



ENGINEERING
PROGRESS

*The Revolution and Evolution of
Working for a Safer World*

THE INSPIRING STORY OF UNDERWRITERS LABORATORIES

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by Keith Williams, President and CEO of Underwriters Laboratories

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Dedicated to the employees of UL, past and present, who continue their unwavering, steadfast, and passionate commitment to making our world a safer place.

—FOREWORD—

By Keith Williams

In the century and decades since its founding, Underwriters Laboratories has stood the test of time while countless good organizations have come and gone. It's a pretty amazing thing when you stop and think about it. UL has flourished because nearly every UL president, leader, and employee has stood by the values UL's founder, William Henry Merrill, insisted on: "know by test and state the facts... with a purpose to serve public safety." The proof of these statements is found within the pages of this enjoyable and well-documented book, *Engineering Progress*.

These pages show how UL did it, and why. They prove that we stood watch by engineering progress, guarding and enhancing safety, security, sustainability and health, beginning with the advent of electricity through World War I, the Great Depression, World War II, the Baby Boom, the Internet of Things, and beyond. UL has always gone about its business quietly and has rarely received the fanfare and business magazine cover articles its record and impact has merited. UL engineers and scientists have contributed in countless ways to the design and production of the technological wonders that changed the world. These surely are some of the reasons UL encouraged people over the decades to write their own histories, why we support our corporate archives team, and why we honor our employees through the William Henry Merrill Society. It is why preserving UL's history

is a non-negotiable responsibility of this president and, I'm sure, those who will come after me. We not only preserve UL's newsletters, correspondence, and annual reports, but our work has also been recorded in books ranging from Harry Chase Brearley's *A Symbol of Safety* published in 1923, to Gene Bockmier's 1993 *History and Reminiscences of Underwriters Laboratories on the West Coast*, to the 1964 book by our fifth president, Merwin Brandon, *Reminiscences of Underwriters' Laboratories*, and *The Disaster Experts* by Scott Gabriel Knowles in 2011.

However, *Engineering Progress* is the most comprehensive and authorized history of UL from its earliest days. It records UL's accomplishments, failures, and unsung heroes in an easy-to-read narrative and places them in social context. Life at UL typically requires a hectic pace, which tends to crowd out the time we need for reflection and discussion about the role our organization has played in the U.S. and in nations around the world. We refrain from thinking about how much we're needed, and how many people we ultimately protect from harm. History matters. Niccoló Machiavelli (1469-1527), an Italian Renaissance historian, philosopher, and humanist wrote: "Wise men say, and not without reason, that whosoever wished to foresee the future might consult the past." It is with knowledge and wisdom gained from our history that we may together best address our future and the future needs of society.

While history inevitably cannot capture the individual contributions of the tens of thousands of outstanding employees at UL over the decades, it can and must document and illustrate our shared achievements and struggles. In reading *Engineering Progress*, I realized UL has always added up to more than the sum of our people and laboratories because of our extraordinary values, our commitment to the work, and our respect for the mission we serve.



William Henry Merrill (1868-1923) graduated from the Massachusetts Institute of Technology as an electrical engineer and later became founder and president of Underwriters Laboratories.

—CHAPTER ONE—

The Engineer and the World's Fair

APPLYING SCIENCE TO SAFETY, THE MOMENT THAT BEGAN IT ALL

We are doing something for manufacturers and buyers and users and property-owners everywhere—we are doing something for humanity.

—WILLIAM H. MERRILL, JR.

Founder and first President, Underwriters' Laboratories, *The Spectator*, 1913

If you walked through an Underwriters Laboratories' facility on any given day in the summer of 2016, you'd find an enormous array of products under testing. At UL's labs around the world, UL engineers and scientists are evaluating 3D printers for chemical effects on users, a robotic surgery device that allows surgeons to remotely perform minimally invasive procedures, and wearable medical devices for biocompatibility, safety, and security. They're testing dietary supplements for purity and potency, evaluating credit card processing systems for reliability, investigating wireless devices to understand

if they are emitting troublesome levels of electromagnetic radiation, and analyzing food for the presence of genetically modified organisms (GMOs). You'd find UL employees working with a consortium of government agencies, universities, and manufacturers to set up the testing and certification process for vehicle-to-vehicle smart auto systems.

This global sampling of UL's work represents a tiny sliver of the research, testing, certification, auditing, inspecting, standards writing, and advisory services being performed by the safety science engineering organization. It also reveals symbols of our lives as we live them now—from the most ordinary objects we depend on but barely notice, to the extraordinary innovations of twenty-first century technology.

As of 2016, UL is a global corporation with 170 facilities, 4.5 million square feet dedicated to public safety, and 13,000 employees worldwide. It oversees more than 1,500 safety and guidance documents and runs close to 100,000 product investigations a year.

The origins of this organization are integrally connected with the birth of late nineteenth century technology that helped create the world we know today. And amid the rapid development of products and new technologies—from electric light bulbs to additive manufacturing—Underwriters Laboratories devoted itself to ensuring that humans would be safer through applied science and engineering. Since its beginnings, UL has prevented untold thousands of injuries and deaths and partnered with generations of businesses, experts, and scientists to develop effective safety standards, and continues to do so. The moment that began it all is remembered as much for violence and death as for its splendor.

