Drawings and Their Media:
Means of Architectural Design Exploration and Expression

by

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ABSTRACT

The nature of architectural design is one of expression, exploration and communication of ideas stemming from the imagination and previous experiences, and are always mediated from the mind to the physical through representational means which include sketches, drawings, three-dimensional models, and verbal explanations. There have been studies of each of these means, and their respective roles to design. The focus of this study falls in the realm of architectural sketching and drawing. This realm has been studied from seeing the drawing as an autonomous entity, to its part as an integral step within a process of thought and exploration, and from analyzing its content to its composition.

The aim of this thesis is to investigate the ways our imagination and architectural design explorations are influenced by our perceptual and physical experiences of different drawing media used in the act of design. The insights gained are of pedagogical significance in the education of architectural design teachers and students alike.

Thesis Supervisor: William L. Porter
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# Table of Contents

Abstract.................................................................................................................................................................5

Acknowledgements......................................................................................................................................................9

Preface........................................................................................................................................................................11

Chapter 1: Introduction
  Statement of inquiry..................................................................................................................................................13
  Significance............................................................................................................................................................14
  Method of inquiry..................................................................................................................................................15

Chapter 2: Play
  Exercise I.............................................................................................................................................................19
    Student A.........................................................................................................................................................21
    Student B.........................................................................................................................................................23
    Student C.........................................................................................................................................................25
    Student D.........................................................................................................................................................29
  Evaluation of Exercise I.......................................................................................................................................31
  Issues raised..........................................................................................................................................................32

Chapter 3: Design
  Exercise II..........................................................................................................................................................39
    Martin.............................................................................................................................................................43
    Mazie..............................................................................................................................................................49
    Cheng-Ta.........................................................................................................................................................53
    Can.................................................................................................................................................................59
    Rajive.............................................................................................................................................................65
    Vassilios..........................................................................................................................................................69
    Dan.................................................................................................................................................................73
    Mark...............................................................................................................................................................77
  Evaluation of Exercise II......................................................................................................................................81

Chapter 4: More Design
  Exercise III..........................................................................................................................................................85

Chapter 5: Summary and Discussion
  Summary...............................................................................................................................................................94
  Discussion.............................................................................................................................................................103

Bibliography.............................................................................................................................................................105

List of Illustrations..................................................................................................................................................109
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In these two years I have learned and experienced so much, and have been influenced by so many people, than I cannot begin to fit them all on this page.

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I cannot express enough my gratitude to my friends and classmates who participated in these thesis design exercises, and who gave selflessly of their time and energy. Without them this thesis would not have been possible.

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I have been influenced and touched by all of these people. My time here has been filled with experiences and emotions interwoven and intertwined, bounded by a spherical wireframe of these people holding hands. How do we imprint every point of the sphere onto the page? I dare not try for some hands may lose hold, break, and allow something to escape.
Preface

Two weeks had passed since the beginning of the final semester of my undergraduate education. Thesis. I had made two sketchbooks by hand, designed a few birthday cards. Still, when I sat at my desk in thesis studio, nothing. I had drafting instruments before me, parallel rule set up on the desk, trace taped down, pencil at the ready, still nothing; coffee breaks after hours of sitting, staring. After talking with thesis classmates, always returning to the desk with the hope that perhaps some inspiration gleaned from the conversations would take seed and grow, then pop onto paper through my hand. Nothing.

I wanted to find a way of expressing my feelings toward the subject-matter of my thesis: the Tiananmen Square Massacre in Beijing, 1989, and the events which led to it. The “facts” were conflicting, perhaps even lacking absolute truth. But fires and bullets were undeniable; pain, suffering and loss, now matter how caused or how much, were real.

Picking up charcoal and colored pastel: black, brown red, I applied them onto the light canary trace. Black, doom, and red, fire and bloodshed, mixed onto the trace, powdery, messy. The transparency of the trace made the colors seem shallow. Its surface offered nothing for the media to adhere to. Many strokes were needed to create depth and denseness. The choice of the media was an intuitively associative one: their physical characteristics seemed representative of crumbling concrete, of rough surfaces, and texture of dry earth I imagined there to be under the slabs of stone that paved the Square.

I looked at the drawing and saw an elevation. It was a vast empty landscape of destruction with fire in the distance and something huge impaled into the ground with the force of a thrown javelin. It became a section: an above-ground, an underground. Not yet sprayed with fixative, I pinned the drawing to the wall and the excess pastel slid off in tiny powdery granules. The drawing seemed to “lighten,” but the image stayed, the idea grew, and the paralysis of design was broken. It was the use of a new medium, the breaking of the fear of the blank page. It freed me from precise and deliberate placement of lines on a page. I had intents to show and the particular behavior of the media on a given surface caused me to counter it or compensate for it in my endeavor to express those intents. I had allowed the knowledge in my hand take over. The hand-eye-mind triangular relationship was quite clear. The medium used somehow influenced the imagination (mind) through perception of visual cues of the material quality of the drawing media and the drawing surface (eye) and the influences and ideas gained in the physical act of drawing (hand).
1. Introduction

"Each material has its own message, and to the creative artist, it’s own song."

Frank Lloyd Wright

Overview:

The aim of this thesis is to investigate how our imagination and architectural design explorations are influenced by our perceptual and physical experiences of different drawing media used in the act of designing. This begins with three propositions. The first is that the process of design is not linear, and each step is mutually-influential and inferential. In an simplified manner, we may describe the process of design as having the following parts: an idea to be made manifest, the means of representing the idea, the media which are the operators of these means of representation, and the expression which results from combining means and media through the filter of the idea. Here we define “means” as systems of communication, specifically, types of drawing: orthogonal, perspective, axonometric and sketch. “Media” are the materials one draws with, that are left of the drawing surface, i.e.: in, graphite, charcoal, and may or may not be encased by or applied with instruments. The second proposition is that ideas are influenced by, transformed through, and confined by the means and medium used to express and explore those ideas. Just as the ideas behind a design are rarely conceived in a vacuum, but are influenced by the program and nature of the design project, so the “appropriateness” and “communicativeness” of the medium used to convey the ideas are influenced by the nature of the medium. The medium, here, can be interpreted as both the material one draws with, to the type of drawing that shows certain specific information. The third proposition which ensues is the notion that every form of expression carries inherent meanings, affordances, and limitations, and is non-interchangeable with any other. For example, music cannot be described or experienced through words, expression of emotion through speech often falls short of true conveyance. Drawings do not possess the three-dimensionality of physical model space, and the three-dimensional model cannot abstract itself into a two-dimensional image. Architectural plans, sections, elevations, models and renderings show different aspects of a building, and work together to form a cohesive “understanding” of a building.

The physical manifestations of ideas are inherently dependent upon the means of the exploration. Models made from two distinct materials can generate very different forms, drawings drawn with different media can evoke different perceptions. The drawing can either be descriptive/representative or speculative/investigative (explorative), and becomes extensions and projections toward something else. Although not every drawing may be informative to the design exploration, all attempts are expressive and hence have some ingrained order within them. From the physical act of “doing” emerges dialogue between the hand and the mind, illustrating the intrinsic reciprocity of communication and influence between the two realms through the interface of the eye. The interest here lies in how the tools/

2. Oliver, Robert, The Sketch, p. 16-17.
media one draws with affect our imagination. This question may open up issues regarding personal preference toward a medium or style.

**Significance:**

Design is an individual endeavor, personal process, relying on imagination and creativity. This is also a discipline of conventions, of taught "ways" of design and presentation of ideas. Imagination is affected intuitively and physically by many things physical and fantastic. Drawings of conventional construction are used as a standard way of communicating. The media one draws with should be of some influence, if we acknowledge that the physical act of drawing informs us.

The nature of education is that of inquiry into the unknown, of the mysterious as pertaining to how and why we do what we do, a quest to understanding ourselves, the world which we live in and the environments which we create for ourselves.

In trying to understand our place and purpose in the world, what greater repository of stuff to inquire about than with in architecture? There has been much inquiry into the process of design. The trend has been to dissect and categorize everything from objects to processes. This is evident in those disciplines which inquire into human workings. We as humans are creative and imaginative. This marries practical knowledge gained from experience and memory with the workings of the imagination.

The tool one uses in such creative endeavors include those that are abstract (imagination) and physical (materials). The tool is only as helpful as one's ability to use it. "Tools" and "media" change roles in design. The object which the tool/media makes then becomes a "tool" to further inform the designer in consequent steps in the design. This conveyor-belt of transformations and translations of tools and things made by the tools is a never-ending cyclical and mutually-influential process. The artifact becomes the tool for the next artifact, which then becomes the tool for the next step in the process, and so on.

As children the first means of expression we are introduced to us (besides our own discoveries of our vocal capacities) are that of crayon and paper. As our education progressed, drawing was the first thing taken away from us, or de-emphasized) as we were taught how to form our marks into patterns which fit into our shared conventions of written communication.

"Each art exists because the ideas special to it cannot be transmitted otherwise...The plastic arts have a logic, a rationality of their own, which cannot be transmuted into the terms of verbal ratiocination, nor even into a form of nonverbal reasoning, applicable to other types of mental activity."  

drawings and conventions of communication.

The word drawing is in itself one which serves as a noun as well as a verb. This is of great importance as one meaning embodies the other; the artifact captures the energy which created it and holds it in time. There are many ways to look at a drawing, analyzing the type of drawing (plan, section, elevation, etc.), the content, the intent, the expression, the technique, the composition, etc. We may see the act of drawing as the execution toward these ends. Drawing is a way of giving life to one's ideas into the real physical world. There are many stages through which an idea takes physical form through drawing, and many transformations through drawing as it becomes a thing of its own, whose seed is from the imagination, but takes on its own life and stimulates imagination in its viewers once it has reached a level of physical maturity.

In each and every case, there is another medium through which the idea is manifested on its journey from the mind into the physical world. That is dependent upon the physical media and material that the conceiver of the idea uses in giving physical form to the idea. We can analyze drawings in all the above mentioned ways and more, but let us look here at the physical media used, its rules, affordances, and limits.

**Approach:**

**Case-based studies:**

The general domain of this investigation is that of self-expression and one's own understanding of that expression first and foremost, and of other's understanding of our intentions. We express ourselves through words and actions, through subtleties of tone of voice, through the slightest change in body language. In verbal language, there is the interdependency between the meaning of the words used and their delivery. In drawing, there is also a language of communication which draws upon a set vocabulary that is realized in many different ways on a drawing surface by each individual hand.

Expression may be achieved through language or conceptualization. Language makes physical our abstract and ephemeral thoughts. It charts our mental expeditions by physical movement through space. Conceptualization takes large, complex thoughts and presents them through means of vocabulary (simple-complex, general/specific).

Because every hand, attitude, perception, and skill is different, the inquiry would best be gained through insights from case-based interviews and studies. Through seeing many different instances, there would hopefully be some trends made visible, as well as special cases. Can one extract the same emotions from two different people who draw the same thing with the same medium and the same intent? Is there something that is characteristically shared by all?

**Exercise I:**

Presenting architecture students with an array of media, I ask them to draw and "play, make marks, experiment" with each. Then give them a photograph and ask them to draw their interpretation of the photograph with the medium/media they choose, whether it be a representation of the photograph or an image the photograph
inspired. Familiarizing oneself with a medium leads to discovery of what one is able to do with it and how it may be used to express his ideas. When one feels that every method of using the material has been exhausted, there is some other way that is discovered.

There may be “obvious” attributes of different media that are influential upon design, though they may not seem so initially. These include the psychological effects of media which are hard/soft, messy/clean, to extra variables such as the type of paper or surface one draws on. Other factors are color differences, and sizes and shapes of the tool (the vehicle for the media). The subject matter is also important, as one would not conventionally draw intricate details with a fat marker, or use a calligraphy pen to take class notes. The “flow” attribute of a tool or a medium matters when sketching at the beginning phases of design. One’s thought run so rapidly that one’s drawing instrument, as well as the hand that draws, must be able to keep up.

When one analyzes the drawing in general terms, categories are made within “drawing” which consist of the different components which comprise a drawing. These categories fall in the domain of physical characteristics such as line, form, contour, object, expressive characteristics like gestural strokes and expression, and mood achieved through manipulation of the physical characteristics. The investigation and description focuses on the marks made and the objects/subject/things drawn. General discussions of physical properties of various drawing media and methods of using them are in drawing manuals and “how to” books. My investigation is intended to focus upon the drawing media of pencil, pen, and colored pastel chalk, to assess different feeling of the use of these media. This investigation is done through conducting experiments and interviews.

Books such as The Painter’s Handbook make generalizations of the characters of different media: basic composition of the materials and basic types of marks one can make with them. The majority of these books was primarily to describe general attributes, and acknowledge that the quality of the “same” media differ between different manufacturers, and some media made by one manufacturer may even vary from batch to batch.

What aspect(s) of such communicative “media” should be investigated? A subcategory of the general domain is the investigation of the use of different drawing media in the design process. It would be interesting to see if one could establish some idea of how drawing media are involved in generating a design (a dynamic role), and how drawing media are used in “cataloguing,” or documenting the design process (a static role in recording frames of ideas in the reel of one’s thought.) Here, let these two distinctions just established be left open as possibilities of investigation. The empirical aspect of this research needs to be executed through a “means,” not to reach some well-defined “ends” in mind, but to yield results that one may make conclusions from as well as open new avenues of investigation.

Exercise II:

Here I ask architecture students to do a simple one-hour design problem, and observe their individual process of design. Varied media would be presented as options for use. Similar to Exercise I, a post-design inter-

view would serve as a reflection of their process as they interpret it, as well as gaining insight to their choice of
drawing media used in design. This is edifying not only for the observer, but also for the designers as well.

**Exercise III:**

How do different media used by one designer affect the development of one design? The design of Exercise
III is asked to be developed by the original designer in different media. These media would include those with
which the designer is not familiar. Thus, the intent and concept of the project is established already, and the focus
is the development of something already existing, allowing the designer to be more aware of the drawing media
employed in the development of the design.

Psychological aspects of drawing, the idiosyncratic reactions to physical attributes of a medium or tool, must be
taken into consideration. These attributes include the weight of the tool, it’s smoothness in drawing, and a personal
preference or affinity toward the medium and tool. These attributes also affect the “think-draw” correlation. For
instance, is the “smoothness” of mental processes proportional to the “smoothness:” of that which makes the physical
output? Some people are “thinkers” who go through the design process in the head before the end product is drawn.
Others are “doers” who make physical outputs at ever stage through two- and three-dimensional means.

Interpretation of another’s drawing is aided by visual cues, memory and expectation, exclusion of extraneous
information, combining and synthesizing discrepancies, and the comparison with one’s past experience with similar
images.

The end of this research and exercise is not to produce a “handbook,’ such as The Painter’s Handbook, of what
media one should use to achieve a certain end to help one design. This is because human preference/talent/skill of
use is the greatest variable. One of the goals is to make latent properties of a medium explicit so that one understands
why it is that they have chosen to work with certain media for certain specific effects.

What I have posed above constitute my hypothesis that different qualities of different media affect people in dif-
ferent ways and influence their drawing behaviors. It is through empirical means that these qualities and effects shall
be found. People often have generalized notions about different drawing media, a stereotyping that is inwardly,
implicitly known. However, people’s breakdown of stereotypes and use of the medium come with familiarity
through practice and use, which also sharpens skill in the handling of the tool and medium, which in turn changes
telepeople’s preconceptions of them.
This exercise was an inquiry to the physical quality of drawing media, from the nature of the material to the instrument of application. Some initial questions that led to the giving of this experiment included seeing if certain media were used to convey a certain emotion or idea? What is it about a piece of charcoal, its physical nature and its nature perceived by the user, that leads to its use for conveying a certain idea that one would not use ink to convey. How are these perceptions shared and understood? For instance, in this exercise, all of the participants used pastel as a medium to show ideas of light and dark. There were no hypotheses posed as to what would result. The interest was to see what people do with different media: how they make their marks, what they convey with their marks. Observations were made as the exercises were done, then a review/interview afterward allowed them to explain their experiences and intents. The participants asked were all post-professional master of architecture students, two at Harvard GSD, 2 at MIT. This presumes a sample pool of a comparable range of skills in using “conventional” architectural tools such as pen and pencil in sketching. The chalk pastel was added because of its physical qualities so different from graphite and ink.

