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Making Places for Scientists [The University of Oregon Science Complex]

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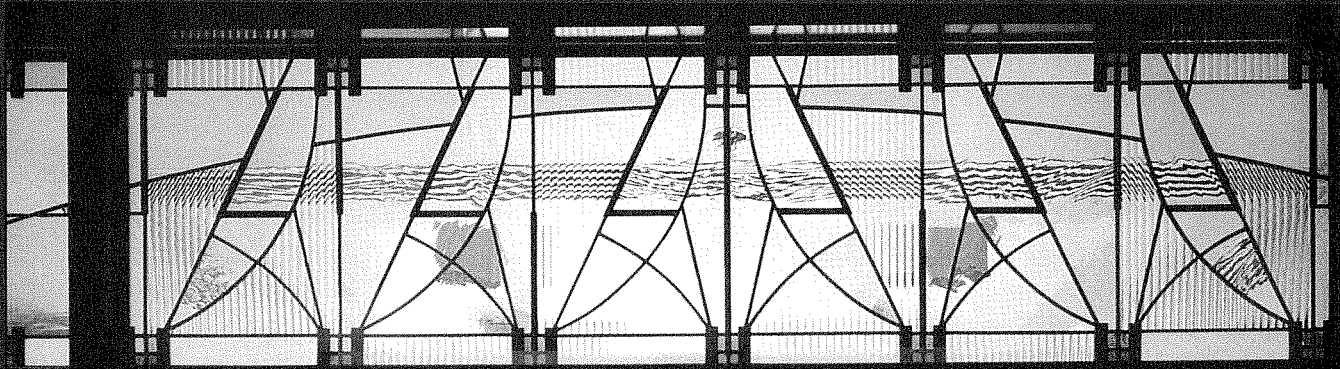
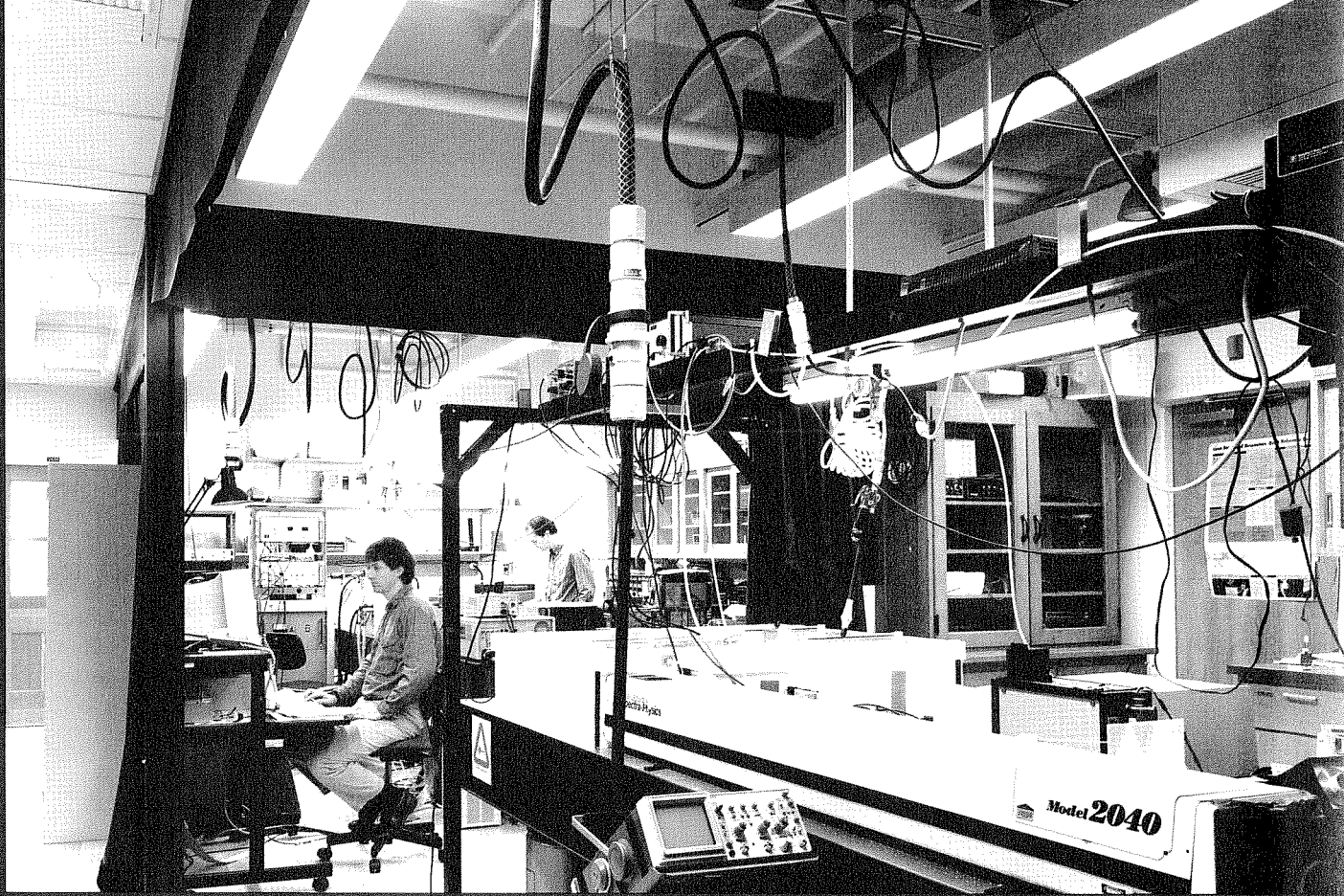
Does quality of place have much to do with quality of science? For science, at least, the caliber of the researchers and their resources seems to be most critical. Nonetheless, scientists at the University of Oregon, embarking on the expansion of their facilities, agreed that it was worth asking questions about laboratories famous for excellent work: What were these places like? How were the labs clustered? What size were the lab modules? What made them special places?