The White City and the Dawn of Safety

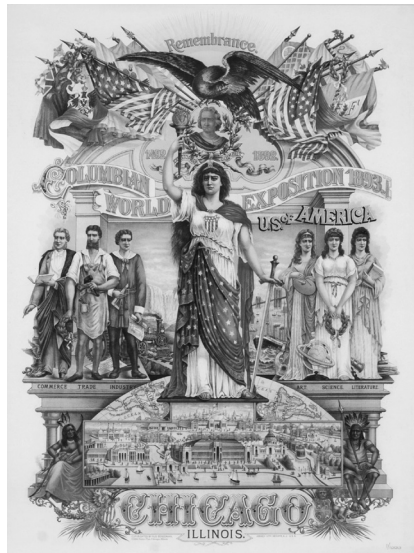
The nineteenth century brought the birth of modern science in an unforeseen explosion of invention, discovery, and advanced learning that had major application to human lives. Steel, electricity, steam engines,

railroads, the incandescent lamp, telephones, and new induction motors came to be. Louis Pasteur developed pasteurization for foods and made the first vaccine against rabies. Dmitri Mendeleev produced the modern periodic table of elements. Inventors started to experiment with machines that could rapidly calculate numbers. The hearth was replaced with the gas stove and coal burning furnaces, followed by endless new products and inventions for the home from the washing machine and sewing machine to gadgets like the eggbeater and can opener, and new unimagined processed foods.

For some it was a time of great exuberance. It seemed that science would eventually eliminate hunger, disease, and human suffering. It was a time of boundless hope as the professions of science surged ahead.

These forces also fueled the Industrial Revolution, and by the late 1880s the United States was in the middle of an unprecedented transformation. Immigration, urban factories, new housing, and new jobs led to huge leaps in city population growth. Workers earning regular wages resettled their families in an increasingly urbanized world. In cities, trains and trolleys clanged through the middle of streets while horse-drawn trucks and carriages maneuvered for space, leaving pedestrians to weave their way through horse droppings and sidewalk awnings. Technology's utopia was still a long way off.

Citizens needed health care, education, and transportation; government scrambled to deliver to keep their working classes working. In



An advertisement for the World's Columbian Exposition (1893). Photograph credit: Getty Images



Future UL President William Henry Merrill worked as the assistant electrical inspector at the Boston Board of Fire Underwriters in 1893.

New York City, by the 1890s, elevated trains carried 850,000 people per day and the first subways were under construction. Washington, D.C. had formed a unified city government, approved large-scale infrastructure projects, and in 1901 formed the MacMillan Commission to redevelop and beautify the National Mall. Chicagoans rebuilt their city after the 1871 fire, and their architects were designing some of the nation's first skyscrapers.

Progress also brought a sense of competition among nations. American business and political leaders envied the success of “World’s Fair” events at England’s Crystal Palace in 1851 and the Exposition Universelle in Paris where the triumphant new Eiffel Tower symbolized French superiority. American leaders wanted their own World’s Fair to trumpet the nation’s achievements and provide a focal point for the yearnings and fears of urban populaces unsure about their fate in American life. It was decided that a new Exposition would be organized around the theme of the 400th anniversary of Columbus making landfall in the New World. The cities of Chicago, New York, St.

Louis, and Washington, D.C., all feverishly competed for the honor of being host. Industrialists and financiers trumped each other with ever-larger financial sponsorships to sway the voting board that would award the Fair. As Chicago Fair historian Robert Rydell noted, "It was clear that the U.S. Congress would have to decide where the fair would be held and that the principal contenders, by virtue of their superior financial resources, would be Chicago and New York." Ultimately, Chicago came out on top. The Fair was titled the World's Columbian Exposition and it would become a defining moment in Chicago's history, the history of the United States as a whole, and important to our story of the beginning of Underwriters Laboratories.¹

The Exposition's leaders named architects Daniel Burnham and his partner John Root as Directors of Works, responsible for designing and building the structures and entertainments of the Fair. The partners hired the noted urban landscape architect Frederick Law Olmstead to turn Chicago's Jackson Park into a magical urban oasis for their design. The eyes of Chicago's (and the rest of the world's) most powerful people were watching them.

That same year, 1,800 miles away in Cambridge, Massachusetts, William Henry Merrill, Jr. was graduating from the Massachusetts Institute of Technology (MIT) and most likely paying little attention to the early spin of the World's Fair hype. The son of a prominent newspaper editor, Merrill was an energetic, articulate, and curious student with a strong interest in the many rapidly developing fields of science.

Merrill bore the influence of the lively, intellectual household in which he was raised. Merrill's father worked as a journalist, editor, and publisher, and took numerous public roles in business, government, and civic life, reflecting a keen interest in public service.

Merrill was one of 21 students in his class at MIT who had taken courses in electrical engineering, a program that had only recently been established in 1882, one year after Thomas Edison first illuminated the

Hinds, Ketchum & Co. lithography business in Manhattan.² The dawn of the electrical age had arrived, and MIT was leading the way. Almost no one working in the U.S. electrical industry at the time had the science and laboratory training that the MIT program provided. Young Merrill was ready to lead in the emerging industry.

After graduating, Merrill used his new degree to get a job as an electrical inspector with an insurance association, the Boston Board of Fire Underwriters. It was here that he got the idea that a service was needed to keep up with the dizzying pace of new electrical inventions and materials. For Merrill, the infant industry could squander the promise and power of this technology—with serious consequences for human health—if manufacturers and contractors failed to create a process for safety and production standards. Merrill urged his employer to get involved in a comprehensive system for examining and testing equipment for safety before its release to the public. His pitch failed to get traction, and the Boston Board turned him down.³ Nevertheless, he was destined for greater things.