Materials:

- **paper:** 8”x11” regular white bond paper
- **drawing media:** (1.)
  - pens: Rapidographs: 0.4 point, 0.25 point
  - Tombow “Zoom” fine-point rollerball pen; heavy in weight, black ink
  - blue Papermate ball-point pen
  - black Pilot medium-point ink pen
- **pencils:** charcoal pencil
  - Berol soft draughting pencil
  - Ebony drawing pencil
  - 4H drafting pencil
- **chalk pastels:** assorted colors
- **photograph:** (2.) Interior/exterior light qualities, staircase on one side leading to roof terrace from whence light comes down the stairs; chosen for possibilities of multi-interpretations of the photograph and the space/objects depicted: mass, contour, color, light qualities

Method of investigation:

1. “Play”: the participant was asked to “play”/doodle and experiment with each media separately (one medium per sheet)

2. Photograph: the participant was shown the photograph and asked to draw any impression they had of it, with any medium or mixed media.

3. An interview to ascertain the participant’s thoughts about what they did, and how they used each medium

As presented here, the participants’ comments from the interview regarding what they did in each part are presented as they pertain to each medium. General comments conclude each participant’s exercise. The words of the participants are presented here in boldfaced type.
STUDENT A

Pastel: (3.) Student A first drew boxes with the pastel, first a thin line horizontally with the edge of the side of the square chalk. Keeping the pastel in the same position, she dragged it vertically to make a line the width of the length of the chalk. She then colored in the boxes with the side of the pastel. As this was repeated with several pastels, the overlap and blending of colors consequently occurred.

The pastels were cool, relaxing and peaceful, not rigid. One can color a page real fast. Student A know that one could mix and layer the colors with the medium of pastel, but she had not worked with pastel often and was not familiar with the medium. The idea behind the “play” was to layer, but there was no intended “expression,” i.e., of an emotion, per se.

Pencil: (4.) Again, Student A drew boxes with the different pencils, first the large one in the center of the page, then the corner ones. She then filled in the boxes with diagonal hatching, holding the pencil at a 45-degree angle, pivoting the hand from the wrist.

Student A did not “like” pencils. The only good thing is the ability to change tone...and one can use the pencil for contours, edges, loose strokes. She was definitely affected by the qualities of the pastel in the first exercise, and wanted to fill the page with the pencil as she had done with the pastel. I liked the charcoal pencil best because of the heavy, gritty texture. I didn’t like the Berol pencil. It wasn’t “fun,” it was dull and I couldn’t “get into it.” It wasn’t gritty or heavy, it “just goes.”

Pen: (5.) First, she drew vertical lines, straight and rigid, with the Tombow rollerball pen, then discovered the weight of the pen and the motion and feel of the pen guiding the hand. Her lines moved faster and curved. She drew horizontal lines, crisscross lines, continuous flow, zigzagging back and forth with speed. Diagonal lines on the page started to free her from orthogonality and wrote cursive letters: “cool.” She tried the Rapidograph technical pens. The 0.25 point was “cool” because of its thinness. The thicker-point is for bolder lines. Student A immediately became “rigid” in her line-making, holding the pen upright, drawing in the conventional architectural manner as if inking a plan.

The rollerball pen is “cool.” I love pen; it’s so “architectural.” The rollerball is smooth for fast sketching. The technical pen allows control of lineweight because it is fine and the drawing can be differentiated with the use of pens of different point-size. The rollerball gives and flows, is too smooth and is hard to control the flow. I use pen to sketch. If only a technical pen is available, I would use it for sketching, but I’d be afraid of breaking the tip.

Photo: (6.) Student A went directly for the pastels. I chose pastel because I like it, and can smudge it. This is about spatial interpretation of the image through color and tones. The yellow is the brightest space, the red is the darkest. The vertical surface drawn is the closest to the viewer and, the most reflective. The differentiation of tone indicated surface. She did not use the white of the page in her composition or interpretation of the photograph.

General Comments:

The order of “play” with each medium indeed became influential, especially “play” with a new or unfamiliar medium. The pastel influenced her use of pencil and pen, and also influenced her approach to part 2 of the exercise. When asked if she gained new insights to the media through this exercise that she might not otherwise have presupposed, she answered that perhaps the characteristics were known subliminally, but the act of using the three media allowed her to discover their densities, especially through layering of the pastel. She was also able to compare the qualities of these three media. She usually uses pencil or pen for sketching, and tends toward black and white drawings instead of color. She expressed she would now try pastel at conceptual stages of design because it allows expression of ambiguous, general ideas such as light and motion, without the need for detail.
7. pastel drawing underneath then smudged into an olive-green haze

8.

9.

10.
STUDENT B

Pastel: (7.) Student B’s first action was to drop the pastel stick, leaving a faded imprint of the impact. He made boxes with thin lines using the corners of the square stick. He then began smudging and finger-painting, drawing directly on his fingers with pastel, then finger-drew on paper for “atmosphere.” He “stamped” the paper by dropping the pastel in various places on the sheet, then smudging the extra powder. Dragging the sides of the pastel lightly across the paper, he said you can draw not only this way, but the other way, too. He continued to layer the pastel over and over, filling the whole page, smearing with straight and circular strokes. I’m more creative standing up. In the end the sheet was completely covered, and looked textured similar to grainy green construction paper. After the exercise, he pointed to the table underneath, with pastel smears and masked edges that recorded the many positions of the paper: that’s the process.

Student B wanted to make it pretty. Smudging and blending were the primary techniques. He had never used pastel before because it was too messy. It’s “fuzzy,” which makes it good to relate to other things, serve as a backdrop to something else. It’s so abstract that you do not see anything specific. I would include a pastel drawing in a presentation, as a sketch, because it shows the initial stages of design. You need such a drawing to show the process of design. This would serve as a background for “clearer” drawings such as pencil or pen architectural drawings (plan, elevation, section, etc.).

Pencil: (8.) Oh. I have to sit down with pencil. He drew a palm tree and kept filling in the foliage, making it as dense as possible with the graphite pencils. Student B applied so much pressure trying to create dense and dark areas, but the HB pencil he used barely puddled the paper, as the graphite is shiny, slick and slippery.

The palm tree was an image from childhood: I like palm trees. He used only the HB pencil, drawing away the entire point to the wood of the pencil. I wanted to “complete” the pencil. I used to draw them all the time. The pencil felt “okay.” The size and length of the pencil “fits” in his hand. He just wanted to draw, draw, draw, and would have continued for quite some time had he not been urged to go on to the next medium.

Pen: (9.) This time he was a bit hurried. Okay, I’m done. He used only the Tombow heavy rollerball pen (he remained seated), and only drew one horizontal line.

I wanted to keep it simple. The pen is “slick” in both looks and feel, and it’s smooth.

Photo: (10.) He used the rollerball pen to draw a window, and pushed a space forward from the page in perspective. He then drew a stair in elevation in the foreground. Pencil toning defined certain surface planes.

I interpreted the photograph to be “architectural.” With regard to expression, the rollerball pen was more clear to express lines. Pencil is used to express and emphasize planes, tones mark out different areas, for example, gray is for concrete. He turned the sheet around, experimenting with the orientation. You can look at it in different ways: up, down, sideways. There’s no “up” or “down.” Only the foreground stays foreground, the background stays back. Student B wanted to cut out the drawing and place it on the pastel sheet. This drawing needs a background, some compositional placement. Use the pastel drawing as background, maybe because the pastel is soft.

General Comments:

Student B’s comment, “that’s the process,” referring to the pastel marks on the table surface, suggested a capturing of the making of the drawing. The marks were “masked” by the paper in different patterns, effectively making another drawing on the table. A drawing can thus be made through another level of mediation; it is not the original material which makes the final product, but the “by-products” of the material.

He learned that one can draw in different ways with pastel. You can flip the paper and draw from many angles and sides (this would be attributed more to the freehand nature of the drawing, and his rotation of the page). The image is so abstract, which lies, in part, in the lack of contour. The planes of color have no bounds other than those of the sheet of paper. No object is defined, the content lies in materiality and imagination of what is perceived.

Student’ B’s exercise raises notions of what he perceived certain media to be “for,” as well as what role the drawing would serve, i.e., abstract sketch, detailed drawing. This is exemplified at the end of part 2 in deciding that the drawing needed to be composed against something, and the pastel serves as a backdrop. He felt the softness of the pastel best serves the making of an “atmospheric background.”
11. landscape

12. seascape with rowers in a boat

13.
STUDENT C

Pastel: (11.) The first pastel drawing Student C drew was of a landscape. His technique was to drag pastel along the flat side of the stick. He layered the medium for density of color. The layering became so thick the paper began to become “saturated” with pastel, and each mark left more powder on the surface.

(12.) The second pastel drawing was of a seascape, switching from blue to black to blue again at the horizon level. When asked if the black had been a “mistake,” he said, no, just wondering if it was day or night. He used different pressures on the pastel. In one instance, he examined all of the edges of one stick of pastel. He had a particular kind of mark in mind and the pastel was warped. He tried the end flat on the page, tried it lengthwise flat on the page, but it was warped so only the ends makes marks. Consequently he dragged the pastel sideways along the edge that was not warped. As the boat was of the only differentiating color, Student C expressed that he needed another color to suggest reflection. His strokes for water suggested movement and the white of the page left between the strokes of curved waves created depth through the granules of pastel chalk.

The pastel is not new to Student C. The pastel is great because it is messy and thick and you have to hurry up, because of the very gestures you make. If you don’t “get it” in the first two or three minutes, you might as well stop, because it’s so thick. You can’t “fix” it. If you still have white spots on the page, you can work with it. Once the color is down, the color laid over it won’t be pure anymore because of the color underneath. He expressed that, had the exercise been given such that the participant had the choice of the order of media to “play” with, he still would have gone for the pastel first because of the colors and personal preference. He felt it would have been interesting just to doodle, so even if there were lines that didn’t make sense, it would have looked nice anyway.

Pencil: (13.) He drew a face with the Berol soft pencil using quick flying short strokes, pencil held loosely. He experimented with the charcoal pencil and the Ebony pencil and decided to draw with the Ebony pencil.

He drew a figure next: light lines over and over, to get the “right form” and quick shading to mask out the desired area. This was a sort of preliminary sketch guide. The figure was developed with short and light pencil strokes.

Between the Berol, Ebony and charcoal pencils, the Ebony is different from the pastel. He like the charcoal which fives a rough feeling. He wanted a smooth feeling which the Ebony pencil gave. All the other pencils and pens are sharp; the Rapidograph is a “turn-off” because you feel like you have to know what to draw a priori, and it is technical, something which is already figured out and not spontaneous. Pens and pencils are for thinking.

Pen: (14.) He chose to draw with the Tombow rollerball pen, making light, straight and fluid lines, some almost “vibrato-like” in nervous energy, and hatching with fluid curving lines.

This drawing is of a monument on the site of his master’s thesis project. He liked the rollerball pen, anyway, I like this pen, the flow, the feel, no worry about sharpness...He usually sketches with pen. Pencil is temporary and will fade. It’s logical to use pen if you want to go back to it later.

Photo: (15.) The child is waiting for his parents to come home. He used the rollerball pen, but pencil would have been equally acceptable to draw it; the Rapidograph is still to sharp. Pastels would not be able to capture the feeling he had about the picture. The expression in the child’s face needed to be captured. You need to get something from the face. It needs to be detailed, and pastel is not good for detail. The pastel is good for gesture. His impressions of the photograph were that no one is home, no furniture, poor or abandoned, lonely and sad: where are the people? The stairs were reminiscent of his own house growing up. He would wait on the stairs for his father to come home.

General Comments:

Student C really worked with each medium, making light preparatory strokes, almost a personal process of drawing, waiting for some “guidance” or “clues” form the medium. The pencil is very basic. It’s the first thing your parents give you to scribble, draw or write. He was very perceptive in comparing the media used, their physical qualities which influences the way one has to use them. The speed of drawing that he said about drawing with pastel also pertains to the time one is allowed to get an idea or be inspired. For instance, the con-
versation in the pastel section regarding the speed with which one has to use it because quickly the page is filled and becomes difficult to change.

On expression: (16.) The medium is different, but it’s the same expression. If you put your mood into it, in your head, it’s always an expression. There is a difference in expression between drawing with a sentiment, and documenting that sentiment. Intense emotion on canvas is rare. Drawing is for relaxation. Once you put an intense emotion such as anger on a drawing surface, it would turn into something else. Two minutes of drawing “anger” is hard. The minute you start to feel angry, it would change because drawing is soothing. If I’m sad or depressed, I would not attempt to draw. It is not the first thing I do when I have an intense emotion. I would talk to someone. Paper is not good enough an outlet.

On imagination: As his “play” exercises were not just random marks, but actual pictorial drawings, we talked of the content of the pastel drawings. In general, the easiest thing to depict is a landscape. (11.) This is true not only with pastel, but with any medium. A landscape could be anywhere on earth. If one were to draw fruit, others would be critical in evaluating how accurate it was to the real thing. If I draw a tomato, I’d want to go get one. Landscapes are in your head. You are constantly looking at landscapes: the sky, water, open space. They are in your head. There is always a landscape in your head; “the view.” You can take smells, food, clothes, parents, with you to different places, but you can only take a landscape with you in your head. Therefore, it is very close to you.
17. colored squares: red, magenta, blue, green, purple, light blue, orange, diagonally scribbled over with dark blue, and yellow, then divided with a black grid

18.

19.

20.
STUDENT D

Pastel: (17.) Student D made a grid of solid color, the speed and the vigor with which the lines were made are captured on the page and looks like they are about to move off the page. He quickly put a black grid to separate the patches of color. He used a technique of crushing the stick to get small chunks of the material, then smeared the material on the page.

   Pastels are fun colors. I'm not good with them, but I like them... Messy is good. Like the pencil, there is variation of color, (too many choices sometimes,) thickness of line, density of line, and gesture of line, to name a few.

Pencil: (18.) This, too, was done with great speed. He used the various pencil types offered. The right-handedness is just as evident as in the pastel. The densities and range of depth the medium of graphite and charcoal are even more evident.

   The dark charcoal looks better. I like contrast. The pencil is fun. You can change the pressure of the mark. It’s a direct translation of emotions.

Pen: (19.) The drawing is also full of energy, a scribbling of lines, no intent behind the marks.

   Pen is boring. I don’t like ink. It’s too monotonous. You can’t change the line without changing pens. The Tombow is smooth and feels better. It still doesn’t allow you to do different things. It is still monotonous ink flow unless you let it sit and blob.

Photo: (20.) The idea behind this drawing was to differentiate light areas of space shown in the photograph from the dark areas.

General Comments:

   The order of the media given was pencil, pen, and pencil last, which differs from the order of the other participants. Here, like Student B, Student C also had in mind what the pencil could be used for: use the pencil to outline. Pens are for writing, notes, sketching. The lines are too fine, and do not allow for many readings. The point about motion comes up again: you can get more into pastels; the arms are involved. There was no real intent behind the drawings. You told me to doodle. So I doodled.
**EVALUATION OF EXERCISE I**

**Questions of control:**

**Method of observation:**

Each student was observed in an inconsistent manner, some observed casually, others closely. The settings of the exercises varied as well. How would the exercise have been affected had the observer not been in the room? The one of the goals of this exercise was to see how people draw with different media, which made it necessary for observation of the exercise. However, did the student feel “pressured” or the need to “put on a performance” while being observed?

