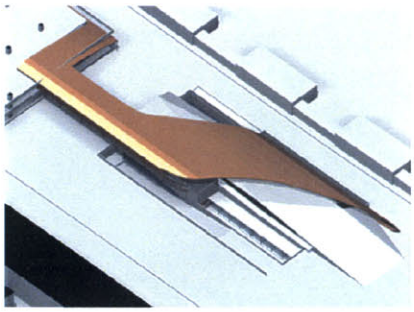


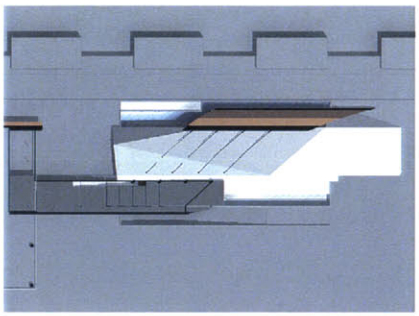


PLANS



plan cut +60'





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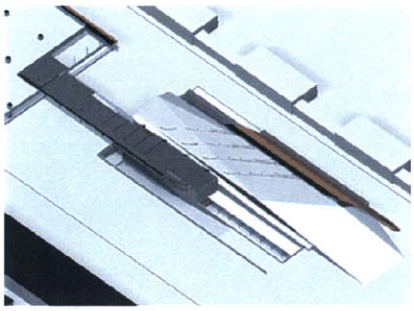

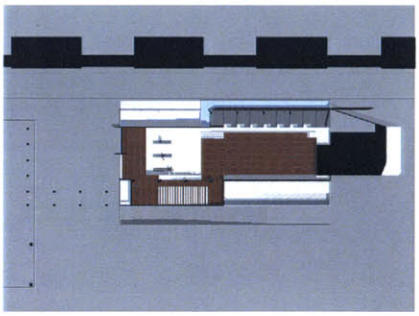

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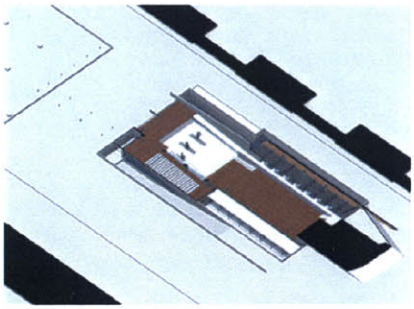

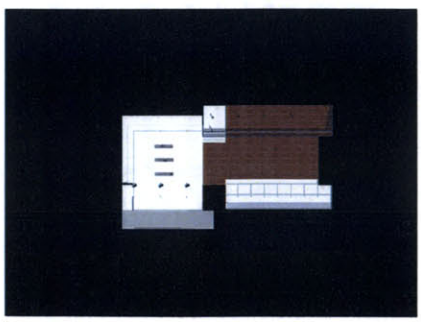

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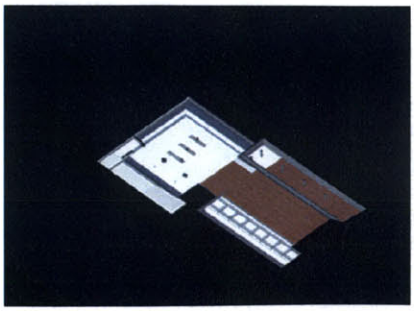
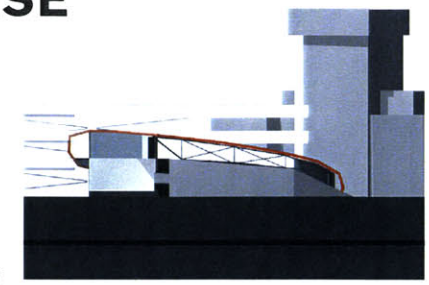
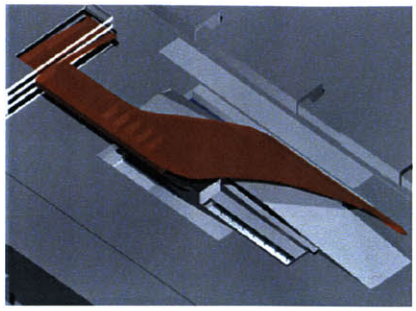


