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Bounding Space

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> Streamlining becomes here an organic force as it relates to the dynamic equilibrium of the motion of the body within encompassed space.
> Frederick Kiesler[1]

Introduction

The cognition and description of spatial conditions are essential components of any foundation for design and the visual arts. However, the ability to discern subtle spatial distinctions and the limits of spatial boundaries is often clouded by habit and apparent familiarity with the conditions in question. For example, one thinks one "knows" the spatial make-up of one's bedroom, but can one really see the space of the room from a position outside of this perceived familiarity? Can pre-cognitive knowledge be converted into critical understanding? Or, to invert the question, how can one know a space that one sees with new eyes? Perhaps we need to take Paul Valery to heart when he suggests that; "to see is to forget the name of the thing one sees."[2]

This process of seeing a thing is a process of defamiliarization. Such a process involves an abstraction of the familiar object (or space) which allows one to step outside of the familiar and habitual understanding of the thing. Orthographic Architectural drawings can be part of this process, but as Frederick Kiesler wrote, "The floor plan is no more than the footprint of the house. From a flat impression of this sort it is difficult to conceive the actual form and content of the building. If God had begun the creation of man with a footprint, a monster all heels and toes would probably have grown up from it, not man."[3] The process must be spatial.

As the basis of a first-year inter-disciplinary foundation design unit, we propose that the design of spaces proceeds from the analysis of boundary conditions.[4] Though in its infancy, we believe that this approach is more directly suited to design education that emphasizes the "holistic" approach permitted by the use of emergent digital technologies. Rather than introduce students to design with exercises derived from modern norms of two-dimensional composition (a skill covered later in the Department of Architecture's pre-professional program), we have chosen to explore the relations of three-dimensional space with time and motion. This approach is, in effect, digital design without the computer.

Part of the University of Nebraska's inter-disciplinary Visual Literacy program, this exploration offers foundation skills and a glimpse into the mysteries of the familiar by focusing on a particular aspect of the formal: boundaries. The seven-week unit, titled Bounding Space© expands the first semester's emphasis on the superficial (surface) qualities of form to a fully three-dimensional and robust understanding of Form. We conceive the four semester pre-architecture program as an exploration of what we call Everyday Geometries. Each semester can be ascribed a geometric equation that denotes the pedagogical focus of the work. For example, the first semester project, the Sandbox© (described elsewhere by Brian Rex) addresses the notion that form = mass x surface. Projects in this unit introduce methods for describing surfaces and techniques for coaxing supple forms from two-dimensional surfaces. The third semester, in the Basic Design year, students explore compositional techniques that follow the assertion that form » form, of form comes from the manipulation of form. In the final semester of Basic Design thicker notions of site and program are progressively introduced along a trajectory best described as form = use / event. The second geometry, Bounding Space, discussed herein is based on the assertion that event » form or form is the trace of motion.

In the studio project we illustrate developing categorizations of boundaries that range from actual, precise, and material (Bona Fide) limits to spatial, legal, immaterial, and ephemeral (Fiat) boundaries. These terms are introduced in the studio as part of an effort to help the students develop not only a complex understanding of form and space, but also a view of design as the resultant vector of an analytical approach to a place and event. By proposing that analysis is design, we introduce students to design fundamentals in a limited field where a priori concepts are avoided to allow ideas to evolve through the work. Thus, the problematic question, "where do ideas come from" is deferred until the student has developed a more facile and complex ability to describe and manipulate three-dimensional form. For the purposes of Bounding Space, all projects share a common ground as analyses of the student's most familiar place, her bedroom.

> A space is something that has been made room for, something that is cleared and free, namely within a boundary... A boundary is not that at which something stops but, as the Greeks recognized, the boundary is that from which something begins its presencing.[5]
> Martin Heidegger

Boundaries

In the same way that direction and speed are the component

conditions of Velocity, surface and volume are the elementary conditions almost universally found in three-dimensional Form. Space, or Raum in the Heideggerian sense, is not endless and universal but bounded. It exists because of and is defined by a location, "Space is in essence that for which room has been made, that which is let into its bounds."[6] Space is thus a framed or otherwise delimited phenomenon that does not exist prior to the creation of a boundary. It exists because of and for the purpose of form. Space is finite and therefore measurable, available for analysis, and subject to external creative forces, such as design. Our work in the Bounding Space exercise concerns the measure of spaces by the description of their bounding surfaces. The creative force is seen here not as the generation of superficial forms ex novo, but as an sequential series of analytical acts which surreptitiously introduce creative activity through the use of imprecise and non-scientific methods. The evident complexity of these issues is kept at a comfortable distance from the students without sacrificing its fundamental power as a paradigm for architectural production.

