PIECE BY PIECE

By Mark Corey

When the need for space is acute, older campus buildings sometimes offer surprising opportunities to expand.

The FG wing's ground level features a cleanroom shared by NUFAB, the school's micro/nano chip research and fabrication facility.
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There is hardly a college or university administrator, professor, or facilities manager anywhere who's satisfied with the amount of space on his or her campus. What to do about it is a vexing problem. Older campuses were laid out featuring unalterable quads meant to give community or contemplative space, or conversely, with buildings close together on available land — or in some cases, with buildings constrained by a city grid. As institutions grew and more space was needed, nearby property was purchased or school buildings were expanded upward. Sometimes, feats of engineering were required: In an infamous case dating from the early 1960s, Northwestern University, hard by the shore of Lake Michigan, moved the shoreline. The Northwestern University Lakefill added 74 acres to the campus in 1964 (and an additional 10 acres in 1968) through a combination of state legislation, city consent, a seawall made of limestone blocks and landfill materials created during the construction of the Port of Indiana.

Expansion of existing structures in the campus inventory is a more common method, but the potential difficulties are numerous. An older building, which may have already been expanded during its lifetime, is likely to include under- or over-sized (and inflexible) teaching spaces or inefficient circulation paths associated with a different era. An expansion typically seeks to solve these issues through a linked renovation, which brings up problems of its own—for example, changes in building codes that require seismic, accessibility, sustainability or sanitation upgrades. These are certain to add significant cost to the project and can render it unworkable or, at least, untenable. Just taking the last on the list, adding to the building's footprint will require it to have more restrooms, which will take away program space. When a university department is desperate for space, the last thing they want to do is add toilets.

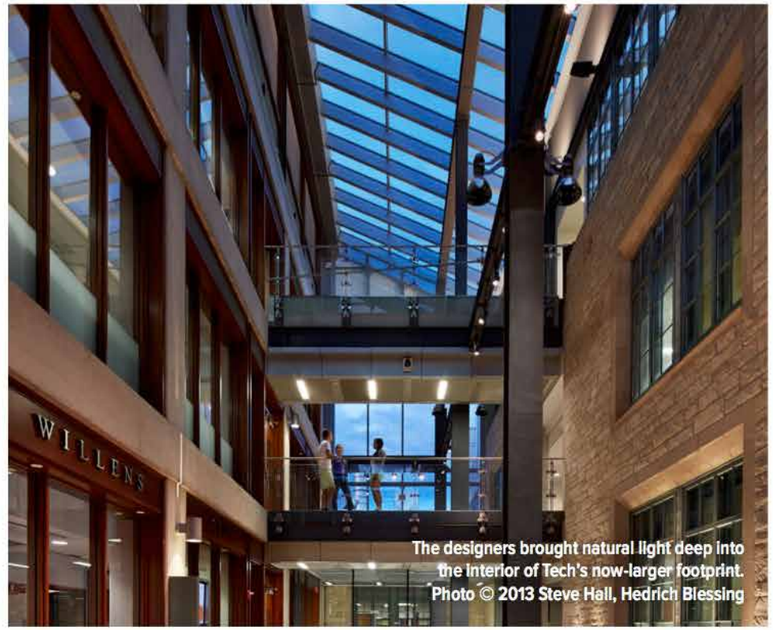
In spite of this, expansion should always be a part of the conversation, for several reasons. An expansion offers both an opportunity to put a literal new face on a department and to conserve a link to the institution's past. Also, as a sustainable strategy, reuse (or adaptive reuse) of older buildings has no peer. And finally, given the nature of the design process, expansion should be considered because, often, the best solution to a problem will reveal itself only after a series of ideas have been conceived and discarded. The best solution, in fact, will often build on one of those discarded ideas.

Between the Lines

As it happens, Northwestern is fertile reclaimed ground for creative expansion plans. Growth on the Evanston campus has been coaxed from a number of unlikely-seeming sources, with the Technological Institute simultaneously the most logical and least conventional.