Scientists who had worked in other laboratories mentioned a number of features they appreciated, such as the “play room” at the Massachusetts Institute of Technology’s Artificial Intelligence Laboratory. Others reported on places that had supported their best work, mentioning views of the Pacific Ocean from the Salk Institute and of the Cascades from the Eugene campus. Excellent laboratories, it turned out, were often cramped and dingy, replete with odors and crammed with specialized equipment. What seemed most to distinguish good laboratories was the vitality of groups working on related questions, not the labs’ architectural features. As architects, we listened and visited many laboratories as we developed design concepts for the science complex expansion.

Many of these design concepts evolved from discussions that had occurred before we were hired. Before selecting an architect, the Science Facilities User Committee published a report that diagrammed the complicated connections among the various disciplines, reflecting current and anticipated cross-disciplinary work. Following a campus history of connected science buildings, the report stated that all disciplines should be interconnected and indicated particularly critical links. The clarity of the faculty vision for the sciences on campus helped us immeasurably to get on with making buildings.

One interpretation of this diagram would have been to create a single monstrous building or megastructure. To spur discussion at the interview for the selection of architects, I momentarily placed a single, large building mass on a model of the site to stress the large size of the project. The selection committee’s negative response was so apparent that I snatched the large block away. They

Laboratory in Willamette Hall and department hearth in Streisinger Hall. Ornamental stained glass is by Ed Carpenter. Top photo by Andrew McKinney. Bottom photo by Timothy Hursley.



audibly relaxed, and I proceeded to describe our ideas for a multi-building complex that could create a series of courtyards and plazas of varying size and character.

As we continued meeting with the Committee, we came to understand that the scientists' work was interconnected in interesting, unexpected ways. Many breakthroughs occur, for example, when chemists or physicists apply their talents to biological problems, or computer scientists join forces with neurologists or psychologists. In some cases the University had recognized these relationships by creating interdisciplinary institutes, such as the Chemical Physics Institute and the Institute of Molecular Biology, and more had been proposed. Somehow we, too, would have to find ways of bridging these distinctions.

Working from the Inside Out

With the concept of connectedness established as the overall framework for the expansion, we needed to learn about the particular spaces within this network. Early on, during a workshop with faculty, staff and students, we asked people in each department to develop a colorful diagram showing what would be essential to their department's new space. We used simple materials, such as cellophane, colored construction paper and parsley, to encourage playfulness and minimize skill differences between architects and non-architects. The informality inherent in these materials allowed people to toy with ideas and explore them freely. We asked people from each department to develop an ideal diagram of its new spaces, with special emphasis on its main social gathering place, a department hearth.

The physics group developed the idea of a central sunlit place that would be surrounded by labs, department headquarters, teaching spaces and its department hearth. Thus, at this early stage of the design process, the physicists' diagram planted the seed for the final concept for Willamette Hall — an atrium that connects several disciplines, functions and buildings.

The seed was planted our third week on the job — too early, it seemed, to fix on any particular scheme. In the following weeks we explored courtyard schemes and street schemes and nearly shelved the atrium scheme. We eventually revived the atrium, although we had some concern about its cost. The User Committee selected it from several options at a design workshop. Over the months the atrium grew into a place with concrete and steel bridges linking chemistry and physics, biology and physics, chemistry and theoretical sciences, and research laboratories and classrooms. I do not think the scientists suspected how very literally we would take the concept of bridging between disciplines.