In January 1892, Chicago Exposition Director Daniel Burnham was feeling the pressure. While progress had been made at the Fair site in Jackson Park with construction of a few major buildings, labor, safety, and financial challenges mounted. As Erik Larson wrote in *The Devil in the White City*, “there was tumult. Wage reductions and layoffs stoked unrest among workers nationwide. ... A rising union man named Samuel Gompers stopped by Burnham’s office to discuss allegations that the exposition discriminated against union workers. ... but what most concerned [Burnham] was the fast-shrinking treasury of the Exposition Company. In advancing the work so quickly and on such a grand scale, Burnham’s department had consumed far more money than anyone had anticipated.” By March 1892, Burnham had only half a year until Dedication Day and he ordered builders to double their workforces and erect electric lights for night work.⁴

Despite the overtime, the Exposition was not completed in

its entirety for the dedication in the fall of 1892. Even by President Grover Cleveland's appearance for its Opening Day on May 1, 1893, major installations including the Midway and Ferris Wheel needed to be finished. But by then Chicagoans and the larger world had seen the Fair's size, scope, and architectural grandeur.

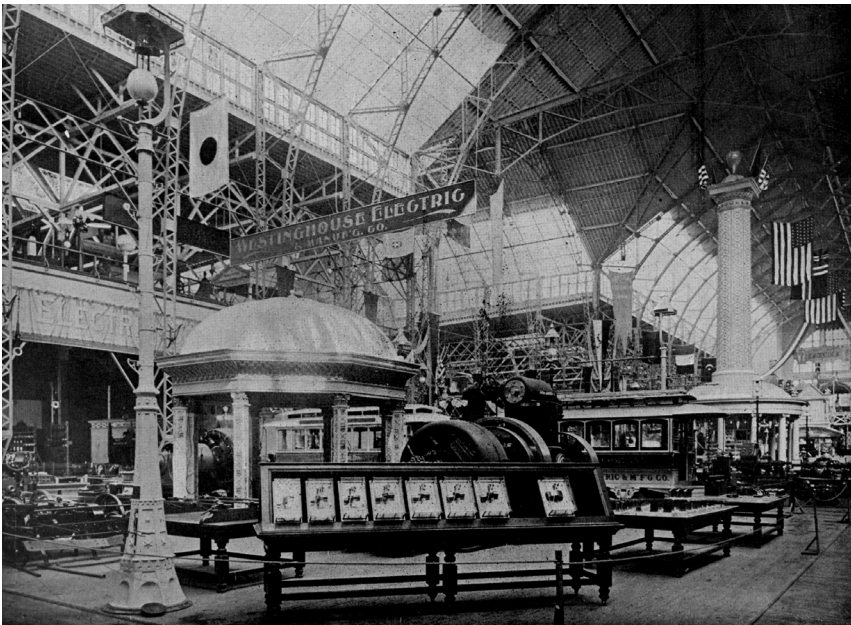
The official name was the World's Columbian Exposition, but under Burnham it became known as the White City. "To build it Burnham had confronted a legion of obstacles," Larson wrote, "any one of which could have—*should* have—killed it long before Opening Day. Together he and his architects had conjured a dream city whose grandeur and beauty exceeded anything each singly could have imagined."⁵

By the end of June 1893, Fair attendance was rising, hotels were filling, and news accounts were glowing. The popular Roof Garden Café on the roof of the White City's Woman's Building served 2,000 people a day, and janitors could not keep up with the garbage, which became fetid under the Chicago summer sun.

Planners, architects, and social critics readily noted Burnham's achievements in the White City, especially his commitment to erecting a coherent urban space that was served well by the technologies of construction, transportation, power, and light that were making and remaking the real cities of industrializing America. Yet while the White City presented itself as a model of reasoned planning, it too reflected the very impulses that had built industrial Chicago. Beyond the fairground gates, a "heavy pall of smoke brooded over the city," and "the chimneys of a blast furnace belched their red flames high into the darkness," one fairgoer recalled.⁶ The dangers of fire, crime, and chaos that hung over the Black City crept into the utopian world of Burnham's creation. Beneath its brilliant facades the White City was a fire disaster waiting to happen.

Who Will Insure the White City?

Underneath this plaster city snaked miles of electrical wires and connections, an electrical infrastructure unmatched in any real city in the world at the time. Concerns over this new and untested technological system—the electrified building—and the flammability it presented led the fire insurance companies contracted to underwrite the fair to consider denying coverage for the fairgrounds in 1892.⁷ The financial and human losses from the Great Chicago Fire of 1871 were seared into their minds. The Exposition’s Palace of Electricity agitated the underwriters most of all. Here, Burnham’s builders had snaked a frightening criss-cross of untried electrical hookups in close proximity to the flammable façade of cheap jute and plaster. This threat led Burnham to beef up the fire department and water delivery infrastructure at the fair, and to adopt a more rigorous inspection regimen than he had initially planned.⁸



An interior view of the Palace of Electricity, a structure erected for World's Fair Columbian Exposition.

Photograph Credit: Shepp's World's Fair Photographed (1893)



Fire insurance companies wanted to deny insurance coverage for the fairgrounds due to dangerous electrical hookups located in close proximity to flammable materials. W.H. Merrill was charged with reviewing the wiring and exhibits in the Palace of Electricity (pictured above) on behalf of the insurance agencies. Photograph credit: Photographs of the World's Fair (1893)

The Chicago Underwriters' Association and the Western Insurance Association Electrical Bureau—both National Board of Fire Underwriters (NBFU) local affiliate underwriters' organizations—decided to contact their counterparts in Boston for additional outside expertise. The Chicagoans liked what they heard about a respected young electrical engineer already making a name for himself in the Boston region. William H. Merrill, Jr., was soon on his way to Chicago.⁹

The underwriters charged Merrill with reviewing the wiring and exhibits to make sense of the electrical fire risks that the Palace of Electricity and the White City presented, including the fire alarm system and electrical components. Burnham and the electrical manufacturers jumped on board. Thomas Edison was said to have looked on with envy

and trepidation as his competitor Westinghouse wired the Fair with alternating current. (Edison believed direct current to be much safer.)

