The History of the *Laboratory of the Year* Competition and Winners; an anthology of modern lab design!

Now in its 54th year, the Lab of the Year (LOY) Competition recognizes innovative designs, materials, and construction for laboratory facilities. It is judged by a panel consisting of architects, lab planners, construction project managers, user representatives, lab managers and/or industry experts. The winners of this prestigious award are internationally recognized as outstanding laboratories.

For those that know me, ever since I started planning and designing laboratories in the mid 1980's, the LOY competition not only served as an inspiration, both in understanding the recent trends in lab planning and design as well as admiring projects that demonstrated great architecture and the integration of building services. But before we discuss the early years of the competition, it is helpful to understand progresses that lead to the development of the modern lab design.

The development of the Modern Lab

Until the 20th century research remained largely a matter of the unorganized effort of individuals, with few companies establishing separate research departments. Although by World War I public attention focused on the accomplishments of applied research (or industrial research as it was then known), most experimental research was still conducted at departmental, science specific university labs. While there were great advances in corporate research expenditures during the early part of the 20th century, the Great Depression made corporate investments scarce. During World War II, corporate researchers were "drafted" into working alongside university and government personnel at university sites. These became multi-science and collaborative environments, thus evolving into a new concept for the research model.

At the same time, highly secret and confidential technologies were being developed, such as nuclear energy, paving the way to the establishment of what we know today as our National Labs. After the war, some of these sites continued their scientific mission, such as Los Alamos National Lab, but most university consortiums like the MIT Radiation Laboratory, the preeminent radar research organization, were abolished. Many researchers returned to their prewar institutions or entered the frenzied and lucrative post war market.

As Secretary of War Robert Patterson explained in October 1945, *"a nation that lags in the laboratory will not only have no chance of victory in a future war…it will not survive."* The late 1940's was the beginning of the industrial research revolution, with many corporations consolidating their laboratories in central locations, thus forming technical centers or research campuses. Those highly interactive university environments established during the war became the model and foundation for the modern multi-disciplinary corporate research centers.

Utilizing the new technologies developed during the war, architects and engineers were in full swing planning and designing larger and more sophisticated, single-purpose modern lab buildings. And to highlight and promote their efforts, many universities and corporations placed emphasis on developing and designing state-of-the-art, architecturally significant laboratory buildings!

An example is the **Johnson Wax Company Laboratories** in Racine, Wisconsin designed by Frank Lloyd Wright and completed in 1949. The research tower is designed with alternating circular office floors above squared laboratory floors that are cantilevered from a central core containing elevators, stairs, and infrastructure (mechanical/plumbing shafts). The. fume hoods are placed along the central shaft while benches flanked the exterior glass-tube curtain wall system.


The **General Motors Technical Center**, located outside Detroit in Warren, Michigan, was designed by Eero Saarinen and constructed between 1951 and 1956. Located on a 710-acre site and now encompassing 38 buildings, this iconic mid-century campus serves as GM's primary design and engineering center. It consolidated GM's technical research and development operations, with the domed design center serving as the centerpiece of the campus.

Considered by many as the most elegant of Saarinen's corporate campuses, the GM Tech Center "perfectly captured the spirit of American big business at high tide—prosperous, self-assured, insular, and faceless."

Meanwhile, soldiers returning home from the war had the ability to enroll in university programs utilizing the GI Bill, requiring universities to expand their curricula specifically their scientific and engineering programs. The *National Defense Education Act* of the early 1960's provided scholarships and capital funding for building construction. The "race for space" prompted by the Russians placing the first satellite into orbit precipitated the construction of new and lean instructional and research structures now known as the "*Sputnik Buildings*."

The development of more sophisticated mechanical systems including containment technologies allowed advancements in biological, medical, and pharmaceutical research. Because of these advances, in the late 1940's the National Institutes of Health transitioned from an "animal farm" outside Washington DC into the current highly sophisticated research campus with state-of-the art laboratories.

As Stuart W. Leslie conferred in his article *Laboratory Architecture: Building and Uncertain Future "*the members of the chemistry department at **Brookhaven National Laboratory,** Upton, NY attempted to circumvent the General Services Administration (GSA) and choose an architect for their proposed new building (Building 555). After interviewing luminaries such as Ludwig Mies van der Rohe and I.M. Pei, the department decided to retain Marcel Breuer's services. To better understand the chemistry department, Breuer sent one of his young partners, Robert Gatje,to interview the chemists. For several weeks Gatje played amateur anthropologist, scrutinizing the behavior and rituals of the atomic-age group: Who talked with whom, and where? What was the appropriate balance between spaces for collaboration and spaces for personal thinking, reflection, and writing?

Back in their New York studio, Breuer and Gatje turned their observations into an architectural program of striking originality. They approached the problem diagrammatically, in terms of the relationships between different subspecialties, the space requirements, and their separate and shared tools. They proposed a novel spatial layout for the laboratories in which offices were placed along the edges of the floor plan (perimeter) to best take advantage of natural light. "

Placed outside the offices was a glass-enclosed hallway, which offered access and connectivity to both the offices and the laboratories while providing daylight into the spaces, and a central utility corridor that allowed access to electricity, pipes, and other mechanical services.
Breuer never built the laboratory because the GSA insisted on its own method of selecting an architect, but the eventual designer of the building incorporated Breuer's innovative floor layout, with construction completed in 1966.

> *"Hypothesis: With a few exceptions, the large industrial laboratories (corporate and government) are likely to be minor sources of major inventions: rather they are likely to be major sources of essentially 'improvement' inventions."* – D. Hamberg, Invention of the Industrial Research Laboratory, 1963

Prompted by a large-scale initiative "*to expand the medical facilities and improve the image of the University as an innovative and modern research institution,"* the University of Pennsylvania, Philadelphia, PA engaged the services of renowned architect Louis I. Kahn to design the **Alfred Newton Richards Medical Research Laboratories**, completed in 1963, and its addition, the **David Goddard Laboratories** (completed in 1964).

"Believing that researchers need both 'physical' and 'psychological' contact with each other," Kahn rejected the traditional standard double-loaded corridor layout with modular bay labs instead planning for a more open, studio-like layout with the spaces stacked in a tower instead of being linear. The buildings are composed of a group of connected vertical volumes, with open-planned laboratories (served spaces) marked by corner windows, while the mechanical shafts and vertical circulation are confined into tall brick-faced towers (servant spaces) that flank the laboratories. At the time, not all researchers embraced the new open-plan concept.