The basis of this pedagogy lies in the basic topological conditions of surfaces. Avrum Stroll writes, "Surfaces are a particular kind of boundary or limit, that which is farthest from the center."[7] Our pedagogical definition of surface is limited to an aggregate of spaces, and for this reason, we need to think of surfaces as boundaries which can be embedded within one another as part of a more complex and dynamic relation of spaces and form. Whereas the Sandbox project focused on the definition of surfaces as visual and tactile manifestations of material form (what we call a Bona Fide Boundary,) Bounding Space adds another degree of complexity with the notion of the surface of an immaterial spatial boundary (a Fiat Boundary). These terms share a topological origin in logical philosophy and are best described by the following passage from Barry Smith and Achile C. Vazi:

> Consider John, the moon, and a lump of cheese. These are objects possessed of divisible bulk. They can be divided, in reality or in thought, into spatially extended parts. They have interiors. They also have boundaries, which we can think of (roughly) as infinitely thin slices. The boundary of the moon is the lunar surface. The boundary of John is the surface of his skin.
>
> But what of "inner" boundaries, the boundaries of the interior parts of things? There are many genuine two-dimensional (sphere- and torus-like) boundaries within the interior of John's body in virtue of the differentiation of his body into organs, cells, and so on. Imagine, however, a spherical ball made of some perfectly homogenous prime matter. If the possession by an object of genuine inner boundaries presupposes either some interior spatial discontinuity or qualitative homogeneity, then there is a sense in which there are no boundaries to be acknowledged within the interior of an object at all.
>
> Yet we do sometimes speak of inner boundaries even in the absence of any corresponding physical discontinuity or qualitative differentiation. Even in relation to a homogenous sphere we can still talk sensibly of its upper and lower hemispheres, its center of mass, and so on. We shall call the inner boundaries involved in such cases "fiat boundaries". Inner boundaries involving spatial discontinuity (holes, fissures, slits) or qualitative heterogeneity (of material constitution, texture, electric charge) we shall call "bona fide boundaries."[8]

We propose that Bona Fide Boundaries are all physical edges, surfaces, and discontinuities in the room while Fiat Boundaries are the immaterial surfaces defined by the movement of a body in space (the student moving in the room.) Thus, the Bona Fide Boundary is defined by walls, windows, moldings, furniture, books, clothing, and other objects located within the room. The Fiat Boundary of a particular event or aggregate of several events is secondary in that it is defined not only by the actor but also by the Bona Fide Boundary itself. The Bona Fide Boundary is primary because it typically influences the Fiat Boundaries of events that take place in the room. We describe the space between the Bona Fide Boundary of the room and the Fiat Boundary as an Interstitial Space. The Bounding Space projects are consequently split into three segments or "phases of space": the first focuses on analyzing and representing the Bona Fide Boundary of the room, the second on the Fiat Boundary as defined by a selection of typical events, and the third on synthesizing this information and discovering the interrelationship of different boundaries and their shared Interstitial Spaces.

The lessons and exercises of Bounding Space are comprised of a series of highly focused and discrete but additive and incremental projects where the thoughts and products of one day become the basic material for the next. The eight weeks of instruction are divided into three phases of work:

Phase 1 - Discerning and Delineating Bona Fide Boundaries

The projects begin with the location and description of the physical boundaries of the room. Bona Fide Boundaries are the physical edges, surfaces, and material discontinuities in the room. The exercises in this phase focus on perception of material quantity and descriptions of the displacement of matter.