Merrill arrived and immediately went to work. He made notes as he followed the fire patrols around the Fair site. Merrill took an interdisciplinary approach, “bringing together the skills of scientific bench-level analysis with an engineer’s understanding of technological systems, and a businessman’s attention to profit and loss.”¹⁰ At least in part as a result of Merrill’s inspections, the underwriters went ahead and wrote policies for the Fair.¹¹

As events would show, electrical blazes, although held to a minimum, persisted. Tragedy and fire found their way into the White City. In the summer of 1893 a fire in the Cold Storage Building led to the death of twelve firemen, most of whom fell to their deaths as a smokestack collapsed while thousands looked on in horror. An investigation showed that the design of the smokestack was flawed, and the firemen’s lives had been unnecessarily lost.¹²

As is now widely known, Patrick Prendergast assassinated Chicago’s Mayor Carter Harrison just days before closing ceremonies, and serial killer H.H. Holmes, who had used the Fair to lure his victims to their death, was captured and convicted. When the White City closed to visitors after a phenomenally successful run, playing host to 27 million people, its ghostly buildings remained a source of fascination in Chicago, the grounds becoming a squatters’ metropolis as the economic crisis of 1893 continued into 1894. In July that year a fire sprang up that quickly grew out of control. The fire department looked on helplessly as the White City was engulfed by a massive conflagration, a large disastrous fire. To many who watched, it was a fantastic ending to a season of spectacle. Legend had it that the flames were visible from as far away as Milwaukee.¹³

For William Henry Merrill, the Fair became a far more auspicious and life-affirming moment.

Merrill became acquainted with many of the electrical equipment

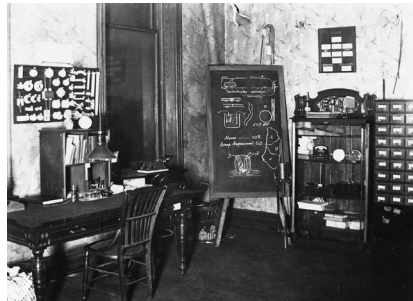
producers and contractors during the Fair. In the aftermath of everything that had occurred, they began talking to him about how to confirm the safety of their new technology. Merrill saw his opening and seized it. Backed by the stock fire insurance underwriters and some of the electrical equipment manufacturers, Merrill founded the Underwriters' Electrical Bureau in Chicago.¹⁴

UL's First Laboratory

The underwriters tasked Merrill's new organization with safety testing electrical products including the arc lamps, sockets and switches, and wires that had made their world debut at the White City. He hired three assistants: William Boyd, Edward Teall, and William C. Robinson, "a Cornell graduate working as an automatic sprinkler inspector for the Chicago Board of Underwriters. Robinson was working on acetylene gas, which had been discovered in 1892 and was being used for illumination and welding, displaying utility but also a propensity to explode."¹⁵

As documented in UL corporate papers, UL's founder first leased space for the new lab on the third floor of the Fire Insurance Patrol Station No. 1 on Chicago's Monroe Street, assembling a testing station in the same room that also served as a hayloft for the salvage corps, who kept their horses stabled below. Office life was not air conditioned. Every work day Merrill and his men not only breathed the soot and smoke of factories and trolley cars, but the grassy pungent dust of hay mixed with the scent of horses. To prepare the lab, his team laid a heavy, Georgia pine floor, and installed a bench along the west wall. William S. Boyd built the testing apparatus, employing nothing more than a toolbox of basic electrical tools.¹⁶ But Merrill and his men had the basics: UL was a startup standing on its feet.

The new lab's first official test analyzed a type of asbestos paper, a "Noncombustible Insulation," that claimed to be both fireproof



In 1894, the Underwriters' Electrical Bureau was founded in Chicago by William Henry Merrill. Merrill leased a space above the Fire Insurance Patrol Station No. 1 on Monroe Street and outfitted it with a heavy pine flooring, benches, tables, and testing apparatus.

and nonabsorbent. Merrill conducted the test, and concluded that the paper was indeed fireproof, but that asbestos “cannot be considered a non-absorptive or an insulating material.”¹⁷

UL published a *Manual of Instruction for Preparation of Reports* in June 1911, that provided the template for preparing inspection reports of that time and into the future. “The report featured a number of key

Underwriters' Electrical Bureau.

LABORATORY RECORD.

No. 1 Rec'd March 24 1894 Ret'n'd 189

Device to be used as a Noncombustible Insulator

Known as the Asbestos paper claimed to be a non-absorbent
non combustible insulator.

Submitted by Mr. Shields

Invented by " "

Manufactured by

Sold by

Test by Merrill Exp't. March 24 1894

Weight of material 6 oz.
 " " " after 1 hour immersion in H_2O at
60° Fahr. = 8 oz

Weight of water absorbed. 2 oz.
 Per cent increase 33 1/3.

Held in gas flame 5 minutes. Could not be made to
 support combustion.

Conclusion: Asbestos cannot be considered a non-
absorptive or an insulating material. It may be
considered non combustible or fire resisting.

