

June 2012

Vol. 54, No. 3

*Advantage*  
Business Media

# R&D

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TECHNOLOGIES & STRATEGIES THAT ENABLE RESEARCH & DEVELOPMENT

## A New Language for Labs

The 2012 Laboratory of the Year winners redefine the research environment.



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School of Medicine Research Building

# A Laboratory for All

By sticking to one big “Idea”, project leaders for the Wisconsin Institutes for Discovery were able to make a number of new laboratory design concepts work.

Research laboratories do not typically have a formal restaurant. Or public meeting areas. They are not often consciously placed in the heart of a bustling city. Even less common is a laboratory that welcomes the public inside, even into its research wing. And unprecedented, perhaps, is to pitch the laboratory’s wide-open spaces as a gathering place for the general public, who can enjoy a musical performance and a fancy meal.

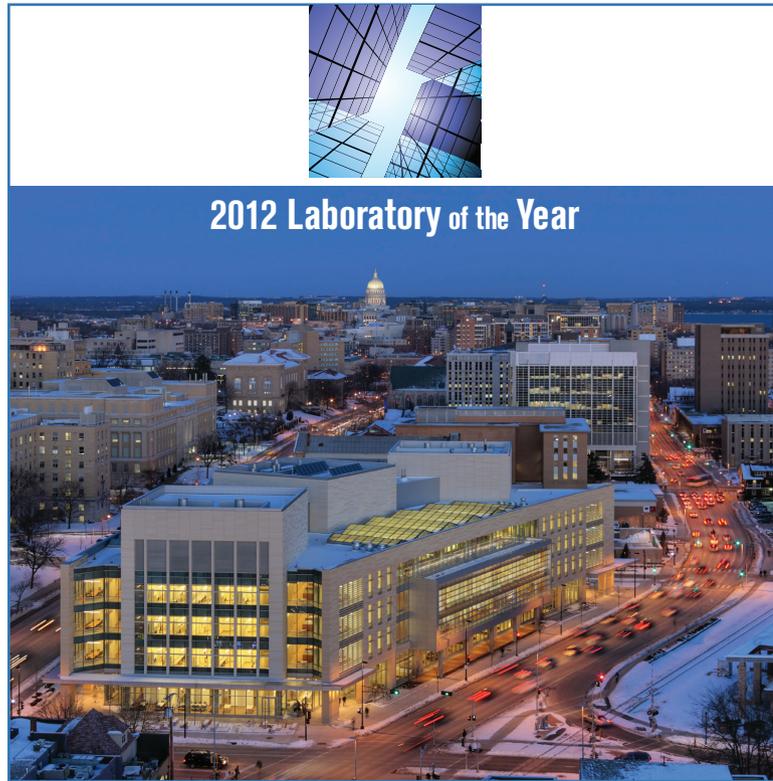
“Institutes are monastic sorts of places. You don’t typically put actuarial, monastic research in a public setting. That makes this building very different,” says Craig Spangler, architect and principal, **Ballinger**, Philadelphia.

The building Spangler refers to is the **Wisconsin Institutes for Discovery**, *R&D Magazine*’s 2012 Laboratory of the Year. That its designers purposely chose to include these features when designing a major new research facility for the **University of Wisconsin-Madison** is telling of the underlying philosophy of its owner. When drawing up plans for what would be a pivotal research laboratory for its downtown campus, the project leader, **Wisconsin Alumni Research Foundation** (WARF), wanted their new building to be as close to the public as possible while still ticking all of the boxes for high-end research in biology, information technology, and engineering. On top of that, they wanted top-tier sustainability and a design that would help keep downtown Madison attractive.

On the road to finishing this ambitious project, a host of new concepts—and one old one—governed the design process that generated a new type of laboratory.

## The Wisconsin Idea

In the first decade of the 20th century, during what historians refer to as the United States’ Progressive Era, University of Wisconsin (UW) President Charles Van Hise presented a new



2012 Laboratory of the Year

Strategically located at the crossroads of the University of Wisconsin and the city of Madison, the Wisconsin Institutes for Discovery blends research and public teaching laboratories in a civic venue for science. Photo: Jeff Goldberg/Esto

vision for the university, one that urged public universities to do work that provides benefit for all residents of the state. He called it the “Wisconsin Idea”. While it began at first as a political movement in state government to limit predatory wealth, many of the ideas it championed became the governing philosophy for the University of Wisconsin System.

“The concept it embodied was all part of this progressive movement that was emerging in the state at that time, and the Idea was that the boundaries of the campus are the boundaries of the state. So the things happening at the university had applicability and impact on the lives of people statewide,” says George Austin, project manager for WARF.

Fast forward 100 years. John and Tashia Morgridge, UW alumni and major private donors to WARF, wanted a groundbreaking facility to

strengthen their alma mater’s position as a leading research university. They were hoping to do more than just attract researchers, and realized that active engagement of the community played into the mission of the university at large. As a result, they and WARF wanted a design that allowed members of the community to take part in science inside the building. The “Idea” became a fundamental guide.

