4.273 Fall 02 Introduction to Design Inquiry – Professor William Porter

List of Assignments

4.273
Introduction to Design Inquiry

Assignment 1: An Object
Teams of 3 or 4 Please!

This assignment initiates our quest to understand how we engage worlds through objects and how we engage objects through worlds. We'd like you to find an object to reflect upon. It can be something apparently ordinary, or something obviously designed. It should be interesting in its own right, but it should also reveal aspects of something else perceived or imagined.

Please come prepared to discuss the object both in terms of its intrinsic qualities and in terms of the qualities that enable it to indicate or to mean something beyond itself.

We would suggest that each team member record his/her own evolving understanding of the object and then share those with the other team members. Please keep track of the differences in understanding among the team members and how and to what extent a shared understanding emerged. And write /draw / make an essay / drawing / object that can be placed in our web-based classroom, which expresses your collective understanding of the object you found and something of the process by which that understanding was achieved. Please bring the object (the original and the ones you made) with you to class.

4.273
Introduction to Design Inquiry

Assignment 2: The Infinite Corridor

This assignment reflects one of the central concerns of this course: how can one be confident that ones own knowledge is true of and in the world outside oneself? Conversely, how can one learn confidently about the world? Which is the more productive view: that knowledge of the world is contained in the world, or that it is triggered in our mind by it: objectively true, or a construction that we make?

This assignment also contains "intermediate objects," the essays through which you will shape a view of the world and your own essays that will convey that view. What are the properties and the content of the assigned essays that enable you to form your views? And what has been critical from your own experience?

Assignment-Part I:
1. Describe the Infinite Corridor here at MIT. What do you see? What is going on? Keep track of the questions you pose for yourself. Put this aside.

What are the elements and the relations that are important in each of the descriptions? What are the similarities and differences? Try to address some of the questions posed above.

Choose the medium you feel is most appropriate. You should assume that you will have 5 minutes to present it. Tell us about what you will need for your presentation.

Assignment-Part II:
Choose two of the essays in the readings below, and write a one or two page essay (with illustrations if you like) of how that author -- as seen through that essay --would have written about the Infinite Corridor.
1. What would they see? What is going on? Keep track of the questions you pose for yourself as you stand in the shoes of the author.
2. Write as if you were the author and construct a narrative in their voice that they might have written about it. Try to become completely absorbed in their world and in their manner of speaking. A fragment of

an essay for each, say 150-200 words would be plenty.
In the class discussion we shall compare and contrast how the environment might be changed to satisfy each author's apparent needs, to meet their implied standards of excellence, and to give them pleasure.

Readings:
Lyford's The Airtight Cage;
Jacobs's Life and Death of Great American Cities;
Durrell's essay on Montevideo in the Spirit of Place,
Mitchell's Bit Cities (any part)

4.273
Introduction to Design Inquiry

Assignment 3: Replication
Group Work

This exercise of "replication" has to do with "making" as a means of "reading" things. It is an attempt to understand through an exercise in creating plausible histories of how the artifact might have come into being. It has the benefit of re-invention where the invention is known. But the force of the artifact, its rationale, its raison d'etre, can be understood through this device of reconstruction in ways that may otherwise be inaccessible. Through replication we may better be able to understand not only the characteristics of the thing, but the world within which it was conceived and intended to function. Please refer to "On Making Things"

In this assignment, we are asking you to find a designed object of any size that you will replicate. By "replication" we mean imagining a constructive design-like process from which the chosen object could emerge. In the article, "Notes on the inner logic of designing: Two thought-experiments," and read in particular the first of the two, the Copley Square design. In this article designing can be viewed as resulting from a dialog between the designer's reading of a particular site and the architectonic ideas evoked in him/her by that reading. This does not pretend to be a full version of what design is, but it is a simplification that permits a moderately clear exercise to be constructed. You might think of the Copley Square exercise as operating within a "compositional" frame of reference where the references to the local situation and to the experimenter's storehouse of images are limited largely to elements of composition. Other frames of reference might be more productive in different situations, as for example, a metaphor that would allow the designer to see a situation as something else, and, therefore, to suggests aspects and characteristics not present in the original situation. Arguably the compositional frame of reference constituted a large part of the "world" of these designers.