The Lab's first official test report was issued on March 24, 1894, and signed by W.H. Merrill. This product, asbestos paper, failed to meet the Lab's rigorous standards.

sections, including an introduction, a description of the device, the claims made for the device, the object of the investigation, the general plan of investigation, the examination and test record, the record in service, improvements, and conclusions.”¹⁸ The first section of the guide calls for “Introductory” material, but surely reflecting the engineer’s passion for data and facts, it reads, “This section is usually unnecessary and will be omitted in most cases.”¹⁹

The work of UL, the NBFU, and other fire prevention experts at the time helped lead to the popularity of asbestos in housing and school

construction. While asbestos later was proven deadly to those who inhaled it during mining, manufacture, or removal, it saved many lives because of its widespread use in construction. During this era, UL was routinely involved with some of the earliest tests of building materials and assemblies in the United States.²⁰

With the reports on electrical fires and the success of Merrill's general approach to compiling test reports, the NBFU started contributing to the work, and the name was changed to the Electrical Bureau of the National Board of Fire Underwriters. Working within the organizational structure of the NBFU, Merrill had access to hundreds of insurance companies and cities and thousands of individual risks. Though it would take a few years for Merrill to exploit the possibilities inherent in his access to a national audience of fire safety expertise, the immediate result was a dramatic increase in testing output. In 1895 Merrill and his small team completed 75 tests on a budget of \$3,000.²¹

Merrill hired H.B. Squires, the son of the superintendent of inspections for the Chicago Underwriters' Association, to take care of mailing lists. By doing so, Merrill was able to "build up a local network of underwriters who might be interested in the work of the lab."²² Squires also worked as a photographer to document product testing, which resulted in a rich and growing collection of illustrations to use in connection with a Laboratories' report.²³ Merrill and his loyal lieutenants typically worked into the late evening. "This was done very willingly," William Boyd wrote, "especially as Mr. Merrill usually worked with us and when supper time came we would adjourn to the old Grand Pacific Hotel lunchroom."

As became the case through UL's history, amateur experts volunteered their own suggestions. For example, according to Boyd, "a man drifted into town one day with a number of small metal-inclosed [sic] torpedoes which were to be placed at intervals throughout a building and connected by hemp, the idea being that the hemp, during a fire

would become ignited and would carry the fire to the torpedo which would explode and give the alarm.”²⁴

Early on, Merrill saw the power of popularizing the laboratories' work. Not long after the lab was underway, he decided to give a reception for prominent local fire underwriters, especially those who were funding his operation. A number of fire demonstrations were staged. Some of the demonstrations were intended to show the dangers of electricity in the home.²⁵ In one, for example, Merrill's team demonstrated how quickly incandescent light bulbs set paper lamp shades on fire. Another exhibit demonstrated how electrical current burned holes in metal pipes. UL also displayed the decorative wooden Indian head which had caused a fire in the old Grand Pacific Hotel.²⁶

New Century, National Momentum

In the early 1900s, Merrill saw the laboratory over the fire station was ready for a bigger stage. He incorporated the “Bureau” as Underwriters Laboratories, Inc. under the laws of Illinois, with the state granting a charter “to establish and maintain laboratories for the testing of appliances and to enter into contracts with the owners and manufacturers of such appliances respecting the recommendation thereof to insurance organizations.”²⁷ During the next decade and a half of growth, Merrill and his men made at least five decisions that stood the test of time over more than 100 years. These include making a priority of safety demonstrations, funding public education, convening peer experts, establishing a national network of testing facilities, and inaugurating a label and certification protocol.

Merrill showed his vision for nationalizing the lab's testing role through work with sprinkler testing. He later remembered working on the first sprinkler test with William Robinson, and “the fear we had that [our findings] would be shot to pieces by our learned confreres in the East.” According to Merrill:

We used to sit up nights and go over them page by page to be sure that they were as nearly bombproof as we could make them. . . . When we sent them out and nothing happened except that the manufacturers of some of the then standard sprinklers we criticised (sic) came to pay their respects and began making the improvements indicated by the reports, we were immensely pleased with ourselves and decided that if we could test automatic sprinklers to the satisfaction of insurance engineers and manufacturers, there might be no limit to the extent of our activities.²⁸

As time went on, Merrill and Robinson began meeting with local fire safety experts to hear about new developments in fire prevention.²⁹

Another key moment occurred just a few months before incorporation, when Merrill became a member of the National Fire Protection Association (NFPA), initiating a partnership that thrives today. Over the decades, the NFPA incorporated UL's testing data and conclusions into codes and standards, and partnered with UL on public education, outreach, and lobbying. Signifying the importance of the partnership, Merrill served the Association as secretary-treasurer from 1903-1908, and president from 1910-1911, where he was responsible for numerous policy changes.

The decade took another positive step when the NBFU substantially increased their financial commitment to UL, allowing UL to secure a construction site on East Ohio Street and begin building a three-story testing laboratory that used the latest fireproofing materials and standards. The lab provided a public demonstration to architects, contractors, and citizens of the possibilities of safety construction, while providing a significantly large building site that supported expansion of the UL facilities as it grew.³⁰ The fireproof laboratory proved to be a great success. The new building on East Ohio Street served as UL's headquarters until 1979. It was designed by architect Argyle Robinson, brother of UL's Chief Engineer at the time, William C. Robinson.³¹



William Colin Robinson, Vice President and Chief Engineer, spearheaded UL's growth from purely electrical testing to work in acetylene equipment and early fire protection testing.