**Standardized instructions:**

Instructions given to each student was ambiguous. “Play” needed to be further defined, as one’s drawings have some sort of content. There is a difference between just “drawing” and “thinking about” drawing. Student C was concerned about the reason for the experiment of an “end.” He was concerned about doing this exercise for analysis, versus just drawing. He was concerned that if he made any random marks, it may “not be enough” for an analysis. This refers back to the previous concern about “pressure” to produce. Student D, however, just “drew.” The student may have been lead through the suggestiveness in the words used in instruction. Student D said, **you said, ‘just doodle,’ so I doodled.**

**Drawing surface:**

There was no paper selection. In the focus to investigate drawing material, the surface which receives the media was neglected. The variables may have been thought to be minimized by keeping the drawing surface constant, but this neglected the inherent differences of drawing media. Bond paper may not have been ideal for use with pastel charcoal, which needs a rough surface to adhere to. Some media inherently require rough surfaces, others, smooth surfaces. The bond paper may not have been ideal for use with the pastel charcoal. Perhaps the type of paper gives clues to the user and influences the selection of drawing media. Variation in paper size may have influenced that which was drawn.

**Varied drawing ability and personal preference:**

Individual drawing ability and skill, or prior knowledge in use of the media can by quite consequential in assessing these experiments. The small sample here consist of graduate architecture students with first-professional degrees, except Student D, who has a four-year undergraduate architecture degree. Each person had varied experience in drawing and drawing in the given media, although this exercise approach presumes
a comparable level of drawing ability and architectural/representational sensibility.

Part 2:

The instructions failed to specify whether the drawing was to be “representational” or “expressive” to show the “feeling and impression” the student felt and saw in the given photograph. The choice of the photograph was influenced by the geometric qualities of the content which included mass, contour, space and suggested space of from the space at the top of the stairs, as well as the atmospheric quality of bright contrast and the “mood” quality of textured walls and ambient light. Students A and D’s drawings (21.) may be considered “representational” or “mimetic” as they tried to reproduce exactly what they saw, interpreting depth and light with the colors used. Students B and C (22.) were more interpretive and made drawings of images which they thought of after seeing the photograph.

Influence of logistics:

As all the media could not be explored simultaneously, there was an order in which the media were explored. The choice of pastel-pencil-pen was arbitrarily set when that was the order taken by Student A. The order of exploration of the different drawing media may have influenced the student’s attitude toward one medium based upon their attitude/affinity toward the preceding or another medium. This was certainly true in the case of Student A and the pastel and pencil. However, this showed that the media were close enough in physical characteristics in order to be compared, and also allowed the generation of discussion of the media in comparison with each other.

Post-Exercise Issues Raised:

There are notions of the physical qualities of different drawing media that are implicitly known and shared by people who draw: the permanence of ink, the loose nature of chalk pastels, etc. The choice of media would be guided according to the intent one wishes to convey. These choices in architectural design change and vary with the level of refinement of the design. For instance, perhaps one would use pastels in the initial stages of design, when ideas are abstract and vague, then proceed onto finer and more permanent pencils and inks.

In The Design of Everyday Things, Donald Norman speaks of “affordances” of objects.6 He defines this term as “perceived and actual properties (of the object), primarily those fundamental properties that determine just how the thing could possibly be used. For the study of affordances of drawing media as related to architectural drawing, one must understand the conventional representations of architectural design. There are a variety of types of conven-

23. Student B

24. Student C
tional architectural drawings such as orthogonal projections including plans, sections, and elevations, which constitute a “set” of drawings that collectively reveal all the information about a building.

Conventional drawing media for these drawings include pencil, pen, and occasionally color is used for diagrammatic or presentation purposes and rendering. Drawings other than orthogonal projections describe non-quantifiable experiential aspects of a space, for instance light qualities that may be conveyed through the use of certain media that lend themselves toward ambiguity. The drawings of Students A and D for part two of Exercise I, and Student B’s pastel drawing in Part One, (23.) are examples of the chalk pastel affording murky, atmospheric qualities of tone, shade, enhanced by the color differences. The different degrees of softness of the pencils afforded tonal differences in shading, as seen in all of the examples of pencil drawings in Part One.

_Affordances:_

The affordances of the three media used in this exercise, the graphite/charcoal in pencil form, ink from pen instruments, and chalk pastel, can be evaluated in many different respects. One can evaluate the affordances of each in light of their use as a design medium in the process of the creation, or as a documenting medium of something which already exists or of a design that is finished. The former would involve the physical capture of fleeting ephemeral thoughts and thought processes toward an end not yet known. The interaction between the hand and the tool and medium in the hand becomes a dynamic and mutually-influential one. The affordances of the medium used as a means of documenting would be more of a “defined” enterprise, as the condition drawn exists and the aim is for exact conveyance of the “reality.”

_Expression:_

The freedom of interpretation in physically expressing either an existing thing or thought often evolves with the nature and unique characteristics of the chosen medium. The content may change and, in the end, may not be what one had initially intended. The control comes with familiarity and practice, the “rapport” created between the hand, the mid, and the medium through time.

These different physical qualities of media affect the way they are used: pastels have the physical characteristics that allow them to be held, not delicately like a fountain pen, but grasped overhand, using the entire arm in a sweeping motion. Pencils, as in Student C’s pencil drawing, allow one to use just a flick of the wrist to leave marks upon the page, and in Student D’s example, (24.), one can assert pressures upon the drawing surface at high speeds to achieve dark marks and capture the speed of the marks, served manner of writing or drawing.

There is also a difference between what the raw medium itself affords and what the combination of the medium and tool affords. The affordances of the medium in its raw nature is enhanced by the tool which applies
it. For instance, ink as prepared for use is a fluid substance which is spread and reconfigured on a surface. Ink from a thick marker affords broad, sweeping, thick lines, and varied-pressured strokes, and the level of detail is dependent upon the width and shape of the marker tip. It becomes an issue of the nature of the drawing instrument, and then an issue of the hand which draws and the imagination which guides the hand in creation.

Interpretation of affordances of a medium is an important issue. What notions of affordances are shared, and how do they become shared? How does one acquire this knowledge? It must be more than what instructional “how to draw” books say. It is gained through experience. An interesting point is illustrated in Student C’s post-exercise interview regarding the expression of emotions (25.) When asked what medium he would use to express the emotion of anger, he said that first, he would not choose to draw when angry, because drawing is a peaceful, calming activity. He would be more likely to slam doors when angry, or talk to a friend when sad, than he would to draw. He then made some strokes violently on a sheet of paper pretending he was angry. He did this with a charcoal pencil and then a drafting pencil. Though the two sets of marks looked different because the media were different, they expressed the same anger. It was very difficult to interpret those marks as being “equal” in intent, or as being expressions of “anger.” The marks had so much energy that they could just as well have been expressions of enthusiasm or excitement and happiness.

How could the knowledge of these affordances made explicit help people design? Is half the battle won in the act of making explicit these affordances of the media which people individually attribute to them? Student B drew his palm tree (26.) with such concentration, elbows on the table, head in one hand, intently pushing layers and layers of graphite into the paper. But how many times have we drawn our own palm trees while in class or while talking on the phone? Is it the object, or content, of what we draw that influences our choice of media? Could we draw these things that we always draw in many different media, or do we always draw them in one specific medium?

There are many variables when one speaks of the affordances of a medium and representation/expression in general. Expressions must be made physically manifest through some means: there is always some vehicle involved when one expresses something to others around him. Drawing media is applied to a surface through some instrument, by a particular hand which expresses some content in a particular method, or through a particular mode of representation.

As this exercise was simply the use of media without a specific given intent, each participant either “doodled,” making random marks, or invented their own content. To see how the media influences architectural design, a specific design problem was given in a second exercise. Unfortunately, not all participants of Exercise I were able to do Exercise II. Only Students A and B were able to participate in Exercise II.
3. Design

EXERCISE II

challenge: creation of a private contemplative space 50 ft. behind house. For reading, viewgazing, retreat. Must provide shelter from wind, sun, rain.

site: - flat site to rock-face cliff
- house 50ft to north, site is behind house; open view from house to cliff site
- view to south out an over cliff to ocean 60ft below
- can build anywhere: on ground, off cliff, etc.
- deciduous trees to West, other nature elements (vegetation/foliage/growies) as imagined and specified by you
- seasonal climate

program: - sheltering structure
- seating area for 5 persons maximum
- contemplative, private space

This is a focus on the media we use to design, and what happens in the physical manifestation of our imagination. The deliberate lack of graphic information was deliberate forces the imagination to design the site an create one’s own environment.

The study of the influences of drawing media in architectural design shall be confined to the task of observing the design as it unfolds in the design process, and observing and speaking with the designer as they design. The study is of the use of media-in-process, and the possible influences of this dynamic act within, on, and in the process of creative imagination in design. These influences are perceptual as well as physically-informed by experiences during the use of the media in design.

The choice of drawing media may not necessarily be made consciously, as the initial expression is that of an idea, not of the possible marks and effects the media may make or possess. The media chosen is usually that of conventional use, what one is taught in class, or a decision based on personal preference.

Observations and interviews give the persons interviewed insight of themselves, be it their design process, their sensibilities toward their chosen design media, or other aspects of themselves that were not apparent or known to them previously. Insights gained by both observer and observed are dependent upon the environment in which the experiment takes place, and the level of rigorous inquiry are dependent upon the questions asked. This is by no means a scientific experiment: there are no “controls” other than the subjects studied are post-professional architecture students at MIT and Harvard. Though the choice of media may shed light on the designer’s education or personal preference, no definitive conclusions as such may be made. The number of people studied do not constitute a “sample size” by any means. They are not representative of a general population of post-professional architecture students,
nor are they representative of the various educational systems in which they received their training. This study proposes to find its merit in the observations made, the making explicit of latent aspects of design for these individuals, and the questions that may be raised by the observer and the designers.

The questions asked were:

1. What role does drawing have for you when you design?
2. How do you use drawing to inform yourself?
   a. As a physical act
   b. As an artifact
3. What do you usually draw with?
4. Why do you draw with the media you choose?
5. Have you found different media have influenced you in different ways? How?
6. What is the concept of the design? What served as inspiration?

Because this is a study of drawing media in process, the observations of the students who participated in the design exercise shall be recounted in a step-by-step manner as the design progressed. These are followed by questions and discussions with each designer. Boldfaced type reflect words of the designer.
The following is the description of the design exercise:

challenge: creation of a private contemplative space 20 ft. behind house, for reading, view-taking; must provide shelter from wind, sun, rain.

site:
- flat site to rock-face cliff
- house 500 ft north, site is behind house, open view from house to cliff site
- view to south of an over cliff, 600 ft. below
- can build anywhere: on ground, off cliff, etc.

program:
- sheltering structure
- seating area for 5 persons max.
- contemplative, private space

This is a focus on the media we use to design, and what happens in the physical manifestation of our imagination. (scary movie music starts here...)
began to draw directly on the 8.5"x11" design brief sheet with a lead-holder, first with an elevation drawing of the cliff and his design, as well as the house, whose size he changed three times. (27.) The enlargement of the house served as a way to give scale to the design. There is a scale problem, and since there is no definite scale, the design always becomes larger during the development. The house is introduced to allow a reference. Colors are used to delineate and differentiate elements in the design: red for walls, purple horizontal elements for the "bridge" and line of separation from enclosure to open space above. The blue water and green of the land marked the site conditions, giving orientation. Light strokes of the purple pencil over the roof element were made next, strengthening of the curved line of the roof/shading piece. The plan was the next drawing done, still with the same lead-holder, and many successive plans after revisiting the brief. The scale of the drawing in plan is determined by the size of the door drawn. Lines were emphasized with the pencil, darkening, going over and over each mark. Two smaller plans and two details were drawn. On the back of the sheet, he drew the site plan. (28.) First he drew the site, then the house, trees, the approach to the house, cars, grass, and the design. Purple was used to poché the walls, pencil for floor tile (again, scale), elements of the bridge and stairs were emphasized in orange. The enclosure of the yard connecting the designed space with the house was quickly established in pencil. The trees were emphasized with green pencil, and using pencil, explored the size of the cars, again, a way of establishing scale to the drawing of the site plan. The figure of the house was hatched and the entrance to the house marked. In pencil, the edge of the cliff was then placed in relation to the designed structure.

Projecting to the bottom half of the page, he began a section drawing. Beginning with stairs, he erased them to re-situate the drawing on the sheet. Light pencil lines projecting from the plan of the designed plan, he proceeded to draw the cliff, bridge, roof element of design, the stair and landings carved out of the side of the cliff. He then began to differentiate the different elements of the design with color: orange for the stairs, blue water, purple outline of the cut of the land, the carving out of the edge of the cliff engaging the descending stairs, quick poché of the land with the side of the pencil, light orange for the side of the structure, emphasis of the roof piece, blue element protruding through the roof, the house in blue, finishing with the bridge in orange.

The design is comprised of separate elements that find their connection to each other: the horizontal elements of the bridge, the separating plane from the enclosed room and open space above, and the curved roof piece at the very top. The diagrammatic emphasis of these elements are strongly tied in the first section where they are "coded" in purple. There is a strong gesture outward and flying out over and above the land and sea of these elements, tied to the
land through the bridge connecting to the house. The stair connecting the land to the sea as shown in the second section is clearly separated from the face of the cliff, but the two are connected in a way that seems almost a result of the force of the stair on the side of the cliff.

The concept of the design is the juxtaposition of an enclosure at ground level, and an open area above. The cliff situation is reinforced with the structure that is light, has no rules, and is what can’t be done with the house. There should be tension: a closed part with some opening which dramatizes the view. This is in contrast to the exterior space above that is the deck of a ship. If it is cold, the space can be enclosed, but with glass; otherwise, it is to remain completely open. The stair connects the two spaces. The stair is the problem because there is an interior and the ‘public’ space leading down the side of the cliff, so there is the need to divide. The various plans drawn were to solve that problem, darkening in the walls, working out the circulation for ascending and descending while separating public from private. The plan en verso shows the public vertical circulation leading from the bridge, continuous from the house and more open. The private stair is on the inside of the space.

Answering the question what he usually uses to draw with, Martin stated that he always uses inappropriate things to start. The mechanical pencil is a nail. It is too hard, but you make something out of it. In designing, you are always unsatisfied with everything...until the roof element was drawn: there is one mark which changes everything. You have a negative image in your head, then one thing is positive, and it comes a half hour or two months later... We talked of imagination and the act of designing, and of the environment as a factor which affects one’s imagination and creativity. The design exercise was done in his thesis office space which he had “customized” for himself, which took him about half the semester to realize that this long table surface running along one wall and linear space was what he really wanted. The imagination is something you want to achieve. This involves customizations of inappropriate things for you. You know there is something out there, struggle with something, still with conviction that it is possible to do, that you can do it though you do not know how.