In 1957 Dr. Jones Salk, after developing the first safe and effective polio vaccine, began his second dream *"to create a collaborative environment where researchers could explore the basic principles of life and contemplate the wider implications of their discoveries for the future of humanity."*

Gifted with 27 acres overlooking the Pacific Ocean in La Jolla, California, Dr. Salk partnered with architect Louis I. Kahn to design a new research center. With financial support from the National Foundation for Infantile Paralysis, now known as the March of Dimes, the **Salk Institute for Biological Studies** opened its doors in 1963, prior to final completion in 1965.

The Salk Institute was to be a campus compound of three clusters: meeting/conference areas, living quarters and laboratories, of which only the laboratory cluster was built. To promote collaboration, two parallel laboratory buildings were designed with no separating walls on any of the floors, creating an open plan concept (served spaces). Vierendeel trusses spanned the laboratory floor, creating a flexible open-planned workroom equipped with movable casework. The space in-between the trusses created a separate floor or interstitial space that housed the ducts, pipes, and electrical systems (servant space). Earl Walls was the lab planner for the project.

Not knowing what type of shape the garden between the two buildings should take, Kahn consulted with Mexican architect Luis Barragan after seeing his work being exhibited at the Museum of Modern Art in New York. Barragan told Kahn that "he should not add one leaf, nor plant, not one flower, not dirt, instead make the plaza with a single water feature."

New and further developments in building technologies allowed for novel ways. Plentiful raw materials supplies combined with increased manufacturing capabilities permitted the implementation of finishes and casework solutions in aesthetically pleasing new ways, modernizing the laboratory, including the utilization of highly durable metal casework we use today.

The above-mentioned examples suggest that "laboratory planning and flexibility depends on both attitude and design, with the laboratory culture mattering as much as the architectural forms that expressed and constrained it" – a philosophy has carried forward into modern laboratory planning and design!

The Laboratory of the Year Competition

One of three competitions honoring various facets of the R&D industry (others being the R*&D 100 Awards* started in 1963 and the *Scientist of the Year Award* started in 1966), the **Laboratory of the Year**

(LOY) competition started in 1967 by *Industrial Research (IR) Magazine (1959 to 1978)*. The predecessor became Industrial *Research and Development (IRD) Magazine* (1978 to 1984), which then became *Research+ Development (R+D) Magazine* (1984 to 2020). For many years, the *Scientist of the Year* served as a member of the LOY jury.

Along with *R+D Magazine, Lab Design News* began co-sponsoring the competition in 1996, and the *Scientific Equipment and Furniture Association (SEFA)* joined the co-sponsoring in 1998. In 2020 SEFA assumed the awards program and re-named it the **SEFA Laboratory of the Year**.

Throughout its history, the purpose of the competition has stayed the same: to recognize outstanding laboratories, defined as buildings used primarily for scientific or engineering research and analysis, or the teaching of science or engineering. Like other International Awards that recognize exemplary projects, honoring the best, significant new buildings and planning projects designed and/or built around the world, the *SEFA Lab of the Year* award program brings attention to innovative laboratory design and construction to the greater public and the professionals' attention.

> *"Some criteria are considered essential components of all lab designs without which an entry cannot be considered for any award. These include safety considerations for lab and adjacent office personnel, hazard control, access for the handicapped, and facilities for the humane treatment of animal research subjects. New and innovative lab design aspects that have the ability to impact the design of future labs have been important points in deciding past LOY winners".* – *Robert R. Jones, Industrial Research Magazine.*

Although the award names have varied throughout the years, at the jury's discretion winning projects are still recognized in the same three categories:

- **Laboratory of the Year** (the top award for new buildings; new multi-building campuses, or which could fall under new, renovated, or adaptive reuse construction categories),
- **High Honors** (projects of excellent quality that just miss LOY status, which fall under new, renovated, or adaptive reuse construction categories, or
- **Special Mention** (projects deserving recognition for a specific quality or feature).

With over 1,200 entries in its history, since 2023 there have been 190 total winners, divided in the following categories:

- Lab of the Year – 61 winners, including 8 Renovated Lab of the Year recipients
- High Honors - 75 winners
- Special Mention – 54 winners

Out of the 190 total winners, College and University projects have received 46% of the awards, followed by 39% for Corporate and 15% for Government projects. The top LOY awards reflect a similar client type breakdown as the rest of the winners.

The LOY is a global competition, with awards granted to internationally located projects in a variety of countries including Spain, Canada, Sweden, United Kingdom, India, Saudi Arabia, Australia, Singapore, and South Korea. The international projects have received:

- Lab of the Year – five awards,
- High Honors Awards – six awards, and
- Special Mention – six awards.

The Winning Projects

There has been a consistently high-level of quality entries throughout the years. At the jury's discretion, the yearly number of awards has varied depending on the number of entries, some years having one and others having as many as five awards. There were no top LOY awards in 1979 and 1983.

> *"Judging day was a ver*y exiting day, looking together at the entries with other people in the field, intellectually exciting!" – Dr. Richard Rietz, LOY judge for over 15years

Perhaps by design or a mere coincidence, the 1967 first competition winners were divided equally among all three client types (corporate, university and government). Regardless, these projects set a very high mark for years to come. The initial winning projects were:

Bell Telephone Laboratories Holmdel Complex, NJ – Laboratory of the Year 1967

Constructed between 1959 and 1962, and designed by Finnish American architect *Eero Saarinen*, the building functioned for forty-four years as a research and development facility, initially for Bell System and later Bell Labs, a division of AT&T.

The centerpiece of the campus was a structure that served as the home to over 6,000 engineers and researchers. The building was expanded in 1966 and 1982 to its final size of two million square feet, housing both office and laboratory space. Internally, the building was divided into four pavilions, each separated from the others by a cross-shaped atrium (two 1,000-by-100-foot atria), linked by sky-bridges and walkways. Due to its mirror exterior curtain wall, the modernist building was dubbed "*the Big Mirror Ever*" by *Architectural Forum Magazine*.