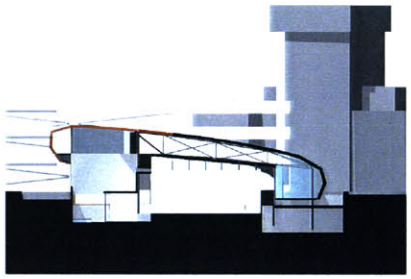
N

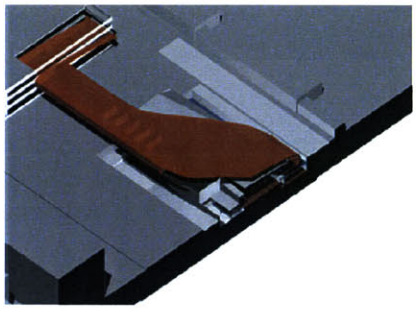
TRANSVERSE SECTIONS





west elevation





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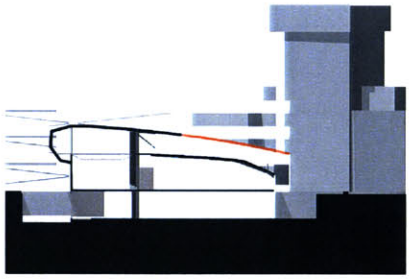

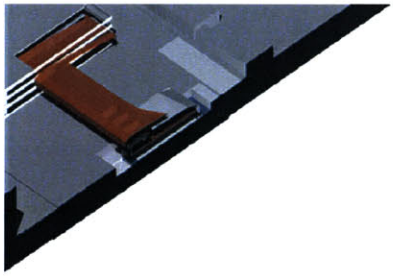

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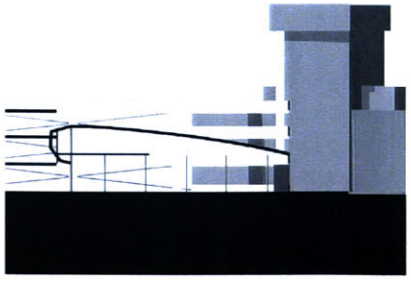

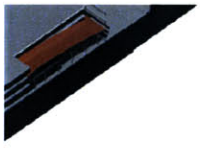

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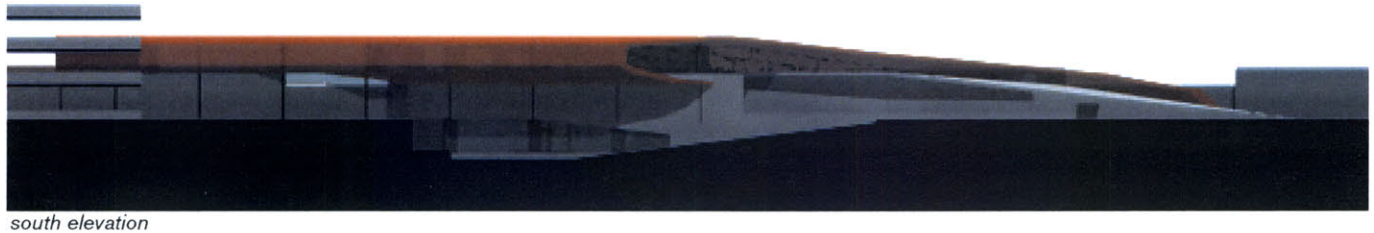
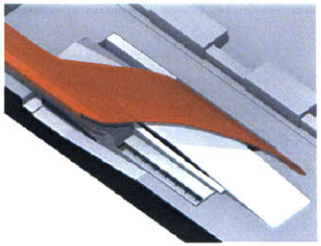
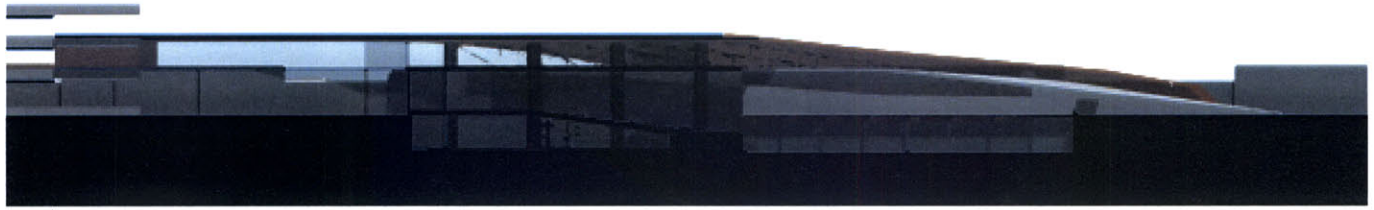


