

# FROM THE ARCHIVES: STRUCTURES FOR SCIENCE: A HANDBOOK FOR PLANNING FACILITIES FOR UNDERGRADUATE NATURAL SCIENCE COMMUNITIES

The work of the LSC builds on decades of facilities-related initiatives undertaken by Project Kaleidoscope (PKAL), an NSF-funded project (1988) to identify and promote best practices in strengthening undergraduate STEM. The early PKAL leadership group quickly realized that attention to spaces was critical, if larger national goals for undergraduate learning were to be realized. In 1992 facilities planning workshops became an essential part of the PKAL portfolio of activities.

In 1995, PKAL published *Structures for Science: A Handbook for Planning Facilities for Undergraduate Natural Science Communities*, a guide capturing lessons about what works in planning spaces, lessons distilled from facilities workshops, national colloquia, consultancies, and reports from campuses involved with PKAL.

Now out-of-print, *Structures* outlines a planning philosophy, principles, and processes that hold still hold true. We present here excerpts from the Foreword (verbatim) and four early chapters (slightly edited).

Together they focus on the very early stages of planning, thus complement reports from the LSC Roundtables being incorporated into the LSC Roadmap.

- I. The Foreword
- II. The Charge to Planners
- III. Focusing on Institutional Mission
- IV. Leadership and Community
- V. Focusing on the Campus

The opportunity to make a bricks and mortar contribution to an institution may come but once in a lifetime: do not waste it (from *Structures*).

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# I. FOREWORD

We begin by focusing on the relationship between mission and planning for curriculum and campus. We also suggest ways that campus leaders can foster an environment in which the community comes to a common understanding about identity and mission, aims and objectives, and about the means to achieve those ends.

There are several paramount concerns as you begin, including the background and aspirations of your students, and the interests and strengths of your faculty, as individual and as members of the community. You must also give attention to how and why students come to understand what scientists do to your vision of an environment for teaching and learning in which students understand how scientists comprehend the world. Whether you are considering renovating a single classroom or constructing a new multidisciplinary faculty, this is a critical time to step back and ask: “How can we improve the environment for learning? How do we know what works?”

In PKAL, we propose that what works is a natural science community, one in which all students—majors and non-majors alike—are actively and personally engaged in learning, have persistent opportunities to do science as scientists do science, collaborate with student and faculty colleagues. Such natural science communities require facilities different from those built twenty or thirty years ago, when there were fewer opportunities for students to enter into apprenticeships with faculty, when the tools for learning were less sophisticated, when pedagogical approaches were based on a different understanding of how students learn, and—most important—when the program was designed primarily for majors—those who were to become the next generation of scientists.

As you begin, be especially attentive to the rich possibilities inherent in the planning process for creating and sustaining community on your campus, community within and beyond the disciplines to be housed in the new spaces.

Your goal should be a structure with soul, one which expresses the institution's values. The spaces should enrich the work and lives of the students and faculty who today do science within its walls, provide a safe and hospitable environment for years to come, and contribute to the humanity of your campus. This will happen if you ask some basic questions about the purpose of the enterprise as you begin and return to those same questions at appropriate times throughout your planning.



## II. THE CHARGE TO PLANNERS

The time of planning learning spaces is a unique opportunity for undergraduate institutions. It is our hope that those who use this Roadmap come to see the process as evolutionary and organic, one integrally related to ongoing efforts to provide a quality learning experiences for the students on their campus—today and into the future.

We suggest that the process is evolutionary because as the process moves forward you will return again and again to fundamental questions about the purpose of the enterprise. You will also be seeking, at every stage, to review issues and gain consensus on questions that need to be asked, on the analysis of responses to those questions, and finally on specific aims and objectives in regard to program and space.

It will help in your planning if you undergraduate the organic nature of the process, seeing how the different activities depend upon one another in what will be a complicated, complex, messy, and extended undertaking. Further, the planning must be inclusive. If the spaces and structures that result from your planning are to provide a safe, engaging, efficient, and cost-effective environment for students and faculty for many years, they must be planned for and by the community that is to use them.