As a post-observation note, though the choice of colors were, according to Martin, “random,” I would like to postulate that there are connections between colors chosen and conceptual representations they are assigned, often subconsciously or as the design progresses. On the front of the sheet (27.), the house and the land are drawing and poché in pencil and black color pencil. This indicates given “grounding” conditions of the site off of which the structure is designed. The stair element can be seen as a unifying element emphasizing the vertical nature of the site and the situation of the design “in the air.” The purple ties the horizontal elements and shows the shifting of elements “of and from the earth” (bridge from the house) into the air (roof element). On the back of the sheet (28.), correlations can also be made between plan and section drawings through the purple-coded elements. The section of the land is articulated with purple poché, as are the walls of the designed structure in plan. This gives the indication of the connection of the land as a horizontal surface with that of the plan of the design as a horizontal surface, an extension of the land past the edge of the cliff. That surface does not only extend past the edge of the land, but extends over and above, as shown in the section. The blue of the house and the blue vertical element protruding through the curved roof of the design seem indicate some relation between the two structures. The orange of the circulation elements is clear and consistent in the drawings, and the orange of the design seems to imply that both the horizontal bridge
and the stairs are elements which extend from the structure to the sea and the house. This is an interesting change in viewpoint from the first section drawing on the front of the sheet (27.) where the bridge element can be read as a connection whose direction comes from the house.

The colors made for these differentiations may have been made unconsciously, this may not even have been deliberate, but I pose these as an observer as possibilities, as this is from the point of an outside viewer. These readings may not have been intended by the designer, but the use of color in this diagrammatic way offers to the viewer more clues for interpretation and understanding of the design. The colors also establish a legend of sorts, conventional notation created for the following drawings of the design.
Mazie did the design exercise at her studio desk at the Harvard GSD. The materials she used were a 2B pencil, sharpened 2H pencil, and a roll of yellow trace. Her first decision was to choose between yellow trace and white trace. Her attitude toward the two was that white trace is for hard-line or presentation drawings, yellow trace is for sketching, and she chose the yellow trace.

With the soft pencil, she diagrammed the site conditions as textually given in the design brief. (29.) She moved the trees around, and decided she wanted only one tree and eliminated the rest. The elevation she started with became a section as she cut into the ground because if it's for five people, let's stack them vertically, with a stair in the back...no, I don't like that, so let's line them together horizontally, and move the tree here. (30.) Making thick and thin walls with the soft pencil, different degrees of enclosure were explored for the adjacent square rooms, and placed the single tree in one of the end rooms. (31.) For access into the rooms, is each one going to be a jail cell? Working in plan and section in the preliminary design, she switched to section and axonometric as another way to diagram and place the rooms. The tree is going to be in one of these rooms. (32.) There is no view out of the room next to this room with the tree, but there is a window into the tree room so a person can look at the tree. No one can go into the room with the tree: they could if they wanted to, but the width of the gap in the dividing wall is only one foot. These walls have to be thick. I don't really know if I like this. It's for five persons? No maximum no minimum? Looking back at the brief, she started sheet 5 (33.), drawing a section in the corner of the sheet. In adding on meaning, what the materials that make up the spaces might be, she imagined a wall or a fence, what different things the lines stand for. At first glance, it might be a treehouse. You just sit in the room and took through the window...She moved on to a next stage with sheet 6 (34.) on which she hardlined the plan and sections with a mechanical pencil, lightly laying out precise gridlines in 1/8” scale. The grid was subdivided with the use of a triangle and parallel rule. The tree was precisely placed with a circle template after marking out the center-point of the room. The roof plan was projected above the plan and a skylight added, measurements always in mind. The walls were pochéd and plans labelled with the 2B pencil. Going back to the mechanical pencil, the elevation was projected above, the ground cut darkened with the 2B pencil. The elevation became a section as the outline is drawn: I know, I'll make it a section...and put in a chair. After pochéd in the walls with the 2B pencil, she erased the chair because she did not like the way it looked. It's not a fixed piece anyway. Turning her attention to the tree, she decided it would be a small one. A human figure was needed to give scale, and after pointing in the section six feet here above the window in the room, three feet here in the center of the window, so you need a chair, can't see
out of the window without a chair. The room is a concrete shell. The room for the tree is an open-air fenced enclosure. The edge of the cliff is two feet away from the south wall. Sheet 7 (35.) was a conceptual sketch of the driving idea which was to have two spaces, one really solid and enclosed with fixed views, to play off another space that is more light and free.

The act of design is not purely experimentation and physical testing of ideas through drawing. Mazie spent time reconsidering the project brief and thinking while twirling the pencil around and around in her hand. The design brief itself left too much to be interpreted. It is clear that the attention was focused on the design of the structure as an autonomous entity without engaging the site. The drafting tools aided in the development of the design, setting out orthogonal design moves.

In discussion afterward, she said she never designs with color, always sketches with pencil. Even in presentation drawings, she uses pencil because the weight, grittiness of the lead in a leadpointer is more precise for the meeting of two lines and gives a clean look, as I’m not skilled with ink. With the pencil, I can design through layers: light to heavy, and keep adding on the layers, generating a thickness of plan. I started my design with a box because that makes me think more with pencil than with ink. The fence was an idea I already had, so I began to differentiate that from the wall using thick and thin lines from the beginning of the design. In designing, she was very conscious of her tools, even conventions of taping down her trace even for sketching that did not need the use of the parallel rule.

Drawings are often analyzed according to physical descriptions such as line drawing, shade and shadow or tone drawing, sketch, rendering, perspective, or orthogonal drawing. By convention, analysis is different according to the stage of the drawing, according to the different drawings that reflect the stage of the design. This difference in analysis lies in the meaning (abstract or representation and definitiveness) of mark, of the character of the mark, of the differentiation of the mark from the mark that is a line that takes on meaning. Hierarchy of lines are established as they begin to represent ideas and take on meaning. By architectural drafting convention, the heaviest line indicates a slice through a solid, the subsequent degrees of lines that indicate objects and planes lighten as they recede in depth from the viewer, and weights vary according to definition of a plane to the indication of its surface texture. These differentiations change in relation to each other as the idea develops and is refined. What begins as the heaviest line may become the lightest as a heavier line is made. The construction lines as compared to the lines of the design is one such example, the single lead allowing different lineweights showing differentiation. The hardness of the 4H incises the trace, leaving a faint line like silverpoints used in previous centuries for laying out construction lines. Perceptually this provides a slight depth and 3-dimensionality to the drawing itself, as well as a feeling of grounding the idea into the page.
generated his design through the use of trace, through his perception and imagination of what elements to allow through to each subsequent sheet of trace from the previous drawing. Drafting tools such as the straightedge, compass, served as form generators, and the transparency and translucency of the trace was exploited in creating a methodology of design generation. **Opaque paper requires the mental transfer of plans, and when drawing upper floors, sometimes dimensions change slightly, and things don’t match up in the end.** His work setting was a drafting board on his kitchen island counter, using non-print pencil for layout, mechanical pencil, artpen, eraser, compass, scale, triangle and parallel rule.

There will be solid aluminum walls. The first floor has not windows, only doors. There will be five stories, one for each person. (36.) After drawing the first floor in ink, freehand with this artpen, he used his compass. I want to use the circle, something perfect: a circle inscribed in a square is perfect. (37.) The stair doesn’t make sense. I’m fascinated with drawing stairs, windows and doors because they are so intricate...and make the drawing look so pretty. There are no windows on the first floor and no view...I don’t like this staircase because it is too irregular. Stairs have to be regular. Taking the section of this plan, I’ll do the stairs first to determine the height of the room from the rise-run ratio. (38.) The grid of rise-run ratio was set up on a separate sheet.

The problem with trace is that you can’t see clearly after three sheets: either the lines from the previous sheets are not visible anymore, or the faint lines obscure your vision and become distracting to see what is drawn on the topmost sheet. So you lay a piece of white paper between the top sheet and the next to create a new clean surface. Then you collage the section onto the plan, (39.) because trace allows you do to do that simultaneously. Freehand in pen, he made a new drawing that combined the overlaid plan and section, making a new plan, and elements of the first plan became support for the suspended stairs. (40.) He poché certain parts with pencil. **The paper size does not matter, unless perhaps it’s for documentation purposes.** He continued taking each new plan, making sections, projecting back into new plan, and so on.

The first floor is all walls and doors because that is the entry. The second floor could be all windows, and the second floor will be derived from the point of arrival from the first floor. The five architectural elements here are door for entry, windows for light, floor, walls, and view, the highest point. The vertical circulation ties these elements together. The five floors, circle-entwined, the processes make five floors which make one building. Then you fold the site in, pull the views in, so the building is self-contained and the site is nonexistent. Then you invent the rest, you have to because the design brief given lacks more specifications.
As this system of design progressed, it became more and more confusing. The critical mind entering into this was faced with more and more choices that involved more than pure overlay of each element, but choices of what elements to continue to the next level had to be made. The criteria for making those choices were not specified in the beginning, because these issues did not rise until faced with these multiple layers, and the spontaneous generations of "rules" became problematic because they were not set from the beginning, which undermines the idea of "rule."

Many of these moves were only specific to that sheet, and not to all levels of derivation and layering.

Take a look. I don't even know what I'm drawing anymore. You set up a logic and try it out, then it becomes this machine trying to generate itself and I have no idea what it is...it's losing sense. At a point you have to make sense of the plan, maybe you have to erase or add to make sense of it. Spatial idea is one thing, but spatial relationships matter, and then you add function.

On top of the precise pencil drawings, he overlaid a sheet and inked freehand, poché’d and determined the figure-ground. If you poché the original sheet, you might ruin it. This (40.) is in between the first and second floor. It is the mezzanine. These are not floors, they are transformations. The mezzanine is the "becoming the second floor." He poché’d with the mechanical pencil, representing the solid parts that carry through all the sheets and becomes the structure. Trace allows you to see all this. They are different floors, but the structure is shared.

He moved the sheets to find more permutations and possibilities, but retreated some moves. It's like playing chess: you can go back but you've upset the system.

He turned his attention to making sections. In sketching an axonometric (41.), he decided to sink the house. There's no need to erase. How do I know if it's a right or wrong move? There's no specific agenda or explicit rules and needs of the given program to inform the decision. Now I'll extract the walls that become structure for the building. Now we decide what's space and what's not, there are areas that can be voids to fit the HVAC system...Where does the staircase go? Continuing on to sheet 8, the section was made of the second floor, pochéing in red, locating the stairs (42.) The pencil was used for the section, drafted with the parallel rule and triangle. He then cut section C (43.) Plans become sections, floor plate becomes wall; investigate the space, the skylight. You can carry the second floor back into the first floor, etc. Try to make sense of it as you go. Try to make sense of the process that is established at the beginning and becomes problematic as the design progresses, as made evident when issues that are appropriate of the specific stage arise.

Somewhere along the line you have to stop this process...and make a model. He picked up the trace and said that the trace can be flipped backwards and superimposed, matching up plans at different points to see what occurs. The choices that are made are definitely not based on the program given in this exercise because it is too vague: you can't go with it, and can't go against it either. The next step is also to draft onto vellum and you can make blueprints. Making something opaque gives a sense of permanence, and you can make changes of the blueprint. You can draw everything on a light table. That's the beauty of trace: when you work together with the light table, you understand where you start from.
Cheng-Ta’s process was self-defined. The procedures he followed were clear: pencil, precisely-drafted drawings, then on an overlay, derivation of another layer in pen, freehand -- the darkness and fluidity of the ink allowing certain portions of drawings to surface and pass on to the next “stage,” and the recording of spontaneous recognition of new relationships in overlaying overlapping conditions.
I start with small sheets of paper. Using a leadpointer, he made graceful contour lines on an A4 sheet. (44.)

I'm imagining a small valley-like thing. I usually start with imagining contour lines of the place. Pencil at 45 degrees, his hand skimming the surface over and over. I'm imagining a road which is trying to fit the topography. A ravine, not a river, but a path for runoff water from the hills. Using vector-like lines, he made a road which was straight at first, then curved to fit the contour lines. There is a bridge for the road to cross the ravine. Starting with the house, he imagined as if it existed. Using white trace overlaid on the first sheet, he defined the contour, darkening the road (a thick line), making a small bridge crossing, curving and redefining the road where the vector lines that generated it crossed. (45.)

So should I design the house also? The house is placed by the road. Making terraces, he placed the house on one, the contemplation space on another. Since I'm making a big slope, people must go down: some sort of stairs, maybe even some water there. I'm playing with some terraces, basically, remodeling the contour lines. There stairs connecting the house to the site are parallel to the road bridge. You place your back against the dark part here, pointing to a dense area of graphite on the drawing, looking out toward the south. Making very light lines, pencil barely touching the page, his hand traced the imagined flow of water, and placed the contour of the edge of the sea.

He went back to the bridge. It's not really a bridge. It's working more like a dam. Turning his attention to the house, he said I know where the kitchen is. Going back to the water, he stated, water appears in some places and not in others because the water happens only occasionally. Do you like the scenario?

On the second sheet of trace, he redefined the road and contour lines. (46.) I'm imagining a structure, or maybe a terrace, not sure yet. Blocking out the site to place it, there are reference lines to the contours and the house. You find where the contour lines go by placing obstacles in their way such as the house and other built structures. If I were doing a model, I would cut at this place, pointing to an area on the sheet. The marks made on the sheet showed the movement of circulation. The contour lines still came freely, darkening the lines. Making a reference line from the road, he placed the structure on the terrace as an object. Red pencil marked the structure, and faint lines projected water flow. There are some objects appearing. I don't know how, but this is somehow a house.

The section was the next drawing. (47.) The marks made first were ambiguous as to their meaning, then given meaning and identity as the design progressed. The marks were darkened, took shape and became architectural ele-
ments: roof planes, floor planes, structure. It’s a funny house. I’m in the middle of the house no...this is a section of the house, there is a terrace where people can look out. Designing the contemplative space, the drew a roof structure of stick-like members in a fan formation, much like the creation of the contours, and drawn in the same gestural fashion and motion. Views were alluded to in the gestural strokes in light pencil. Motion of the hand and the thinking process were captured in the layers of drawing material. The contour lines were almost personified, weaving their way around the sheet, and from sheet to sheet.

Continuing the design in section: There are a lot of people looking toward the same direction. There is a swimming pool right here. The structure moves, the structure is light and cantilevered. The bridge is represented on its side here and should go the other way, but it is for representation and reminds him that it’s a bridge...It seems that the structure is blocking the view of the house, but it’s not because this section is different than in plan. The cuts in the plan are not aligned. You can represent different things the way you want in section. The terrace was explored again: here’s a slope, and then there’s a big drop.

A new sheet (48.) was overlaid on the previous sheet to derive and rework the design, turning the first opaque A4 sheet over to serve as a white background to see on. He sunk the terrace of the contemplation space and focused on defining the contour lines, how they interact with the edge of the terraces. With the darkening of the line, he defined the contours and the stairway. Retaining walls were specified.

In plan the structure became a pool. (49.) Logically, the water should flow this way (gesturing). Wherever you go, you look toward the ocean and you have water here at the pool. Going back to sheet 2, he tried to figure other things here, pointing to a dense mass of lines between the site and the house. Placing this last sheet (49.) and sheet 2 (45.) together as reference, he created more scenarios. People are sitting here. They are putting their own tables here. That’s what you say when you’re not able to design it, basically. He made notations on the plans, and made a big diagonal line and a vertical one as axes: you’re sitting here and you’re the king of everything. He liked sheet 2 (45.) the most because it has almost all the lines together, condensed. You can always look at it and see lots of different things. Ideas appear on their own, as opposed to what happens in the design process: as you go further, you can only express one idea precisely and clearly, and other ideas fall by the wayside.

When designing, Can always starts with making a caricature of the site at the beginning of the site. This is done on a small sheet of paper, working with only the important aspects of the site, or else it becomes too large and there are too many things to deal with. Afterward, he enlarges the drawing through the photocopy machine. In enlarging the drawing, things that were not seen before become visible, and the proportions are maintained. The site drawings may not be precise, but the often the proportions are the more important aspects in a design. The transmission of knowledge from the sheets before depends upon what is drawn. If there are curves and other difficult-to-quantify measurements and qualitative information, the proportional information cannot be transferred with copying, but if it were a square, all the parts are defined in the mind, so there is no need to copy or trace.

