

CASE STUDY:

Arizona State University Biodesign Institute

Tempe, Arizona

Crossing Boundaries: Interdisciplinary science and innovative design set a standard for the next generation of research facilities.

By David Sokol

Problems aren't what they used to be in the field of life sciences. Thanks to globalization and a recent wave of intense urbanization, for example, approximately 20 new infectious diseases have been discovered in the last 25 years—a more rapid emergence than ever before. As the price of oil creeps ever higher, researchers are rushing to find an agricultural alternative that quenches the thirst for fuel without competing for the precious resources of food consumption. And bioterrorism has become a very real possibility.

Photo © Mark Boisclair



Battling humanity's foes not only seems more urgent now, but it also requires a more interdisciplinary method of practice. Whereas scientists once emphasized their specialties, the profession has recognized the value of placing them together so that, say, a biologist can identify a drug-resistant bacterium, a computer modeler can project its spread within a population, a nanoengineer can analyze the molecule that's fighting off antibiotics, and a chemist can then help develop a nano-scale drug that slips past those defenses.

A new way of working requires a new environment for work, and the Biodesign Institute at Arizona State University sets a standard for the next generation of research facilities. Located on the eastern edge of ASU's Tempe, Arizona, campus, the Biodesign Institute currently comprises two broad, four-story brick-and-glass-faced buildings opened in 2005 and 2006. Connected on all levels by a glazed passageway, buildings A and B are almost mirror images of one another, and together account for 350,000 square feet of offices, open labs and their accompanying support spaces, plus dining and auditorium

facilities on three floors. Building A's basement level also contains a separate, buffered zone for nanoengineering research and fabrication. The 13-acre site will ultimately include another pair of rectilinear buildings linked to its predecessors in an L-shaped plan, overlooking a courtyard garden to the east and light-rail stop just north of that. Buildings C and D will add 440,000 square feet to the institute's total work area.

This future mini-campus's L shape seems to resist sustainable principles, as buildings A and B were built on a north-south axis. This is especially interesting considering that ASU president Michael Crow mandated, upon his arrival to ASU in 2002, that all new buildings achieve LEED Silver certification. And yet the site plan persevered in order to foster connections among all four structures, while the buildings themselves earned separate LEED certifications at the Gold and Platinum levels. Indeed, balancing the demands of an interdisciplinary, collegial atmosphere and of rigorous green standards characterizes the collaboration between Biodesign Institute architects Lord, Aeck & Sargent, based in Atlanta, and the Phoenix office of Gould Evans.

The two firms began work in 2000, when the team was hired to create a strategic research facilities master plan as part of a mission by ASU, one of the nation's largest teaching universities, to redefine itself as an equally committed research institution. Gould Evans' Tamara Shroll says, "When we first learned of this work, we started looking for firms that have great laboratory experience." Of partnering with Lord, Aeck & Sargent, she adds, "Each of us felt that one firm had some expertise that the other didn't, and by merging, we could be the best possible team for the university." When the client decided to realize the Biodesign

Institute, Lord, Aeck & Sargent focused primarily on the lab interior and Gould Evans on the exterior, although both parties crossed over frequently to share ideas and knowledge.

Lord, Aeck & Sargent were responsible for earlier breakthroughs in lab design. Larry Lord, FAIA, points to the firm's design for the Georgia Public Health Labs, completed in 1997, as one such watershed moment. "A warren of small laboratories with no windows was definitely the norm at the time," he says, and the Georgia project introduced open plans and daylight in its stead.

If the decade-old Georgia lab recognized that scientists were like other workers in experiencing productivity and morale boosts with daylighting, the Biodesign Institute interior went one step further, acknowledging that science is creative and that interaction among professionals yields great strides forward. For example, the glazed link between buildings A and B transitions into atria that run the length and height of both building interiors. Moreover, the atrium's glazed interior walls line offices to the eastern portion of the buildings and laboratory and service spaces opposite them, allowing colleagues to glimpse each other's work. They can then swap ideas on the roomy internal staircases that run up and down the atriums, or meet more formally in one of the many comfortable breakout spaces that dot them. These sorts of spontaneous meeting spaces—corridors, atria, and staircases—have been embraced in office and academic design for years, but haven't taken as much hold in the sometimes-closed-off world of research laboratories.

