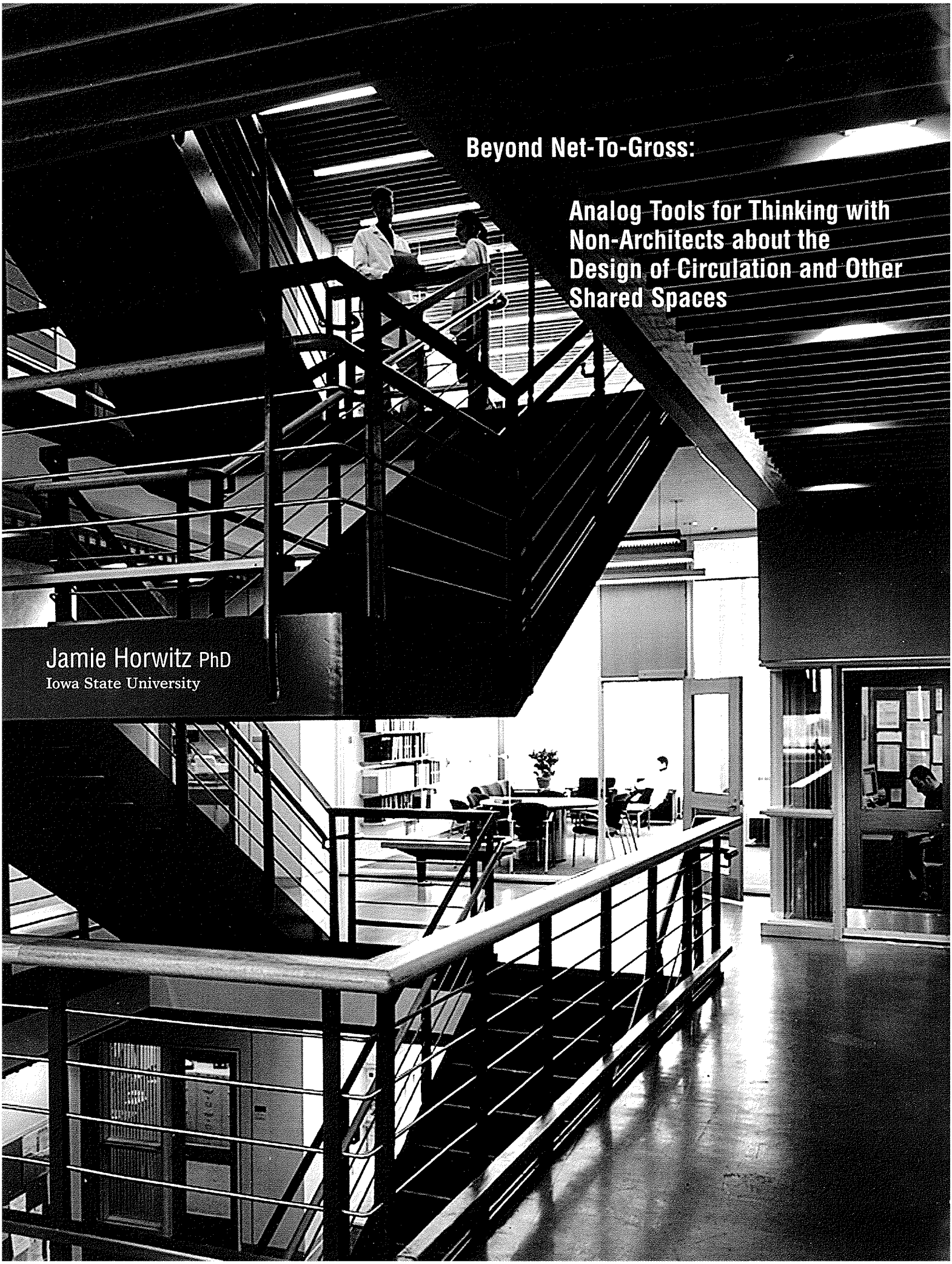

Beyond Net-To-Gross:

Analog Tools for Thinking with Non-Architects about the Design of Circulation and Other Shared Spaces

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I. Introduction

Among the challenges facing contemporary architects today is a growing public interest in evidence-based design. As recently reported in the AIA Journal evidence-based design is a "rigorous, hypothesis-testing" approach to design practice that builds on a literature of user-oriented building evaluation research (post-occupancy evaluation research or POEs).[1] Bringing the authority of scientific method into design practice, we are told, will be the next qualifying standard among firms.[2]

A designer's desire to lend the authority of science to the art and pragmatics of building is understandable. So are a client's desire for greater accountability and less uncertainty when selecting an architect, establishing a budget, negotiating a design, and most of all, deciding to invest in facilities rather than in people or services. Everyone wants to decrease his or her exposure.

Design conventions that evolve through iterative refinement and empirical evaluation are likely to be better—and any approach that welcomes research into design practice is promising—for society, for the environment, and for a person like me who is likely to find more room at the table. Yet, the idea that science trumps architecture troubles me. In the multivalent context of design decision-making, I fear the results of a process in which architectural thought could be effaced in the name of 'evidence'.