National Center for Atmospheric Research (NCAR) Research Building, Boulder, CO – Honorable Mention 1967

Nested against the foothills of the Rocky Mountains in Boulder, CO., *I.M. Pei's* NCAR laboratory was both visionary and idiosyncratic. A half century after the lab opened, the "monastical" looking building still looks avant-garde. Solar astronomer Walter Roberts, the founding director of NCAR, commissioned it and "sought to create a place where individual researchers, either alone or in small groups, could follow their muse. "

Envisioned for small-scale conventional atmospheric chemistry and meteorology, Mesa Lab, as it is known, has had to adjust to the demands of a truly global science and is becoming an increasingly virtual laboratory. The computers required to run ever more sophisticated and complex climate models ended up costing more than the laboratory itself; most of them have been moved to Wyoming, where energy costs are lower.

Rice University Space Sciences and Technology Laboratory, Houston, TX – Honorable Mention 1967

Rice University began its first research collaborations with NASA in 1959, just months after the agency was founded. On Sept. 12, 1962, as part of Rice's semicentennial celebrations, then President John F. Kennedy spoke at Rice Stadium, challenging the United States to become "the world's greatest space-faring nation." In direct response to President Kennedy's speech, the university established the nation's first dedicated space science department in 1963.

Built in 1966, the 88,000 SF building housed the space science department. George and Abel B. Pierce, Houston TX, were the architects for the building. The building, considered the birthplace of nanotechnology, underwent complete renovation in 2018.

> "New and innovative lab designs aspects that have the ability to impact the design of future labs have been important points in deciding past LOY winners." R&D Magazine

Duquesne University, Richard King Mellon Hall of Science, Pittsburg, PA – Laboratory of the Year 1969

Another notable award-wining project during the first few years of the competition and designed by *Ludwig Mies van der Rohe*, The Richard King Mellon Hall of Science, also known as Mellon Hall, is a four-story building containing two large lecture halls on the ground floor and three floors of laboratories above. It currently serves the biology, biochemistry, and pharmacy departments.

The upper floors have a double loaded internal loop corridor with laboratories along the perimeter, and elevators, stairs and support spaces forming an internal, compact core in the center. The first level, set back forming a colonnade around all sides, has solid buff-colored brick and floor to ceiling glass. The top three floors have a black steel and tinted gray façade.

Although there have been excellent and inspiring winning projects throughout the years, it would be exhaustive to recognize and highlight all these projects. We can observe that every project has unique characteristics, not resembling any past winner!

As competition juror for over 15 years Dr. Richard Rietz has mentioned that throughout the decades the competition entries and winners have reflected "*the pulse of the nation*", that is, the projects have represented the most prevalent science, client types and architectural styles of their time. It is the intention of this article to highlight not just top Lab of the Year winners, but also High Honors and Special Mention projects that, in my opinion, have best represented their period.

Winning projects in the 1970's decade represented a variety of science types and clients, with micro-electronics, petroleum, biological /pharmaceutical and chemical research labs being among the winners. This decade was characterized by efficient laboratory layouts with center corridors flanked by internal, distributed mechanical air supply, return and exhaust shafts and low floor to floor heights.

Research Center Tower & Pavilion, **Philip Morris Company**, Richmond VA – Laboratory of the Year 1970

Housing advanced technological equipment and laboratories for research on the development of tobacco and other products, the Research Center Tower & Pavilion formed part of the tobacco giant Philip Morris. Architecturally, the project was a brutalist-style building designed by Ezra Stoller, a German born American architect who worked for I. M. Pei before starting up his own practice. While some architects might think twice about working and awarding a cigarette manufacturer, in the early 1970's over 40 per cent of the adult American population were smokers, and a tobacco research facility was viewed indifferently from any other.

Laboratorio ITT Standard Electrica, Madrid, Spain – Honorable Mention 1972.

The first international winner, Standard Electrica S.A. (SESA) started as an international subsidiary of *International Telephone and Telegraph (ITT) Company* in Spain, developing and manufacturing telecommunication systems, hardware equipment, and fiber-optic cabling. In 1970 it employed over 15,000 workers. The building has been demolished.

Squibb Institute for Medical Research E.R. Squibb and Sons, Inc., Princeton, NJ – Laboratory of the Year 1973

Founded in Brooklyn, NY in 1858, Squibb established their worldwide headquarters in Princeton in 1971, expanding facilities for the Squibb Institute for medical Research. Designed by HOK, the new laboratories allowed Squibb to advance their discoveries in the medical sciences. In 1989, Bristol-Meyers and Squibb merged and became Bristol-Meyers Squibb. In 1999, the company received the *National Medal of Technology* from the United States government, the highest recognition for technical achievement “for extending, and enhancing human life through innovative pharmaceutical research and development.”

Environmental Health Laboratory, **Monsanto Corporation**, Chesterfield, MO – Honors 1979

Founded in 1901, Monsanto Corporation was an American Corporation and a leading producer of chemical, agricultural, and biochemical products. It was acquired by Bayer in 2018, ceasing to exist as an entity. This large, brick-clad 1970’s modernist architectural building is noted for its biochemical laboratories and extensive rooftop greenhouse chambers.

The **decade of the 1980’s** was marked by an abundance of entries and awards, with multiple winners in the materials sciences, chemical/petrochemical, biomedical and agriculture/food sciences.

> “Being a scientist, it was interesting to see new trends. I pushed to recognize those that reflected where science was changing, such as more instrumentation and flexible ways of dealing with it.” Dr. Richard Rietz, Judge

The science conducted in these spaces required more advanced mechanical systems, such as once through laboratory air systems and biological containment, improving the health and safety in the laboratory environments.
Although animal models had been used in research since ancient times, mostly for anatomical and physiological studies, the 1980’s saw an explosion of new technologies for inbreeding mice and rats’ stains and the creation of transgenic rodent model, allowing *in vivo* genetic experimentation and the need for additional and more sophisticated vivarium facilities. This was the beginning of the biosciences project bonanza!

Also marking this decade was the beginning of the independent, entrepreneurial scientific businesses, many in the biotechnology industry. To support and accelerate this industry, many regional governments created “incubator” laboratories. Some projects of this decade were:

Halliburton Services Research Building, Duncan, OK – Laboratory of the Year 1981
Founded in 1919 in Duncan Oklahoma, Halliburton is one of the world’s largest providers of products and services for the energy industry.