1. Photo-Collage: The first act is to make a representation of

Fig. 1. Photomontage- Jack Hopkins

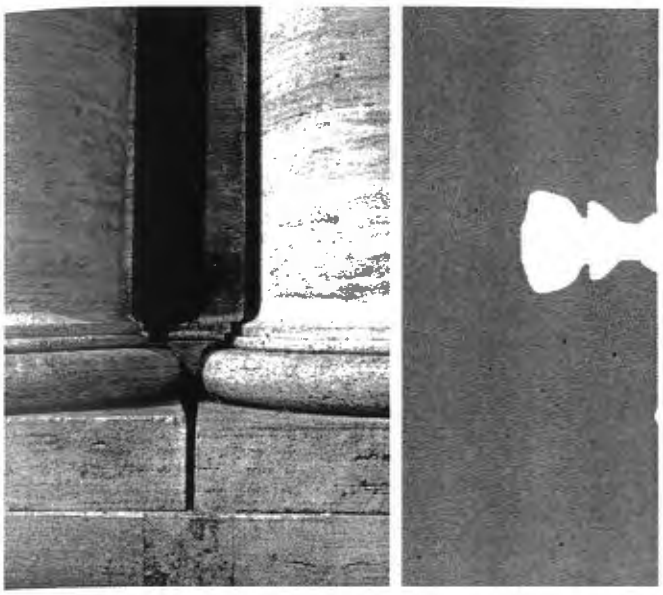


Fig. 2. Profiles- Bernini and Viola Kern's doorknob knife.

the room with a constructed frame photograph of the type made popular by the artist David Hockney. The purpose of this exercise is twofold: One, it provides a visual reference for the remainder of the study, and two, it offers the student a method for representing the room which exists somewhere between the perceived objectivity of photography and the perceived subjectivity of painting.

2. Profile Knives: Akin ot Duchamp's "Standard Stoppages", this exercise provides an introduction to basic notions of how a section is perceived and constructed. Each student constructs a set of 1:1 sectional strips of relationships in the room. Students are encouraged to developed a critical cross-section of the variety of localized profiles occurring in the room. Sections are clearly demarcated as a privileged condition between two conditions of physicality.

3. Material Catalogs: To better understand the role of matter in the act of inhabitation and personalizing a room, the students make a graphic catalog of the contents of the room organized with a clear typological structure

4. Cardinal sections of the room: In the most conventionally architectural exercise, students measure the momentary section through the middle of the room "in situ" through each of the cardinal directions (horizontal at the mid-point between floor and ceiling, vertical side to side, and vertical front to back). These sections follow the profiles of wall or furniture as the student cuts through a specific part of the room, but they do not show the interiors or construction layers of intervening objects. Thus, the surface of a piece of furniture becomes continuous with the wall or floor depending on the placement of the object. All construction and "regulating" lines are to be preserved. The line on these drawings represents a Bona Fide Boundary of the room.

Phase 2, the description of motion

> But we must not confound the data of the senses, which perceive the movement, with the artifice of the mind, which recomposes it. The senses, left to themselves, present to us the real movement, between two real halts, as a solid and undivided whole. The division is the work of our imagination...like the instantaneous flash which illuminates a stormy landscape by night.[9]
> Henri Bergson

In Matter and Memory, Bergson developed a very clear presentation of what movement is and what relationships can be drawn between movement and matter. Bergson, like many others of his time, was very much affected by photographic studies that collapsed movement (the time-motion studies of Etienne-Jules Marey or Edward Muybridge for instance). Specifically, he and others were intrigued by how such records of movement could affect the arts. This kind of thinking had profound influence on Futurism, dada, and Cubism. One of the distinctions that can be inferred from Bergson about movement is that there are two ways to measure or quantify movement: 1. in the relative terms of a geometer where things are measured according to something (a coordinated reference) beyond the action in question or, 2. in the real terms of a physicist where things are measured according to conditions internal to the event or action in question. As students seek the various bounding spaces of their rooms they will begin with the real and the specific, quantifying individual events or actions by evaluating their own internal structures.