The planning process quickly got complex. WARF and UW-Madison approached the design team as partners, and the design team was charged with building a major facility for twin institutes: the private, nonprofit **Morgridge Institute for Research** and the public Wisconsin Institutes for Discovery. On top of this

was the need for a civic space for science.

To facilitate the process and help the team members fulfill their goals, a new type of project planning process—integrated project delivery—was developed that gave concepts like the Wisconsin Idea and the Town Center equal weight with technology transfer and building administration in contributing to the core mission of interdisciplinary research.

“Integrated project delivery was a concept that no one had experience with at that point, but the concept of it played into the values we were trying to establish for the Wisconsin Institutes project, and we felt we had the opportunity to drive value to the owner,” says Austin.

A triangular building sited between two downtown thoroughfares, Campus Drive and University Avenue, Wisconsin Institutes for Discovery was conceived from the beginning as

a “no back-door” building. Instead of featuring a central atrium, the atria framed the outside of the building on the two longer sides of the triangle. Multiple entrances on all sides of the building helped create an inviting space. The result is an unusual building that does not feel like a traditional research building.

“There really is no precedent. We looked to as many buildings as we could to find the right amount of public space,” says Spangler. The team eventually realized that they had a unique situation on their hands.

Central to finding the solution to the design was what to do with the main public space of the building. With the help of Gwen Drury, a UW-Madison graduate sociology student writing a dissertation on research environments, a new assessment scorecard called Socially Ergonomic Environmental Design (SEED) attached a value to interaction in collaborative research facilities. Derived from the popular LEED (Leadership in Energy and Environmental Design) checklist, the categories and vocabulary in this tool evolved from assessing relevant benchmarks and considering what design, organization strategy, and features best insured a holistic collaborative environment.

“We spent an extraordinary amount of time trying to figure how much public space should be part of the program,” says Spangler. “When we went there before the project, it felt like a campus section that didn’t have any vitality. We felt that as a quadrant, this building could be a major rallying space, and if we could make it place where people pass through the building, it could spark conversation.”

The Town Center solution incorporates the “Power of 10” concept promoted by the non-



The open, transparent research environment is securely and acoustically segregated while visually integrated with the public Town Center. Photo: Jeff Goldberg/Esto

profit organization **Project for Public Spaces**. Its strategy of ensuring 10 or more different functions to make a public place vital became central to the design of the Town Center. A short list includes a botanical garden, an indoor and outdoor cafe, interactive media wall, informal and formal dining, a forum, an Entrepreneur Resource Clinic, a Cisco TelePresence room, and a dairy bar. The North Atrium is more relaxed; the South Atrium more formal.

“A lot of thought was given to the physical space, and a lot of thought was given to how to organize a “Town Center,”” says Austin.

The reception to the Town Center has been positive, with 330 events being hosted in the first year. In fact, the success of the area highlights perhaps the only thing Spangler would have changed about the design: more internal storage for events material.

Over the Town Center lives a secure nested research environment, spanning three floors and contained between the North and South Atrium. This nesting strategy, says Austin, visually engages

the public Town Center with the research area above. It also serves as an acoustical buffer from the surrounding roadways and creates an environmentally sensitive double wall building.

On each research floor, the public Wisconsin Institute for Discovery is located in the west wet pod and the private Morgridge Institute for Research is located in the east wet pod. The twin institutes share a central dry pod. This arrangement, says Austin, provides identity for each institute while intentionally blurring their distinction to foster interactions and maximize the benefit of their strategic partnership.

The approach makes sense because of the distinct but related research mission of the two institutes. The Morgridge Center for Research is geared toward biomedical investigation, including regenerative medicine, virology, medical devices, pharmaceutical informatics, and education outreach. The Wisconsin Institutes for Discovery has a broader focus, developing solutions in systems biology and epigenetics while also serving as a locus for the university’s computational and nanotechnological capabilities. One example is optimization, which uses computers to provide solutions to problems with many variables. Another is BIONATES, a cross between biology and nanotechnology focused on building very small scaffolds upon which therapeutic cells or tissue can be implanted into the human body for repair or replacement.

The relatively large 50,000 square-foot floor plates are designed to accommodate interdisciplinary teams of up to 10 principal investigators. The second floor contains the Researchers’ Link, a place for institute events, which provides lounge, dining, and conference space.