As firms reflect on contemporary challenges and opportunities, some are questioning conventional models of practice in a knowledge-oriented service economy.[3] The inter-relationship of design, research and strategic services is leading some architects to recast their firms into an 'ideas company' in which professional practice can lead or follow client-centered consulting contracts.[4] Whether or not models of practice change, today more and different types of expertise participate in all levels of design decisions.

Will the new mix of services make for better buildings, better cities, and better environments? I believe that depends not only on bringing new knowledge into design decisions; better environments depend on bringing the inherently integrative thinking of architecture into design decisions that are, all too often, made without architects.

For example, the simple calculus of 'net to gross' might be characterized as one kind of evaluation tool that is used to replace thinking rather than be a tool to think with. The 80/20 standard ratio is a means to determine the square footage efficiency of those areas assumed to provide a return on investment.[5] Buildings as different as low-rise, office parks, retirement homes, and junior high schools are all too often subject to the same measure and stick, despite the very different role that 'non-revenue' spaces, such as circulation, play in the different building types. In this sense 'net to gross' could be considered an un-tested hypothesis that needs to be rigorously evaluated and fundamentally challenged.[6]

The means by which clever designers overcome the constraints of 'net to gross' could, on the other hand, be considered a school in itself. As an outsider to the traditional world of practice, I find this 'schooling' one of the secret codes that no amount of reading or building evaluation research would have helped me understand. It is not that 'net to gross' is so elusive, but I have experienced it as a kind of shadow that is cast over, what I consider to be, the most critical social factors in a building—the way that it connects people, and connects functions.

This paper is a product of multiple sources and methods of inquiry. They consist of:

- the architects who brought me as a researcher into their firms, introduced me to clients, and building committees, and communicated some of their design intensions regarding the circulation design that animates the interior life of the projects I would study,[7]

- on-site studies of completed projects in which I observed, interviewed, and surveyed those who live and work in these buildings,

- multi-disciplinary literature about networks that comprises social networks, spatial and built networks, and network theory. This includes as well, the architectural history of passages through buildings, the evolution of the corridor, the sociology of networks people establish with one another, and as groups, the difference that physical environments make to these networks, and analytic tools that I use to study the spatial, and therefore social connections that architecture creates in cities, on campuses, and within buildings.

The purpose of this chapter is to weave these forms of evidence through the context of one extremely successful building project in order to demonstrate retrospectively, and hypothetically, how architectural ideas and spatial thinking might engage the 'evidentiary' basis of design decisions. Design deliberations represent a form of intellectual engagement that can:

- provide arguments for linking design solutions to the substantive issues about the client's activities, strategies and goals,

- bring historically significant material into the discussion, and make the evolution of architectural thought more visible and audible to the non-architects at the table,

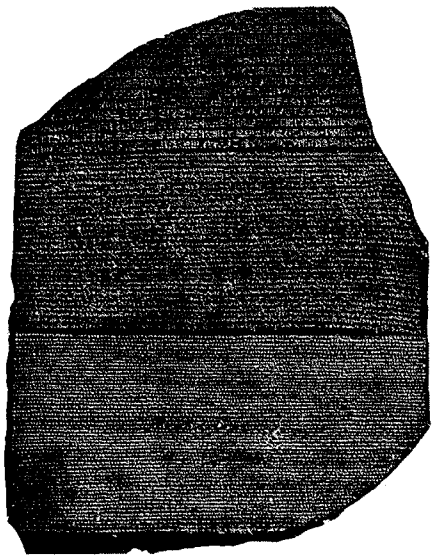


Figure 1 The Rosetta Stone

- reveal the intellectual tools of architectural design, especially their capacity to puzzle through problems and to arrive at spatial solutions by demonstrating thinking through the use of analog tools that are infinitely adjustable, more like slide-rules than digital calculators.

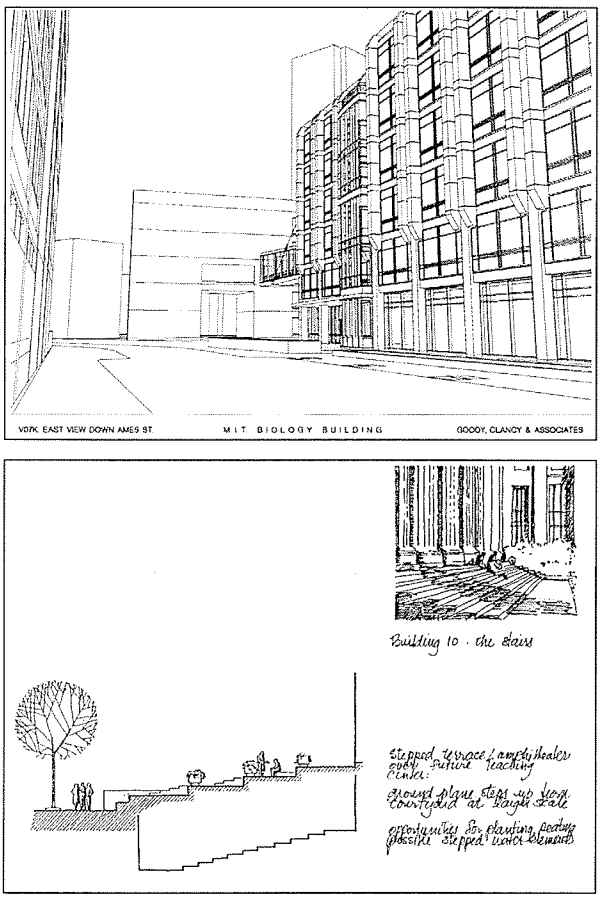
I call these analog tools, in that they are tools to think with and to share one's architectural thinking with non-architects.