5. Event Catalogs: Catalogs of events that "take-place" within the room: The students make a list of 20 activities that they performed on a typical day in the room. The students title and describe each event on a 3 x 5 index card and a chronological categorization of the list is supplemented with other taxonomies. These groupings could be based on duration, intensity, volume of space occupied, superimposition, and so on. An example set by Nick Neary:

Action List

sleep

get out of bed

get clothes out of dresser/closet

get dressed

put socks and shoes on feet

"style" hair

apply antiperspirant/deodorant

leave room

enter room

sit in chair thinking of ways to pass time

read

sip r.c. soda

mess with stereo

put kraftwerk record on

watch pokemon

make shoddy attempt at rocking out on base

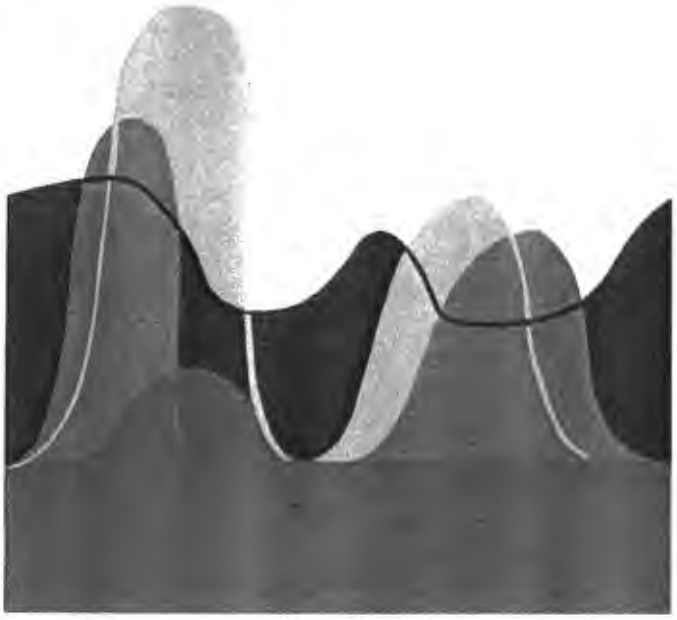


Fig. 3. Event Diagram- Elisia Stute

turn kraftwerk record over

get snack

eat snack

watch alf

pog

use wiffle golf ball as a projectile

drink restaurant quality lemonade

watch craig kilborn

homework

remove shoes and socks from feet

take off clothes

get into bed

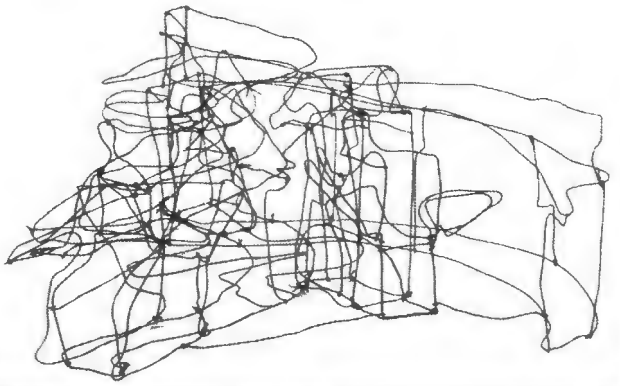
sleep

6. Event Diagrams: With the Event Catalog at hand, the students create a set of diagrams to depict in various ways both diachronic and synchronic relations between events in terms of spatial volume, frequency of occurrence, location, and temporal sequence. Students experiment with these images to predict the non-material spatial boundaries defined by the everyday trajectories of events that occur in their dwelling.

Fig. 4. Chronophotography- Cinthe Blevins

7. Chrono-Photography: This exercise adds an element of time to the documentation process and is associated with Bergson's second class of measurement. In collaborative groups of three or four, students make a roll of time-exposed slides documenting several actions as they take place in their rooms over the course of a few seconds or minutes each. Actions and events are represented spatially by the trails of lights worn by the students as they perform the activity before the open shutter. Students select all of the actions introduced into this experiment from the original list made in the second exercise, and when viewed in sequence, the images produce a record of the space occupied by selected groupings from the event catalog.