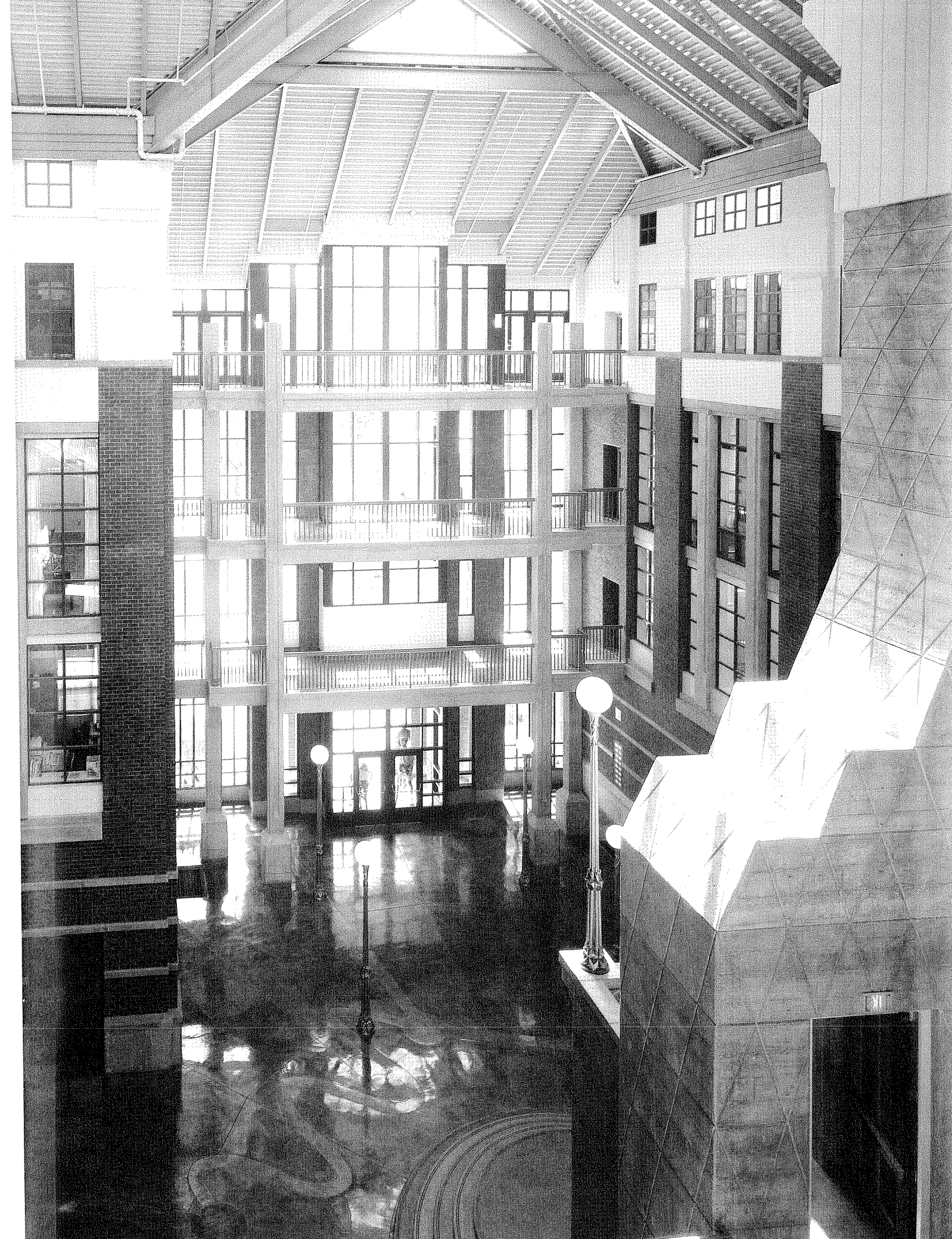
In campus building projects, it is typical that the amount of space available for laboratories, offices and teaching space is less than what faculty and staff think they need, and that each square foot of a new building is parceled out carefully to particular users and activities. Unprogrammed space the size of a four-story atrium with bridges flying through it is a rare commodity. Moreover, an atrium looks extravagant and thus violates the first rule of public projects: They need not be cheap, but must look cheap.

This truism took a turn in the expansion of the science complex. The issue, it turned out, was not whether the atrium looked expensive but

whether the University was getting value for its money.

The atrium did cost more, at least enough to house another scientist. It required additional roof structure, fire sprinklers, smoke exhaust fans and walls (including a glass wall on the south facade). But the atrium did not cost as much as it appeared: Most of the walls were already needed to enclose laboratories and classrooms. We calculated that the atrium could do without heating, ventilating and air conditioning: Running the exhaust fans would cool it on hot, sunny days, and even on cold, cloudy, rainy days some solar heating could be expected. Moreover, the atrium created some savings. Without it, the bridges connecting the departments would need weather enclosures. And, adjacent laboratories and classrooms would benefit from the mild atrium climate (in practice, roughly 80 percent of indoor temperatures), reducing the cost of heating and cooling them.

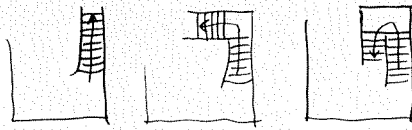
There is no easy answer as to why the atrium survived the budget balancing process. Certainly, Campus Planner J. David Rowe argued in his quiet but persuasive way that the University was about excellence, both scientific and architectural. Physicist John Moseley, also the University vice president for research, argued that the design manifested the University's interdisciplinary program. Don Van Houten, Dean of the College of Arts and Sciences, argued that the project benefitted the campus as a whole and not just the science community. We argued in favor of the atrium, but feared for it, as a design team always fears for any feature that strictly speaking could be lived without.



These examples show how patterns from A Pattern Language were transformed into specific patterns for the University of Oregon campus, then into special places in the science complex.

133. Staircase as a stage

Place the main stair in a key position, central and visible. Treat the whole staircase as a room. Arrange it so that the stair and the room are one, with the stair coming down around one or two walls of the room. Flare out the bottom of the stair with open windows and wide steps so that people coming down the stair become part of the action in the room and so people will naturally use the stair for seats.