2. The Rosetta Stone Model:
Architecture collects languages that are 'out of sight'

The Rosetta Stone is perhaps the greatest example of an analog tool. A black slab of basalt dating from 196 BC, it was inscribed by ancient Egyptians with a royal decree: once in Egyptian, once in hieroglyphic, and once in Greek.[8] As a tool for deciphering hitherto unknown languages, the Rosetta Stone has become emblematic of something that makes evident what had been obscure until now. It so happens that this analog tool has also been used to describe the architectural project on which this chapter is focused (figure 1).

Figure 2. Perspective drawing showing Koch on the right, and Pei's Landau building in the background.

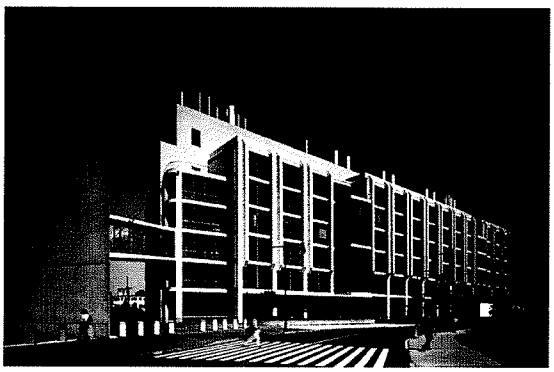
Figure 3. Goody Clancy proposal drawings of Koch exterior steps and drawings of steps on the original MIT buildings by Bosworth.



Richard P. Dober, in *Campus Architecture: Building in the Groves of Academe* (McGraw Hill 1996) describes the Massachusetts Institute of Technology's Building #68, or Koch Biology—completed in 1995 by Goody Clancy Architects—as follows:

> [The building is a] watershed structure in campus design at an institution whose eastward expansion is a model of sound campus planning and adventuresome architecture. A century of exemplary American higher education buildings can be found in the precinct, produced by the leading architects of their time. These include ... among the notables. The Goody Clancy design is an architectural Rosetta stone. The shapes and textures in their felicitously modulated facade are derived and combined from older campus buildings, and can be read and translated as the architect's code of hierarchy and importance.

Figure 4 Koch and Pei building



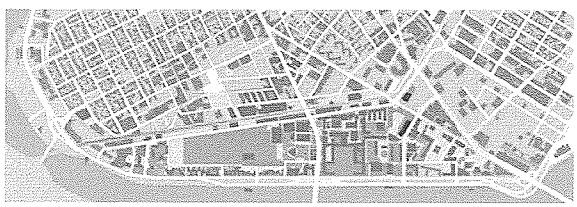


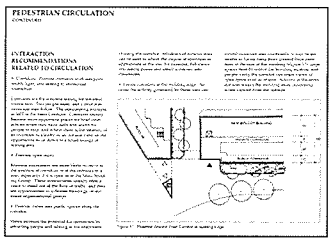
Figure 5 Plan of northeast MIT campus indicating the intersection of grids

Dober's laudatory remarks point to the exterior expression of the Koch Biology building, and makes reference more to the original buildings by Bosworth (1916-1939)—on the other side of campus —than to I.M. Pei's Landau building(1974), its nearest neighbor (figures 2 and 3).

For example, one of these references can be found in Goody Clancy's three-dimensional expression of the repeated vertical bays on the facade, rather than a more monolithic, taut envelope with cut-outs. The finely made, well-proportioned Pei structure next-door is a sculptural, stand-alone building with a small footprint. As such, it does not suggest the changeability or expandability Goody Clancy wanted to express with the Koch Biology building. However, Pei's design made a bold and "brilliant shift in the grid"—as Roger Goldstein, a design principal in Goody Clancy explained to me; a shift away from the grid established by the River and Massachusetts Avenue, and toward Main Street and the railroad lines. The Koch building followed Pei's shift, orienting the biology buildings and northeastern campus toward Main Street, and what has become a massive district of bio-technology development (figures 4 and 5).

Figure 6 Koch pedestrian circulation.

Figure 7 MIT campus circulation plan in the early 1990's provided the context for the Koch Biology Building design



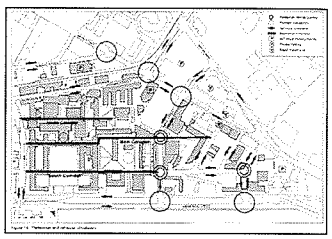


Figure 8 View showing the porous vertical circulation node intersecting with the horizontal lounges and tea rooms

While not reflecting the surface appearance of Landau, Goody Clancy's design physically reaches out to its neighbors as it sends out a bridge element between the Biology building and the Landau Chemical Engineering building on the third floor, as well as tunnel to the Cancer Research Center, maintaining the interior passageway known as "MIT's Infinite Corridor"[9] (figures 6 and 7).

The Koch Biology Building's interior circulation, and particularly the 'core'—as Joan Goody refers to the vertical circulation nodes—is itself a Rosetta stone that transfers and translates research on the socio-spatial networks between research and practice (Figure 8).

