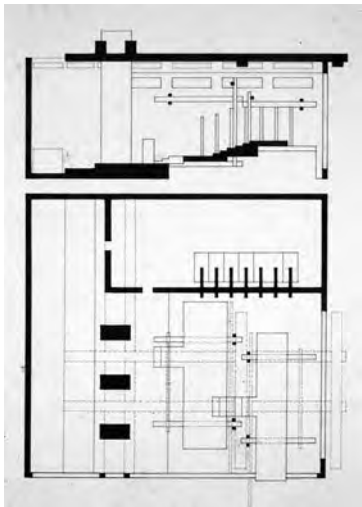## Scale Problems

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Before I began architecture school I found myself walking through the lobby of a new resort hotel with several friends, among them a practicing architect. Eager to engage in the talk of my soon-to-be profession, I casually asked him what he thought of the building. He looked around and said, "I think it has scale problems." "Ah yes," I said, and nodded knowingly. "Scale problems." I didn't have the faintest idea what he meant.
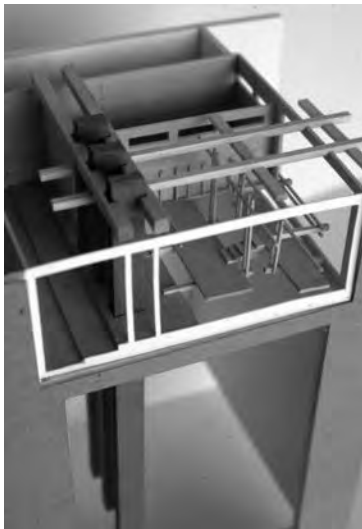
I. Architects usually work between two scales: the scale of the notational object under consideration (a drawing or model) and the scale of the architectural object to which it refers. This condition of working between is not evident to architectural students, who are rarely asked to test their ideas at full scale. Small scale drawings and models are the sole experience of most students (and many professors) of architecture. However, they are only one portion of the much more complex practice of architecture. To alert students to the relativity of the objects they make, I have run several studio problems which operate between the scale of studio production and the scale of the architectural product. These scale problems, and the resulting problems I encountered or uncovered are the focus of this paper.

The first problem is a full scale drawing project. I assigned it to second semester freshmen as a four day group project. The studio, taught to landscape architecture and interior design students as well as architecture students, focused on one project at various scales through the course of the semester. After designing an Invisible City based on readings by Calvino in conjunction with formal analysis of a tool or machine, students were asked to locate and design a room from which to read their cities. (The miniature scale of the city is something to which I will return.) The students designed their reading rooms independently, then I chose several projects which were relatively advanced and asked the students, in assigned teams of two to five, to develop the projects further. They revised existing plans and sections collectively at the assigned scale (usually 1/8"= 1'-0"), then produced full scale drawings. I encouraged them to determine and adjust spacing, heights, stair widths, etc. based on their inhabitation of the drawings as they made them. I suggested materials--chalk, black paint, butcher paper, explained the importance of collaboration to the success of the project, and left them alone. They found places to work (parking decks, dormitory commons rooms) and ways to work. They learned to snap chalk lines, found which marks required a straight edge,

determined the best way to tape together forty foot drawings, and how to transport them.

On pin-up day the architecture building was effectively "wrapped." I had assigned plan locations adjacent to balconies for corroborating sections, and students unfurled their drawings. I juried the drawings by walking around on them, remarking on changes, questioning the particularities of refinements. In the face of such obvious effort and audacity I found it hard to be too critical. And, beyond my unwillingness, I actually felt unable to act as a critic in the normal sense: The drawings overwhelmed me.

Unlike most of the projects I jury, which fit well within my cone of vision, these taxed my peripheral view. As I lost my visual focus I seemed to lose my concentration. The difficulty of judging the projects, in the traditional sense, was even more acute in the next project, to which I had invited outside critics.

I ran a second scale problem in the spring semester of the fourth year. The studio brief hypothesized a reciprocal relationship between the human body and the body of the earth through the mediating scale of the building. I proposed the zone of architecture was a fluctuating field, capable of being inscribed by the human body and the body of the earth, and capable of prescribing to the human body and the body of the earth. The first project was the upfit of the students' studio space. Both the construction of the program and the literal construction of the space were to uncover strategies of inscription and prescription applicable at a larger scale. The second project, an experimental farm in Gainesville, was to further these strategies while the students continued operating inside their first project, thus profiting from both its successes and failures.

The students began the project in typical fashion, with scaled drawings and models. They had never done so small a project before, and their drawings of a 30-foot square room looked like small cities. After the first presentation, we spent an afternoon moving desks. They quickly realized their elaborate and manipulative circulation schemes made it impossible to accommodate generous work stations, and that they would be the ones to suffer for their plan appeal. They began to do more mock-ups. One day hundreds of lines appeared at eye level, the next day curious mirrors on the lawn outside reflected light to a dimly lit corner of the room.