UL further formalized its partnership with the NBFU and NFPA in 1914 through a memorandum of understanding, directing that the three would “continue to co-operate in preparing regulations for the installation of devices and apparatus having a bearing on the fire haz-

ard.” The three organizations divided the work; UL alone determined the technical “suitability” of “devices and apparatus” and what was defined as work of NFPA and NBFU.³²

UL financially split from the NBFU in 1917, and focused its work on product testing for manufacturers. UL’s model charged manufacturers fees to have their products evaluated. This pivotal step in UL’s history was important because it meant UL controlled its own client list and credibility; clients paid whether their products were certified or not. By testing similar products multiple times a year, UL developed “minimum standards that every product of a certain type—from electric irons to roofing materials—needed to meet to earn the label.”³³

The funding relationship caused a good deal of anxiety for both UL and the NBFU. C.F. Shallcross of NBFU and Merrill exchanged tense correspondence. Shallcross worried about “the necessity for saving the National Board, so far as possible, from being made a party to suits and controversies, as, for example, the wire controversy, the hose suit, and the Milburn Acetylene suit.”³⁴ Merrill protected UL’s integrity like a courteous pit bull and wanted UL to be independent of what some outsiders perceived as NBFU’s agenda. He wrote:

I know of no other business that has contributed a quarter of a million dollars to any enterprise having the public welfare chiefly in mind. The life insurance companies have not established any laboratories for the certification of milk, spring water, or food products. . . . The railroads have not thus far contributed any such sum to the establishment of laboratories for the prevention of accidents on their lines. No group of public utility corporations, among which insurance companies are coming to be classed, has established any such commendable foundation.

I am not at all in sympathy with the press notices, which have gone out from Mr. Mallalieu’s office, indicating that the National Board makes large annual contributions to the support or the operation

of Underwriters Laboratories. ... They will not bear analysis when compared with the financial statements, which have been published in connection with our reports to the National Board; consequently some of them must ultimately act as a boomerang.³⁵

The Label Service and Branch Offices

In these and other decisions, Merrill progressed in making UL a national institution. Among the most far-reaching was the inauguration in 1906 of a label service to certify individual products that met the standards tested by UL's investigations that were carried out in the laboratory and on the assembly line. The label became a certificate of character awarded to an inanimate object.³⁶

The UL label, known worldwide in the twenty-first century for its incorruptible credibility and the resulting economic value offered to insurance underwriting and efficient markets, proved its worth in these formative years. Between 1915 and 1923 the annual output of UL labels increased from fifty million per year to fifty million *per month*.³⁷ The labels were awarded as part of a ruthlessly rigorous process. It began with initial laboratory testing of the "beta" or product sample, included follow-up site visits by UL inspectors to the manufacturer's factory, review and approval of the findings of engineers by UL-convened councils of experts. Additional protocols included the production of a custom handbook for the inspector and manufacturer to follow when examining lots of sample manufactured goods.

The inspection and label services soon required that Merrill open branch offices for UL's growing number of inspectors, and by the early 1920s UL examiners visited thousands of factories from 68 different cities. The New York City inspection office was the first, busiest, and most important of the product inspection offices and encompassed a territory stretching from southern New Jersey to Bridgeport, Con-

necticut. Dana Pierce was named Vice President in charge of the New York office in 1912. Even as early as 1907, UL experts in New York were having an impact. UL engineer Hugh T. Wreaks was asked by New York City officials to prepare a report on the causes and need for changes to prevent pier fires along New York's waterfront. His report made the front page of *The New York Times* on June 2, 1907.

In 1921, William H. Merrill established a Canadian branch in Toronto, Ontario, patented and chartered as Underwriters Laboratories of Canada (ULC). Prior to the charter, UL performed testing and follow-up inspections in Canada on a modest scale of \$20,000-\$30,000 per year. The underwriting and insurance industry in Canada welcomed this greater commitment which Merrill and the Board believed would increase the use of UL's services.

For a number of years, ULC provided inspection services at Canadian factories, but laboratory tests on devices and materials were performed in the United States. This practice remained in place until after World War II.

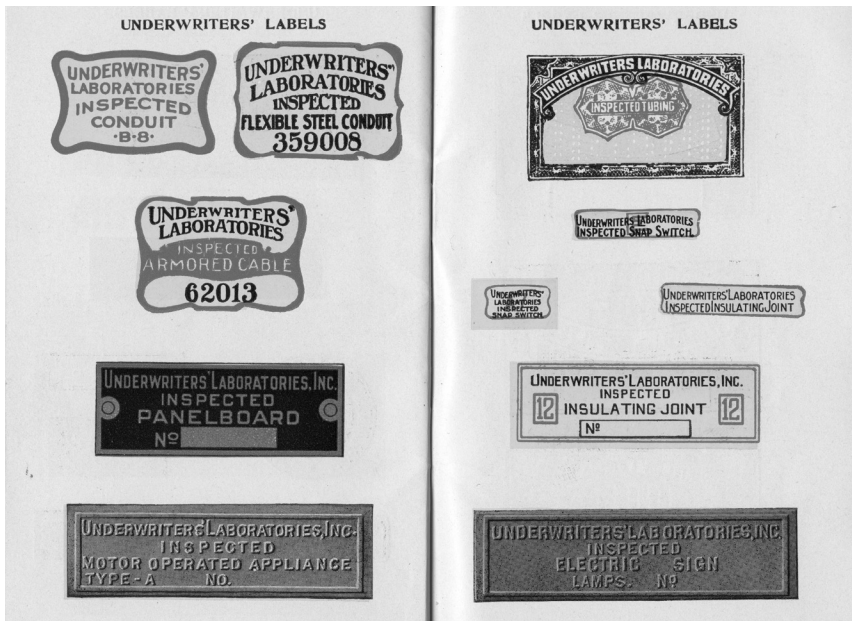
Inside the Early Testing Process

How did UL design its now famous testing protocol in those first decades? First, "manufacturers would apply for a test and file a description of the device for test, and UL would then say how many and what sizes should be submitted. For large devices, usually one test device was sufficient. For

UL Evolution: Underwriters Laboratories of Canada chartered in 1921

"To establish and maintain laboratories and an inspection service for the examination and testing of appliances and devices and to enter into contracts with the owners and manufacturers of such appliances and devices respecting recommendation thereof to insurance organizations and others..."