"Tech" was already Northwestern's largest building when it was dedicated in 1942, and it has since become one of the largest academic buildings in the world, with nearly 1 million square feet of labs, research facilities, classrooms and offices. Designed originally in the shape of two letter E's placed back to back and joined by a central structure, Tech got three new wings attached to its eastern elevation and space added to the library and physics wing in 1963, just one of many renovations and additions to have been completed over the past 74 years. The McCormick School of Engineering has benefited from a series of buildings appended or connected to Tech, such as the Seeley G. Mudd Library for Science and Engineering (1977), the Center for Catalysis and Surface Science (1986), Cook Hall (originally the Materials and Life Sciences Building, 1989) and the Ford Motor Company Engineering Design Center (2005). And, it was just 17 years ago that the university completed a 10-year, $125 million renovation to Tech that included the reconfiguring of lab and research space, in addition to interior reconstruction and replacement of outdated mechanical, plumbing and electrical systems.

And yet, the engineering and arts and science programs have remained short of research space



The designers brought natural light deep into the interior of Tech's now-larger footprint. Photo © 2013 Steve Hall, Hedrich Blessing

and in acute need of lab space, so much so that the university has sought solutions from Flad Architects for an ongoing series of additions to Tech, as well as a forthcoming major addition to and reconfiguring of Mudd Library. Flad's expansion of Tech has comprised three additions to the building, and a fourth that is currently in design.

What makes these additions particularly interesting is their location inside the arms of existing building wings, which were denoted by the letters A, B, C, E on one side of the central spine and F, G, H, K on the other. Barred from expanding upward—Evanston's zoning laws limit building heights in this neighborhood to 85 feet, and the region's building codes would require that the original structure be upgraded to meet modern seismic codes—Northwestern has boosted its space while not significantly increasing the amount of property devoted to the engineering school.

The firm's initial assignment was a two-pronged project that added 50,000 square feet in what in 2008 was designated the future "BC" wing and another 50,000 square feet in what would become "FG." Faced with engineering and quality-of-life issues, the designers were able to create a column grid that would allow flexible placement of labs, while making a key decision to incorporate atria along the inside wall of each infill location. This arrangement brought natural light deep into the interior of Tech's now-larger footprint, and was to become the template for future infill additions.

The shaft of daylight goes three to four stories deep, space that provides conference rooms and other common areas for group work and informal meetings, as well as bridges above that connect upper floors to the original building. The atria stand alongside multiple floors of labs, faculty offices and classrooms; beneath the atria are core facilities such as (in BC, now known as the Willens Engineering Life Sciences Wing) the Integrated Molecular Structure Education and Research Center (IMSERC), which has around 37,000 square feet of research space and laboratories, including a suite of nine NMRs. A section of the Willens atrium features a glass floor through which the IMSERC can be viewed.

The FG wing's three floors of office, work and classroom space for the Earth and Planetary Science Department are daylit by a three-story atrium, under which sits a one-story interstitial space and, on the ground level, the wing's core space—a cleanroom shared by NUFAB, the school's micro/nano chip research and fabrication facility. Its specialized use required a different connection to the existing building—a smaller opening than BC's, with access to gowning at the entry.

Tech's 50,000-square-foot "J" wing, the most recently completed infill project, concluded in 2015 and provided space for new laboratory research and expanding program needs in the International Institute for Nanotechnology. Its core space on the first level is an imaging suite of STMs (scanning tunneling microscopes), SEMs (scanning electron microscopes), AFMs (atomic force microscopes) and the like, and

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the potential for regular movement of large equipment through the wing suggested the incorporation of a small elevator. This freed up space elsewhere that the other infill wings utilize for stairs, leading to a larger atrium with no bridges.