He usually draws with a leadpointer or pencil. The softness is not very important, but when it’s thicker, it’s difficult to control. The lead size would be chosen according to size of the sheet: 0.2mm for larger size, 0.05mm for
a smaller sheet. **When you hard-line, you lose a lot of things, a lot of overlapping lines, and you never know which line is the “right” one.** You go back to the rough sketch, then to hard-line, etc., until you’re satisfied. Then you blow up the drawing to 200 scale or larger, and start again with the rough sketch.

His concept in design of creating terraces comes through in the marks he makes. His lines of varying weight and thickness, of various graininess and compactness depending upon the strength of the hand in making the lines, exude the energy with which they were made. **Because the concept of this design is terraces, there are no objects. Even the house is not an object, but the terraces of the spaces of the house overlook and overflow into each other.**

The evidence of the hand and of thought are very clear in his drawings. The process of the thought going from ambiguity to preciseness is ingrained into the drawings. **The intent should be evident.** When you look at the drawing, you should get something back.
RAJIVE

used a mechanical pencil, Berol soft graphite pencil, and a large 18” x 24” sketchpad. He began diagramming the site. (50.) **How far is the house from the edge of the cliff? Why is it for five people when this is a contemplative space?** He was very contemplative throughout the entire exercise, stopping to think more than he drew. He constantly went back and forth between using the mechanical pencil and the Berol pencil in drawing the site diagram, the section, (51.) and the plan, then to the stair section. (52.) He wanted to **take full advantage of the setting, putting the staircase into the ground. There is a protruding structure to cover the entry of the stair.** (53.) **You go down into a carved-out space. It’s a natural, cave-like quality.** Inside this space, there is a limited view of the sea. **There is a deck to see out over and into the water. It can be glass.**

He drew the second section of his design with light lines using his mechanical pencil, and erased often. He moved on to the third section with the same pencil. Each drawing was articulated with both the mechanical pencil and the Berol soft pencil, with varied lineweights.

His method of design exploration involved drawing and erasure. The decision of what is solid and what is open was made through pochéing something solid, then erasing spaces, a subtractive form of drawing and design. He added a stair in the third section, then revisited the plan and drew the oval element. Then he stared at section 2 (52.). After some time, he labelled the space in section 3 (53.), darkened the cut of the ground, and pochéed the earth.

He sat back. **Was I bothering him by my observation of him working, and my writing notes?**

Yes.

He read what I had written. **Hm, then went back to the drawing pad.**

**There is no designed furniture in this space underground.** (54.) **There are rocks, and the walls are natural and rough. I want to be as close to nature as possible. If I’m alone in the space, what type of space would it be?**

He looked at section 3 (53.). **There’s some sort of skylight. There is natural light that comes in from some angle, that shines on the place where you sit...I’m thinking of the shape of the room. It’s rounded, maybe circular.**

He constantly spoke of the space, with the same contemplative speed as his thoughts in silent reflection. I asked if he could show it graphically. **I’ll try.** With the Berol pencil, he first drew lightly an interior view (55.), with soft curved strokes. With the mechanical pencil, he hatched the stair and the ground. **The mechanical pencil gives sharp lines: lines to draw stairs.** The Berol was used to draw the circle cut in the ground. **I think this place is just for**
myself. Someone else who comes will sit on the floor. I’ll sit on the floor. He labelled the plan with the mechanical pencil. While drawing between the interior view and the plan, he began to get new ideas. There should be a fireplace also. It’s nice to have water and fire at the same time. He thought of this through thinking about the space while drawing it. The bed is scooped out of the wall, like the fireplace. There is a small refrigerator, a music system, all placed within the wall, hidden.

Rajive was extremely contemplative in this design exercise. There was much time spent sitting and thinking. As he drew, he constantly went back and forth between the thick Berol pencil and the thin mechanical pencil. When you start drafting, there is the issue of scale. These drawings are not “drafting” drafting. There was no specified scale.

Usually I use colors to indicate layers. Once I’m conceptually set, I go into color pens, drawing layers on the same sheet. This way I can see how things fit together. (This is very similar to Cheng-Ta’s experimental process for his design exercise, and computer drafting packages structure the lines and elements of drawings with layers.)

As for this design exercise, I closed my eyes and imagine water and the sound of water. You mentally visualize what you’d want.

The pencil feels more flexible: a flaky feeling. It merges with the paper. It’s different with ink. In the cliff, the “edge” of it, the feeling of it…in pencil it’s not permanent, and can still change. The pen is permanent, firm. Pen on trace finalizes and refines. I begin with pencil, then ink. (See how this comment is consistent with the pencil-pen-pencil process Cheng-Ta went through in his design) On drawing surfaces, lines show more on opaque paper.

His personal drawing design method or compositional style is to draw the plan and section together in starting the design. I think in plan and section at the same time. Regarding the section in the first drawing, which is turned sideways, shows his image of a cliff. There is always something protruding; it’s not a straight cliff… I usually design with a lot of foam models.

When asked why he changes between two pencils while drawing, he first had to understand that he did in fact change drawing instruments, and that he had specific reasons why, namely the differences in the preciseness of the pencil tips. Given that he is a very contemplative designer, thinking before drawing, perhaps the changing of drawing instruments in this case (the medium is still graphite) lies in having the choice of being able to change. Perhaps it lies in the physical putting down of one thing and picking up of another, that allows for a “pausing” of the hand, like the “pausing” when we stop to think. Had the media been different, it would have given insight to how much the mind and the hand had in the role of design: if he thought differently with the hand that uses a medium of a different nature, or if his imagination would have dictated what the new medium was to show.
VASSILIOS

On a 18-inch long roll of white trace paper, he took a huge piece of charcoal and began to draw in a large scale, the entire arm moving across the page, and short strokes with the edge of the charcoal, controlled by short pulls of the fingers, lightly skimming the page, setting up an idea of site. (56.) Looking at the palette of colored pastel, he picked up a black pastel and began to draw over some areas of what was drawn in charcoal in drawing 2 (57.), emphasizing certain areas, further defining the areas. He continued to use the black pastel for subsequent drawings. I’m a formalist, he laughed, as he worked on sketch 3 (58.). I love this, he remarked regarding the color palette of the pastel. He marked the entrance with a pink triangle over the black pastel. Why do we always have to communicate through our drawings?

As the design progressed, he asked, can it be a small house? I can imagine a deck. (59.) That’s what I’m imagining right now. Drawing the interior perspective (60.), his hand skimming across the window frames that framed the view out, saying I can imagine the ocean. It must be so nice. There’s a couch. If I had such a place, I’d give it to visitors. “Why is everything here twisted, mom?” He laughed as he made his sweeping strokes to define the floor area in the interior perspective. I don’t like it, he said of the pink pastel he made a mark with. Ah, an idea. Blue, for water, the ocean.

He sprayed fixative on the drawings. The trace was long like a scroll, unrolling to the right. You can rework the drawing when it is still wet from the fixative.

He used pink to indicate structure, keeping the “color coding” consistent from the second sketch, or “frame” in this film-like sheet of sketches, each one a “view” into what the project is at that stage of creative conception and refinement of ideas. Orange pastel was used to go over the pink which he decided he did not like.

The tracing paper served as a physical way to record thought in a linear way. This scroll allows one to always see the previous step. I never cut the roll, but keep the sequence of steps. The concept of the design is first informed by the cliff. It is cantilevering off the cliff.

We talked of creativity and how images of inspiration help us design. He remembered listening to a song by Bjork and played it to me on his Discman. It expressed the experience of falling. The word “cliff” made him think of the song, and began to inform a design. Your back is protected, going under the ground plane, going down against the cliff. “Cliff” is the key word. The idea of falling off, on the way of diving in, of hiding from the house, isolated. Going down the stairs emphasizes the descent. The lyric “to feel safe again” in the song was the feeling he wanted to convey. This has to be over the cliff. You have to pass the line to feel what it’s all about.
Going back over each drawing, he said the charcoal of the first drawing was the first stage. Blurring of the gray charcoal set up mass and proportions. The pastels used starting from the second drawing give a much darker line, used to redefine ideas. The design flowed out rapidly through quick, strong gestures of the arm. The weird shape of the structure is inspired by boat architecture: a deck, observatory. It’s relaxing to watch the ocean. The charcoal is a fast way to give two kinds of shading. The thin section, the thick but controlled line. It gives shadows, smudges, for surfaces and masses.

In communicating in drawing, previous ideas from past projects are part of the design vocabulary. You try out thing you’ve had before in you head, see if they “fit,” and can elaborate those ideas, if you’re persistent with the idea, you can make it work, and graphics help. In using charcoal versus the pen, one line of the charcoal may take 4 lines of the pen to achieve the same thickness or like effect. In designing the stair, the thin lines are not the same nor are they regularly spaced. In trying to readjust the lines, an idea may come suddenly: “this is it,” and you move on to the next step. The third drawing/frame began with an abstract shape, the weird shape of the structure is inspired by boat architecture: a deck, observatory. It’s relaxing to watch the ocean. The charcoal is a fast way to give two kinds of shading. The thin section, the thick but controlled line. It gives shadows, smudges, for surfaces and masses. The colors used in the second drawing redefine and refine the shape because the charcoal smudges and loses the shape. The red/pink is something that can only be points, not surfaces, but shows points and linear paths and structure. It marks the entrance in the 3rd drawing. The target of view is always the ocean, not the sky. One is always looking down, to the blue water.
DAN

His design environment was in front of the computer. He had two monitors connected together, so that he could use the two screens together -- he could drag objects from screen to screen. He began with a sketch in Photoshop 3.0, drawing with a stylus on a Wacom board. (61.) From the tool menu, he drew with the point brush, airbrush, and smudge tool, with controlled wrist movement and care. This was saved as an underlay, intended to be a tool for the "projected other," the design of the given problem. There were some technical difficulties that arose when trying to bring the Photoshop file into FormZ resulting in crashing of the computer. When the Photoshop sketch was scaled when brought up in FormZ to serve as an underlay. (62.) In plan, he drew objects: two cylinders and two rectangular blocks. These were made as 3-dimentional entities from the very beginning. He looked at the drawing in axonometric view, then into perspective views. On the other screen was the layer palette. Each step needed to be deliberate, even if just to test an idea (much like design by hand): the thickness of enclosure, the height of the cylinders, etc. In hand drawing the sense of "stages" is not as evident as when using a computer drafting program. In CAD or FormZ and the like, each move is there is a sense of "finish" when you enter the command and wait for the outcome. The pencil in the hand can, on the other hand, take instant action when felt compelled to do so. There is another force that is beyond the self. The computer does not do anything on its own accord unless programed to do so, or unless it crashes.

The first thing Dan did was to construct the site in FormZ, creating a volume, picking a face and dragging it down vertically. (63.) The objects, once made, can still be manipulated. It's fully interactive. The site was modeled using the "terrain model" option. Switching to an elevation view, he manipulated the placement of the objects. A quick rendering of the scene allows a further understanding of the space of the wireframe. It also allows you to see where your objects are located. (64.) You may think you are looking at the front elevation in the wireframe, but you may actually be behind the building, and you don’t know that until you render. It locates yourself with respect to the design as well.

In creating a perspective, objects that would normally be in the way of getting to a specific view may be ghosted in order to get to tight views.

The creation and understanding of the space were the first and main concerns, as he went directly into perspective views of how the space would be to the occupant. Decisions of shelter, public and private space, and how one enters, were all concerns as perspective views were set up to explore those issues. The circular forms were markers of entrance, and could be anything. Because of the time constraint of this design exercise, measurements and

73
dimensions were thought of earlier in the process. This is not a building yet, it's just a three-dimensional diagram now. The next step would be to make it into a building.

Does the distance the hand moves, the tactile part make a large difference in design? This is where the computer challenges that. Not to negate the idea or render it a foolish notion, but reveals that there are other ways of thinking about the senses. In hand drawing, there is a lot of difference between making a small sketch or a large drawing. In the computer, the notion of representational scale is not a factor in drawing once the true scale is specified. The scale issue becomes an issue when printing into hard-copy. When drawing, one zooms in and out of the drawing without disturbing the scale of the drawing.

With more visual information, for example, multiple views are set up on the screen as you set up perspectives, one needs to project oneself more into the project, use more imagination, construct the whole thing mentally. The mind-hand-eye relationship is different. The eye has more visual bombardment -- more knowledge is revealed through bombarding the eye with multiple views.

The setting up of perspective views involves four windows on the screen so that one could see where one was in plan and section in relation to the perspective view.

We spoke of process and procedure: his design process, and procedures on the computer. You can make something a number of ways. I was going to start with a huge chunk and carve, but decided to start with a small depth and build up the cliff. His way of design is to find points of reference in the project or in the site, etc., and release from it, then zoom in, and zoom back out. How does the computer facilitate that type of design process? Faster? Efficient? How did the tool create/influence and foster that manner of design process?
began with a pencil sketch of an idea, a pictorial drawing. In FormZ, he made the terrain: stepped model, triangulated facets, and surface-assigned. The notion of customization was evident, as his was light lines on a black background. Setting up the views of the model, you then render it to see if the view you’re looking at is from the front or the back. In Photoshop, he attempted to approximate the “essence of sketch.”

For the design, the first thing is to figure out what the site is talking about and what issues of design and tectonics, the two can be totally different, you want to raise. Making the sketch in Photoshop, (65.) straight lines, airbrushed strokes capturing movement, just sketching, “pathmaker” command works like a spline. In FormZ, the Photoshop sketch is used as an underlay. (66.) With the tools of stylus, and the mouse ball, there are varying degrees of accuracy, of knowing where you are within the drawing. This placing of the self is important because the traditional manner of drawing is subverted by the fact that our hand is physically one place when the marks show up on a different surface than on the one our hand is on. We look at the screen as the lines appear, and our hands that input the lines are in our periphery, or out of our cone of vision. (67.)

The image is a start from which you begin the investigation: the sketch holds ideological ideas of what the site is trying to do and why. This is not just object-making, it’s about responding to the environment and context. Sometimes you choose to blend in and sometimes to stand out, but this is a reasoned decision...The idea here is of a deck, where underneath is a viewing/contemplating lounge, and above is a private, inward-looking space. There are no rules or laws of what makes a private space a private space, but I want to play with that (the “image”) but I don’t know how it’s going to look... The upper level gives a view. Something on a cliff over an ocean is powerful. The structure extends outward to allow you to see the view and be a part of it.

He makes a shape with he “sweep command” that extrudes a shape into a curve. (66., 67., 68.. 69.) Rendering allows the understanding of location of solid planes Operable fins were circularly arrayed as a sort of roof canopy. This was in response to the seasonal climate condition as stated in the program. Streaks of light coming between the fins lead the eye outward. (70.) They rotate according to the sun.

The design of the contemplative part of the program was directed by an image of Ando’s work and his meditative spaces. It’s about the interior and focusing on something inside. The curving element for him seemed to hold sensibilities toward meditative spaces, but there are not steadfast rules of meaning attributed to a form,
or any dictates of how one uses a form. The path of this space leads from extroverted space outside to introverted space inside the interior of the curve. (70.)

FormZ is the best model: it is intuitive, allows play, interactivity, and is malleable. You need to be strong about the ideas of what you want to do. The idea is not so much image, but your intentions and concepts. The save command is important and allows you to return to previous saved stages.