Meanwhile, I had the problem of finding one group design within ten initially disparate projects. To solve this, I asked the students to work on each other's designs and within two weeks we forged a not-too-unhappy marriage of ideas. But frustrations arose. They complained that the purity of their individual schemes was

being sacrificed for a mediocre common ground. I agreed, and asked whose project we should all spend a month building and another three months living in. A compromise was struck.

I introduced the idea of budget and suggested materials. They were to pay for the project ($20 apiece, as if it was a studio project). As we neared a solution (still in drawings and models) I asked for a cost estimate. They were over budget by 100%. (Isn't everyone?) When they realized how much of the project would have to be cut, they immediately increased their budget. (Doesn't everyone?)

At last, building began. I should say that I have difficulty recounting this project as a given assignment, because I was so much within it. The primary spatial idea was a raised common space overlooking a garden three stories below, accessible by ramps from all work stations. One student's father, a contractor, volunteered to help. We built the floor system in one 12 hour day, complete with slight skews and quirky dimensions. After three more weeks of solid work we had a school-wide open house and called the project finished.

I invited three outside critics, all with active practices, to jury the project. They had the same difficulty I had experienced in the first scale problem--they floated around the space, found it difficult to focus comments, to act professorial. They tried to find a place to lean, a view from which to see the project, the students. Finally they settled in. Their comments seemed to me overly specific. But then, I was fully implicated in the outcome of the design.

II. I anticipated, even counted on, the first set of problems these scale problems generated. These projects were much more costly to make than small drawings and models, and students believed they could have produced a better full scale thing (object? piece? construction?) given a larger budget. Likewise , these projects took alot longer to produced and students believed, given more time, they would have achieved better results. And, in order to physically do these projects, they were required to work in groups, which is not necessarily to say cooperatively. Lack of money, lack of time, lack of cooperation have a familiar ring to practicing architects, and I hoped my students would realize these (to borrow Eisenman's phrase) "second text(s)" are built into the production of architecture. Similarly, naive assumptions about use, such as my fourth year students' insistence that everyone walk out of his or her way to pass through the common space, became irritations as they had to occupy the studio they had designed and built. They will, I hope, be less inclined to force behavior patterns into theoretical conformance having seen themselves crawl through walls to subvert their own design intentions.

Despite my success in exposing these problems, I never felt I conclusively addressed the problem of the human body within the projects--something always intervened. Of course we discussed isolated situations--the height of a wall, the narrowness of a ramp, the difficulty of kneeling over a gigantic drawing or carrying lumber without an elevator. But these discussions seemed to me fragmentary and disconcerting, especially given my predisposition toward the body as a design determinant. My dissatisfaction with this aspect of the scale problems is critical to understanding their potential, and I will discuss it more in my conclusion. In fact, tracking this disappointment proved to be key to the real scale problems.

III. I did not anticipate the emotional response these projects generated. Each time I ran one I felt personally involved and vulnerable. It was impossible to maintain professorial distance, especially since I was far from the most skilled laborer in the group. The students who spent many hours working together with their bodies and minds, and, probably feeling the same vulnerability, became extremely close, family-like.

While most people were supportive a few were unexpectedly critical because, I believe, these projects were "in their faces." By their sheer size, the projects demanded a response, and a bodily response. In the twenty-four hour period the full scale drawings were hanging, older students threw a football through one, literally shredding it. When such acts of vandalism are perpetrated on desk-top drawings punishment is swift and severe; in this case I was told that "boys will be boys." Likewise the apparent violence of the demolition of the studio upfit both surprised and disturbed me.

Imperfections of construction and scalar misfits between the projects and incidental users could not be overlooked. In the studio upfit students had tailored dimensions to their own bodies quite specifically. For instance, when the shortest student stood at the top of one ramp and the tallest at the bottom, their eyes were level. Widths were similarly customized, which led some of the critics, who were more amply proportioned than the students, to react negatively. These reactions however were generalized, and somehow primal. It is hard to intellectualize a wall that hits your elbow every time you walk through the door. And it is rude to point out that, for instance, the ramp only feels narrow to a critic who is stocky.

Evidence of emotion, generally repressed in an academic environment, was beginning to surface. Because I believe it takes a powerful provocation to lift the emotional lid within an institutional setting, I began to look at the causes of the disturbance more carefully. I believe these projects rattled the foundations of some firmly held beliefs about architecture and

architectural education. These scale-generated problems suggest trajectories for further inquiry.