south elevation





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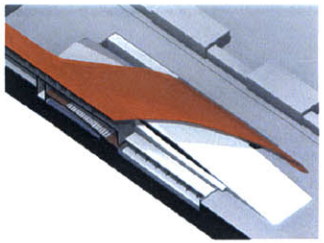

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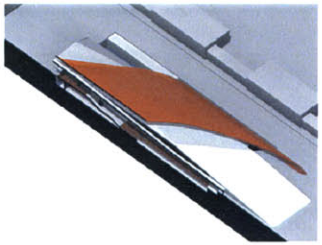
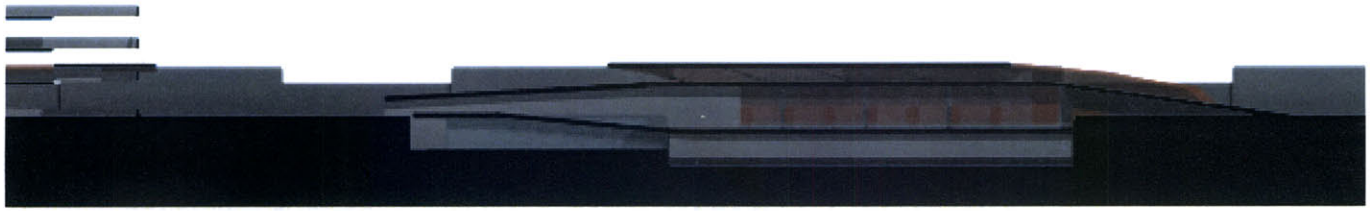
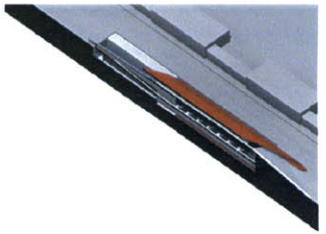