Mark usually sketches on paper first, but because of time constraints of this exercise, he went straight to the computer to draw his interpretation of the site description given, and think of something to enhance the site. He did, however, draw a sketch of the site and a structure off the cliff. (71.) This was done lightly in pencil, capturing subtle tonal differences and the motion of the hand.
EVALUATION OF EXERCISE II

The processes of design were as varied as the individual people. This exercise took a horizontal cut across a group of people who share the qualities of creativity and imagination and individual skill. They are by no means representative of one another, but are representative only for themselves in this particular time in this particular culture. What, then, could be the merit of this enterprise? It is the making explicit for each one personally the insight into how they design, what they do, and the postulation of why they might do what they do, that is edifying to this inquiry, as well as to themselves. One of the most rewarding moments was when one participant expressed his thanks for letting him realize what the trends of his design process, and way of working, are.

Rethinking design parameters:

A way of making oneself aware to one’s working methodologies to work in a medium that has a framework all its own to work in. The use of the computer, like any other medium, subjects the user to operate and work by its rules and parameters. In an interview with Amanda, a classmate who uses the computer in design, the following insights were gained:

1. The methodology of designing with conventional methods of sketching and physical model-making is changing over the years. Sketches are not important because the idea is in the head in 2 dimensions already. Models and 3-dimensional representations are more informative.

2. Hard-line drawings are produced very quickly into the design process. Exact dimensions are known. Sketches can be at any scale and therefore misleading, unless the proportions are correct.

3. Autocad is her preferred tool of drawing; the most important reason is that it allows one to go immediately into three dimensions. This allows one to see things that are not able to be initially conceived. Autocad eliminates "fudging" of dimensions and connections because exactness of dimensions and connections is required. One must first specify specific dimensions from the beginning of drawing, even if exact dimensions are not known. This forces the notion of scale and measurements and proportion from an early stage in design. Autocad allows fast change and alterations, provided the framework of setting up the drawing is efficient.

5. Have you found that the computer has affected you in terms of design? You make it do what you want. My designs are minimalist with modules and everything is regular. In fact, drawing with conventional tools like pen and pencil allows one to "fudge" and one can fool oneself. One will not "fall in love" with a computer drawing like one would with a sketch, where one might nurse the sketch a bit, make it pretty, add shadows, it is an illusion to the self and to others. The computer drawing (orthogonal) is impersonal and depersonalize itself.
People still sketch, so the computer will not change the design process, but will make it different. One can say that drawing by hand allows for creativity through the mistakes. Autocad is precise, but that does not mean it is not creative because it is requires precision. There is a sense of efficiency here that is in the end greatly affected by the ways of the computer. She thinks in modular/regulated ways which is most like computer-character. Hence the speed and ease with which she feels comfortable with is best performed by the computer.

Precision in thought increases with the level of development in design. This is true no matter what medium is used in design, and we choose media that best allows us to be precise, there is a choice and a transfer and switch of media. With the computer, the issue of precision exists from the outset. One has to give quantities and numeric values, just to test an idea. One cannot stick a railing against a wall without drawing how that rail is attached to the wall.

An interview with classmate Partho on his experiences with Autocad in an Urban Planning design studio, the “Boston Studio,” revealed the following:

On the nature of drawing with Autocad, the project was to complete the urban fabric of Boston’s North End/Government Center area. The dark blocks in the modes are the proposed buildings. One very important observation that was critical was that three-dimensional shapes were generated from geometrical shapes (predefined primitives such as circles and squares, as well as those shapes made in plan by the designer and extruded so that is it that specified shape throughout its length) The area of the Boston studio project which illustrates this is the crescent-shaped portion of the design by the Boston City Hall building. The nature of urban planning as he described is one that deals with form and overall placement in the site. He sketched some ways of approach to urban design: forms are usually placed to form a space. The placement of mass is not dictate by a strict shape in plan, but are placed to loosely form an enclosure. (72.) The plan does not usually dictate exact shapes of massing forms. In Autocad, it is difficult to just make sketch massing forms. A precise geometrical form has to be created. One can cut and chamfer and add to a solid, but a geometrical form needs first to be made. He did not want an exact crescent-shaped building, but his only option was to cast an arc which had a center, radius, and arc length. It would have been difficult for him to cast many different arcs and centerpoints to generate different smaller portions. The exactness of placement and orientation is completely different from hand sketching. Whether it be an issue of familiarizing oneself with a computer-aided design package, or being well-versed and skilled in using such a program, the design was still affected by and in this case, changed, because the form was extruded from a perfect circular shape in plan. Usually, the placement of the mass in design determines the plan, not the other way around with lines in plan determining the placement of the forms.
4. More design

To delve more into the question of media and materiality and these effects on design, a further task would be to have one person either design two more similar projects with different media, or develop the design in Exercise II in another medium. Cheng-Ta participated in this next step, but the problem set forth was to continue the design of Exercise II by adding another space to it. He developed the design using soft pencil, thick compressed charcoal, and color pastel, three different types of media he had never used before. His design experiences with these media in this follow-up exercise were as edifying to him as they were to me, the observer.

In looking through the sheets of his previous design, he made an analogy between drawings using the transparency of the trace and the computer drawings he has been drawing at work. Sandwiching the loose sheets of trace between his hands like a book about to fall apart, he said these are the layers. In the computer drawing, all the layers are one sheet. All the information’s there. When I have to present certain ideas, I have to go through the layers and systematically hide them to show what I want.

We decided to keep the drawing media to soft pencils: HB drawing pencils, black China Marker, a fat compressed charcoal stick, and color pastels. Each were used separately in different stages of development of the Exercise II design. The modification he made to this exercise was to design the second space as one part, in one medium, and then explore the relationships between the second space and the original design in the other two media of the charcoal stick and color pastel. As for drawing surface, he wanted to explore design on opaque paper this time.

The first part was done with soft pencil, beginning with dots in a circular arrangement. What the hell am I doing? I suppose this is a completely open building...and as he began to draw lines connecting some of the dots. These are REALLY thick walls. Or maybe not. Maybe they’re spaces inside...He was reminded that he was to stay with one medium per stage of this exercise, and he became a bit frustrated and disappointed, argh! I want to see it in color!...

These thin lines are windows. Changing to the thick China Marker, he remarked I’m using the thick pencil as a thin one. I don’t know why. His motion was from his wrist, like handling a small instrument. He was aware that it felt awkward, but did not know why at this point.

I’ve got to start carving spaces out because it’s so massive. After a while of drawing, he exclaimed, ugh! This is a pattern. I hate this drawing...Okay. This is an attachment. How do you go in? Hmm. Circles make things hard. I’m being too careful. Let’s draw some trees. This was his way of "loosening up" by drawing something organic, without strict geometrical constraints because he felt these constraints to be dictating

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6. As it is impossible not to be influenced by a design done previously, the new problem would be to keep the program of a contemplative space constant, varying the medium and site. These would be 2 variables which change. The important thing is to keep the comparison within one person, with constant process and understanding of their biases and perceptions of the media they given them.
certain moves that in the end became "pattern-making" and stuck within the form. It looks like a section of an orange.

When he began to draw the trees, the freeness of there being no strict "form" allowed him to free the movement of his arm. He made some free meandering lines across the page in a plan-like drawing, then began to make vertical strokes with his entire arm. The dense area on the page was made by pushing the arm up from the shoulder. Even his grip of the China Marker changed to an overhand grip, the end of the pencil in his palm, an overhand grip, and sometimes controlling the stroke at the wrist. There is a certain way to draw trees, because trees only grow up. I'm going to make some perspectives. Here is the circle. Do you know what's the beauty about the circle? It's Zen. He laughed as he drew the circle, holding the China Marker like a writing pen, holding his hand, arm, and torso stiff, pivoting from the waist around in a circle. He had peeled off more paper around the China Marker to expose more drawing material, but had pulled too much paper off, exposing too much of the stick. Oops, now I have to draw softer.

Here's a more technical version, switching to the HB pencil. The thinner lead allows more accuracy. I'll use the China Marker to poche. The media is making this new space go underground. It's massive, it wants to hide because it's thick and chunky. It wants to be made of massive bricks...like how Kahn would do it. Now I understand why he wants to draw such huge buildings. Here's a person. He drew this small dark spot to the left of the section/elevation drawing he drew while speaking. That's Shaq O'Neil (professional basketball player), 7'-1". These are huge chunks of buildings, that's why he has pure forms.

Tonight I'm less theoretical, but more classically inspired.

I can't work with thick pencil. It's not my sort of thing. At least I discovered I can't work with pencil.

He began intently drawing an oval shape at the top of the page, and a linear element to the side. When asked what that was, he laughed a bowl and a pair of chopsticks! heheh...no! It's a coliseum!...as he quickly drew in tiers of the interior of the coliseum, small entrances. This is the tunnel, hatching the linear element. I have no idea what this is. Okay. Give me a different medium to explore the relationship between this second space with the original one designed in Exercise II.

The relationship between the two has changed. It is no longer beside it, but underneath it because of the thick media, it goes underground and the only logical place for this second space to be then is underneath. There are three levels: the basement floor, the level of the building, and the floor at the top, between the building and the sky. The material given to him for this next step of exploration was the large stick of compressed charcoal. He thought ahead I'll use the color pastels to explore the relationship between the building and the sky. There's more view up at the tip, more colorful.

With the compressed charcoal, he drew a section. (74.) The ground eats into it, it's not a perfect round shape. He drew a circular stair in the square floor plan of the Exercise II design. It's too typical, isn't it? What's another way to go from floor to floor? He began to draw a grid of lines. There's no inspiration today. He tapped on the paper with the tip of the charcoal, then made a sweeping gesture across the page. This is a guardrail. Here is the sky above, mountains, actually, it's more like a desert. I'm making a context now. I
orange sky

green sea

magenta stair

yellow floor

76.

77.
work really badly with sites.

Maybe you should do this for a career: architectural design therapy; let people discover what they’re bad at. "If you use less pencil, you get more agitated in the office"..."Aah, now I see..."

How does Kahn do it? He draws this, this, this, and he makes courtyards, and "voila!" Quickly, he drew pure forms intersecting, squares, circles, These are his projects...India... and this, this is Salk, see...right?

Oh, now I’m inspired. How does he do it? He envisions thick walls. I can’t envision thick walls. I envision six-inch walls. He envisions huge goddamn walls!

This developed into a drawing of a set of stairs in plan. (75.) This stair starts from here on the first floor (at the bottom of the curve) and ends here on the upper floor (pointing to the top of the curve). He then specified that this was a stair detail, labelled it, and located it on the previous sheet. He drew another sweeping line, which became a sloping floor, a set of stairs ascending to a second level, a perspective, and at the top of the page, drew a long curved line. This is a skylight, with louvres. The strokes were very quick, but even here he is able to graphically differentiate between the louvre elements with thickness of the marks. He put a key in to the drawing to locate where the drawing is in the overall site idea, and drew it on each of the previous sheets. These stairs are in elevation and perspective, it’s trying to show a three-dimensional space; can you see it? Give me a skylight. It’s like Ando.

I like charcoal! It’s so great! It covers so much space so fast!

Give me a new sheet. Let me diagram where we are now. He revisited each sheet, locating where in the site each drawing was an exploration of. Now let’s explore the top of this design. (76.) For this last part of the exploration, the medium was changed to color chalk pastel. Hot pink? No one touches this. This is barely used. He decided to use it. Since this is a square room, know what I’m going to draw? I’ll draw a square room. He began drawing with conviction and speed. Go, Corb, Go. Do you know what building this is? I won’t admit it...fine...the stair is a dear give-away...I might as well do it then...I was definitely influenced by these guys (referring to Kahn and Le Corbusier). These are empty mullions, without glass in between them. There is a courtyard outside. The mullions are different. They frame different heights for different people...The sea was not happy today. So it was green...In some way, I like this drawing the best. It’s natural, so vibrant...The sky was a weird sky, (making the sky orange), it made all the difference in the world. It’s more spatial and honest, don’t you feel it? I like to do perspectives with these pastels. They cover a lot of space, and allow you to do quick perspectives. They make me think spatially. The color represents...I don’t know...Now you need to make a three-dimensional model because architecture is about space. Wouldn’t it be interesting if you had someone build a model during one of these design exercises? Build one in three hours as you talk?

Oh, square rooms. Starting a new sheet, he made a key diagram with the China Marker. (77.) How do you go up to the top? Through a round elevator, like at the Cooper Union, the Hejduk elevator. These are aluminum panels, lights above. These are the elevator doors. He did all this in yellow pastel, for no reason, it’s just the color in my head. Blue lights come down. This is beginning to look more like its’ outside, doesn’t it remind you of a round vestibule than a round elevator?
I just discovered something else, Dr. Ku, I have no color-coordination, I’m not a Josef Albers.

These are funky doors, the ones I like. These are louvre systems. There’s too much green. How about red? Do you have red? Ooh -- hot pink, red...yow, baby! The color was quite shocking. He then filled in the square patterns on the floor with different colors. I just want to create a rainbow floor. Gosh, that’s ugly. No red, huh, no... As for the color placement, he chose whatever gives the most contrast.

A new sheet was started with the China Marker. (78.) Let’s draw in three-dimensions. This is on the opt of the square. This is really very conventional. He picked up the HB pencil an began tapping, drawing a circle, arm pivoting from the shoulder. He reached an impasse. I think I’m done. I can’t figure it out. It’s so conventional. Drawing trees, he wondered what would others do in this case? Let’s shade one. I want to do perspectives like the person you showed me. (Referring to Vassilios’ Exercise II design which he saw after he had done design Exercise II about a month prior to this follow-up exercise).

We spoke of framing a drawing, of composition, as seen in Vassilios’ drawings. I never thought about the frame within architectural drawing. Usually the frame in architectural drawing is the title block. He drew a small sheet and title block. Even Autocad is configured that way, with icons and menus. You need to impose a frame. The setup within computer drawing implies a frame.

Today I’m not very productive. Maybe next year when you come back doing the same thesis, I’ll be more productive. But next year. Not this year.

Flipping through the sheets he had drawn he said you have to go through all this to get to something remotely interesting...The sheet with the stair detail turned into perspective is the best. The drawings on Sheet 2 have a logic, so symmetrical, so "right" in their composition. He referred to the diagrams of pure shapes as those of Kahn, not himself. Pointing to the middle of the sheet: look at my forms: not so much. And look at sheet 1: this is doodling, pure junk. You win some, you lose some.

These three media of soft pencils, charcoal and pastel given for this follow-up exercise was to see how Cheng-Ta would work with materials that are not precise, pristine ones he was accustomed to.
6. Summary and Discussion

This study of the effects and influences of drawing media on design has been approached through observations of eight master of architecture students in the process of designing, and through discussions with them afterward. The capturing of effects of media "in process" allows the understanding of the generation of the designs firsthand from the designer. The drawings that are made are physical artifacts left from the design, and can be studied further. Design exploration drawings communicate to others as much as they do to the designer. The discussions of each participant’s are not critiques of the designs, but are analyses of the way the drawing material was used by the designer: what representational or conceptual meaning, if any, was attributed to the material, what gestures of drawing with the chosen material were employed, and how the physical act may have influenced the designer. It is as much developing the ability to read a drawing as it is to understand where that drawing is located in time relative to design process, and its contribution to the development of the design.

These individual case-studies reveal media in process: the perceived affordances and limitations of what can be done with the media by the designer, as well as the demonstration through this display of individual designers at work, that perceived limitations and affordances are brought by the designer. New ways of using a tool, new techniques, and new forms of expression are found just when one feels those possibilities have been exhausted.

What can be done now with the insights gained from these anecdotal episodes? The participants of theses exercises are master of architecture students who in essence have the potential of becoming teachers themselves, and many of them have already had experience teaching design studios. The study is pedagogical and therefore I shall imagine now that the audience which this study addresses is one of teachers and future teachers of architectural design. They are already architecturally informed, which allows them to work in the realm of architectural design concepts with a mastery of the vocabulary used. This allows a concentration on the exploration specifically of the way media influences communication and design.