Designed by Benham-Blair & Associates, Oklahoma City for Halliburton, the Services Research Building was a flexible and technologically advanced research building with modular laboratories flanking service corridors which housed noisy equipment and facilitated chemical deliveries. The building's mechanical air handling systems, including heat wheels, were housed at an interstitial level.

Alberta Research Council, Research laboratories, Edmonton, Canada – High Honors 1987
Alberta Innovates (AI), formerly the Canadian Research Council, is a Canadian provincial crown corporation created and funded by the government of Alberta, responsible for promoting innovation in the province, including the support and fostering of emerging technologies. The administration and laboratory complex, the first phase of the complex, was constructed as an office, research and development incubator facility. It includes conventional wet chemistry laboratories and support spaces, high and low hazard high-bay areas, and a pilot plant.

As a testament to the structure's flexibility, the building has accommodated a number of industries and research projects over time, with not a single project at the time of opening being housed in the facility today. Graham McCourt, Calgary, Alberta were the architects for the project.

Vollum Institute for Advanced Biomedical Research, **Oregon Health Sciences University**, Portland, OR – Laboratory of the Year 1988
Designed by the Portland firm of Zimmer Gunsul Frasca (ZGF) Architects and opened in late 1987, the six-story, 67,000 square foot Vollum Institute building was made possible by a $20 million dollar gift from the late philanthropist and co-founder of Tektronix, Howard Vollum.

The story of the Vollum Institute for Advanced Biomedical Research at the Oregon Health Sciences University begins in the early 1980s, when Leonard Laster, then the President of OHSU, proposed the formation of a new research center focused on "molecular medicine," an emerging discipline that was transforming the scientific basis of patient care. The Vollum Institute, with its host of research laboratories engaged in basic sciences research, is a major center for investigating how the brain functions.

In keeping with the "post-modern architectural style", the architects wanting a more expressive materials than marble, steel, and stone, they specified terra cotta for the south face of the Vollum Institute.

Between 1967 and 1989, sixty-five per cent of the Lab of the Year winners were Corporate Clients.

The 1990's was the turning point, with College and University beginning to lead awards over corporate clients. This decade was best known for the introduction of the *interdisciplinary research model*, spreading around the world, and countering the trend towards specialization that had dominated science since the Second World War.

> "*The problems in the world are not within-discipline problems, we have to bring people with different kinds of skills and expertise together. No one has everything that's needed to deal with the issues that we're facing."* says Sharon Derry, an educational psychologist at the University of North Carolina at Chapel Hill who studies interdisciplinarity.

Arnold O. and Mabel Beckman Institute for Advanced Science and Technology, University of Illinois, Urbana, IL – Laboratory of the Year 1990

When University of Illinois alumnus Arnold Beckman and Professor Ted Brown dreamed up the concept of the Beckman Institute, the idea of a collaborative, interdisciplinary research space was unique and untested. In its initial stages, the concept met strong resistance. Department heads fretted that faculty members, and their grants, would be snatched away. Some colleagues scorned the idea of creating open office spaces to foster interactions between graduate students: surely the din would make it impossible to get serious work done. And then there was the stigma. *"Interdisciplinary research is for people who aren't good enough to make it in their own field,"* an illustrious unnamed physicist.

A few hectic years later, the 312,000 SF (29,000-square-meters) Beckman Institute for Advanced Science and Technology, was born. Soon, large grants from organizations such as the Department of Defense and the National Science Foundation poured in, hushing many critics. Thirty years later, the Beckman Institute has enabled novel ideas, discoveries that bridge traditional fields, and research training for thousands of young scientists.

The Institute consists of two parallel structures separated by an internal atrium and connected by bridges on each floor. The south wing houses investigators, graduate students, and administrative offices, while the north wing houses blocks of both wet and dry laboratories. As the focal point of U of I's north campus quadrangle, the building exterior harmonizes with its brick campus context. SmithGroup Detroit was the architect and laboratory planner for the project.

Fred Hutchinson Cancer Research Center, Seattle, WA 1994 – Laboratory of the Year 1994

Designed by Zimmer Gunsul Frasca (ZGF), Portland, OR, the Fred Hutchinson Cancer Research Center is an institute dedicated to the elimination of cancer and related diseases as causes of human suffering and death. Their researchers are producing some of the most important breakthroughs in the prevention, early detection and treatment of cancer, HIV, and other diseases, uncovering factors in disease risk, occurrence, and progression. The center is also known as Fred Hutch or *The Hutch*.

Set on a lake in the heart of Seattle, WA, the 15-acre campus anchors the city's burgeoning biotech corridor. More than 5,700 people work in these state-of-the-art facilities, designed with flexibility, collaboration, and sustainability in mind. With many courtyards and green spaces, the outdoors invites conversation and reflection.

thirteen buildings organized around a central art filled courtyard, and in close proximity to research and patient care partners at the Seattle Cancer Care Alliance, University of Washington, Seattle Children's Hospital and the Bill and Melinda Gates Foundation. *The Hutch* also catalyzed the neighborhood, now home to Amazon's Headquarters, Facebook, Google, and many other research and technology clients.

Over twenty-five years later, the 1.3 million square foot campus includes

Chiron Life Sciences Center, Emeryville, CA - Laboratory of the Year 1999

The Chiron Life Sciences Center is a multi-phased corporate laboratory campus designed by signature architect Ricardo Legorreta of Mexico City with Flad & Associates of Madison, WI as the Architect of Record. The project consisted of two structures. Building 7A was designed as the first module of the large central plant.

Building 4 houses approximately 500 scientific researchers and support staff in a unique six-story laboratory and office structure containing biological and chemical labs, corporate executive offices, open office space, conference rooms, administrative support, and mechanical equipment space. The design is marked with vibrant colors, and a bright four-level open atrium which serves as the focal point of the structure. Modern, state-of-the art laboratories are flanked by individual offices which surround the central atrium and the glass-enclosed conference areas.

With *Genomics* as the buzz word, biological, biomedical, and pharmaceutical projects awards continued in the **new decade of the 21st Century.** The *Intramural Research Program (IRP),* the National Institutes of Health's (NIH) internal research program known for its synergist approach to biomedical science, aided in the funding of many university research programs. Its mission*, to accelerate basic, translational, and clinical research* across all fields of biomedical study, became the axiom for many projects.