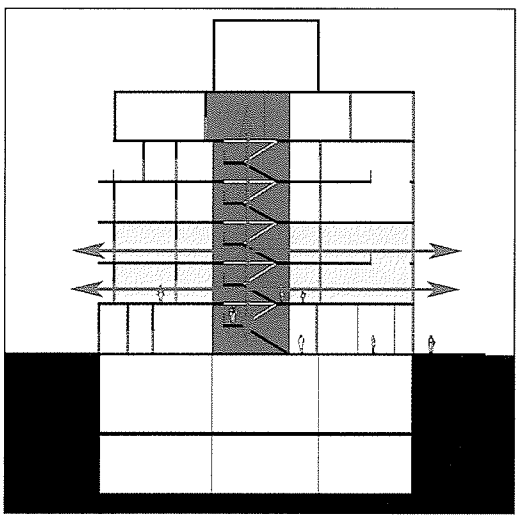
In what follows, I develop examples of evidentiary arguments linked to the design of the Koch Biology Building 'core'. Needless to say, these are my own retrospective reconstructions and not those of Goody Clancy. They are used as a demonstration of using analog tools in order to make translations between research and practice—in this case resulting in an extraordinary zone of connectivity from the most carefully controlled access to the most publicly accessible space, and at every point in between.

3. a. Research:
The history of interior passages or buildings without corridors

In his essay "Figures, Doors and Passages," the late architect and historian Robin Evans traces the evolution of something so familiar we take it for granted—the interior corridor. Unable to find, prior to the 1700s, evidence of the most commonplace model of a corridor with single-entry rooms off of it, Evans shows us that in palaces as well as farm houses, people simply moved from room to room. Room-through circulation means that rooms must have multiple doors (when the doors are aligned we call the string of spaces *enfilade),* and there is, also, an unavoidable mingling of activity with what we now call traffic.

Evans shows us that the way through a building was and continues to be un-related to architectural style, yet it always affects the way we occupy a building, and the "style" of living or working there. Making observations from building plans and paintings, Evans hypothesized that the emergence of corridors as a means of removing traffic from rooms and into single or double-loaded corridors occurred because of a desire for more controlled access, particularly to avoid servants knowing the business of their employers. The effect of removing passage from place, Evans fears, is that buildings can become void of the conviviality that derives from the access and mingling of activity and movement.

Figure 9 Author's drawing showing stacked enfilade section of Koch core (red) and horizontal enfilade of lounge-staircase-lounge (yellow)



The possibility that visually porous circulation could be designed in section as well as in plan first came to my attention in the context of a planning and programming study for the Iowa State Memorial Union.[10] Completed in 1929, the building's formal procession space was bisected on the main floor by an entrance hall (in memory of students who had died in wars), while a chapel, reading room, and eating commons are located below grade.

Over forty years and eleven additions, in which room after room was slapped on to the east and south facades, the original axial organization had become entirely embedded in a dense labyrinth of space that made no effort to link back to or amplify the original circulation pattern (figures 9 and 10). After surveying more than a thousand students, interviewing faculty and staff, the data clearly indicated that the confusion over the location of activities, and spatial orientation in the building, kept its inhabitants from exploring this campus treasure house that alumni continue to describe as a "chateau on the prairie."

Figure 10 The genealogy display context in Koch core

But evidence of a problem does not a solution make. Reflecting on the building and the data with my collaborator, Professor Michael Underhill (at that time Chairman of the ISU Department of Architecture) pointed out that the confusing circulation in the building might only be solved by something as radical as blowing holes through the floors to open up a visual and spatial connectivity.

3. b. Design strategy:
Inflecting axial plans into section

The vertical core designed by Goody Clancy for the Koch Biology Building resolves this kind of problem by surrounding the intersection of horizontal and vertical circulation with glazed rooms that together form a stacked enfilade system (figure 9).

At first sight, the vertical circulation core appears to function as a friendly node between the controlled access of individual laboratories and the uncontrolled, public access to the faculty offices, and gathering spaces of students, scientists, and visitors to the building. When I interviewed several of the distinguished senior scientists who had been members of the Koch Biology Building committee, I learned that the committee had pressured their architect with an over-arching requirement that eventually shaped the design. Bob Sauer, the Biology Department Head, explained to me last summer that:

> we told Goody Clancy that we wanted a design that made it impossible not to see other people all the time. You didn't have to interact with them. You could be as grumpy as you wanted. But you couldn't go through the day only running into people in your own labs.

Goody Clancy responded with an elegant and visually porous vertical circulation core in which staircase and elevator wrap around seminar rooms, faculty offices, restrooms, and "tea rooms". A legacy of senior faculty who had trained at Cambridge University labs, these meeting rooms, with their kitchens and white boards, work as impromptu meeting places for conversation, cooking, and eating.