133S. The social stair

This pattern describes how stairs can be used to provide a place for informal interaction. It calls for generous, visible stairs with views and light to encourage their use and for extra-wide landings and balconies with places to linger, lean, or sit. The aim is to encourage the casual passing conversation to develop into something more serious, which will seldom happen if it is interrupted by the end of an elevator ride.

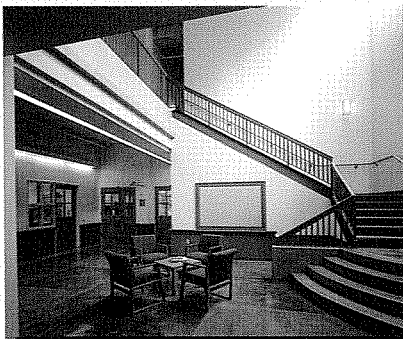
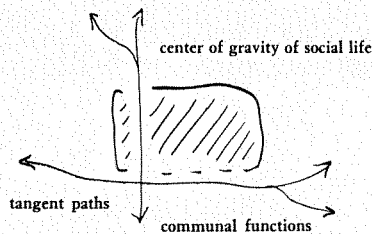


Photo by Timothy Hursley.
Top drawings from *A Pattern Language*, by Christopher Alexander. © 1977 Oxford University Press. Used by permission.
Plan, drawing at right courtesy The Ratcliff Architects.

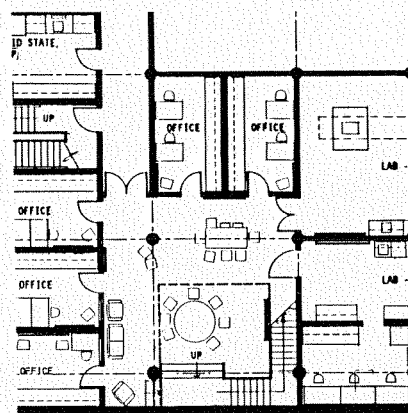
29. Common areas at the heart

Create a single common area for every social group. Locate it at the center of gravity of all the spaces the group occupies, and in such a way that the paths which go in and out of the building lie tangent to it. A successful common area should have a kitchen and eating space (since eating is one of most communal of activities), comfortable seating and an outdoor area.



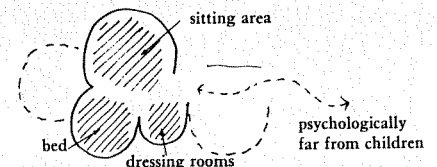
129S. Department hearth

This pattern calls for the creation of a social hearth near the center of department activity. It would create a single center for each department, a place to have a seminar or a discussion, to pick up mail, to get a cup of coffee or some supplies. It would include bulletin boards for student and faculty information, offices for the staff and perhaps a small library. All department faculty offices should be within 500 feet of this hearth.



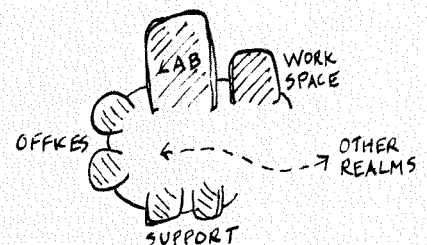
136. Couple's realm

The presence of children in a family often destroys the closeness and the special privacy which husband and wife need together. Make a special part of the house distinct from the common areas and all the children's rooms, where the man and woman of the house can be together in private. Give this place a quick path to the children's rooms, but, at all costs, make it a distinctly separate realm.



136S. Research realm

This pattern describes the domain of a faculty researcher. It includes a private office, the laboratory, individual support spaces and work areas for other members of the research team. These spaces must satisfy the need for intense work within the group and encourage communication with adjacent groups. Visitors to the realm, particularly to the faculty office, must not intrude upon the laboratory work. Connections to corridors, access to shared facilities, natural light and the need for views must be considered in laying out a research realm.



When it came to making hard choices to keep the building within budget, the scientists took a broad view, cutting a number of other items and keeping the atrium. One of the cuts even reduced the width of physics labs from 25 to 24 feet. The atrium's existence was finally assured only by a construction bid three to four percent below what had been expected.

The Oregon Approach and The Oregon Experiment

The design process was striking for its openness and high level of participation among a diverse group of consultants and University representatives. That the process was collaborative was no accident, given the University's tradition of collaborative decision-making — I had experienced this first hand, having taught there for several years during the 1970s. I was confident there would be open, critical discussion of anything we presented and that we could comfortably involve both the Campus Planning Committee and the User Committee from the start.

We were working under the University master plan, *The Oregon Experiment*, which articulates principles to be followed in making and altering places on campus. The principles of organic order, participation and coordination had grown out of the University's longstanding collaborative tradition and were firmly agreed upon by all. The principle of piecemeal growth, while violated by the large size of the project, was supported by the concept of a complex of smaller buildings. The principle of diagnosis was hard to dispute; many places needed improvement, even on a campus as attractive as Oregon's.

The principle of using patterns was a different matter. We faced an early test when scientists began reviewing *The Pattern Language*. Some physicists saw the pattern "Wings of Light" and told us forcefully that the recommended 25-foot maximum building width did not apply to physics labs and was, in fact, foolish. This encounter with a pattern that needed recalculation for the application at hand encouraged their natural skepticism. Did they have to use *The Pattern Language*?