Even though **sustainability** gained momentum in the mid 1990's**,** it did not become mainstream until the mid-2000's**.** Since then, it has become a primary criterion for LOY award winners. Several LOY projects have been highlighted as Environmental Protection Agency (EPA) Case Studies in the ***Laboratories for the Twenty-First Century (Labs 21®)*** program. *Labs 21® Case Study* projects included:

- Lab of the Year 1994: Fred Hutchinson Cancer Research Center, Seatle, WA – ZGF Partnership, Portland, OR, architect
- Lab of the Year 1998: Georgia Public Health Laboratory, Decatur, GA - Lord, Aeck & Sargent, Atlanta Ga, architect, and lab planner,
- Special Mention for Sustainability 2006: National Renewable Energy Laboratory Science and Technology Facility, Golden, CO. – SmithGroup, Phoenix, AZ, architect, and lab planner.

"The fun part as a judge was to see the new trends such as sustainability and LEED (Leadership in Energy and Environmental Design)." – David Wiffee Past SEFA Board Member and LOY Juror

Millennium Pharmaceuticals at University Park MIT and Harvard University, Cambridge, MA – Laboratory of the Year 2003.

Millennium Pharmaceuticals, a biotechnology firm in Cambridge, MA, uses *strategic alliances* to finance the development of technology platforms based on the latest breakthroughs in *genomics*. The company's goal is *to revolutionize drug development by making it more predictable, faster, and less costly*. Rather than signing blanket agreements, the company forms alliances that target specific diseases, allowing it to forge lucrative relationships with several partners.

Located in University Park, Cambridge, and designed by Elkus Manfredi Architects, Boston, MA, the building program for the 228,000-square-foot, 9-story biopharmaceutical laboratory, research, and office facility was both unusual and challenging. To ensure research flexibility, mechanical, electrical, and plumbing systems were constructed to allow for either chemistry or biological research. In addition, the building houses a vivarium facility. The envelope of the building features a dramatic, volumetric skin comprised of brick and three separate curtain wall types in four different colors of glass.

James Clark Center, **Stanford University**, Stanford, CA – Laboratory of the Year 2004

Completed in 2003, the James H. Clark Center at Stanford University, is a building that houses interdisciplinary research in the biological sciences. The Clark Center is home to *Stanford's Bio-X Program*, which seeks to encourage researchers in the biological sciences to interact with researchers in other fields. As a prime example of Stanford's interest in fostering a multidisciplinary approach to research, the building provides facilities for 700 academics from 23 different University departments working within dynamic teams to meet some of the most pressing scientific and medical challenges of the last decades.

Designed by Foster and Partners, London, UK in collaboration with MBT Architecture, San Francisco, CA. (now Perkins+Will), the three-story building takes the form of three wings housing highly flexible laboratories that frame an open courtyard overlooked by balconies. The use of movable casework, combined with plug-and-play overhead utility service connections, facilitates its flexibility.

A forum at the heart of the courtyard is used for exhibitions, concerts, and other events. With tables and chairs spilling out onto the courtyard, a large restaurant on the ground floor of the south wing has become a new social focus for the entire University.

Structurally the building combines rigidity with flexibility to facilitate the use of highly sensitive equipment such as lasers and to withstand seismic activity. The building's rich palette of materials echoes both the red-tiled roofs and limestone façades typical of the Stanford vocabulary of other campus buildings.

Biodesign Institute, **Arizona State University,** Tempe, AZ – Laboratory of the Year 2006
Arizona State University (ASU) created an interdisciplinary research institute devoted entirely to innovations inspired by nature's grand designs. As Arizona's largest investment in infrastructure devoted to bioscience-related research, the Biodesign Institute has more than a dozen innovative research centers and over 200 active research projects. The faculty and bioscience initiatives are redefining medical research, harnessing cutting-edge technology for the good of the planet, creating "bioinspired" solutions to an array of global challenges and focusing scientific expertise on the areas of greatest human need.
Designed by Lord, Aeck & Sargent, Atlanta, GA, the Biodesign Institute includes 554,000 SF, and is a LEED-certified building. Glass enclosed offices and laboratories are flanked by a central atrium.

Janelia Farms, Howard Hughes Medical Institute, Ashburn, VA - Laboratory of the Year 2007
As scientific research continues to evolve, so do the opportunities to foster innovation. For decades the Howard Hughes Medical Institute (HHMI) has employed scientists at host institutions across the United States so they can pursue basic research questions. In 1999, HHMI leaders knew that some of science's most profound questions were best pursued in a collaborative environment – and that collaboration between different scientific disciplines was becoming ever more important. They also felt that there was a shortage of scientists engaged in innovating new tools required to make progress in many research areas, as well as a shortage of places where experienced scientists could continue to do, rather than simply manage, experimental work.
When Janelia broke ground in 2003, many conversations led to Janelia's original emphasis: to identify the general principles that govern how information is processed by neuronal circuits and to develop imaging technologies and computational methods for image analysis.

To design the campus, HHMI turned to renowned architect Rafael Viñoly and Associates and to Robert H. McGhee, who was at the time HHMI's architect and senior facilities officer. They wanted a physical place that embodied the ideals of Janelia's philosophy-- something that encouraged freedom, independence, and creativity. At the same time, they needed it to be efficient, functional, and flexible. Viñoly's team designed the campus while HHMI's team designed the scientific program, each informing the other along the way.

Blending the architecture into the surrounding landscape, Viñoly made a 900-foot-long building the centerpiece of the campus. It incorporated a gently undulating design with three stories terraced into a hillside. The glass and steel structure incorporates flexible laboratory space that can change depending on the equipment, purpose, and needs. It includes inviting social spaces that encourage people to meet and share ideas. In 2006, three years after breaking ground, Janelia had grown its campus: the research building, a housing village, and guest house.

Broad Institute for MIT and Harvard University, Cambridge, MA - High Honors 2007

The architecture of the Broad Institute building is designed to promote interdisciplinary interaction and an "open" and transparent scientific process. The building integrates laboratory, office, exhibition, and retail space, and an auditorium into a single building. The design speaks to this vision through a layered use of glass, both on the exterior skin and within the building. Light suffuses through the interior glass walls which enclose offices, conference rooms, and laboratories and travels to interior corridors and common spaces. The project is noted as one of the first to use glass partitions to separate the desk from the laboratory bench area.