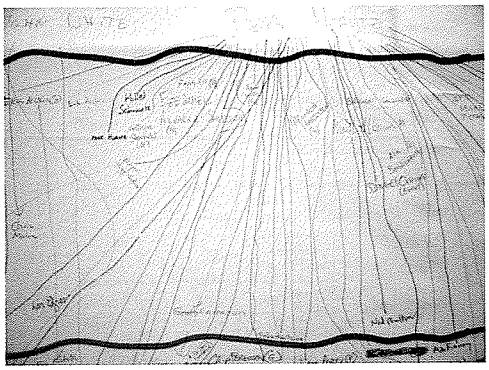
By shifting the floor height from eight feet in the lab corridors to eleven feet in the core, the design shifts attention upward toward a wood ceiling grid and the transparent staircase elements. The warm color and feeling of the wood and the natural light from the surrounding windows through the glazed rooms contribute to the un-laboratory-like character of the gathering and circulation node. Here the overlapping of activities from the lab suites, the ease and beauty of the staircase also support the location of amenities, where one goes to the bathroom, gets a drink, meets in groups, and takes a meal break.

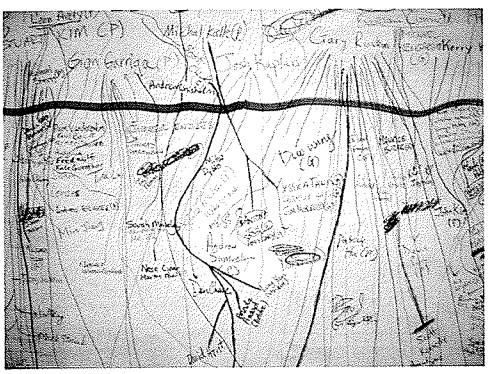
A threshold in the vertical core improves connectivity between labs, an incentive for taking the stairs, and reflects the tradition of having tea in the community of science.

The enfilade stacking of shared spaces around the vertical circulation in the Koch Biology Building 'core' amplifies the allocated footage for circulation, contributes to the increased concentration of social interaction, and adds a transparent sense of spatial orientation in this large building. But there is more worth noting and teasing apart.

These multi-junction nodes appear to have the use pattern and vitality of a vernacular space—a common shared space by the whole community. How do I know?

Figure 11 and 12. Details of genealogy maps.





4. a. Research:

A common is a rule-based pattern of activity in an easy-to-reach location, not an elaborately designed place at the hierarchical center.

A "common", as J.B. Jackson defined its historical meaning:

> was not simply a village grazing area; it was a vernacular space. A vernacular space, unlike a planned and carefully designed public or civic space with its political overtones, is one that comes into being and is formed by the daily customs and needs of the families who live nearby. It serves a variety of useful, temporary functions, none of which is permitted to transform the area in a permanent manner.[11]

4. b. Design Strategy:

Leave room for improvisation at the intersection of primary and secondary nodes.

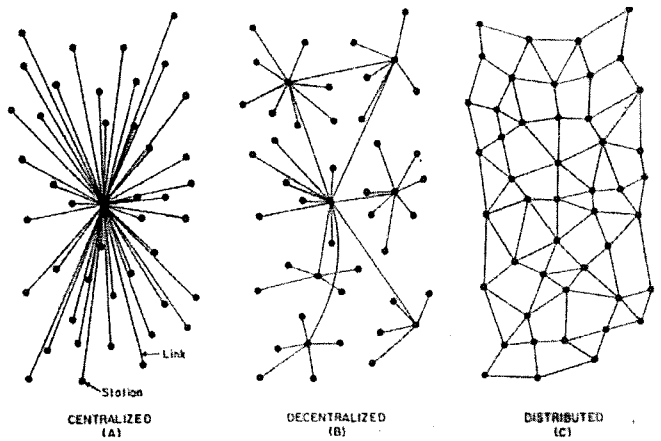
Can vernacular spaces be designed? Must they only be out-growths of the right conditions, or the absence of prohibitions and constraints? While there is room for argument here, the observed behavior and physical traces—standard methods of data collection in design research—can point to the role of a setting in the life of a larger community.[12] Such traces, and the settings in which they are found, offer methods for discovering how places work, and how their understanding can guide new design.

Physical traces of behavior in the Koch Biology Building's vertical core provide evidence of the patterns of use in a common that is a vernacular space. One clue comes from the graduated levels of ownership and display on the glass surfaces facing the staircase and landing area. While notices are taped to interior and exterior doors to explain the rules and schedules of a specific laboratory like problems of shared food, clean-up, and so forth, the glass walls contain political posters. If a designer learns to read 'physical traces', they may in fact add up to quite a bit more than merely some clutter on the wall.[13]

During my visit in June of 2004, I noticed that facing the staircase, and covering part of the seminar room walls, hung pencil-drawn diagrams of the intellectual genealogies of MIT's community of science (figures 10, 11, and 12).

The intellectual genealogies are, in a sense, maps that trace individual paths in a larger network. Not just the collective 'personalization' of a workspace, these maps represent evidence that individuals view themselves as part of the "community of science," and the Koch Biology Buildings vertical core as their "vernacular common."

Figure 13 Figures from Baran's showing three network types



By posting these maps on the public side of the seminar walls is evidence that users perceive and use this as a vernacular space—a common. My hypothesis is that Goody Clancy designed a vernacular space for this biology community by forming a junction—both elegant and rough—between a secondary or 'local' node (laboratory gathering space), and a primary or non-local node (the vertical circulation).

5. a Research:

Historians of science and technology as well as strategists of public policy and defense demonstrate three fundamentally different types of network configurations and their associated capacities for social control and physical access.