IV. Architecture studios generally teach students to make architectural models, not architecture. The modeling tradition goes back to Vitruvius, and is brought into modern usage through Alberti:

"Suetonius tells us that Julius Caesar completely demolished a house on his estate at Nemi, because it did not totally meet with his approval, although he had begun it from the foundations and had it finished at vast expense.....For this reason I will always commend the time-honored custom, practiced by the best builders, of preparing not only drawings and sketches but also models of wood or any other material. These will enable us to weigh up repeatedly and examine, with the advice of experts, the work as a whole and the individual dimensions of all the parts, and before continuing any farther, to estimate the likely trouble and expense. Having constructed these models, it will be possible to examine clearly and consider thoroughly the relationship between the site and the surrounding district, the shape of the area, the number and order of the parts of the building, the appearance of the walls, the strength of the covering, and in short the design and construction of all the elements discussed in the previous book. It will also allow one to increase or decrease the size of those elements freely, to exchange them, and to make new proposals and alterations until everything fits together well and meets with approval. Furthermore, it will provide a surer indication of the likely costs--which is not unimportant--by allowing one to calculate the width and height of individual elements, their thickness, number, extent, form, appearance, and quality, according to their importance and the workmanship they require."[1]

An experienced architect may, as Alberti suggests, test the confluence of practical and aesthetic concerns in model form, but students rarely do. The difference between a model studying building practices and one exploring architectural form is significant. In the studio upfit project, as students proceeded toward building, the inadequacies of the form model became evident. It was with the straightforward purpose of distinguishing this difference that I gave the problems, and at that level they were fairly successful.

As we discussed cost, collaboration, procedures, accommodation, in short, a whole range of issues integrally tied to architectural practice, the framework of academia began to fall away. My stories became anecdotal, our conversations, chatty. It was hard to formalize these discussions of practice. They were part of our lived experience and required flexible handling. This fluidity seemed quite potent. Susan Stewart describes the so-

called conversational genres. "(W)hat is hidden within (or beneath) this flat surface of "ordinary language" is the range of genres that still characterize a face-to-face mode of social interaction: gossiping, flirting, promising, joking, making conversation, doing introductions, and so on. The functions of these "invisible" genres is not to serve as purely utilitarian modes, to serve as "pointers" toward the material world. Rather, it is to maintain, manipulate, and transform the ongoing social reality from which such individual genres have arisen."[2] So this informal, non-academic mode of communication, far from being trivial, has the potential to transform or manipulate, as well as to maintain, ongoing realities of architectural practice and academic protocol.

The conventional way to discuss issues of practice in school is through so-called instruments such as AIA Document #201, the General Conditions for the Contract of Construction. The law, which turns the technology of language to the problem of exchange, precisely avoids the particular, the contingent. Quoting Stewart, "...in a reciprocal-exchange economy, performer and audience are functions of situation, functions into which (if only theoretically) any social member can step. But in a society in which these roles are specialized (i.e. architecture), the role becomes larger than the member who assumes it; the role is determinate....The product of technology is not a function of a mutual context of making and use. It works to make invisible the labor that produced it, to appear as its own object, and thus to be self-perpetuating."[3] The traditional discussion of architectural practice, shielded by the technology of law and the profession, render labor invisible, therefore unalterable. By chatting about practices, and by making real physical labor prominent, the myth of self-perpetuating technology is scuttled. Evidence of labor, according to Marxist critique, challenges the capitalists' notion of the primacy of the product. So these products irritate the techno-logic of capitalism by discussing practice and by posing labor (or practice) and theory as covalent.

If one of the problematics these scale problems uncovers is the conventional repression of practice, another is the ambiguities of model making in architecture school. I began by suggesting architecture students do not generally make models, as Alberti proposed, to ferret out construction problems. And, as my students saw, there is a vast difference between the model as map and the built territory, so they are not simply a smaller version of reality. What then, do models do? Or what might they do?

Both Susan Stewart and Gaston Bachelard richly describe literatures of the miniature. They include everything from miniature books, first produced during the Renaissance, to miniature people described and miniature worlds found in full scale situations such as the inside of a teacup or under a leaf. I

think that architectural models often operate as miniatures in some or all of these senses, with strongly mixed results. Stewart, describing miniature books says, "Nearly invisible, the (written) mark continues to signify; it is a signification which is increased rather than diminished by its minuteness....Minute writing is emblematic of craft and discipline, while the materiality of the product is diminished, the labor involved multiplies, and so does the significance of the total object."[4] The model seems to operate this way in architecture school. The smaller it is, the more seductive, the more significant. Size allows vague gestures to be filled with meaning, meaning supplied eagerly by both the student and critic.