Signer Harris Architects and Maryann Thompson Architects served as the design architect while Elkus Manfredi was the Architect of Record.

The glass volume on the exterior of the building identifies the laboratory spaces and encourages public awareness and support of the processes within. The floor plan promotes *interdisciplinary interaction*. Crossroads between laboratories are occupied by interactive program pieces, such as open kitchen spaces, in order to create an environment where scientists from diverse disciplines will "bump into each other," promoting discourse and the cross-fertilization of ideas[1]

Although Biological Sciences project entries continued to flourish, it was in the **decade of the 2010's** that we saw the proliferation of Engineering Building entries and winners. With clients embracing *the 2030 Promise* and investing in *sustainable development program* goals, LOY winners not only strived for, but many achieved Leadership in Engineering and Environmental Design (LEED) Silver, Gold and Platinum certifications.
This was also a turning point for science education, transforming it from a didactic to a collaborative pedagogy. "*Hands-on*" experimentation became the norm, with most engineering education programs embracing the idea and incorporating "*maker-spaces"* or construction labs in their new buildings. Highlighted projects of this decade are:

The King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia – Laboratory of the Year 2011
Located on the Red Sea, and sited on more than 36 square kilometers (14 sq mi), the university's core campus encompasses a marine sanctuary, museum, and research facility.

KAUST is the first mixed-gender university campus in Saudi Arabia, with the hope it would help modernize the Kingdom's perspective on societal roles. Women are allowed to mix freely with men, and they are not required to wear veils in the coeducational classes.

KAUST organizes its research teams across three academic disciplines, 12 research centers and individual faculty labs. KAUST focuses its research around the areas of food and health, water, energy, the environment, and the digital domain. The University includes three Academic Divisions are:

- Biological and Environmental Science and Engineering Division,
- Computer, Electrical and Mathematical Sciences and Engineering Division, and
- Physical Sciences and Engineering Division.

KAUST was Saudi Arabia's first LEED certified project and is the world's largest LEED Platinum campus, and was chosen by the American Institute of Architects (AIA) Committee on the Environment (COTE) as one of the 2010 Top Ten Green Projects. An international architecture team of Hellmuth, Obata and Kassabaum (HOK), served as the architect and laboratory planner for the project.

The Wisconsin Institute of Discovery, Madison Wisconsin – Laboratory of the Year 2012

The publicly funded *Wisconsin Institute for Discovery* (WID) is an interdisciplinary public research institute focused on science on the University of Wisconsin, Madison, WI. The institute is located in the *Discovery Building*, which also houses the private biomedical-focused *Morgridge Institute for Research* and the Wisconsin Alumni Research Foundation's Town Center, WID partners that help deliver outreach programming and public events.

The WID is an experiment in interdisciplinarity, bringing together the best minds from various fields to study change in complex systems. It aims to address global challenges such as climate change, pandemics, and technological advancements by fostering unlikely collaborations. By transcending departmental boundaries, WID seeks to amplify benefits and minimize harm in a rapidly changing world. WID researchers delve into fundamental discoveries at the intersections of disciplines. Some key areas include Data Science, Precision Medicine, Complex Systems and Emerging Technologies.

The innovative 330,000-square-foot facility was built with three research floors aboveground and one below, and a block-long, public venue for science that spans its main floor. In addition to flexible state-of-the-art laboratories, it includes civic spaces and a Mesozoic Garden, meeting rooms, three public restaurants, and a university resource center for inventors, entrepreneurs, and startup companies. The building earned LEED Gold certification.

The research floors are organized as laboratory “pods” with each designed to house up to five principal investigators and their teams. Two pods per floor are designated as wet laboratory space and a central pod shared by each floor’s occupants is focused on dry, computational operations.

Teaching laboratories, designed and outfitted exactly like the research labs, are in pods on each of the three upper research floors and built with separate, secure access from the research areas.

Large interior windows provide open views between the teaching labs, research areas and the Town Center below. The teaching labs are used with K-12 students and learners of all ages who take part in hands-on outreach programs, as well as with faculty and staff from across campus who attend workshops, equipment demonstrations and other events.
The Ballinger Company (Ballinger), Philadelphia, PA was the architects and laboratory planners for the project.

Energy Systems and Integration Facility, National Renewable Energy Laboratory (NERL), Golden, CO – Laboratory of the Year 2014
The Energy Systems Integration Facility (ESIF) at the Department of Energy's National Renewable Energy Laboratory (NREL) campus is a model in sustainable design and energy efficient performance. The ESIF creates a home for scientists and engineers to collaborate on the development and delivery of renewable energy technologies and houses the most powerful and energy efficient data center in the world dedicated solely to renewable energy and energy efficiency research.

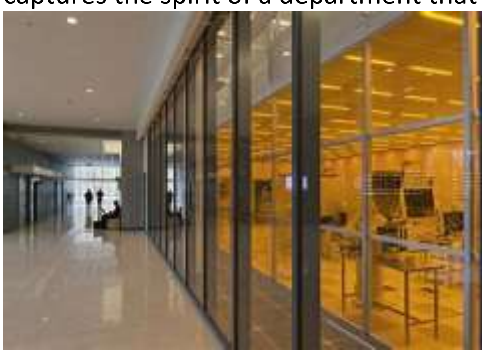
© Bill Timmerman
The ESIF is the nation's only facility that can conduct integrated megawatt-scale testing of the components and strategies needed to safely move clean energy technologies onto the electrical grid "in-flight" at the speed and scale required to meet federal policy.

SmithGroup, Phoenix, AZ served as the architect and laboratory planner of the three-story, 182,500-square-foot research complex. A showcase of sustainable design, the ESIF incorporates the best in energy efficiency, environmental performance, and advanced controls using a "whole building" integrated design approach that complies with Energy Star standards. Working together with the facility users to support the Department of Energy's goal to develop an energy efficient building that imparts minimal impact on the environment, the ESIF earned a LEED Platinum rating from the U.S. Green Building Council.