The issue of physical access, communications and social control are always present in discussions of networks, whether the subject is building passages and corridors (such as those studied by Robin Evans), the regional infrastructure of highways, or global communications systems.

Strategy analysts, who study patterns of growth or destruction to gather evidence for modeling reliable projections, describe three fundamentally different types of networks: centralized, decentralized and distributed (Figure 13). These are conceptual models, without scale. And they immediately call to mind the underlying configurations of large buildings and building complexes.

The three network diagrams in figure 13 come from the 1964 report "On Distributed Communications," written by Paul Barans for the RAND Corporation.[14] One of a series of reports influential in developing Cold War public policy, they were intended to inform strategic planning of vital resources in order to protect United States industrial capability in the event of a first-strike by the Soviet Union The centralized and decentralized networks are portraits of vulnerability. Safety has only one configuration and that is dispersion.

Barans was an electrical engineer and his job, explains Peter Galison, the historian of science and technology:

> was to ensure the survival of the United States telecommunications infrastructure through a Russian first strike—a vital link not only for domestic communication but also for command and control. His response...was a plan to remove completely critical nodes from the telephone system. Like the three highways many wanted from each dispersed defense plant, Baran's vision aimed for safety in redundantly connected, spatially distributed mini-centers.[15]

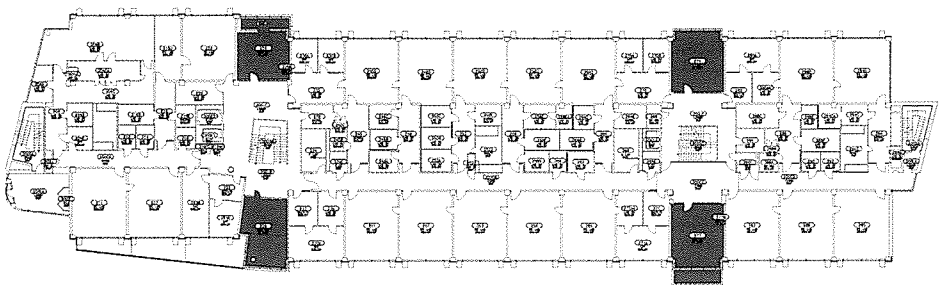


Figure 14 Plan showing lounges in Koch Biology

The redundancy of both nodes and connections is a model of connectivity that is referenced in many different literatures today. One reason for this is that Barans' model of a distributed network conceptually re-engineered the telephone network, and he is credited with theorizing the internet, or what one physicist describes as "an incredible insight...[that] the ideal survivable architecture is a distributed mesh-like network."[16]

But how do the properties of a more distributed network operate as a built architecture (rather than as computer or internet "architecture")? This is the research question that I will pursue in the future. A series of circulation design evaluations I conducted in full-service retirement communities provide my initial response.[17]

A building may be designed in such a way that residents inhabit a distributed network of social/spatial connections without the building looking like a non-hierarchical mesh, particularly not in plan.

5. b. Design strategy:
Enhance, differentiate and disperse, multi-access secondary nodes.

The model of connectivity found in a distributed network appears to be consistent with a building in which secondary nodes are located on primary paths with high visibility, access, and where they are sufficiently differentiated from other types of gathering spaces, as well as differentiated among other all-community spaces. This pattern is proven in my retirement community design research, and it is suggested by observations and interviews at the Koch Biology Building.

The vertical core in the Koch Biology Building offers a variety of formal and informal gathering spaces that are associated with individual laboratories (such as the tea rooms). Furthermore one lounge on every floor is a two-story high community space. Goody Clancy expressed the difference through that increased height and a projection of the facade out into the space of the campus (figure 14).

Those configurations that are consistent with a distributed network model of connectivity exhibit sufficient redundancy in the system that multiple means of access and resources are available. In terms of space planning, this can mean that the location of something like a lounge, a balcony, or a reading room needs to be positioned in the circulation system in such a way that it has multiple means of access. For example, if located on a cul-de-sac, a sharable space is more easily territorialized by their nearest neighbor, removing it from the community network.

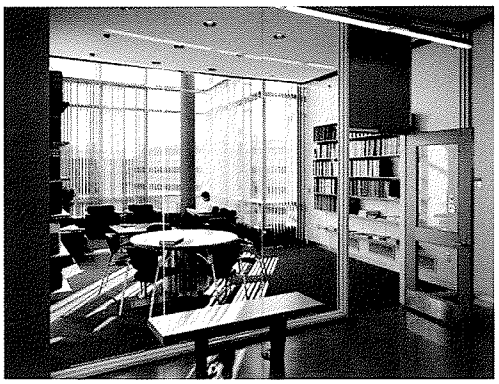


Figure 15 The visual porosity of rooms surrounding the stairs at Koch

6. a. Research:

a principle strategy for increasing individual and organizational value is forming connections outside one's primary circle of relationships and contexts.

The sociological foundation of network theory derives from a 1973 essay by Mark S. Granovetter. In "The Strength of Weak Ties," Granovetter traces how "weak ties" formed by casual acquaintances (outside one's primary circle of co-workers, family or friends) lead to a clear advantage in finding the job they seek. The importance of generating "weak ties" and interacting with multiple contexts has formed the basis of considerable further research. Ronald Burt (1992) finds that when conversations occur between people from different social networks, even irregular contact can bridge the gaps he refers to as *structural holes*. Structural holes are a result of being isolated within one's own context.