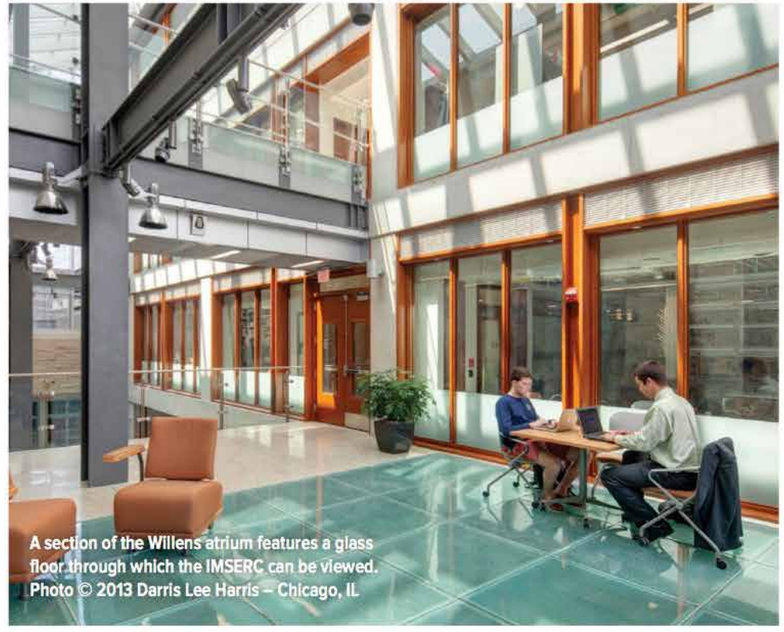
The J wing represents a departure from previous infills in that it is, from a building code standpoint, an entirely separate structure from Tech, due to the enormous building's diminished hazardous material capacity. Currently in schematic design, the new "AB" wing will share this approach, which necessitates details in the plan such as the addition of firewalls and an elevator but allows Tech to function in its larger form. Designed to house a materials scientist and pioneer in bioelectronics, AB will incorporate a cleanroom of as-yet indeterminate size, labs intended for research and development of implantation devices, and teaching spaces, along with the familiar interior atrium and collaborative spaces.

The Final Frontier

The search for space, particularly in the sciences, can be a never-ending quest, a consequence of the money and prestige that accrue to institutions able to lure cutting-edge researchers to their campuses. Tech's J wing, which began with one research group, is now the home of a 50-person lab, about 10 times the size of a typical lab. The original principal investigator, a member of the President's Council of Advisors on Science and Technology, or PCAST, leads the nanotechnology institute and holds six professorships in chemistry, medicine, chemical and biological engineering, biomedical engineering, and materials science and engineering. Another notable faculty member in the J wing is a professor of materials science, chemistry and medicine whose research has aided the fields of regenerative medicine, supramolecular chemistry, nanotechnology and organic electronic materials.

As briefly noted, each of the infill additions is designed for the specific needs of its resident program, as well as of each program's specific equipment. Obviously, it pays to work with a design firm that specializes in such facilities, given the need for (for example) floor slabs that absorb vibration, allowing for delicate and accurate measurements to be made with an electron microscope. But it also is beneficial to work with designers who understand how great research happens—the need for spaces that can encourage collaboration, are flexible and are motivational for students and prospective students—not to mention professors and prospective professors.

An understanding of the place where scientific research and sustainability intersect is also of paramount importance



A section of the Willens atrium features a glass floor through which the IMSERC can be viewed. Photo © 2013 Darris Lee Harris – Chicago, IL

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in this day and age. Not all of the sciences will demand daylight, and some will require more complex mechanical systems to control air flow and limit environmental pollutants. In an infill scheme like Northwestern's, the designers were aided in their quest to meet the school's goal of LEED Silver certification by the efficiency gained as a consequence of cutting down on the size of the exterior envelope. The design and specification of atria brought daylight into each wing but also helped alleviate one of the by-products of the infill project: the difficulty in orienting oneself within the facility when views to the outside have been removed from corridors. That said, difficulty in wayfinding has been a hallmark of Tech from the beginning; Northwestern maintains a "Tech Room Finder" on its engineering web page. The different infills actually help with wayfinding in the sense that each new wing has a specific function.

Last, designers of such projects have to have a keenly developed ability to mesh old and new in a way that makes the additions seamless. Tech is a classically designed 1940s-era building, but it now includes elements from numerous decades, and its various wings were designed functionally for many different engineering disciplines, meaning that window patterns and stonework vary from wing to wing. Flad's infills stand one story taller than the original structure, and each have their own architectural character, but only the relative cleanliness of the stone would let you know that you were looking at something brand-new.

Much of the building's central core, which includes a 774-seat auditorium, remains as a reminder of classical methods of teaching and styles of learning, and this may be reason enough to preserve such a link to the past. The decision to reclaim and put to use campus land that was "building-locked" for many years gives the university the ability to simultaneously embrace part of its past while moving resolutely into the future.

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