Electrical and Computer Engineering Building, University of Illinois, Urbana, IL – Laboratory of the Year 2016
The Electrical and Computer Engineering Building (ECEB) is meant to be a living laboratory, allowing students and faculty members to research its sustainable features and use its solar panels for teaching

and research, as well as for energy production. It was also meant to be a model for **net-zero energy design** in the Midwest, proving that a tropical climate is not required to gain this certification.

At 235,000 SF, the ECEB is a multi-use building with labs, classrooms, a large two-story open foyer, office space, clean room, and machine shop. It reflects the University's commitment to sustainable design and captures the spirit of a department that is always pushing the limits of technological innovation.



The structure has more than 20 lab spaces intended for student instruction and learning. These labs continue the Illinois ECE tradition of hands-on learning, especially on cutting-edge topics like nanofabrication, optics, control, and robotics. In the Open Projects Lab, students have access to state-of-the-art equipment for use in non-classroom projects. Students can pursue their passions, innovating and experimenting, in this unique *maker-space*.

The building gives students and faculty members access to many collaborative spaces, including a grand lobby filled with seating and multiple conference rooms. Graduate students share large, open workspaces, which allow for communication among those in different research areas.

ECEB was designed to consume approximately half the energy of an average new building of the same size and type and comes in at less than 50% of the national minimum energy standards. Designed to be one of the largest net-zero energy buildings of its kind in the country, the building includes countless features to help meet that goal. It achieved *LEED Platinum certification* in 2019. In February 2023, the ECE Building became the university's first *Zero-Energy certified facility*. All of the operational energy associated with the building is offset through a combination of on-site solar production and solar renewable energy credits (SRECs), which earned the facility official *Zero-Energy (ZE) Certification* from the International Living Future Institute (ILFI).

The Francis Crick Institute, London, UK – Laboratory of the Year 2017

The Francis Crick Institute is a biomedical discovery institute aiming to help understand why disease develops and to find new ways to treat, diagnose and prevent illnesses such as cancer, heart disease, stroke, infections, and neurodegenerative diseases. The institute defines its research program as exploring "high-level science questions reflecting both major issues of interest in biomedical research and the current research strategies of its six founders".

Opened in 2016, the Francis Crick Institute was built next to St. Pancras railway station in the Camden area of Central London. It consists of four reinforced concrete blocks up to eight stories high plus four basement levels. The total internal floor area is 882,862 SF (82,578 m^2) including 314,080 SF (29,179 m^2) of laboratories with 5 km (3.1 mi) of laboratory benching and 235,073 SF (21,839 m^2) of associated write up space.

Laboratories within the building are arranged over four floors, made up of four interconnected neighborhoods, designed to encourage interaction between scientists working in different research fields. The institute also includes a public exhibition/gallery space, an educational space, a 450-seat auditorium, and a community facility.

A third of the building is below ground to reduce its visible size. In addition, these lower levels provide further protection for sensitive equipment since it houses state of the art scientific equipment, much of it extremely sensitive to vibration and electromagnetic emissions and requiring advanced methods of air handling.

Solar panels installed in the roof provide extra renewable power. The facility incorporates a combined heat and power plant in order to provide low-carbon onsite power. HOK was the Architect of Record for the project. PLP Architecture, London collaborated on the building's external envelope and BMJ Architects, London was retained as a biological research facilities consultant.

CJ Blossom, Suwon, South Korea - Lab of the Year 2018

As one of Korea's largest companies, the CJ Corporation sought to create a world-class scientific discovery center reflecting the company's "*Only One*" spirit and its desire to be the "first, best and different" in all aspects of business. The result was a one-of-a-kind research and development headquarters, consolidating CJ Corporation's previously disparate pharmaceutical, biotechnology and food products businesses into a single location, and repositioning the company's operations into an interdisciplinary format that increases efficiency, creates a culture of integrated innovation, and accelerates speed-to-market.

Devised by CannonDesign, the building's architecture was inspired by CJ's brand identity – a three-petal blossom that represents "Better life of happiness, enjoyment and convenience." The three-petal towers are organized around CJ's main departments: biotech (blue), food (orange) and pharma (red). This expansive, 1.2 million SF building locates the full spectrum of research and development facilities around a dynamic central atrium that cultivates interconnectivity and engagement with fluid circulation and natural light.

Surrounding the atrium at the first and mezzanine levels are 100,000 SF of amenities, including product showrooms, a café and restaurant, library, work out facilities, sleeping pods and even an interior living forest. This broad spectrum of space helps people who are doing very intensive, focused work have moments of balance in their lives so they can push discoveries and progress forward without getting burned out. This three-dimensional connectivity is further emphasized with a series of double-height interaction spaces linking labs, offices, and amenity spaces within each tower.

At the start of our **current decade,** Engineering school projects seem to have the continuum from the last decade, with bioscience projects narrowing their focus to the neurosciences. Although the idea of a traditional office environment has been challenged for some time, new trends in alternative officing have emerged in the new designs. Potentially, the COVID "work from home" phenomenon will further impact our building's designs. As part of their sustainable criteria, most projects incorporated a variety of wellness programs, with biophilic designs, exterior meeting areas, exercise rooms among others. Among the very impressive buildings being completed in this decade we find:

Stavros Niarchos Foundation - Rockefeller University, New York, NY – Laboratory of the Year 2020
The *Marie-Josée and Henry R. Kravis Research Building*, the centerpiece of the new campus, has added two acres, expansive laboratory space, beautiful landscaping, and inspiring East River views to The Rockefeller University's existing 14-acre campus. Additionally, the campus features a landscaped roof with two low pavilions—the *Anne T. and Robert M. Bass Dining Commons* and the *Hess Academic Center*.

The Kravis Research Building is a five-story structure designed and laboratory planned by Rafael Viñoly Architects. Concentrated on two floors, the design for the laboratory itself reflects the University's need for flexible lab space that allows for internal growth and contraction of research groups. This facilitates for future modifications to scientific practices and evolution of individual researcher programs; and cost-effective standardized laboratory fit-out components that can be reasonably customized by each user. The core and shell of the building is developed to house the labs in the broadest possible footprints available on the constrained urban campus, and to meet the need for increasing amounts of laboratory support space. For the fit-out of the labs, the architects developed a bollard system which provides the university with maximum flexibility for the reconfiguration of the laboratory bench, write-up, office, and support spaces.