Canadian Government Letter of Patent



Examples of early UL labels can be found in the publication *General Information in Reference to the Organization, its Purpose and its Methods* (1913).

smaller devices, often many would be tested. In some cases, with extremely large machines, like industrial steam boilers or generators, UL inspectors would go on-site for tests, with manufacturers paying the cost of travel.

“Time for tests ranged from ten days to six months. In 1916, the average time was one month. When finished, if the results were favorable, they were sent out to the UL branches and the insurance organizations subscribing to UL’s bulletins. The bulletin and the complete report were given to the applicant. About half of products submitted passed, and UL took pride that they did not serve as consulting engineers for failed products. The manufacturers could consult the safety standards related to their class of goods, and in many cases minor changes to a product might gain UL approval and a follow-up test. Of course, the manufacturer had to be willing to pay, pass or fail.”³⁸

Testing occurred in a variety of locations within the UL complex. In describing their methods, UL engineers boasted that “some things

we test by explosion, some by corrosion, some by weathering; some by flame and artificial hurricane, as in the case of roofing; some by collision, as with automobile bumpers; some by heating and dropping, as with safes.”³⁹ Another UL engineer stated his philosophy of testing a bit more simply: “we give it hell.”⁴⁰

Engineers used standardized language to record test results. In the 1911 *Manual of Instructions for Preparation of Reports*, a standard terminology was proposed for the lab work. The subject of the report was termed “The Device.” Other “appropriate” terms included “Material, Apparatus, Equipment, Product, Machine, Article System, Appliance.” The client was the “Submittor”; if the device was seen regularly, the client could be listed as a “Manufacturer.”⁴¹

Such regimentation in recording tests and results was deemed necessary considering that many products would be tested multiple times. It was also, perhaps, yet another method of demonstrating to UL’s patrons the thorough work done by the testing engineers.⁴²

By 1911, UL’s New York operation expanded to a new facility solely for its electrical testing. As Merrill wrote in *The Spectator*, “In

UL Evolution: The Label Service 1916-1923

Above all considerations, UL protected the integrity of the label in certifying that the product had met the Laboratories’ standards for reducing hazard when used. This was essential considering the role of the label in evaluating insurance risk, Merrill’s sense of public mission, and the sales value of UL’s label. Label certification was only reached after a combination of steps including:

- ▶ Preliminary conferences with manufacturers;
- ▶ Extensive laboratory testing replicating conditions that the product could conceivably undergo in the field including extreme, harsh conditions to determine the product’s failure point;
- ▶ Evaluation by appropriate UL Council of experts;
- ▶ Reexamination services consisting of follow-up tests of appliances at least once per year; and
- ▶ Label service including a local inspector, custom handbook, step-by-step checklist review of the first lot of goods followed by regular factory inspections.

1911 the volume of our electrical business coming from east of the Appalachian Range made apparent the necessity for an electrical testing station in the East, and this we located as near as possible to our New York office, leasing a floor of one of the Edison buildings on Vandam Street, where electrical energy is available in various forms.”⁴³

Convening Councils and Hiring a Workforce

In a decision historian Scott Knowles and others note as significant to the history of risk prevention in the United States, Merrill also nationalized safety by convening and giving authority to Councils “including recognized authorities of wide experience,”⁴⁴ many of them prominent insurance underwriters, who had no personal or business conflicts of interest. Merrill gave the Councils review and approval authority over the Laboratories’ findings. By 1923, UL had formed Councils in Fire, Casualty, Electrical, Automobile, and Burglary Protection. UL also built national consensus through industry conferences, where its engineers sought out manufacturers’ problems and questions, as well as ongoing public information campaigns.

As part of its public education efforts, UL published a monthly journal, *Laboratories’ Data*. Issues were packed with information including correspondence from Merrill and other leaders, technical data, reports on new test challenges (such as “elevator interlocks” to solve the issue