LONGITUDINAL SECTIONS

section cut 3





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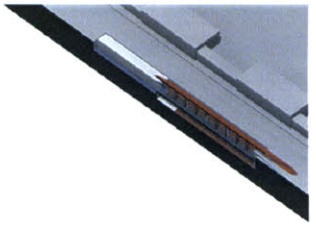
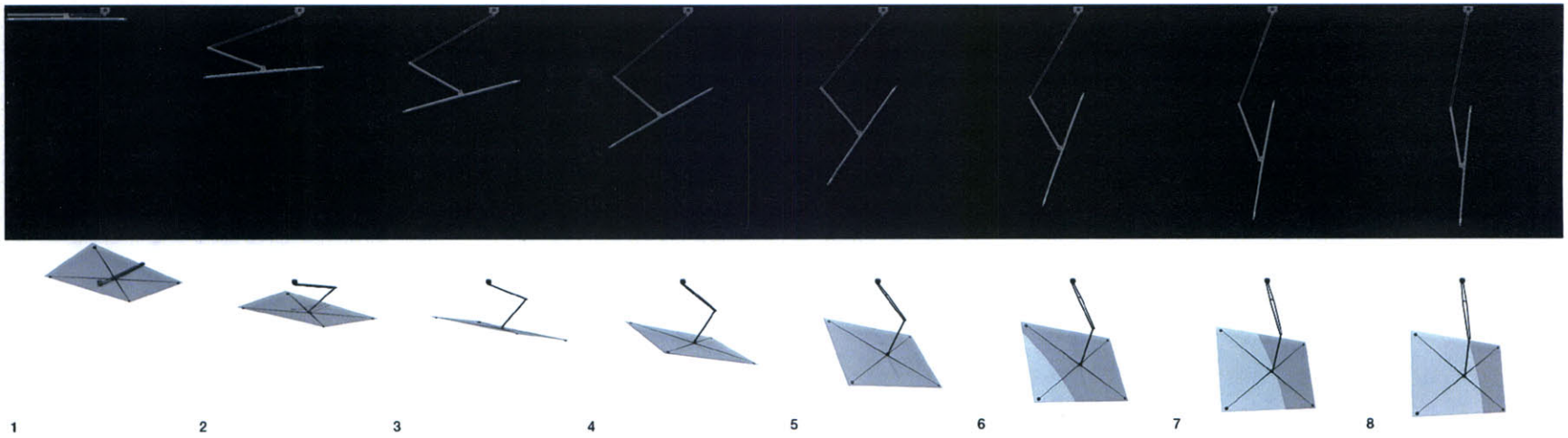


section cut 5

LONGITUDINAL SECTIONS



The ceiling panels seen in the rendered views of the digital drafting room (pages 27-29) are components of the Knowledge Stream surface. Stowed in the ceiling space when not needed, these panels can fold down as shown in the above illustration to form ad hoc enclosed spaces. These panels are active and interactive, and respond to voice, touch and gesture input. In addition, like the rest of the Knowledge Stream, data "flows" across the panel's surface, migrating from one panel to the other, keeping people aware of the totality of activity happening in the structure.

DETAIL: FOLDING DISPLAY PANELS

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Personal Interviews

Eric Petzer, New Product Manager. TSMC, Incorporated, San Jose, California.

John Dwyer, Senior Analyst. Arthur Andersen, Wellesley, Massachusetts.

Robert Ansin, CEO. Massachusetts Innovation Center, Fitchburg, Massachusetts.

Craig Johnston, Assistant City Planner. Burbank Community Development Department, Burbank , California.

Maps and Aerial Photos

USGS Digitalorthographic Survey, *http://edcwww.cr.usgs.gov/webglis*

Microsoft Terraserver, *http://terraserver.microsoft.com/*

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http://www.nbia.org/. National Business Incubation Association.

http://www.positioningitc.org/home.html. Silicon Valley Positioning Information Technology Cluster.

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Sibel Bozdogan, Reader
William J. Mitchell, Reader

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Apple Power Macintosh 8500/G3250

Software:
AutoDesSys Form•Z 2.9.3
Adobe After Effects 3.0
Adobe PageMaker 6.5
Adobe Photoshop 5.0
Adobe Premiere 4.2
Electric Image 2.5
GoLive CyberStudio 3.0
Macromedia Director 6.0
Macromedia FreeHand 8.0
Microsoft Word 98

Body text set in Berthold Akzidenz Grotesk BE.

CD-ROM INFORMATION

The companion CD-ROM includes all the images in this book in a digital format, as well as the final presentation as delivered to the review jury on December 11, 1998. Also included is the midterm review presentation. The format for the CD and files is as follows:

CD-ROM Format: Apple Macintosh HFS format
Hardware requirements: Any Macintosh, or compatible machine, running on MacOS 8.0 or higher
Software requirements: Netscape Navigator 4.0 or higher, or Microsoft Internet Explorer 4.0 or higher recommended

The presentation is in HTML format, so any web browser will be able to access the data. For maximum effectiveness, a Javascript capable browser is recommended.