Fig. 5. Wire Frame Models



8. Wire Frame Models- Digital and Analog: With the empirical data from the chrono-photographic study, students create scaled models of the spaces defined by the action. The first set of models are representations of the discrete volumes of space occupied by the event. Thus, the surface defined by the wire frame is equivalent to the surface defined in the chrono-photography exercise. A second model of superimposed spaces represents the aggregate boundary of space occupied

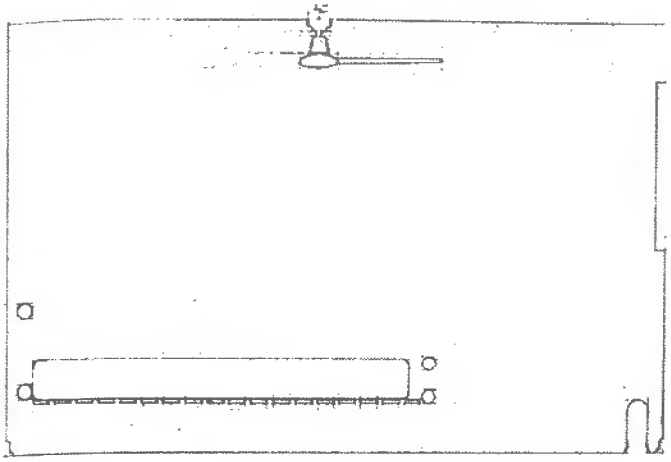


Fig. 6. CAT Scans- Jack Hopkins

by all events in the study. We define the outer surface of this form as the Fiat Boundary of events in the room. The critical distinction between the captured form of the model, representing a fluid form with only fleeting existence and the relatively long-lived form of the Bona Fide Boundaries becomes an important topic of discussion and evaluation.

Phase 3, Interstitial Space

> A thing is a hole in a thing it is not.[10]
> Carl Andre

In the final phase of the set of exercises a criticism of the two notions of bounding begins to develop. The characteristics of each are represented in converging methods until the only difference between the two is simply formal reciprocity. Two surfaces emerge. The fiat surface is never larger than the surface of the bona fide understanding of a boundary. Where there is space between the two, when the fit between the two is loose, there is an in-between. This interstitial space is in the bona fide space but not in the fiat. What is this space? Is it leftover? Excessive? Is this a precise description of the spaces of the physical and active conditions of the living space? Has space been generated or has it been depicted in these exercises?

9. CAT Scan Sections: To collapse the two notions of boundary together a series of sections is conceptually cut through both the bona fide surfaces of the cardinal sections and the fiat surfaces in the wire and computer models. They are compressed into the same space and sections are cut at one foot increments across one dimension of the room. The result is a direct transcription of the relationship between the two boundaries. In this exercise the student develops a robust and precise understanding of the relationship between the two in sectional space, further distancing the student's understanding of space from the familiar scenographic representations of space's physical boundaries.

10. Radical Reconstruction: In the final exercise in the sequence, the thorough understanding of the relationship between types of boundaries is solidified. The students are challenged to construct solid white models by cutting sheets of extruded polystyrene to correspond to each of the Cat-

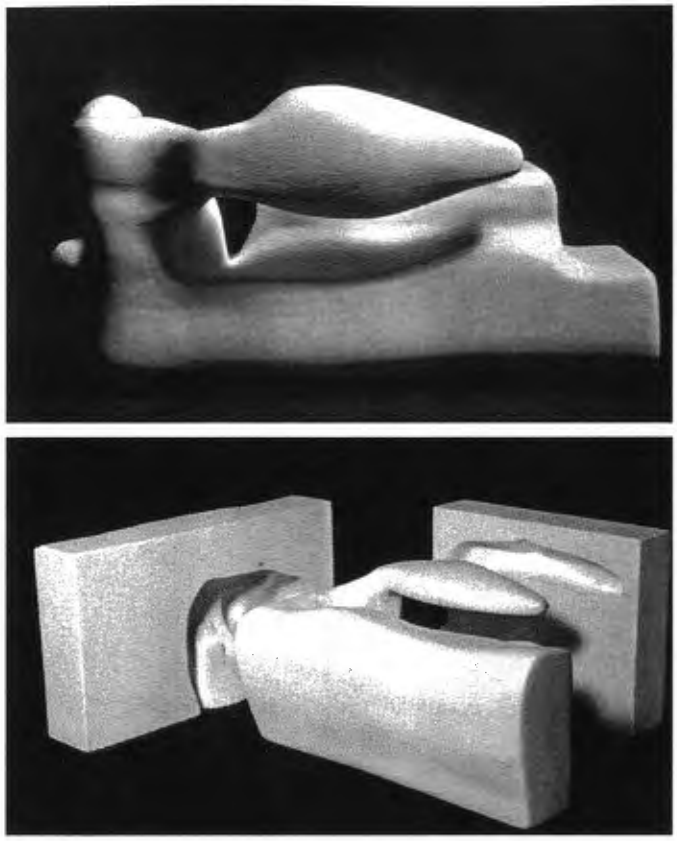


Fig. 7. Radical Reconstruction- Ryan Carman

Scan Sections. Once laminated, sanded, and painted, the models provide a return to the room as a whole.