In your assignment you should choose the frame of reference (imagine the "world") you believe will best fit your selected object. The object may be a building, a place or any designed artifact. Does it suggest an original or primitive object from which it was somehow derived? What sorts of uses does it engender, and how does it do that? Can you describe your direct tactile experience of the object? Are there related experiences in your past? What can you draw from your storehouse of images and imagery that relates to it?
Is there a process of discovery associated with the object and, if so, what are the events along that path of discovery? Can you clarify the underlying rules that seem to govern its design and production? How does the history of the object impinge upon your own experience and understanding of it? What are the clues that imply such a history? Can you construct a plausible history of the development of the object? Does that plausible construction help either in understanding better the object or in imagining the probable history?

You should not duplicate the Copley Square "compositional" frame of reference unless you feel it is appropriate. This exercise is one that is intended to combine memory and experience in an evolving drama of "what if." Each group should present its project in class in twenty minutes or so and record it on the web.

Please also read On_Making_Things.doc which can be found under Supplementary Information.

4.273
Introduction to Design Inquiry

Assignment 4: Reading a Building: The Exeter Library

Reading a Building

Group Work

The assignment calls for a four stage process: your own personal reading; your group's collaboration and collective efforts; your interaction with the class, and your later reflections. It asks you to communicate your approach to others as a means to improve your "reading" as well as to move toward a more commonly shared understanding.

During the visit, focusing on your direct experience, examine how the building embodies and expresses that of which it is made, look for how its formal elements and relations may suggest larger ideas and purposes. Look carefully at how you engage in this "reading" process, and record it. That process may be carried out by selecting one specific feature of the library, such as a handrail, or material, or episode in your experience that you find particularly revealing. What questions, puzzles, anomalies rise to the surface of your mind? What strategies do you employ to address and resolve them? What new evidence do you gather in an effort to resolve the questions? How do the questions arise in the first place? Can you mine the question-raising moments in ways to suggest further inquiry?

Each group should create an (intermediary) object (or objects) that will help you to convey your understanding of the building. There should be one object or set of objects per group. Try to let the class build its impressions of what you are trying to say through artful exposure to the objects you have made. Keep track of the evolution of your ideas throughout these three stages and record your reflections on that evolution after the class presentation and discussion.

4.273
Introduction to Design Inquiry

Assignment 5: Type

Individual and Group Work

This assignment addresses a major idea that has coursed through the history of architectural theory. The idea of Type is powerful and dangerous: powerful in that it can connect an individual work to a much larger set of ideas in architecture itself and in culture more generally; dangerous in that it can be misused to substitute for deeper exploration and thus fail to imbue building with communicative power to reach a wide variety of contemporary users.

Type appears either as a central or a mediating element in a variety of different activities or "operations" that the designer performs. For example in:
- giving form to functions and to program
- perception and "reading" of the built form
- communication with others about the built form
- establishing the generality of a building, or its particularity and uniqueness
- fitting a building into or differentiating it from its context
- establishing continuity or discontinuity with the past
- expressing our own times
- ...

Type is also a hinge between the two major sections of 4.273: the first dealing with how we view and "read" the world; and the second dealing with how we design (in) it. In the idea of type are contained many of the ideas regarding how the artifact can be described and generated.

For this assignment, we are asking you to re-read a complex object that, by this time, you know rather well, the Exeter Library, using type as a conceptual "tool" of analysis. Draw on the bibliographical references below to fashion your argument. Beware: the authors do not necessarily agree!

Each group should construct an argument among two or more of the authors as they might try to construe this building as an exemplar of their ideas about type. This should be the main body of the assignment.