The design team was committed to *The Pattern Language* as one of the basic principles of the master plan. However, to the science faculty, an enforced reading of *The Pattern Language* was unimaginable. We decided literally to cover the walls of our on-site studio with "patterns," which make creative connections between social issues and physical forms. We made casual and natural reference to them when convenient. We wrote specialized patterns for the science buildings (although we never had much time to codify our patterns). We surrounded plans that we drew with summaries of relevant patterns. In short, we insisted quietly, but firmly, that these were principles about buildings that we found useful to bear in mind as we designed.

Site Repair

Several patterns became part of our everyday vocabulary and had very significant form-giving power. Most powerful was "Site Repair." The pattern suggests that new buildings should be located in ugly places and not handsome places, and that new construction should be used to repair places that do not work. This makes more sense than seeking the most beautiful spot and filling it with a building.

This pattern became a guiding principle for one of our earliest participatory design exercises. We asked the faculty, students and staff to consider what part of the campus worked well and what part worked least well. Small groups were asked to locate paths, gathering spaces, places of special beauty or interest, and places requiring repair. We then noted these observations on acetate maps. We overlaid the maps using an overhead projector and rapidly identified common patterns and intriguing variations.

Everyone seemed to like the older red brick portion of the campus, mature landscaping and sunny places. No one seemed to like large paved plazas, large parking lots and large expanses of gray concrete. The science quadrant was a favorite with few and clearly possessed many opportunities for site repair. Although much of this was not surprising, the articulate nature of the responses and the virtual unanimity were striking. Not all of our discussions were so nearly unanimous.

The Heart of Darkness

Sometimes the scientists strongly advocated ideas that the design group questioned. One of the ongoing discussions with the cell biologists concerned their preferred plan: a very dense arrangement with labs and faculty offices at the perimeter and more labs and graduate offices at the core. They wanted everyone horizontally contiguous on one enormous level, a scheme that seemed so contrary to "Wings of Light" that we dubbed it "Heart of Darkness."

Social Stairs

The cell biologists had concerns beyond making sure they were located close to each other; they also wanted a social gathering space at the heart of their building. This proved the seed for interesting architecture.

We talked of many models for this space. One model that recurred was the pub at Cambridge University's MRC laboratory, which is famous for work on DNA. Since the laboratories were crowded and by definition unsafe to eat in, the English had topped the building with a pub.

While a pub was neither legal on a public campus in Oregon nor a typical part of local culture, the model was useful. What was it about a pub that made it a focus of scientific discussion at Cambridge? It was a natural part of many people's daily lives. You might bump into the same people there by accident or have standing arrangements to meet particular people. It could be part of a daily routine. Many liked the idea of laboratories surrounding a gathering space, making it the fabric that provided daily connections among laboratories and offices.

We were able to address this while solving a functional problem the new floor assignments posed. The challenge was to make the second level, where four cell biology laboratories were located, seem connected to the third level, where related interdisciplinary work in plant and animal cell biology was taking place in several connected buildings.

Many members of the design team had ideas for how to make a special stair that would achieve this connection. Six or eight of us made sketches: straight stairs, diagonal stairs, L-shaped stairs, stairs with benches on landings, stairs that functioned as stages or podiums. Almost all of us

We had seen many biology labs built on this model. One of the 1960s buildings at Oregon was a classic example, in plan a very thick rectangle with many interior rooms. The designer of the building had simplified the architectural problem to one of making as many functions adjacent to each other as possible; all else was disciplined to follow. The design group reacted against the rabbit warren of corridors and the windowless spaces.

The cell biologists also wanted virtually the entire department to be on the third floor, so that vital connections could be established with biologists and chemists on the third floors of two nearby buildings. Facilities for storing research animals were assigned to the second floor. The relatively new Computer and Information Sciences Department was recruited to occupy the ground floor.