As in previous projects, the architects included a comprehensive daylighting scheme for the labs: The eastern elevation of buildings A and B comprise an expansive area of glass that sweeps around the buildings' corners, while western elevations are primarily masonry in order to block out the punishing desert sun and to reflect the architecture of the adjacent ASU campus.

In order to negotiate morning sun, Gould Evans devised dual internal louver systems. One set automatically tracks the sun's path, diffusing sunlight by reflecting it off the interior ceilings, while another system is manually operable. Although outdoor vertical aluminum fins offer shading on the south- and west-facing portions of the glazing, an exterior structure was prohibited from the east side in order to prevent birds from roosting. Lord notes that, to compensate, the palo verde trees in the courtyard's indigenous-species garden—nourished by air-conditioning condensation collected in a 5,000-gallon basement cistern—will soon provide an extra, homegrown sun barrier for occupants.

Whether or not they're contending with brilliant daylight, labs are well-known energy hogs, using as much as eight times more energy per square foot than most other building type in America. The facility draws chilled water and steam for its mechanical system from a campus central plant. Working alongside ASU design professors like Marlin Addison, who took charge of energy modeling, the design team continues to fine-tune the variable speed drives for the mechanical system and the variable air volume (VAV) units to minimize consumption while adhering to strict fresh-air requirements for labs. Remote sensors will cue a flushing-out of air in each zone, should they sniff rising levels of carbon dioxide or rarer chemicals. At other times, however, Lord says the staff has been able to reduce the air changes per hour more than expected for offices and computer spaces.

Similarly, Lord, Aeck & Sargent and Gould Evans are still pursuing green features like a 167-kilowatt rooftop photovoltaic array, which brings building B's total energy offset to 58.39 percent over the base case; prior to the PV installation, that reduction totaled 52.4 percent. The difference has helped building B cross the threshold from a LEED-Gold rating to Platinum.

The Biodesign Institute's boundless program, and the manifestation of its mission in the form of a collaborative, green workplace, has lured professors from all over the country. And the buildings have proven as effective as they are attractive. The institute has already given birth to several startup companies, its users have earned substantial grants, and its research validates its interdisciplinary scope; for example, scientists are buzzing about a photosynthetic bacteria that produces a lipid almost identical to biofuel. In a gesture that reflects poetically on the institute's new green home, a pilot project will begin farming the sustainable power source this spring.

KEY PARAMETERS

LOCATION: Tempe, Arizona (Salt River watershed)

GROSS SQUARE FOOTAGE: 347,000 ft² (32,240 m²)

COST: \$104 million

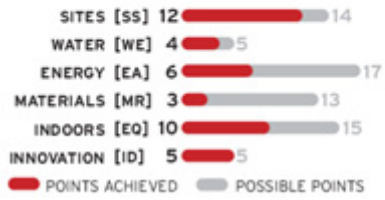
COMPLETED: December 2004 (Building A); November 2005 (Building B)

ANNUAL PURCHASED ENERGY USE (BASED ON SIMULATION): 145 kBtu/ft² (1,650 MJ/m²)

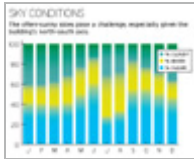
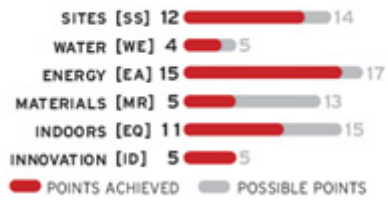
ANNUAL CARBON FOOTPRINT (PREDICTED): 19.1 lbs. CO₂/ft² (93.3 kg CO₂/m²)

PROGRAM: Laboratory space, lab support spaces, open office space, private offices, conference rooms, atrium (collaborative space), public entry lobby, auditorium, and cafe.

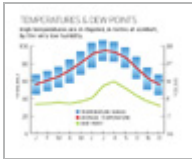
LEED SCORES (BUILDING A/PHASE 1) LEED-NC Version 2 Gold



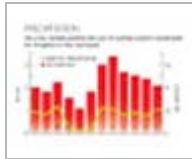
LEED SCORES (BUILDING B/PHASE 2) LEED-NC Version 2 Platinum



Sky Conditions



Temp./Dew Points



Precipitation

OWNER: Arizona State University

ARCHITECT: Gould Evans Associates and Lord, Aeck & Sargent