The Research Building was also designed with the importance of "soft" spaces –lounges, informal congregation areas, seminar rooms, and general food and beverage spaces – as true components of the building's research area rather than tacked on program amenities.

In addition, a center for scientific exchange, the *Anna-Maria and Stephen Kellen BioLink*, was built at the northern end of the campus, adjacent to the President's House. The *Kellen BioLink* is a venue for scientific cross fertilization and information sharing among Rockefeller scientists, as well as with scientists from other institutions.

The project extends the campus towards the East River, merging the SNF–FDR River Campus seamlessly with the existing grounds. The university achieved this feat by using Rockefeller's air rights over the FDR Drive. As part of the construction methodology, off-site prefabricated sections of the structural skeleton of the building were lifted from barges into place over the FDR Drive.

Harvard University, Science and Engineering Complex, Allston, MA – Laboratory of the Year 2021
The Science and Engineering Complex (SEC), located on Harvard University's emerging Allston campus, integrates one of the country's most diverse engineering programs into a single 497,000-square-foot structure. As the primary home of the *John A. Paulson School of Engineering and Applied Sciences (SEAS),* the state-of-the-art complex defines a new series of environments that support SEAS' profound commitment to interdisciplinary collaboration both in teaching and research and exploits these qualities to create vibrant public spaces at a variety of scales throughout the building.

The new facility establishes a strong precedent for the development of outdoor space, street activation, and integration with larger public space networks. The massing of the building forms a new landscaped courtyard space suitable for outdoor recreation and events towards the site's center, while the balance of the site to the south is preserved for future development.

Designed by the Behnisch Architeckten Boston office, this building is expressed as a series of floating, highly flexible research boxes above a two-story transparent plinth comprised of the more public, active elements of the program. This plinth adopts an architectural language of terracing elements as it reaches south to define the courtyard, establishing a building scale that respects the adjacent residential fabric.

Organizationally, the building follows the massing logic, with classrooms, teaching labs, and amenity spaces occupying the lower plinth floors, while research labs in the upper volumes maintain appropriate levels of solitude and security. Additional teaching spaces, fabrication shops, core research facilities, and a loading dock occupy the below-grade levels. All six above-grade and below-grade levels are connected vertically by a central atrium space facing south toward the courtyard, which delivers daylight to all floors and serves as the communicative heart of the complex. Smaller distributed atria punctuate other areas of the building away from the atrium and define more local neighborhood groupings. Jacobs conducted the laboratory planning for the project.

The SEC integrates a highly progressive sustainability agenda. The façade design calibrates the scale of the SEC, creates an identity for the complex, and plays a crucial role in the energy performance and occupant comfort in the building. Ventilation rates, typically the strongest driver of laboratory energy consumption, were scrutinized as part of a comprehensive risk assessment to determine appropriate air flow for all spaces in the building, with the goal of reducing ventilation rates by as much as one-third without sacrificing occupant safety.

In non-laboratory spaces, a comprehensive natural ventilation system circulates fresh outdoor air throughout the building interior without the need for energy intensive fan systems. The building atria in combination with highly glazed interior partitions transmit daylight deep into the building footprint.

Joan and Sanford I. Well Neuroscience Building, University of California San Francisco, San Francisco, CA – Laboratory of the Year 2022

photo@Tim Griffith

The *Joan and Sanford I. Weill Neurosciences Building,* is a landmark, exciting and transparent edifice at the Mission Bay Campus of the University of California San Francisco (UCSF).

This new center integrates research, diagnosis and treatment of neurology and psychiatry. Its program challenges the traditional boundaries of research, blurring the lines and fueling connectivity between research, clinical and education to complete the cycle of bench to bedside to breakthrough.

This six-storied plus penthouse, 282,900 GSF building provides flexible laboratory spaces that consolidate research typologies with high quality, sensitive, efficient, and flexible clinical spaces. SmithGroup with Mark Cavagnero Associates, San Francisco were the architects and Jacobs and SmihGroup were the lab planners for the project.

Safaram CheM-H and Wu Tsai Neurosciences Institute, Stanford University, Stanford, CA - Lab of the Year 2023

As an inter-disciplinary, flexible, collaborative, and transparent complex, Stanford's *Sarafan Chemistry, Engineering and Medicine for Human Health (ChEM-H) and WuTsai Neurosciences Institute (SNI) Buildings* serve as a gateway and a catalyst between the School of Medicine, the School of Engineering and the Schools of Humanities and Sciences. This two-storied plus basement and penthouse, 231,883 GSF (21,543 square meters) research complex is strategically shared between the two Institutes and split into co-equal buildings that are connected by walkways and bridges. While the two buildings appear equal and similar from the exterior, the inside of each is finely tuned to the distinct programmatic needs of the respective Institutes. Research labs for both Institutes are designed to be flexible, reconfigurable, and highly customizable.

photo@Bruce Damonte

Together, the two buildings surround an elliptical courtyard serving as a communal space and social heart of the two Institutes. A common interior “living room” surrounds the ellipse, with a continuous exterior terrace on the second floor wrapping around the garden courtyard below. The common spaces of the complex on the first-floor act as a magnet to draw the Stanford community to the west side of campus. These amenities include a pub, multi-purpose meeting space, and specialty lab programs.

Ennead Architects LLP, New York, NY were the architects and GL Planning + Design, San Francisco, CA were the lab planners for the project.

In closing, as a past member of the SEFA Advisory Board I felt it to be important to document the *Laboratory of the Year* history. I would like to thank everyone that helped me to collect information, including web-based sites such as Wikipedia and others. I believe that as we aim high, these are the perfect departing words:

> *“It is not the goal of this competition to honor all outstanding laboratories. Rather, we hope to encourage architects and researchers who may be involved in the planning and design of a research lab to work together to approach as near as possible the accomplishment of the unobtainable perfect laboratory.”* – *Robert R. Jones, Industrial Research and Development Magazine.*

About the author

Victor J. Cardona is a retired architect and laboratory designer based in Michigan and Florida. He served as a senior planner, vice-president, and Director Laboratory Planning Group for SmithGroup. A past member of SEFA’s Advisory Board, he has been a past judge in the LOY competition. He has published many laboratory-planning articles and presented them at national and international forums. His projects have been recognized by multiple entities, including four LOY awards. He now spends most of his time sailing Lake Michigan.