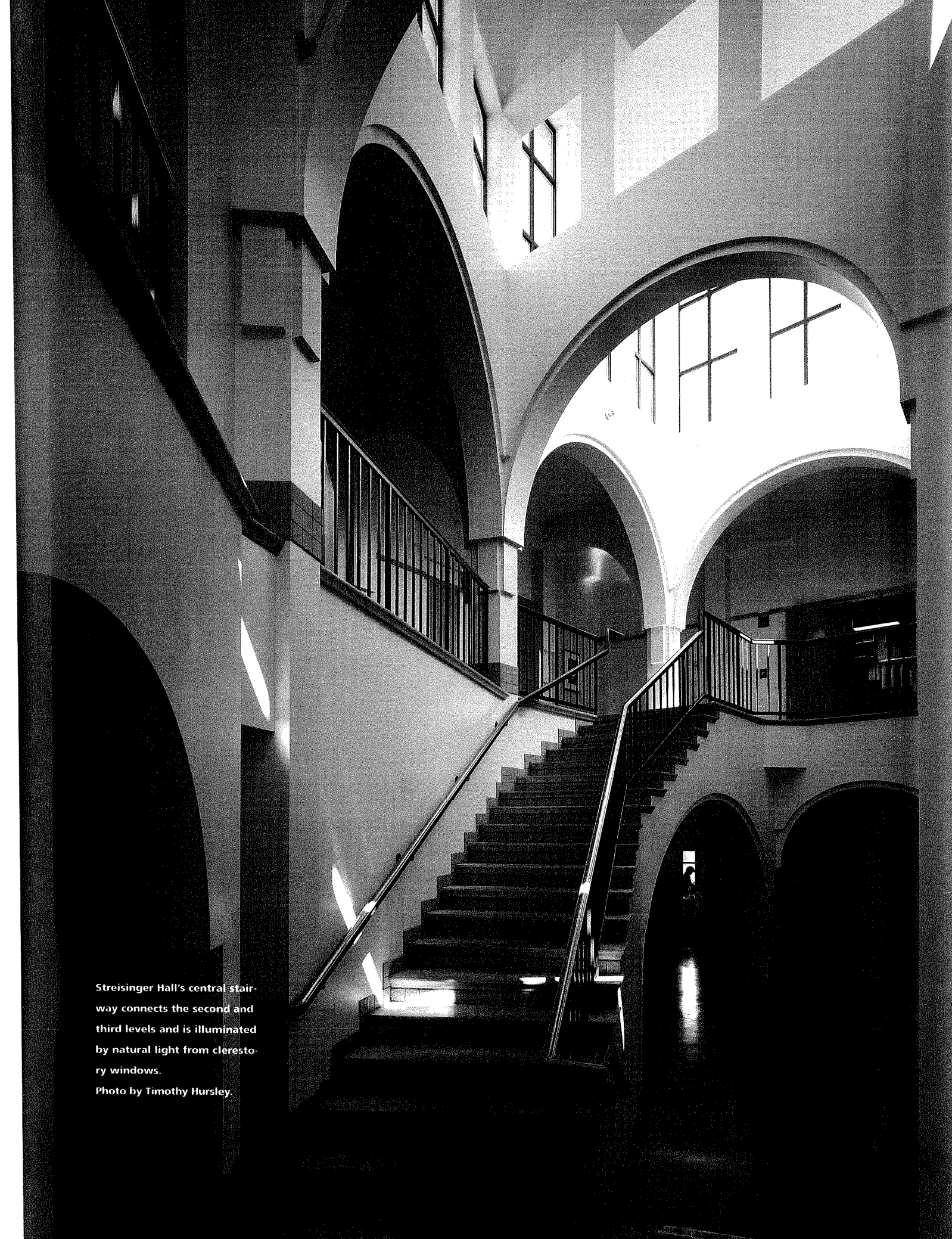
The computer scientists began to question their role as the base of a densely built "Heart of Darkness" scheme. They had heard rumors that biochemical laboratories dripped and gushed from time to time on anything unlucky enough to occupy space below. Not only that, but these drips and gushes might include chemically and biologically interesting substances. The intervention of a floor housing research animals was hardly more reassuring. The computer scientists thought of their delicate electronic instruments and the maple bookcases they were planning to bring from home. We did not think the drips and gushes would be frequent, but no one was willing to give an iron-clad guarantee that they would never occur.

When our cost studies disclosed it would be less expensive to house the computer scientists in a separate building, the computer scientists could

hardly have been more pleased. They were looking for an ivory tower, not the first floor in a "Heart of Darkness" scheme. Each professor taught many hundreds of undergraduates and needed a retreat where serious research could be accomplished. The department very much wanted a building of its own and would have wanted one even if it had not heard instances of biochemical laboratories expanding into adjacent space.

The computer scientists also sought an egalitarian physical arrangement. They thought each faculty member should have an office and a lab with windows and, if possible, views. They regarded the "Heart of Darkness" scheme, with its windowless labs and offices in the core, as a major obstacle to their functioning as a group of peers. If only some labs and offices had windows, how would the department decide who received the better quarters? Would tenured faculty offer the better space to the newest members, because it is so hard to recruit good young faculty? The department chose not to force this choice by providing everyone with windows.

Putting the computer scientists in a separate building resolved one problem, but we still had to address the matter of the first two floors of the cell biology building. No one volunteered to occupy the ground floor and hold up the biology laboratories, so we were forced to rethink. The result was we reduced the size of the second and third levels, split the biochemical laboratories for the cell biologists between them and assigned the animal quarters to the ground floor.



Streisinger Hall's central stairway connects the second and third levels and is illuminated by natural light from clerestory windows.

Photo by Timothy Hursley.

envisioned large skylights or lanterns with many windows to flood the space with daylight and help it work as the social core of the building.

We invited Charles Moore to examine our sketches. Each idea seemed quite good. How could we include as many of them as possible? Charles discovered a way to make a diagonal, somewhat L-shaped stair with a long, straight section, a bench on the landing and the beginnings of a playful set of monitors that were to banish the darkness at the heart of the building. The staircase became a very special place in the complex, an in-between space that defied formal definition and celebrated the importance of the connections among the laboratories.

Garages and Kitchens

We also worked with the scientists to design their individual laboratories. As we worked with scientists from different disciplines, we discovered their ideals about laboratory space varied significantly. Early on we concluded that the notion of universal laboratory space was beyond our means; we could not afford to equip every space for every eventuality. However, we began to recognize several different patterns for ideal laboratories.