Burt theorizes that organizational value increases by identifying and crossing "structural holes" in one's organization or industry. Doing so makes one more competitive and fosters a better understanding of the social structure of competition, or what he calls "the *social capital of structural holes*".

If social capital is an advantage that accrues from "connections" beyond one's primary group or context, site and building design have many tools for increasing organizational value. More than a few are evident in Goody Clancy's design of the Koch Biology Building.

6. b. Design Strategies:

The spatial connectivity in a building inscribes patterns of social interaction and movement. Architecture also models connections between people and their surrounding, non-human environment. By responding to more than one site context, the inhabitants visualize bridging "structural holes."

Several bold examples of cross-laboratory connectivity in the Koch Building were previously mentioned in this chapter. Other gestures are less noticeable unless one spends time in the building. For example, the location of men's and women's restrooms varies from floor to floor.

Given that environmental behavior is slightly out of awareness and habituated, amenities that is less predictable (but equally available) break the "auto-pilot" routine. In the process, it is necessary to walk a different way, take another stair, and sometimes apologize.

The bathroom routine may seem trivial in the overall dance in a university research facility. Yet, the subtle features of architecture accumulate; and they animate the inward apprehension of time and place, as well as one's awareness of other people and other contexts.

Goody Clancy posits a shift in awareness through the architectural expression of the community lounges. As seen on the facade, in plan, and section, these two-storey, all-community lounges jut away from the tightly held order. Extending a community resource by a few feet in height and out into the plaza below, inhabitants can see the Charles River while reading in the lounge.

Figure 16 Drawing showing the expression of the community lounges on the exterior

Figure 17 The view to the exterior a Tea Room in Koch

Being able to catch a glimpse of the river, the light, and Boston skyline beyond, the architecture integrates the original grid of campus (Massachusetts Avenue and the river), and the grid of Main Street's growing bio-medical industry. Goody Clancy's Koch Biology Building demonstrates an architectural manifestation of bridging a structural hole (figures 15, 16, and 17).

Conclusion

In this chapter, I construct (retrospectively) a body of evidentiary arguments linked to the design of the Koch Biology Building. Needless to say, these are my own, and not those of the architects. They are used to demonstrate translations between research and practice. In this case they have resulted in the design of an extraordinary zone of connectivity from the most carefully controlled to the most accessible space, and every point in between.

The best evidence, however, can be found in the way that this design contributes to the forward movement of the science it houses. During an interview last summer, I pressed Professor Richard Hynes, (a member of the original Biology Building Committee), about whether bumping into other researchers with whom one does not work is actually critical to the growth of science. Isn't connecting on-line, at conferences and through the literature more important? Hynes responded,

RH: I don't know if everyone else thinks this way—I remember the architects were surprised by how adamant we were. But we were right.

JH: Is it because of how inter-disciplinary Biology has become?

RH: Yes, I think so. It is a very fast-moving science. So, being plugged into the grapevine is very important...There is a lot of scientific gossip. I would have thought that [other sciences] did it as well. But I did have an argument with a Dean, when I was Department Head, who was complaining that I was always seeking more money for our courses, for re-tooling our courses. So, I asked him when they start teaching the undergraduates Post World War II Physics. He said we don't get to that until graduate school. Well, I said, nothing much that we teach precedes World War II. Everything is rapidly moving and everything changes every year—even at the undergraduate level.

So that may be another reflection of the fact that what we do now is not what we did a year or two ago. The way in which we do things—and this is why MIT is such a good place—is that it is so close to the grapevine, both without and within.