Conclusion

Understanding of the room has been filtered through a series of de-familiarizing exercises. The ultimate goal of the unit is to help students look at spaces in a more complex way and to realize that spaces are defined by boundaries. The students explore a range of surface boundary categories (between Fiat and Bona Fide) as they are perceived in the space of a room (their abode) and the non-material spatial boundaries defined by the everyday trajectories of events that occur in their abode. Skills of description, representation, and reconstruction are explored not through design so much as analysis.

This pedagogic structure, including the discussion about the product that emerges from it, effectively helps to build an understanding that is not based in architecture or any other discipline. A major component of the daily instruction is a time in which the students talk about each other's work in a critical way. In the execution of this critique it is strongly stressed that the conversation about the contents of the work focus on adjectives and verbs on the subject of the analysis rather than the metaphors of external reference. So, statements of fact such as "It is..." rather than "It looks like..." are encouraged. The value of this self-referential nature for the Visual Literacy student is enhanced when it is tailored to be non-representational, and it is open to a diversity of external references in criticism (drapery, landscape, flesh, etc.) The removal of the idea-generating phase of design allows the stu-

Fig. 8. Radical Reconstruction- Ryan Carman

dent to approach making directly and with a modicum of objectivity so the discourse of the studio does not founder on issues of taste. Ultimately, these exercises based in "A-disciplinary" tactics result in solutions for cross-disciplinary strategies demanded by the demographics of Visual Literacy.

In his book Surfaces, Avrum Stroll writes about how geometry is separate from language. He says that there are systems and parts of language set up to mediate between the geometric and the linguistic: the geometry of ordinary speech.[11] In the everyday a side of beef is different than a sideline but both are anecessary and base level descriptions of the corresponding conditions they represent. Both are descriptions of space and a condition of objects positioned in space. Brim, Brink, Verge are types of boundaries but are not typically part of mathematically derived geometric descriptions. They are part of the geometry of ordinary speech.

We believe that this set of exercises introduces simple notions of space and spatial recognition in a progression through investigations of "everyday geometries". Simple and straight-forward delineations of different boundaries in space collapse into understandings of familiar and everyday space. Everyday geometry resists reduction to a "statisti-form", an amalgam of behavioral conditions. It is not a barometer of economy. It is the incision of the commonplace with its own geometry and provides a clearly defined and specific description of space as an introduction to design and design thinking.

Notes

1. Frederick Kiesler, "Notes on Architecture, the Space House", Hound and Horn, vol. 6, no. 3, (1934): 282-97.
2. Paul Valery, quoted in Lawrence Weschler, Seeing is Forgetting the Name of the Thing One Sees (Berkeley: University of California Press: 1982)
3. Frederick Kiesler, "Pseudo-Functionalism in Modern Architecture", Yehuda Safran, ed., Frederick Keisler, 1890-1965 (London: Architectural Association, 1989): 56.
4. This paper is a re-working of issues first presented by the authors in a paper titled "Bounding Space", presented at the 2001 Annual Meeting of the ACSA in Baltimore.
5. Martin Heidegger, "Building, Dwelling, Thinking", Poetry, Language, Thought (New York: Harper Colophon Books: 1971) 154.
6. ibid., 154.
7. Avrum Stroll, Surfaces (St. Paul: U. Minnesota Press: 1993) 39.
8. Barry Smith and Achile C. Vazi, "Fiat and Bona fide Boundaries," forth coming in Philosophy and Phenomenological Research.
9. Henri Bergson, Matter and Memory, (New York: Zone Books, 1988): 189.
10. Carl Andre, quoted by Robert Smithson, Jack Flam, ed, Robert Smithson: The Collected Writings (Berkeley: University of California Press: 1996) 95.
11. Avrum Stroll, Surfaces (St. Paul: U. Minnesota Press: 1993) 84.