The physicists, in principle, agreed with author Richard Feynman, who described a good physics laboratory as “a double garage with a lot of electricity.”¹ Their way of life included a lot of tinkering, with frequent visits to the local hardware store. A simple loft space suited them.

Careful attention was given to laboratory details, such as cabinetry and windows.

Photo by Andrew McKinney.



Make Every Day Like Saturday

As we worked with the physicists on the details of their labs, we discovered many ways in which the modern execution of Feynman's concept required substantial technical support. Physics laboratories must accommodate a range of special apparatus from argon lasers, requiring 70 amps of three-cycle 440-volt power, to nuclear magnetic resonance equipment, which can erase your credit cards. They must also accommodate hazardous substances like xylene, which will ignite on contact with air.

For the physicists, we made a basic loft space 24 feet by 50 feet and provided it with an overhead cable tray for electrical and communications wiring, standard piped services and heating, ventilating and air conditioning. This allows users reasonable leeway to adjust over time. (When a new program caused a change of laboratory assignments prior to occupancy of the building, six laboratories were reassigned with very minimal change.)

A good biology lab, on the other hand, is more like a good kitchen, idiosyncratically fitted out with a wide variety of machines, lots of counter space and as much storage as possible. In some cases, we worked closely with faculty recruiting committees to custom tailor laboratories for promising new faculty members, such as a professor working with barn owls. Yet some generalizations can be made here, also. We made the basic bench modules quite similar from laboratory to laboratory, while providing for variation in a specialty zone. The bench areas, where the scientists spend much of their time, were placed along the window wall. We placed the specialty zone nearest the large air ducts, cable trays and gas mains to simplify adding and deleting services as needed.

Early in the process, biologist Aaron Novick, when asked what his ideal laboratory might look like, said he would be happy if we could make a place where "every day would be like Saturday." Because both scientists and architects complain of being drawn into management and having to return on Saturday to do the "real" work, we recognized this wish.

While I cannot claim that we ever discovered the ultimate architectural manifestation of Novick's wish, it set a very high goal for us. We tried not only to separate the research laboratories from casual traffic and noise, but to make them places worthy of a Saturday excursion.

Few are drawn on Saturdays to windowless places with eight-foot ceilings covered with rows and columns of four-foot cool-white fluorescent tubes set in two-foot by four-foot grids of acoustic fluff. Windows, views, daylight, high ceilings, natural wood and color are a more likely vocabulary for a solution. Perhaps one should think of the laboratory as one thinks of a family dining place, not only as a machine for the sanitary ingestion of food, but as a pleasurable and social place where people spend significant moments of their lives. It is possible to become so overwhelmed by the technical requirements of laboratories that one loses sight of such things as the fragrance of the bushes outside the laboratory door or the pattern of the sunshine on the laboratory floor.

Working from the Outside In

Inevitably a new building has an edge about it that calls attention to it in a negative way, not unlike the new student in a high school class who, not having assimilated the local customs yet, wears a sophisticated outfit when the others are wearing playful, comfortable clothing. Our goal was to make the new buildings look so comfortable that there would be ambiguity between old and new. We sought to make the older buildings look better.

Early in the process we began to develop a common aesthetic vocabulary with faculty and staff by conducting a sort of “Rorschach test” with slides. We selected 80 slides representing a wide variety of historic and contemporary architectural examples. None of the buildings had been designed by any of the architects involved in the science complex, freeing viewers to respond openly without hiding their feelings to save ours. We then asked faculty, staff and ourselves to answer two questions about each slide: Do you like it? Do you like it for the science complex?

None of the aggressively high-tech buildings received many votes. Several, such as the Crystal Cathedral, a steel and glass church, were greeted with disbelief: Why would we even show such a building? The most votes were awarded to a picture of grass and trees with no visible buildings. The least votes went to an austere stone landscape with no vegetation. This seemed a strong vote for the pastoral portions of the Oregon campus. Many people who worked on campus had moved from dense urban areas to Eugene, and had little relish for doubling the density of the science quadrant.

The picture of a building that was given the most votes was of the Central Beher, an insurance company office in Appeldorn, Netherlands, by Hermann Hertzberger. The picture showed sunshine, large corner windows, trees and concrete block, and suggested there would be lots of sunshine inside. The building was not very tall: two or three stories. It had more shape than a simple, big box, possibly even some personality. The materials were ordinary and easy to understand; they seemed to have been placed by people, not machines. They looked durable, as though they would not break, and they looked as though a person could understand how to fix them even if they were to break. The building looked affordable rather than extravagant. It looked friendly.

Getting nearly as many votes was a picture of the Lane County Public Services Building in Eugene, designed by Unthank, Sedar, Poticha. Again, it was a friendly building. Public offices were arranged on a three-level, daylighted arcade, making them open and accessible. As with Central Beher, the picture showed plants, sunshine, simple materials and a low scale that a person would not feel dwarfed by. It looked well built, neither extravagant nor cheap.