Those who understand the nature of the learning that is to happen in the spaces must have a leadership role—a voice—in the process of planning. The planning team must also involve those with responsibilities that affect or can be affected by the new spaces: faculty colleagues; presidents, deans, alumni, and trustees; budget officers campus planners, architects and facilities officers; directors of assessment offices, teaching learning centers, student services offices, and development offices.

There are many questions that need to be addressed as your planning proceeds. This Roadmap is structured around such questions, with special attention to those emerging from the LSC Roundtables. The answers and ideas you will find in the Roadmap are intended to be illustrative, not prescriptive. Some possible answers to those questions are suggested, but they are posed to catalyze discussions campus-wide and within a planning team. In the architectural case studies, you will find further questions and examples of how different institutions have identified and address questions that fit your context and vision of your future.

The Roadmap is designed around the recognition that planning is not linear; it will proceed with different (perhaps) over-lapping groups considering options for programmatic and pedagogical initiatives as well as faculty development, for individual classrooms or a major new facility, for budgets—annual and capital and for fundraising. These sometimes parallel, sometimes converging, activities are all part of the adventure—the journey of planning.



### III. FOCUSING ON THE INSTITUTIONAL MISSION

You are convinced that your undergraduate students and faculty need new spaces for teaching, learning and research. For some, the tendency at this point is to reach for a piece of paper and to begin sketching out labs, classrooms, and offices. That is not the way to begin.

Instead, your first order of business should be to wrestle with issues of mission, with issues relating to aims and objectives of the academic program, and with issues about the shape of the academic program and the community of learners to be housed in the spaces you are planning. Such wrestling with critical issues must be done before you can know what kind of spaces and facilities are needed.

This Handbook (Roadmap) thus begins by connecting facilities planning to larger institutional issues, mindful of Ortega's exhortation (still relevant today) that sound and healthy institutions are those that have put the "question" squarely: *What is a university for and what must it consequently be?*

*But an institution cannot be built of whole-some usage, until its precise mission has been determined. An institution is a machine in that its whole structure and functioning must be divined in view of the service it is expected to perform. In other words, the root of university reform is a complete formulation of its purpose. Any alternation, or touching up, or adjustment about this house of ours, unless it starts by reviewing the problem of its mission—clearly, decisively, truthfully, will be love's labor's lost.*

— Jose Ortega y Gasset. *Mission of the University*. 1930.

Discussions about institutional mission take place with regularity on a campus—at the time of accreditation, at the beginning of a new presidency, or at the start of a capital campaign; they provide direction at critical times in the life of a college or university.

The planning of a major renovation or new facility for undergraduate learners is such a critical time, and this is why we encourage you to start your planning here. Such discussions help avoid ad hoc decisions; they shape and reinforce an institutional commitment to new and renewed spaces for learning—for students at all levels, with diverse backgrounds and career aspirations, each exploring what she or he to become, be able to do by the time they graduate.



### III. FOCUSING ON THE INSTITUTIONAL MISSION

Why are questions about mission so essential? Facilities are expensive—to build, maintain, update, repurpose and replace. There must be a campus-wide understanding about how building and sustaining strong academic programs—across the disciplines—connects to the institutional mission of preparing students for life and work in the world beyond the campus.

#### WHAT WORKS

*We assert that the most important attribute of undergraduate programs that attract and sustain student interest, motivate them to persist and succeed, is a thriving community of learners, a community in which:*

- *Learning is experiential, hands-on, and steeped in investigation from the very first courses for all students to cap-stone courses in their major.*
- *Learning is personally meaningful to students and to faculty. It makes connections to other fields of inquiry, is embedded in the context of its own history and rationale, and suggests practical applications related to the experience of students.*
- *Learning takes place in a community where faculty are committed equally to undergraduate teaching and to their own intellectual vitality, where faculty see students as partners in learning, where faculty give students responsibility for constructing their own knowledge, where students collaborate with one another and gain confidence that they can succeed, and where there is visible institutional support for such communities.*



## IV. LEADERSHIP AND COMMUNITY

Moving from idea to physical reality in the process of planning learning spaces in the undergraduate setting is a long, complicated, complex undertaking, one that involves the collaborative involvement and leadership of many members of your community.