By odd coincidence I read this phrase by poet Noel Bureau, "He lay down behind the blade of grass To enlarge the sky"[5] on the same day I learned our students are now calling their small models "bug models." Bachelard describes a curious inversion which might occur while contemplating a miniature: "sometimes the transactions between small and large multiply, have repercussions. Then, when a familiar image grows to the dimensions of the sky, one is suddenly struck by the impression that, correlatively, familiar objects become the miniatures of a world."[6] This leads to what Bachelard calls a "center of active gravity" which "allows us to be world conscious at slight risk. And how restful this exercise on a dominated world can be! For miniature rests us without ever putting us to sleep. Here the imagination is both vigilant and content."[7]

The possibility of crafting a space of reverie within a modeled miniature holds great appeal. Many academic architects, myself included, believe the university must itself be such a space, a center of active gravity. Yet there is a dark side to the notion of the miniature, which Bachelard hints at in his description of an "exercise on a dominated world." He characterizes miniatures made by distance, cities seen on the horizon, or from a tower. He says, "From the top of his tower, a philosopher of domination sees the universe in miniature. Everything is small because he is so high. And since he is high, he is great, the height of his station is proof of his own greatness."[8] The miniature is also a panopticon, institutionalized through the profession and through the academy. Inevitably, then, a challenge to the miniature will meet resistance.

And so I return to full scale, a reaction to an architecture of domination through vision. The ancient Greeks built models at full scale, called paradeigma or specimens.[9] These paradeigma were made of wood, stucco, or clay, and sometimes even stone. In at least one case the paradeigma was incorporated into the final temple along with other capitals. Scholars know these architects designed special details such as triglyphs and capitals at full scale. Lacking evidence of intermediate models, they

suggest these subtle detail redefinitions required site-specific proportional adjustments to the strongly fixed temple type. I imagine the architect walking the site, adjusting column spacing, orientation, heights, based on a complex set of specific issues, too complex to know through intermediaries. Doxiades describes the layout of the Acropolis in these terms.

But of course the method is undermined in its naming. Paradigms, as Kuhn tells us, are meant to be overturned. And we now lack the type-based codification necessary to allow design to be made exclusively through details. So while the strategy of on-site design (more recently practiced by Wright and Scarpa) holds real appeal, its application cannot be, well, paradigmatic.

My full scale studio problems have been attempts to move the lush variability of the studio object toward the architectural object, to avoid the deadening finality of all those built projects with "scale problems." In my simple-minded desire to design in full scale I believe I have accidentally uncovered repressed operations of practice, and challenged the dominating visuality of the miniature. One further approach to making a poetic image in real scale, what Bachelard calls "the duality of subject and object (which) is iridescent, shimmering, unceasingly active in its inversions"[10] is through the body. For as designers we are more than eyes and hands. Our bodily prehensility is complex, varied, destabilizing.

Yet beyond the most general idea, method eludes me. Stewart cites the carnival, for "The carnival presents a reply to everyday life which is at the same time an inversion, an intensification, and a manipulation of that life, for it exposes and transforms both pattern and contradiction, presenting the argument and the antithesis of everyday life in an explosion that bears the capacity to destroy that life." The carnival is a place in which certain social rules are in force and others suspended, and one never knows which is which. And so it was in these scale problems. The students were both designers and occupants. I was a critic and a collaborator. Students made a studio project, yet also a studio. The projects were judged based on precise, specific physical requirements that varied wildly from person to person. We spoke of practices of building, of professional practice, of studio practices. The difficulties of limiting, criticizing, defining the varied, reciprocal, and very physical roles of the makers and the made became the success of the project, and often its failure.

Bachelard cites another poem, by Jules Supervielle, in a collection called "Gravitations."

> The man, the woman, the children
> At the aerial table

Resting on a miracle
That seeks definition.[11]

Like many of you, I am trying to construct that aerial table. I believe certain aspects of the architectural project, such as practices in human scale, offer the possibility of the miraculous seeking, and always seeking, definition.

[1]Leon Battista Alberti, On the Art of Building in Ten Books, trans. Joseph Rykwert, Neil Leach, Robert Tavernor, (Cambridge: MIT Press, 1988), p. 32.
[2]Susan Stewart, On Longing, (Baltimore: Johns Hopkins Press, 1984), p. 16.
[3]Stewart, p. 8.
[4]Stewart, p. 38.
[5]Gaston Bachelard, The Poetics of Space,(Boston: Beacon Press, 1969), p. 168
[6]Bachelard, p. 168.
[7]Bachelard, p. 160.
[8]Bachelard, p. 173.
[9]J. J. Coulton, Ancient Greek Architects at Work, (Ithaca: Cornell Press, 1977). My thanks to my colleague Diana Bitz for call this to my attention.
[10]Bachelard, p. xv.
[11]Bachelard, p. 170.