You should choose the medium or media that best express these authors' ideas.

For the purposes of later discussion you should be prepared:
1. to reflect on the degree to which these authors have helped you see more as well as how they seem to fall short of what you now know about the building; and
2. to comment on how (if at all) you think the idea of type enters into the experience of buildings.

4.273
Introduction to Design Inquiry

Assignment 6: Redesigning the Game

Group Work
In playing out the silent game, our intention is to provide a "stage" for experiencing directly and collectively some of the communication paradoxes that emerge from the design and reading of simple artifacts. The silent game allows exploration of how meaning gets embedded in, and conveyed through, forms, and reveals common misunderstandings between builders and readers of an artifact. The Silent Game provides an opportunity to model some of these phenomena, play them out, and witness their interactions, thereby enlightening the mechanics of creation and recognition.
Taking leads from your play of the Silent Game and from the reading of Habraken's Concept Design Games, Book Two, formulate an issue that, in your mind, was not clearly revealed in the silent design, an issue that you will explore through some ingenious variation of the game. The issue might relate to areas such as communication, design rules, operations of design, representation, roles people play in architectural practice, etc. We suggest that you base your derived game on the structure of the Silent Game by introducing a minor variation (altering one or two of the Game components - see chapter 3 of Book One) to help you address your issue. Proposed variations will be discussed in class and some of them will be played out on October 25. (Please tell us what preparations are necessary.)

Reading due by Wednesday, October 23, 2002
John Habraken et al, Selections from Concept Design Games (in the reader)
Wittengenstein: Selections from the Blue and the Brown Book (in the reader)

4.273
Introduction to Design Inquiry

Assignment 7: Open Experiment

Outline: We will divide your group into the designers and the players. The designers will prepare a set of shapes and assembly rules from an architectural drawing. The players will use the set to solve a design problem.

Designers:

1. Select a piece of architectural graphics. Choose a well-known and simple one. Simplify it if needs be.

Some ideas :

layout of structural walls and columns in a plan of some famous architecture

floor layout of furniture

facade of a building showing various openings

2. Articulate it into a small number of component types (less than 10 but more than 2) If you want a type to be parametric, indicate which dimension is a variable. For instance, you might like to allow length of a wall to be changeable.

3. Prepare a set of shape transformation rules that guides assembling of the components. Try to design a set that can re-produce the original graphics, and also can create other variations of the same style.

A simple rule indicates how one component is added to another.

C1 -> C1 + C2 (adding a room C2 next to another C1, for example)

Its variation can be

C1 + C2 -> C1 + C2 + C3 (inserting a wall C3 between columns C1 and C2, for example)

A more complex approach is to use abstract markers. For example, you can represent a linear plan of special end conditions by a set below.

M1 -> M2 + M3 + M2 (M1 represents the whole. M2 are ends, M3 is the middle.)

M2 -> C1 (M2 can be replaced by the component C1.)

M2 -> C2 (It can also be replaced by the component C2.)

M3 -> C3 (The other end can be replace by the component C3.)

4. If your group is large, you may divide the designers into sub-groups and let each sub-group prepare a set of rules.

5. Prepare a design problem which the players will solve through applications of the rules. For example, if the original graphics is a plan, you can provide its basic program such as the number of rooms required and the size of the building. If there are many players, you may give each a slightly different program.

6. **<u>Do NOT reveal the original graphics to the players.</u>**

Players: Solve the design problem made by the designers. Try producing one or more alternative solutions.

Each design solution must be generated through applications of the rules prepared by the designers. The players must not be shown the original graphics. If a player feels that a rule absolutely needs to be modified/added, document your reasoning and what your modification does to the outcome of your design solution.

Medium: You can use any drafting software or Photoshop as a game board. If you want to avoid digital, use paper or transparency.

Presentation: Include the followings.