Major new facilities, as well as major renovations and repurposing of existing spaces—within and beyond those used now for learning and research—have to be planned within the context of overall campus and programmatic needs. They must be tied to an institutional vision that incorporates the long-term goals and strengths of the college or university and must be balanced against other needs of the institution.

The process of reaching a campus consensus on the shape, scope, and intent of new or repurposed spaces can in itself create a broad-ranging campus conversation about how spaces matter. It is this process that makes the planning of new/renewed spaces a defining moment in the life of an institution.

The challenge to those with leadership roles in the planning process—administrators, trustees, faculty and a wide range of stakeholders—is to create a climate in which such as committee can flourish. Your building will reflect the community that brought it to life; it will then nurture and sustain the community that it serves.

There are different leadership and management roles that come into play in your planning. Each of these involves responsibilities that must be fulfilled if the project is to proceed as planned. How they are assumed and assigned, however, will differ from campus to campus based on local culture and policies, and the scope of your project.

Presidents and other senior administrators will have a significant role in the discussions about mission, academic plan, and campus that brought you to this point in considering new spaces and structures for learning. At some institutions, the president will be actively involved in early stages, as the vision is shaped, the program is developed, design professionals selected, and other milestones reached. On other campuses, a designated senior administrator or a faculty member who becomes project shepherd will move into the primary leadership role as the planning proceeds.

Regardless of how institutional culture shapes the leadership structure for your project, it is essential that the president or a designed senior administrator have a strong presence throughout. The president, together with the chief officers for academic and financial affairs, is accountable for the long-term welfare of the institution. Working with trustees and faculty, these senior officers are responsible for anticipating an institutional future, and for securing the internal and external resources to achieve that future. These campus leaders will make the final decisions about the scope and character of your project, as well as about the timing of construction and fundraising.



## IV. LEADERSHIP AND COMMUNITY

As important as it is to be advocates for the program internally and externally, the president and other senior administrators have the even more critical responsibility to keep your planning focused on a vision of the institutional mission and to ensure that all planners have an “enlarged sense of the possible.”

This will happen as faculty and staff make benchmarking visits to other campuses and facilities. It should also happen as the campus community comes together to think about ‘what if’ and ‘why not’ in regard to the future of learning on your campus. In the process of thinking about transforming programs and space, your campus leaders should see that the right questions are asked at each phase of the planning. The president and senior officers should:

- Bring the best people to the task from all appropriate divisions of the campus and empower them with the requisite responsibility and resources.
- See that avenues of communication are kept open and that the discussions are wide-ranging throughout the process.
- See that decisions are made fairly and firmly.
- Nurture an institutional climate in which ideas flourish.
- Keep the project in harmony with the institutional mission and goals.

The characteristics of community—a predisposition to share ideas, to challenge precepts, and to revel in exploring unfamiliar territory—relate directly to the endeavor of collaborative planning.

How can this be?

Think about how a true community exhibits the willingness, even the drive, to discuss matters of the moment informally with colleagues in the lounge, or to explore issues in formal, regular sessions with peer. Community is the spirited enactment of the conviction that ideas are important, and that they gain life when people bring different perspectives to their consideration. Communities embrace a common vision yet allow—even promote—difficult dialogues. This is the challenge to leaders, within the entire community, as your planning proceeds.