The issues that emerged from these discussions centered on green space, daylight, human scale, down-to-earth materials that wear well (particularly in the rain) and friendliness — an elusive property. These discussions supported our own tendencies to view the green space and buildings as equally important, to introduce daylight almost everywhere (short of obvious exceptions such as photographic dark-rooms), to make the built forms relate to the size of people, to use brick, tile, concrete and other locally available

and inexpensive materials, and to place major importance on the in-between spaces that connect both people and buildings and make the campus as a whole more habitable.

Although ornamentation was not, in general, sought by faculty and staff, we were excited by the possibilities for ornamentation and embellishment inherent in brick, tile and concrete. Some of our favorite building ornamentation, such as the animal motifs on Harvard’s Agassiz Museum, received few votes in the Rorschach test, but we decided to keep the discussion alive. After all, the Rorschach test was never seen as a plebiscite, but rather as the kindling for discussion.

As our designs developed we worked to make the visual connections among buildings seem strong without losing the character of individual buildings in the overall complex. Linked buildings became friends and cousins but never identical twins. Each new building nearly touched or connected to several existing structures. We could easily adapt the brick, tile and concrete to these different contexts, altering coloration and patterning. Also, we could mitigate the major increase in density that these buildings constituted by varying the patterns of brickwork. The new buildings would not only survive the rain intact, but look warmly welcoming in the rain.

As we introduced ornamentation into our drawings, many of the faculty, staff and students began to welcome and encourage it, although a few continued to favor the plain. Among our friends were critics who questioned our apparently traditional design. We were frequently asked why we did not

develop industrialized, shiny metal, glass and plastic buildings to express modern science. Certainly some celebrated contemporary laboratories follow this esthetic. We had included this option in our discussions. The results had been clear.

Although there was some interest in the buildings functioning as statements about science and technology, there was more interest in their being habitable in the fullest sense for campus and scientific life. Science is a human as well as a technical pursuit. Scientists are far too varied for there to be any one simple answer to what a science building should look like. Most felt the actual scientific work would express science and technology and that the buildings' representation of science need not be direct and linear.

In-use Evaluation

Most articles on science buildings focus on providing places for machines and scientific processes. In making the new science buildings at the University of Oregon, we worked very hard to identify and employ appropriate, safe and adaptable technical solutions throughout the buildings, while making places that are friendly to the pursuit of science and to the needs of other campus users.

Now that the buildings are built and occupied, we are asking users to tell us how we did: Did we do what we set out to do? Was the original program satisfied? Did we set out to do the right thing? Would a different program have made more sense in retrospect? What specific technical problems and benefits have the buildings produced?

When we learn of a problem, we want to help fix it and devise strategies to avoid repeating that mistake. Although we claim to be equally interested in problems and praise, it would be dishonest to say that the complaints were equally welcome. We have little need to learn how to create problems with architecture and engineering. Ideas that work should form our repertoire, or pattern language.

The Core Users Group reports the complex consists not only of more or less the right number of rooms arrayed in the correct proximity to each other and the required taps and outlets, but also of friendly spaces that support collaboration in science and tie the science complex to the overall campus. The scientists report the recruitment of excellent young scientists to use the new labs.

We do not expect them to answer the question I posed initially: Does the quality of place have much to do with the quality of science? Making good places for scientists is not only, or even primarily, an architectural concern. Yet architecture plays a part by making it harder or easier to develop a community of scientists.

Notes

1. Richard Feynman, *Surely You're Joking, Mr. Feynman* (New York: W.W. Norton, 1985).

Credits

The Ratcliff Architects:

Christopher Ratcliff, *Principal*; Christie Johnson Coffin, *Project Director*; Carl Christiansen, *Project Architect, Willamette and Deschutes halls*; Stephannie Bartos, *Project Architect, Streisinger Hall*; Takeshi Yamamoto, *Project Architect, Cascade Hall*; Yung-Ling Chen, *Interior Architecture*; Miyo Itakura, *Coordinator*; Jack Margolis, *Specifications/Quality Control*; Eugene Kodani, *Senior Technical Architect*; David Alpert, Michael Bade, John Baker, Richard Bartlett, Laura Blake, Bill Blessing, Tom Blessing, Alan Burkett, Burns Calwalader, Crodd Chin, Luminita Ruva Ciupitu, Donald Corner, Joelyn Gropp, Logan Hopper, Mel Jordan, Stephanie Kenan, Pauline Ma-Senturia, Michael Pease, Rick Reynoso, Sara Stauffer, Alison Strayer, Dan Werrapon, Dan Wetherell, Jenny Young, *Project Team*.

Moore Ruble Yudell (Associated Designer):

Buzz Yudell, *Principal Designer, Principal-in-Charge*; Charles Moore, *Principal Designer*; John Ruble, *Principal Designer*; Stephen Harby, James Morton, *Project Managers*; Hong Chen, Neal Matsuno, Bill Mochidome, William Murray, George Nakatani, James O'Connor, Patrick Ousey, Richard Song, Brian Tichenor, Renzo Zecchitto, Katie Zabal, *Project Team*.

Brockmeyer, McDonnell (Associated Architect):

Gene Brockmeyer, Gerald McDonnell, Larry Massey, Russ Mercedey.

Colors, Tile and Brick Patterns:

Tina Beebe, Stephen Sidelinger, Dani Rosen.