The three pods rise seamlessly through three floors, leaving a substantial amount of open

## VITAL STATS

**Project:** Wisconsin Institutes for Discovery  
Madison, Wis.

**Project owner:** University of Wisconsin/  
Wisconsin Alumni Research Foundation

**Size:** 330,000 square feet

**Cost:** \$213 million

**Architect, Design Architect, and  
Laboratory Planner:**  
Ballinger, Philadelphia

**Associate Architect/Interior Designer:**  
Uihlein Wilson Architects, Milwaukee

**MEP Engineer:**  
Affiliated Engineers, Inc., Madison, Wis.

**Landscape Architect:**  
Olin Partnership, Philadelphia

**Structural and Civil Engineer:**  
Graef, Anhalt, Schloemer & Assoc. Inc.,  
Madison, Wis.

**Construction Manager:**  
J.H. Findorff & Sons, Inc., Madison, Wis.,  
M.A. Mortensen Co., Brookfield, Wis.

**Casework:**  
AT Villa USA, Milwaukee



The wet laboratory pods for chemistry and biology are sized to accommodate interdisciplinary teams for up to five principal investigators. The laboratory furniture consists of rolling cabinets and 6-foot bench/shelving units that are moveable and/or removable for floor-mounted equipment. Photo: Tom Crane Photography

space, filled with what the design team calls "draws". Other pod-like features include a public teaching laboratory, which fills the outreach mission but has segregated support facilities to maintain research security.

Workstations are visually connected to the laboratory environment, but segregated for safety. In the pods, casework (AT Villa USA, Milwaukee) was developed to be highly recon-

figurable and features a standardized interface panel that holds and operates all utilities, including air, gas, vacuum, power, and data.

The lower level of the building includes building services and supplies, mechanical functions, offices for use by the WARF and a variety of specialty core laboratories, including a BLS-3 suite; an Advanced Fabrication prototyping laboratory; and a 3D visualization laboratory

that holds the Cave Automatic Virtual Environment (CAVE) space. This facility, used to simulate new health care technologies, immerses users in a 3D interactive experience within a 10-foot cube that projects imagery on all surfaces including floor and ceiling. Finally, the type of research being done at Morgridge Center for Research called for the installation of a 27,000-square foot vivarium, which is located near the service dock via a tunnel under Orchard Street.

### The third mission: Sustainability

By nesting laboratory environments within an open work environment surrounded by the Town Center atria, Ballinger created a "triple wall building." The buffer does a substantial part of the work in shielding the research environment from the harsh temperatures of the upper Midwest.

The atria allowed Ballinger to create three different zones with their own air handling characteristics.

"Having the public zone gives us a wider temperature tolerance," says Spangler, so windows in this space did not have to be fixed. "It's



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amazing to have open windows. It gives the air a different smell, and it allowed us to deal with energy and daylighting more effectively. It has a real impact on energy load.”

The team employed exterior wall commissioning, complete with a whole building air leakage test by the **U.S. Army Corps of Engineers** to insure that air tightness parameters were being met.

Air change rates were reduced using water-sourced chilled beam technology, which allowed a 25% reduction from UW-Madison air change rate standards. Energy recovery, solar generation of domestic hot water, and solar tracking for automatic internal shading of offices for the offices and laboratories are among the other sustainable system technologies and strategies that helped Wisconsin Institutes for Discovery earn LEED Gold certification from the **U.S. Green Building Council**. According to Austin, energy demand and carbon dioxide emissions were reduced by 50% benchmarked against other UW-Madison research facilities and recent **Labs 21** national data for similar buildings.

One of the unique features of the building is the presence of 75 geothermal wells drilled 300

feet below ground around the perimeter of the building. Using the ground’s temperature to offset energy demand is a common strategy, but it is uncommon for an urban setting.

#### **A model for the future?**

In 1904, when Van Hise presented the Wisconsin Idea to the university, the state as a whole was already calling itself “the laboratory of democracy”. In some sense, then, the concepts embraced by the Wisconsin Idea—that public universities should create benefit—are the ones that have always been instrumental in the research process. But making them work at the scale of a modern research laboratory is a challenge, and Wisconsin Institutes for Discovery is a special case because it is home to both a private and public institution.

Austin says a special design case like this might not be scalable, and might not work for everyone. “One of the things this project has shown is that you need to assume some risk and act with autonomy,” says Austin. “When you combine that type of an owner with relationships with designers and contractors, and a mis-

sion-driven process, the opportunity for success greatly increases. We think [Wisconsin Institutes for Discovery] offers insights many will find useful and helpful.”

Laboratory of the Year judges remarked that the project was a brave experiment on the part of the University of Wisconsin, and does offer some lessons for future designers.

“The project is a step in a very new direction in how we might envision how to do research, how we might enable and encourage cross disciplinary interactions and collaborations,” says William Odell, senior vice president and director of science & technology, **HOK**, St. Louis.

“I believe the major feature that sets this project apart from others is the incorporation of public space into a research facility. This is very unique in a public or private setting,” says Kevin Brettman, director, science & technology, **JE Dunn Construction**, Denver. “I think we will see more incorporation of public space into research facilities as public-private partnerships gain in popularity and the benefits of science are exposed to the public.”

—Paul Livingstone



*Congratulations to the  
Wisconsin Institutes for Discovery  
“2012 Lab of the Year Winner”*



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