Exercise I established the perceptions and tactile qualities of specific drawing media as attributed to and discovered by four graduate students of architecture. Exercise II further attempted to gain insight on drawing media and their influence on design through a small design exercise. This enriches the problem with issues of personal process of design, concept and intent, and imagination. As Exercise III was to see how the design of Exercise II would develop through the use of different drawing media.
**Process of drawing and design:**

“The process of drawing is before all else the process of putting the visual intelligence into action, the very mechanics of taking visual thought...it is the process by which the artist makes clear to himself, and not to the spectator, what he is doing. It is a soliloquy before it becomes communication.”

Michael Ayrton 7

“Process” implies there are a series of steps one goes through in design. The path is assumed to be linear, that there are many solutions possible for a particular problem, and that these exist in parallel. However, the steps are not linear and the designer goes back and forth between drawings in reevaluation. All of the participants went back to previous drawings and saw new information each time, and revisiting the drawings and the project brief allowed them to remember their first intents and keep their thoughts anchored as new ideas came to them. It also allowed them to make decisions and reasons to shift to new intents and change old ones.

In exploring an idea, a drawing is at the same time speculation and representation. Initial design ideas may be first manifested in a conceptual sketch from which the exploration begins. The drawing that begins as conveying one idea, object, or type of drawing transforms as the design develops. It is this transformation that is of interest, and the media and means by which the design is transformed and developed. 8 Examples of this transformation include Mazie's sectional drawing which began as a diagram of vertical relationships and became, within the same drawing, a section. As the marks of soft pencil she was using became less sharp, she began to poch6 the section of the land as the tip became fatter and made a thicker line, and she articulated the thickness of the walls, differentiating the underground ones from the thinner above-ground walls. In Cheng-Ta's case, the transparency of the trace paper as the receiving surface of his drawings influenced the development of the design, guided by his imagination and the rules he dictated of overlay and the interplay and systematic switching between plan and section.

There is usually a logical progression in making design decisions in the development of design. There is a frame of logic one sets up with regard to intent and physically with the medium used. For example, people attribute the pencil to be not as permanent as ink, therefore initial ideas are done in pencil, allowing a possibility of change, and does not make the designer feel that every move is unalterable. But what happens when one uses a hard lead which incises the drawing surface? Though the material may be erased, the incision remains, how does that texture influence the designer? In computer drawings, one can delete layers completely. How does the knowledge that something has disappeared and been subtracted affect the designer, if it does at all? Designing in the computer, the drawing instrument and receiving surface become infused into one, redefining the original nature of he impression

8. As stated in the introduction, the term media refers to the materials one draws with and the material one draws on; means refers to the type of drawing: orthogonal projections, sketch, perspective, that are aids with which to understand and conceive of spaces and intents.
of the gestures of the hand directly in the drawing surface. Here, the hand is physically remote. We do not even look at the hand, but at the lines made by the hand. Does this affect design or the conception of design? The computer programs have rules and logic one must follow. That which is drawn, or information that is inputted, must be defined, not as what they represent to the designer, per se, but as exactly what they are. For example, lines in Autocad need to be defined as line or polyline, one a specific layer, with a specific thickness. All elements reside in a layer, or in a defined group which is part of the bigger drawing. Elements are nested to make the complete drawing: one element is a part of another, and this other system is part of a bigger framework, which eventually leads to the whole drawing.

Cheng-Ta's self-constructed "logic" served as the framework for the development of the design: each informed from the previous move, as perceived from the previous plan. As they are all generations which can be traced back to the very beginning, the interesting parts of the design were those of conflict. There were many possibilities in generating something out of a previous drawing, and he had to refer to a meta-rule that was stated at the beginning, for example, each consecutive drawing would alternate between plan and section, and therefore the elements would be thought of in plan or section. However, as these drawings increased, the amount of information increased as well, and there came the need for critical selection of elements that would continue and be transformed into the next plan or section, or be eliminated from the next stage. Consequently, there were rules or decisions that were made to serve the purposes of that particular drawing at that particular time in response to unforeseen situations. When there were no evident clues to guide his next design move, or when possibilities were too many, and he had to reach into his imagination to find some sort of "inspiration," or arrive at a reason why certain moves were better than another. How does one proceed when there are no clear directions in the midst of many possibilities? As an aside, does one feel that the worth of the design and the process of the designer lessened, diminished, or compromised in any way if the process is not set or defined or following any strict concept from the beginning? I would say in previous experiences, the above has occurred, but design is a creative endeavor that takes joy in the unexpected.

Where does invention play a role? FormZ dictates a specific framework in which to construct a drawing, with layers, objects, etc., as a meta-structure, but one can create one's own sub-logic within that greater framework (with customizations, etc.) This framework within which one works can also be setup in hand drawing, as exemplified in Cheng-Ta's setup of a framework of design strategies, and as new ideas arose as they were perceived, and he was able to change his framework. How do we perceive new things or be inspired by new thought and intents? It is in the time taken to think and physically "play around" in experimenting with ideas that new ideas and perceptions surface. (Example from Exercise III)

9. In a computer aided drafting program called Draw, the drawing is set up according to lines which are grouped not in layers, but according to penwidths. These comprise "figures," which then make up the "sheet"

10. How does one proceed when there are no clear directions in the midst of many possibilities? As an aside, does one feel that the worth of the design and the process of the designer lessened, diminished, or compromised in any way if the process is not set or defined or following any strict concept from the beginning? I would say in previous experiences, the above has occurred, but design is a creative endeavor that takes joy in the unexpected.
A discussion of types of drawings and their affordances and limits is unavoidable, as a drawing must be of something, and therefore take a specific type of representative mode in drawing. Conventional architectural drawings include orthogonal projections and perspectives. These raise the issue of levels of abstraction, which is both perceptual and conceptual. Orthogonal drawings are by nature abstract representations of space, giving the most minimal information in a quantitative way: showing dimensions and measurements. The description of light of a space in these drawings may be described in quantitative ways, but unless rendered, they do not convey sensate qualities.

The line is the most basic reductive system used for representation. From the point, to line to plane, these are the basic vocabulary to describe surface and volume in quantitative terms. In Student B's exercise I, the pen exercise was simply a line. In Cheng-Ta's design Exercise II, the line closes to make a form which is derived from traces of the previous generation. The line automatically makes us choose, it divides the page, left-right, up-down. The design which ensues is where we qualify that which the line delineates, and giving meaning and identity, positive-negative becomes figure-ground. The line takes on different qualities dependent upon the medium with which it is drawn. A solid ink line signifies presence and conviction. A grainy charcoal line of varying lineweight and thickness conveys an impreciseness, a coming into being, a restlessness that it does not want to be permanently fixed and defined. The graphite lines of Can's drawings are very much about a real presence constantly in redefinition. Here the lines become the topography, they spread to become a plane, with definite thickness (sectional drawing with roof elements), they become floating horizontal terraces that suggest varying degrees of enclosed space.

The types of drawings used in architectural design lead to a discussion of "stages." What types of drawings are used in what "stage," this referring to the idea of design process. Different names are given for drawing in different stages of design. In "Tangible Speculation," Michael Graves defines drawings as that of the referential sketch, the preparatory study, and the definitive drawing. Each can be the other at any stage of design, and one need not assume that they are confined to a particular time of the design stage. What is it about our education that poses the need to ascertain stages of design and the stages determining the types of drawing used? How is "worth" attributed to a drawing, and why does it seem to be "time-dependent"? The example is that of the conceptual sketch, which is assumed to be done at the beginning of the design endeavor. If ideas and sources of inspiration are constantly surfacing, when does it matter when a sketch is made? This involves the idea of a presentation sketch, where the audience is presupposed. Is there a feeling of "genuineness" when the viewer sees a "process sketch"? Almost voyeuristic, does one feel witness to someone's working process, somehow privileged to look over the designer's shoulder and witness the very first act of creation? One must realize that perhaps the first marks do not end up in the final design. This does not mean they were "useless" but in most cases needed to have been made in order to progress and develop into the final design. The idea espoused here is that in design there are "things" one "must" go through that cannot bypasses, that there is a process which is nonlinear but constantly looping. Perhaps a

"conceptual sketch" that is most clear is done at the end of a design, where one is able to clearly convey concepts through the most effective media. Understanding of the characteristics of drawing media and the affordances of drawing means combine to make a most effective conveyance of ideas.

As a design progresses, one begins to understand the nature of that which is being designed. And through the exploration of the design, one gains insight into that nature through the medium one uses in exploring. This development of understanding that which is being drawn is very important. In this exploration, that which is explored can be either representation of something which already exists, or creation of something not yet existing. In either case, it is the act of exploration through drawing that the hand, eye, and mind find a way to penetrate the object in their understanding of it, and begin to show it graphically. Can’s design is an example of exploration of the creation of a nonexistent situation, and the representation of the idea of something which exists but not physically seen is in Cheng-Ta’s follow-up exercise.

Material transformation:

Though a drawing is illusional, for in reality is only what it is physically made of, graphite and paper, the drawing material becomes something that is transformed into what is drawn.

“Drawing as the fine instrument of vision centers its initial effort on the draftsman’s own understanding of his experience. The connection between the various fragments of experience are what drawing seeks…general marks are deceptive. In this case we must not overlook the infinite shades of interpretation which individual personality and sensibility bring to experience, not the layers of meaning which the word experience itself possesses…Line mediates a silent conversation between the draftsman and the currents of his experience…the draftsman attempts to maintain a condition where the senses meet directly with reality, where past experience and preconceptions assist but are not substituted for fresh examination…Whatever meaningful order the draftsman determines will be as singular and the individual himself; how significant it will be to others is, of course, another question.”

Can’s design exercise is very much about the site. The program given is but one small part of what fits on the site, but the design is primarily one of discovering the site. This discovery is sparked by his imagination and explored by the act of drawing the topographical lines, each sheet is a refinement and creation of site, and each graphite line searches the surface for its placement. It is brandished into the tracing paper in an attempt to fix itself after wandering the surface. Here it is not a representation of an existing thing, but the creation of one. The graphite topographical marks become the land, each layer finessing the grade, the marks blurring, becoming the topsoil which blankets the difference in grade and makes it one smooth surface which rolls and plunges, and is retained by thick walls.

Technique of drawing is a way of seeing and understanding. There is as much knowledge in the hand as there is in the eye or in the mind. What is not cognitively admitted as knowledge, is perceived and expressed in the movement of the hand in drawing. Cheng-Ta’s trees in the follow-up drawing were drawn vertically -- the stroke

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12. Hill, 43.
from the ground line up. He understood that trees grow in this fashion. That are they not only vertical, but grow from bottom up, so his vigorous strokes were from bottom up. The drawing is extremely abstract, of course, and he did not have a grove of trees to look at, but his understanding of trees, from his observations and memory, allowed him to abstract them in this manner, capturing the essence of the growth behavior of trees.

**The act of drawing:**

So it is not just the medium which makes the difference, it is in the end, exploration through drawing and training of the hand-eye-mind, but the physical medium we use is a big influence because as soon as we employ tools outside ourselves, we have to play by the rules intrinsically inherent in those tools.

The use of different media in an individual drawing is to effect visual differentiation that indicates the assignment of different meanings. This is most clearly exemplified in the use of color for "coding" of a drawing, as seen in Martin's design. The use of color in the designs made through the computer by Dan and Mark are not as much designation of meaning, but instead as an organizational method of discerning layers and the construct of systems by the designer. Colors used in sketches, habitual use of color and tones and technique, add to the sophistication of the idea and the sketch. The drawing is given more qualitative definition.

Understanding the nature of a medium and how to use a drawing instrument of tool allows the designer to use these in personal expressive ways. The medium and tool have qualities which inherently make the designer draw in specific ways. In Exercise I, Student B felt he had to stand up when drawing with the pastel. This was not some whim or fancy, but allowed him to make greater movements with his arm, pivoting at the elbow. In the follow-up exercise, Cheng-Ta automatically gripped the 1/2" diameter compressed charcoal in a certain way and made large gestures with his arm, pivoting at the shoulder. This was especially evident when he drew circles, keeping his arm stiff as his body pivoted in a circular way from the waist.

**Exploration and expression:**

An explorative drawing explores an idea, changes and develops. However often the expression of a concept is drawn and put on a wall as the concept itself. Many of Mendelsohn's sketches may be considered "closed" that reduce the drawing to one powerful idea, such as a drawing that is solely about dynamics. These drawings are part of a process, and contribute to the development of the design, but they are complete in and of themselves. The media used are of a great variety, and they express ideas of motion in different ways. His pencil sketches seem to pixelize and come into being up through the page as one follows the lines of grainy graphite deposits. The motion of the viewer's eye crisscrosses the image as it is felt to come up from the page. The pen sketches evoke the feeling of motion captured, with an understanding of the origin of the motion, and where the image would be positioned in the next drawing, if it were made. The motion is horizontal, going across the page, and the speed can be imagined. Martin's design in Exercise II can be considered an open drawing: the concept is the building, the drawings were

drawn and redrawn, remodifying the elements which set up the dichotomy of and enclosed space and an open one above. Can’s design would also be considered “open,” as each sheet was a rearticulation of the land which was the focus of the design.

Two fundamental differences of architectural drawing lie in the need for quantitative precision and qualitative expression. Our creative mind does not think in solely abstract terms. We learn to think abstractly to capture the essence of complex thoughts. We do not think from abstract to detail in a linear sequence. The process of design, by pure virtue of using those terms, suggest somewhat falsely that the nature of thinking it can be followed in clean and neat categories, that diminishes the possibility of instant creation or a subconscious or unconscious something that incubates unbeknownst to the designer, and all of a sudden emerges. It suggest some sort of formulaic possibility for anyone to be able to follow and design. We are trained to think in abstract terms with line, but we think in qualitative terms; the experience of someone occupying a space, the views he will see. But we do not draw the view, we talk about it; we talk of light filling the space, but we do not draw it the light itself. We draw in black and white when we see in color, and learn to abstract color, using it as coding representations. What about materiality? As the choice of building material is deliberate, so should be the choice of drawing media and technique in design exploration. Here lies the dichotomy between sensate and abstract thinking and expression.

The precision with which Mazie designed lies in keeping exact measurements, from room sizes to person heights and placement of the tree in the exact center of the enclosure. This precision leads to conventional architectural orthogonal documents. The plan and sections tell clearly the dimensions of the room, the sharpened point of the pencil creates precise lines of specified line-weight, abstracting the space into its precise planes of enclosure. The sensate qualities of the room can only be imagined as one reads the drawing and sees the exact positions of the windows, imagines the directed views, the amount of sunlight, the shapes of the shadows cast from the geometries of the window, etc.

The receiving surface:

The surface that supports the drawing is as important as that with which we draw. Working with tracing paper is different from drawing on an opaque surface. There was a studio in which the students were given 2 large sheets of white two-ply Strathmore paper and were instructed to design their project on those sheets for the entire semester. Those very sheets would be the final presentation drawings as well. The students used inking pens, pencils, and other media they chose. The lines that were erased still left incisions in the surface of the sheet. Blue non-print lead was used by some to establish ordering systems such as grids and measurements for scale, much like techniques used by Mazie and Cheng-Ta in Exercise II. In the end, the sheets looked like paintings, with superimpositions of line drawings, with different line-weight, remnants of lines that could not be completely erased. Images seemed to rise to the surface and recede as the eye tried to read the drawing. Similar notions of palimpsest and fixing the process of design on one surface are exemplified in techniques of drawing and erasing or covering over with gesso, creating new layers on which to draw. The transparency of those layers are dependent upon how the covering layer dries.
Perhaps the question is not of new materials, but how to use existing ones. Innovation comes about when existing means are executed with new techniques and methods. In using new means in old ways, i.e. the computer, we realize that often we do not understand what and why it is that we do and we do not understand the potential of the new and fail to explore what it can do. Often it is the use of a new tool that allows us to understand or conventions of the old. For example, we “save” drawings on the computer at certain intervals of time in case there is a power failure, or the computer crashes, or some other unforeseen catastrophe. We save views for revisiting in the future. The drawings drawn are not for an “end,” but for continual development and change. In conventional hand drawing, the drawing does come to a stage where it can be considered at a stage to “save.” This means that it needs to be left at that stage, otherwise it would continue and become something else and there is no frozen point in time to refer to. This has repercussions on our understanding of “stages,” as they are often arbitrary. Through exploration of conventional drawing with new tools such as the computer, we question "convention" and discover attributes of the new tool. There is the issue of creativity through mistakes in drawing and designing by hand. Mistakes or unanticipated outcomes happen in computer drawings as well that are equally as influential on creativity. Is this an issue of perception? Is something that a computer does of any lesser value than that of human error?