- the original graphics selected

- illustration of rules made by the designers

- description of the design problem prepared by the designers

- illustration of the design solutions made by the players

- illustration of the design development through applications of the rules by the players

1. How close or different were the design solutions in comparison to the original graphics?

2. Were the rules used as intended?

3. What rules did the players want to change or add if any?

4. Is there any way to improve the format of this experiment?

4.273
Introduction to Design Inquiry

Assignment 8: Evolutionary Design

TASK:

Set up an evolutionary design system and show a genealogy of designs generated by the system.

CONSTRAINTS:

The designs should be based on a grid of cells, and the genes should activate rules for transforming the grid, the cells, or both. The system should exhibit the key components of the evolutionary design systems we have discussed in class. Note especially the italicized words in the following description:

"Genetic algorithms are a search method rooted in the mechanisms of natural selection and the notion of evolution. They consist of some type of *population* (such as candidate solutions to a problem), some method of *selection* (such as an exogenous fitness calculation), and the operators of *crossover* and *mutation* which transform one population into another. Genetic algorithms are *stochastic* in the sense that all of the operators use some form of randomness in their process. However, the genetic algorithm's *iterative structure* of selection, based on survival of the fittest,
and crossover, a form of sexual reproduction, transforms the probabilistic nature of the process into a directed and adaptive mechanism which exhibits the characteristics of evolution. The process of transforming one population into another over many generations results in the *evolution* of the general population towards the goals of the fitness function."

REQUIRED PRODUCTS:

A clear description of your system: this should include (at least) the gene structure and grid transformations, a description of the resultant design space, population size and selection criteria, forms of crossover and mutation employed.

A genealogy of designs: this should include (at least) several sequential populations of designs and genes, which clearly exhibit evolutionary properties (i.e. a directed search through the design space you have created - not simply a random walk).

A NOTE ON TECHNIQUE:

Though almost any evolutionary design system can be interesting to watch for the first few rounds, they don't provide something for nothing: there is no free lunch, and poorly designed systems become a bore very quickly. Subtle decisions regarding gene structure and means of mapping the gene to grid transformations, as well as methods of selecting and transforming one population to the next, can have radical effects on the nature of your design space and the way in which your system searches through it. Pay careful attention to these factors, and the sensitivity of your system's behavior to changes in structure. The creation of your evolutionary system should involve its own iterative, evolutionary process.

4.273
Introduction to Design Inquiry

Assignment 9: Meaningful Processes

Group Work

This assignment has two phases:

Phase One:
We would like you to create a process that you judge to have good qualities. The process should generate spatial or architectural configurations Â– outcomes (conditions, continuities or states) that you regard as very likely to be acceptable. You may wish to design the elements and relations of your process as:

1. fixed;
2. variable as a function of the current condition or "state" of the process.
3. variable as a function of user intervention.

An example of two might be when Lego pieces you had selected took the form of a square.
You may also wish to design the variation strategy for #2 and #3 in order to control the outcomes.

You may wish to draw upon either the shape grammar or the genetic algorithm model of process, or to invent your own. The process need not be computer-based.

The priority should be in the first place to create high quality ingredients of the process and in the second place to shape the outcome or ultimate state(s). This should be seen in contrast with the exercise to make an object that made sense of the Exeter Library, where the emphasis was on the object rather than on its making or production. Also by way of contrast, this exercise is open ended, extrapolative, rather than interpolative, or in some way standing between you and some other already known object.

Phase Two:
Please have others use or play with your process. Ask them to articulate what they understand the process-in-use to mean. You should try to analyze their use and their reactions in terms of the "internal" and "external" meanings of your process, i.e., their affective and intellective responses to their experience of using the process per se; and, second, what they think it refers to or associates with in its parts and as a whole.

4.273
Introduction to Design Inquiry

Assignment 10: Reflection

Due: In class

Please reflect on the relation between 4.273 and your own direction of development,
OR
reflect on a subject of your choosing.

Media: your choice.