# WHAT WORKS

Facilities that work:

- Clearly reflect the institution's vision for learners, what they should become and be able to do when they enter the world upon graduation
- Recognize the increasingly social nature of learning and research in the undergraduate setting
- Support learning that is experiential, student-owned, student-centered
- Acknowledge the role of serendipity in the process of learning, by including spaces for exploiting the unplanned, teachable moment
- Are so inviting, safe, and well equipped that they are used by students and faculty most hours of the day, seven days a week
- Anticipate the future by providing flexibility in space and infrastructure
- Respect and reflect the community that brought them into being.
- Contribute to the humanity of the campus.



## V. FOCUSING ON THE CAMPUS

What is a campus? Significantly, the campus is the stage setting for the life of your community; the campus is the common ground that unifies the diversity of activities in which students and faculty are engaged, and the diversity of buildings in which those activities take place. On a campus built over the years, this common ground brings order and stability to the diversity that has accompanied such growth and change. The common ground that is your campus should make sense from the symbolic, educational, aesthetic, and functional perspective. It should have such strength and clarity that each building proclaims its own individuality, yet at the same time contributes to the greater good.

All individual buildings on a campus have a physical as well as a curricular context, yet (unlike regularly recurring discussions about curricular issues) rarely do campuses come together to consider how the campus as a whole (built over generations) works for them now.

As you consider any major facilities project—major from the perspective of its impact on student learning and the institutional community and culture—it is essential to consider both campus and program from the perspective of mission, strategic goals, and priorities, and to reflect on the social nature of architecture. In fact, programmatic planning and campus planning must be woven together over the many months until your community comes to final decisions about what the spaces will be, become.

Walk around and through the buildings and open spaces on your campus. Observe how buildings planned and built in earlier eras, which reflect the ideas and values of different times, come together in a coherent pattern and serve as an appropriate stage setting for the life of your community today.

Ask:

- How does the campus reflect our particular academic traditions?
- Does the campus reflect the values of our community today and our vision for our future?
- What are the best, the strongest characteristics of our campus that should be preserved and extended?
- What are the buildings that alumni return to again and again?
- Is there a sense of place that brings life and meaning to our community?

Your campus as well as your program can be a clear expression of how your community asks and answers questions about the purpose of the enterprise: how you understand the relationship between the how and what and where of learning. We believe that planning of new spaces for learning can be a defining moment for an institution. It is an opportunity to step back as a community and reflect on the physical setting into which new spaces must fit.



## V. FOCUSING ON THE CAMPUS

Ask:

- Do our buildings, individually or collectively, serve as centers of intellectual and social activity?
- Is there an inherent unity, integrity, and coherence to our campus, or does the placement and character of the buildings, walks, and roads suggest that decisions over the years have been in a piecemeal, ad hoc fashion, building by building?
- Can a new facility reinforce what works now in campus patterns and anticipate new patterns that will accompany future growth and change?
- Should a new structure be an opportunity for redefining “centers” on our campus?
- In what ways might the new facility or renovated structure remedy past mistakes in campus planning?
- How can we be certain that a new building enhances the unity, the common ground that we already have?
- In what ways might the structure we are now planning become a physical expression of our vision for the future of our institution?
- Can the landscape design be used as an educational tool, as celebration of our culture and context?

Answering such questions helps to determine what must be done and what must not be done, as well as what it might be nice to do.

In the process of planning either new programs or new spaces, connections should be recognized and created—among departments and disciplines, between campus buildings old and new. Considerations should be given to the architectural and intellectual connections that foster community. The programs, the spaces, and the structures themselves will not create community. Communities are based on a sense of shared purpose and bound together by a common vision.

The end result of all your planning will be new spaces and structures for learning. Whether they will actually work will depend on the degree to which they reflect the ideas of the many and diverse communities on your campus, as well as the identity and mission of the institution.

It is important also to recognize the communities that surround and shape the external environment for the institution. Representatives should be informed, and involved if appropriate, as your planning proceeds.

Never lose sight of the physical expression of community that is your campus at it's best, strongest, and most “characteristic” characteristics. These are what make you what you are; they are what should be preserved and extended in your current planning.