**Tools: Traditional and New:**

"Traditionally, new technologies begin life by imitating those they replace..."^{15}

As Martin stated in Exercise II, "I never start with the "appropriate tool," since one "never knows where ideas start from" or where they will go as they take life of their own. The understanding of behavior and characteristics of media and means allows us to experiment. The choice of a drawing medium or tool is often intuitive. Personal preferences lead one to prefer one tool over another for certain tasks, and inevitably, one always feels that one never has the "right" tool, that one always wishes they had a pen other than the one they have. The instrument is what mediates between the hand and the drawing medium. The way its form conforms to the hand has quite a lot of influence on how it is used. In Exercise I, Student B said of the pencil "it fits." He connected with it so much that he “wanted to use it up and ‘complete it’.”

The introduction of computer drawing directly affects the notions of separation of tools in physical form: a new method of working a new way of conceiving, and different ways of linking eye and hand when it is the mark that is really what the eye is seeing, not the hand and the media together making the mark. There is a new understanding of the line and mark. Nothing is chance. All is deliberate from the start, and the modified after. The initial definitions are always given, if intuitively by the designer, still quantitatively by the program. What is a simple line to the designer is transcribed into "0"s and "1"s, or the like.

The designer may draw a free curve with many different tools such as a pressure-sensitive stylus or other haptic tool, but the computer always generates a representation of that curve in a way that the designer perhaps never

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intended. Another set of information is generated by the computer program to describe it for itself. It is a representation that the person who drew it had no intention of making, but it exists in the computer. How does this affect the design if that which one had control over when one drew it, becomes redefined in a way that only allows the person to manipulate it in a certain way after it has been drawn?

Of course one cannot make generalizations regarding computer-aided design tools and programs. Autocad has many limitations that are not common to all computer-based tools, and serves better as a drafting package rather than a design tool because of the need for precise input of information. The implementation of different programs should be distinguished from the computer itself.  

The computer also allows us to design in ways that allow us to work in specific ways, filtering out particular aspects of reality that may hinder design exploration. For instance, gravity can be negated when building three-dimensional models in a computer program, which allows pieces to be manipulated independent of each other and pinned in space for specific study. When building a physical model, it may take very long to glue pieces together in strange ways when connections are not at right angles, or one may need multiple hands to hold pieces in place while moving others. Also once pieces are glued, they may be difficult to alter and move, making the enterprise inefficient with regard to time and effort.

Experience: Visual, Physical

The evaluative criteria of looking at architectural drawings is that the drawing is a tool which projects onto the world the designer’s vision of what he intends there to exist in the world. It is the making of space from physical materials and surfaces with their inherent unique qualities.

In finding the qualities of the media, one must look at the marks made: types of line, shade, shadow, tone, indication of surface texture, which project toward a certain quality of space. The gesture in applying the media via specific drawing tools is the main thing which bestows intent and evokes experience. There are certain qualities of a drawing which allows the eye to visually enter into and understand it. The “slickness” of material corresponds to slickness of line and image. Inked drawings on mylar seem to float on the page. The texture of the material grips onto the page; tonal differences grabs eye and pulls into the drawing. High contrast, finality makes eye skim over and off the drawing surface. What is considered a “finished” drawing often deters people from questioning the information displayed, e.g., realistic computer renderings.

How does one enter the drawing? Contrast is what brings the eye into a specific area of a drawing. This is achieved in a number of ways through line-weight, unevenness of line, unresolved areas such as broken lines where the viewer’s eye connects them, etc. There are programs which simulate the hand sketch that aims to convey a certain gesture or trace of the hand. What does this say about the act of drawing or the visual "worth" attributed to a drawing? The act of drawing benefits the one who draws, so hand drawing will not be replaced, as it involves

16. Julie Dorsey
17. Julie Dorsey
mental, intuitive, and physical faculties. With computer-simulated hand sketching, the expression of the drawing is still conveyed visually. However, the subtleties still surface. Hand drawing captures the motion of the hand in a raw manner. The amount of energy a mark is made can be similar, what is evident in hand drawing might be lost in drawing through the computer, although haptic interfaces do allow touch to affect the output. However, these exist in limited settings at the moment. One may be very physically very vigorous in clicking the mouse in drawing the line, or bang on the keyboard in setting up rendering parameters, but it is never seen in the image which results. I am typing furiously on the computer at this moment, but this would never be evident when printed. There are no indentations on the screen’s surface which support these typed letters of places where I hit the key very hard. There are no clues as to where I stopped to pause in this sentence. This is very different from the written page where one can see the frantic scribble of the hand. What is the clue into gesture on the typed page? Do the clues lie in the number of spelling mistakes? Even then the words can be corrected, sections cut and pasted elsewhere, and the previous step is gone. Still there is experience to be gained by the designer using the computer as a medium of design. This lies in the element of anticipation and surprise. For example, in computer rendering, there is anticipation in what will result in the end.

Imagination:

In design we may be inspired by anything. Ideas may be sparked by seeing a passing cloud or a stain on the sidewalk, remembering a conversation, hearing a song, smelling a smell. Anything can be “appropriate” to start our imagination.

Student C in Exercise I stated, “We carry with us a whole vocabulary of things, and experiment with tools to express our ideas.” The imagery he imagined after seeing the photograph in that exercise was of a little boy and the feeling of abandonment. He said he “could have used any medium, but the pencil and pen allowed the detail to be captured, and the most important thing is to convey the feeling.” We will do what we want and can with the material to achieve our intent.

For Dan in Exercise II, this vocabulary of ideas came from a previous project that was similar to the one given for this exercise. For this exercise he had predetermined the environment and means of design: use of the computer and the programs of Photoshop and FormZ. This program reminded him of a previous project which he had used physical models to design. This time he tried some of those previous ideas with the use of computer, which allowed him a different experience because the program allowed him to go into perspective views sooner than the time needed to draw a perspective by hand or make a physical model and then try to look inside for perspectival views. The scale of the physical model determines how much interior space can be seen whereas in the computer model, he ghosted objects that would occlude certain views, and the camera was able to move around freely inside the spaces. He was also quite facile at moving around the design with his views on the computer screen.

In Exercise III, Cheng-Ta, who has always been inspired by Le Corbusier and Kahn, immediately made a connection between the charcoal and Kahn’s use of the material. He began to draw diagrams of Kahn’s buildings. But there is nothing wrong with emulating others, because it was his own hand that was drawing. In that act, he was
making the experience his, and came to some sort of understanding of how Kahn may have been influenced by the material, because Cheng-Ta was himself so affected. Here Cheng-Ta connected not with the forms of Kahn's buildings, but with the charcoal and how its characteristics of thick, abstract, and heavy lines causes one to envision space and architecture. He realized that he doesn’t envision walls the same as Kahn must have envisioned walls, and most importantly he started to wonder why he couldn’t envision the way Kahn envisioned.

**DISCUSSION**

Along with the tools, the media and means with which we design, is creativity through observation, memory and imagination, explored and expressed through means of drawing. The components of drawing include media, applied by instruments, with the help of drafting aids, on a drawing surface. The act of drawing involves motion of the hand and cognitive and perceptual activity. Design drawings convey intent and the content is developed in a process of design which is unique and personal to each individual, but with certain conventions so as tried to be made understood by many. These drawings are not created in an absolutely linear way, but are revisited in any given moment of design. When these drawings are revisited, it is the combination of the new ideas inspired by elements not previously seen in the previous drawing, with the reinterpretation of things previously seen, that lead to new insights. These new insights are based on observation and thinking, and these are dependent upon the mark and materials making up the physical drawing. The act of drawing is dependent upon the information in dialogue between the hand and the mind, perceived by the eye. The behavior of the material is controlled by the drawing surface, the choice of technique and facility and inventiveness of the designer.

What has been shown is that the act of drawing is extremely informative. The physical learning and the knowledge inherent in physical motion should not become subordinate to mental knowledge. Examples given have shown that tactile qualities of different media figures greatly in the automatic response to the material. The use of materials one is not familiar with can prove to be quite edifying, as exemplified in my own experience with my bachelor’s thesis, and Cheng-Ta’s experience doing the follow-up exercise.

But how much does the physical act of drawing matter? An example of great interest was found during Mark and Dan's design exercises. The software allowed them to go into perspective extremely quickly. The amount of visual information was incredible. Their hands and arms may not have physically covered much distance in clicking and dragging the mouse, but they hardly blinked to intake all of the information in multiple windows and multiple views. The quickness of execution of design commands: array, spline, render, etc., allowed them to increase the amount of information generated.

We know that design does not begin and end in a clear straight path, or very rarely at best. The path may be informed by clear logic, but is always circuitous. As issues which arise in design are vast and varied, the process is always reiterative, moving ahead, then going back to a previous stage, and advancing to another level with new infor-
mation. This process cannot be eliminated, as it is one in which the designer works with his senses, experience, and imagination, through his hands, his perception, and his mind.

The designer, perceiving with his senses and referring to imagination and experience, must go through this circuitous path, thinking as he draws, builds physical models, and speaks of his designs. It is in the time of doing that one discovers his strengths and weaknesses, and is inspired by ideas he would not otherwise have had, if not for physical exploration and experimentation. Cheng-Ta came to his own understanding of Kahn to a certain degree through his own use of charcoal while drawing, as he had never used charcoal for designing before. Rajive had never thought much about his switching between drawing instruments as he designed. After the exercise he became more aware of his habits and recognized how his intuitive knowledge of the characteristics of drawing media might be used in drawing and design. Martin felt that one always starts with “inappropriate” means, and accepted it because he also had the belief that one’s imagination guides one to accomplish one’s vision. May was resigned in a certain way that she was very conventional, and accepted that. It would be interesting to see how Exercise III would affect her. Perhaps for Mark and Dan the next step of development would be to make physical models. Would the spaces seen in the computer-generated perspectives be seen in the model, as some walls and occluding elements were removed in the computer model. Would one be able pragmatically to build a physical model of their designs?

Some other ways of approaching the study of the influence of drawing media on design is to draw the same design in different media, keeping in mind the intent of the design and seeing how the media must be manipulated to express the intent. As designers are never satisfied with their designs and are never really “finished,” different media used in the iterative drawing of the design may even change some of the intents of the design. As drawing is a way of communicating one’s ideas, it is also something which one must learn to read to extract ideas and intents. Another exercise may be to compare drawings of an existing building with the built space itself, and see how the information, both quantitative and qualitative, perceived in the drawings is transferred into the real space.

The greatest impact that this study may have had, besides on myself, is on the participants themselves in revisiting the importance of architectural design through drawing, with specific attention to the media and means with which they draw and design. They gained insights to their process and, in their post-experiment discussions, they were able to listen to themselves in what they said and their attitude toward their own approach to design. Some came to the realization that they had specific preferences toward media and means of representation, and began to understand their reasons for their preferences. Many of them also realized what tools they were facile at, and others that they had never tried. These exercises also reminded them of the difficulty of expressing intent through drawing and the necessity for experimentation through different means to better communicate one’s ideas.

As Cheng-Ta flipped through his drawings he reflected upon his experiences of Exercise III, he sighed, at least I discovered I can’t work with charcoal...You have to go through all this to get to something remotely good.
Bibliography


13. __________, *No. 5*.


List of Illustrations

1. media used in Exercise I; photo: P. Ku
2. photograph for Exercise I, part 2: entrance to residence in the old city-center of Essaouira, Morocco; photo: P. Ku
3. Exercise I: pastel; Student A
4. Exercise I: pencil; Student A
5. Exercise I: pen; Student A
6. Exercise I: photo interpretation; Student A
7. Exercise I: pastel; Student B
8. Exercise I: pencil; Student B
9. Exercise I: pen; Student B
10. Exercise I: photo interpretation; Student B
11. Exercise I: pastel (landscape); Student C
12. Exercise I: pastel (seascape); Student C
13. Exercise I: pencil; Student C
14. Exercise I: pen; Student C
15. Exercise I: photo interpretation; Student C
16. Exercise I: transferrence of emotion on paper: “anger”; Student C
17. Exercise I: pastel; Student D
18. Exercise I: pencil; Student D
19. Exercise I: pen; Student D
20. Exercise I: photo interpretation; Student D
21. Exercise I: photo interpretation comparison; Students A and D
22. Exercise I: photo interpretation comparison; Students B and C
23. Exercise I: pastel comparison; Students A, B and D
24. Exercise I: pencil comparison; Students C and D
25. Exercise I: “anger”; Student C
26. Exercise I: pencil; Student B
27. Exercise II: Martin
28. Exercise II: Martin
29. Exercise II: site diagram; Mazie
30. Exercise II: plan, axonometrics; Mazie
31. Exercise II: plan; Mazie
32. Exercise II: plan; Mazie
33. Exercise II: plan; Mazie
34. Exercise II: section, plan, roof plan; Mazie
35. Exercise II: conceptual diagram; Mazie
36. Exercise II: plan; Cheng-Ta
37. Exercise II: plan; Cheng-Ta
38. Exercise II: plan, section; Cheng-Ta
39. Exercise II: section; Cheng-Ta
40. Exercise II: plan; Cheng-Ta
41. Exercise II: section, axonometric; Cheng-Ta
42. Exercise II: plan, section; Cheng-Ta
43. Exercise II: section; Cheng-Ta
44. Exercise II: site plan; Can
45. Exercise II: plan; Can
46. Exercise II: plan; Can
47. Exercise II: section; Can
48. Exercise II: section; Can
49. Exercise II: plan; Can
50. Exercise II: site plan, site section; Rajive
51. Exercise II: section; Rajive
52. Exercise II: section; Rajive
53. Exercise II: section; Rajive
54. Exercise II: plan; Rajive
55. Exercise II: interior perspective; Rajive
56. Exercise II: site section, site diagram; Vassilios
57. Exercise II: site plan diagram; Vassilios
58. Exercise II: plan; Vassilios
59. Exercise II: section; Vassilios
60. Exercise II: interior perspective; Vassilios
61. Exercise II: conceptual site sketch; Dan
62. Exercise II: site plan; Dan
63. Exercise II: plan; Dan
64. Exercise II: axonometric; Dan
65. Exercise II: conceptual site sketch; Mark
66. Exercise II: site/design axonometric; Mark
67. Exercise II: site/design axonometric; Mark
68. Exercise II: plan; Mark
69. Exercise II: section; Mark
70. Exercise II: perspective; Mark
71. Exercise II: preliminary sketch, pencil; Mark
72. Boston Studio, MIT Fall 1995: rendered computer model; Partho
73. Exercise III: soft graphite pencils; Cheng-Ta
74. Exercise III: charcoal; Cheng-Ta
75. Exercise III: charcoal; Cheng-Ta
76. Exercise III: pastel; Cheng-Ta
77. Exercise III: pastel; Cheng-Ta
78. Exercise III: soft graphite pencils; Cheng-Ta