Notes

1. Since the mid-1960s there exists a rich record of research about the effect of places on people (such as post-occupancy evaluation or POEs), and the application of this and other environment-behavior research into design decisions. In 1968, the Environmental Design Research Association (EDRA) was founded by design professionals, social scientists, students, educators, and facility managers for the advancement and dissemination of environmental design research from its several thousand members who engage in discipline-crossing design research within and between public and private sectors, and from within universities, consulting practice and design firms. For more information visit http://www.edra.org. This website has links to edra-affiliated scholarly journals, book series about behavior-based architectural research, and several PhD programs.
2. See D. Kirk Hamilton, "Four Levels of Evidence-Based Practice," in *AIA Journal of Architecture* (December 2004).
3. One that emphasizes digital technology: J. Novitsky, "Changing the Face of Practice with Digital Technologies," in *Architectural Record* (February 25, 2004). For an approach that focuses on business models from other industries see a good summary of the work of Susan Harris and Kyle Davy of the Advanced Management Institute for Architecture and Engineering, "Architects Play Catch-up in the Business World," in *Seattle Daily Journal* (November 20, 2003).
4. This description reflects conversations between the author and the principals of MK Think, San Francisco.
5. My evidence about the origins of net-to-gross is anecdotal. However, the typical use as a ratio of rentable space, such as in the case of commercial office space, is considered efficient when it occupies at least 80% of the gross square footage, so that the least amount of capital is devoted to non-rentable spaces like corridors, bathrooms, storage, and mechanical rooms.
6. In another sense, the tools we need now are just like net-to gross—easily used by architects and non-architects, like an analog tool, that works directly, manually.
7. I had contracts with Engelbrecht Griffin Architects (1988-1998), and I was the first recipient of the Goody Clancy Summer Faculty Fellowship (2004).
8. Discovered by Napoleon's troops in 1799, near the seaside town of Rosetta in lower Egypt, a British physicist and French Egyptologist collaborated to decipher the hieroglyphic and demotic texts by comparing them with the Greek opening. There are many books about the stone which resides in the British Museum as well as the riddles of deciphering it.
9. The campus planning attitude that stresses the connectivity of campus buildings (over their object status) and typically wrap rectilinear buildings around interior courtyards were part of an MIT tradition that may have ended with the retirement of an era of planning directed by Robert Simha. Neither of these MIT versions of campus urbanism are present in the Stata Center designed by Frank O. Gehry and Associates.
10. See Jamie Horwitz and Michael Underhill, *Iowa State's Memorial Union: An Architectural and Social Evaluation of a Campus Treasure* (Ames, Ia.: Design Research Institute, Iowa State University, 1989).
11. Jackson's quote continues:
"It suffers, in other words, from no landscaping, no beautification, no overt behavioral design. In the Medieval village this vernacular space was where we grazed our domestic livestock, where we gathered herbs and plants, where we went for kindling and gravel, and where we played games and celebrated holidays. The use and abuse of the common was almost always a source of contention and ad hoc rules, but the use of it, the right to use it, was an essential part of citizenship, and to be excluded from it was the equivalent of ostracization and exile."
12. John Zeisel, *Sociology and Architectural Design* (New York, N.Y.: Russell Sage Foundation, New York, 1975), 25.
13. 'Behavioral traces' comprise a method of collecting data about how people use places that is explained in John Zeisel, *Inquiry by Design* and *Sociology and Architectural Design*.
14. Paul Baran, *On Distributed Communications,* RAND Corporation memorandum RM-3420-PR (August 1964).
15. Peter Galison, "War Against the Center," in *Architecture and the Sciences,* Antoine Picon and Alessandra Ponte, eds., (New York, N.Y.: Princeton Architectural Press, 2003), 220.
16. Albert-Laszlo Barabasi, *Linked: The New Science of Networks* (Cambridge, Mass: Perseus, 2002), 144.
17. At the invitation of Mark Engelbrecht and Engelbrecht Griffin Architects (EGA), I studied full-service retirement communities that were designed by EGA and occupied for at least ten years. Initially, I focused on Friendship Village of Columbus (FVC) with its three hundred plus independent living apartments, health care and associated amenities; FVC was a standard upscale CCRC within efficiency standards. A large suburban tract and an unusual degree of freedom in the design development Engelbrecht was able to execute a design experiment that broke many of the rules of thumb and standard walking distances for a project of this type. And he wanted me to evaluate it.

Engelbrecht thought that his previous designs of CCRCs for Weitz had overly differentiated the components of the CCRC program, creating a building that neglected the intermediate spaces needed for socializing, allowing for the ebb and flow that, he hypothesized, could be evoked by a clustered plan. Engelbrecht wanted the energy and activity associated with the entry gathering spaces to be "threaded throughout the village-like structure." His concept was to divide the building into five residential wings, each wing wrapping short segments around a multi-access courtyard with rest areas at 90 degree turns. Keeping the main lounges at the entry, Engelbrecht located "neighborhood lounges" on the ground floor of each residential wing. The five Wing Lounges have partial glass doors, a rear access to street parking, a full kitchen and restrooms, and can seat up to twenty in a comfortable, living/dining room style room.

By conducting focus group interviews, surveys, and living at FVC, I learned that the wings are not perceived as neighborhoods. No one uses a Wing Lounge for casual socializing or because it is near their apartment. Wing lounges are booked, sometimes a year in advance, for family parties, bridge tournaments, and church groups for residents who remain mindful of making plans, and appreciate bringing guests coming to the Wing Lounges directly from an affiliated entry in the parking lot. Residents with less organized social lives use the central lounges and the charge that comes from being by the entry, and none of them worry very much about getting lost in the exceptionally complex and elongated configuration.

Initial data revealed not only contradictions with the architect's desired "neighborhood strategy" but also a long waiting list for vacancies, in part because residents of FVC were living much longer than expected (actuarial tables had to be revised) amidst an extraordinary conviviality (more than 40 different resident committees kept the management and the Ohio legislature, busy) and I began to study CCRC's that are similar in every way other than the circulation and gathering places. CCRC's with split commons, and centralized commons showed statistically significant less satisfaction with their social life, social spaces, and observably less presence in the hallways, longevity, or the vitality of activities with social groups outside the retirement community. Reflecting on FVC through network theory made me see that because residents use all the different lounges, and residents and guests can enter from the parking lot to wing lounges, they rival the main entry in terms of their connectivity. While the building appears to be a decentralized network in plan, such a model would remain dependent on the hierarchical center of the main entry. Here the entry at the wings and their gathering spaces create a redundancy of access and control, thus competing with the center.

It is worth noting that the "pioneers" (the originally residents and long-lived leadership) of FVC succeeded in taking a bill through the Ohio legislature that would guarantee all residents of life-care community's access to the financial records of their management, in this case, Life Care Services.

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