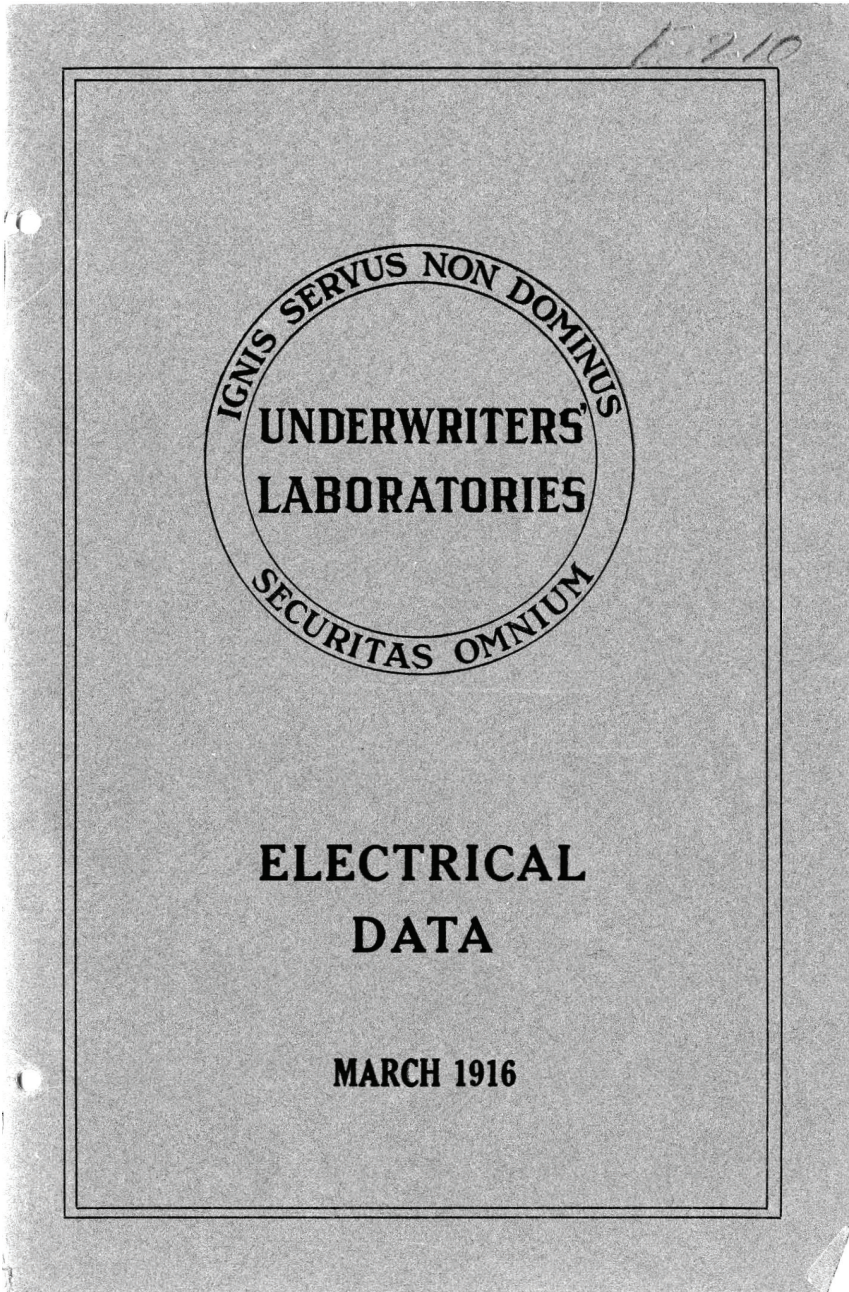
UL in the News

Front page, *New York Times*, June 2, 1907:

ENGINEER WREAKS ON PIER PROBLEMS

Varying Character of North River Bottom Presents Puzzling Questions. NO NEED OF COSTLY PIERS ...

Hugh T. Wreaks, engineer of the Underwriters’ Laboratories of this city, has prepared a report containing some interesting facts and figures on steamship piers, shed construction, and the conditions along the New York water front, in view of the heavy losses in pier fires in recent years.



An early example of UL publication *Laboratories' Data*, originally named *Electrical Data*. The newsletter was started in 1915, and changed its name in 1919 to reflect the larger scope of UL's business activities.

of people rushing closed elevator doors, written by N.R. White of the Casualty Department in 1923), quotes by UL executives, updates on expansion, and news about people's "comings and goings." The newsletters make for a rich, detailed archive of the work and relationships that characterized UL during the early decades of the twentieth century. They also make vivid the dangers of everyday existence in the United States. The newsletters recount accident reports in a section called "Fires and Accidents Reported due to Electrical Causes." At the time they were offered "as illustrating conditions of special interest" for the testing engineer and cautionary tales for consumers. Today they remind the twenty-first century reader of the safety we take for granted, in large part because of the early work of UL, the NFPA, the NBFU, and the national cadre of early twentieth century safety and fire experts. Some sample headlines from these hundreds of reports include:

- Laborer Electrocuted by Accidentally Striking 5,000-Volt Wires with Iron Bar
- Fisherman Killed When Steel Rod Accidentally Made Contact with High Tension Wires
- Lineman Killed by Touching Nearby Wires

3595. Injury Due to 4,000-Volt Circuit on Green Pole.

A lineman in climbing a green pole struck his right shoulder against one of the wires of the 4,000-volt alternating current circuit carried by the pole. With his left hand at the time in contact with one of the steps of the pole, current passed through his body and the pole to ground and in addition to a severe shock he received burns on his right shoulder and left hand.

3596. Received Fatal Shock Through Pliers.

A lineman working on a pole tried to push a wire of the high-tension side of an alternating current circuit out of the way while standing with one foot on the grounded supporting wire of a telephone cable. In doing this he used a pair of pliers supposed to have insulated handles. A bare part of the pliers came in contact with his hand. It had just been raining and the lineman's clothes were very wet. As a result of this combination of conditions his right hand and left foot were badly burned and he was shocked with fatal result.

3597. Touches Trolley Wire.

A night man in a street car barn attempted to pull down a trolley pole which had been left in contact with the wire. In doing this he came in contact with the trolley wire, received a severe shock, and fell to the floor of the barn and added some bruises.

Sample headlines from the March 1916 edition of *Electrical Data*.

During World War I, William Henry Merrill volunteered to serve as a committee chairman of the Fire Prevention Section of the War Industries Board, which assisted the assessment of fire risks in munitions and other industrial plants.⁴⁵

After World War I, by 1922, UL's board of directors had grown to 15 members and Councils ranged in size from 8 on the Burglary Protection Council to 48 on the Electrical Council. Alphonso Gray Dugan became a member of UL's Board of Directors in 1909 and was elected Chairman in 1921. Dugan, the Western Manager of the Hartford Fire Insurance Company, served UL in this capacity until 1938. The UL employee count reached well over 300 in eight departments: fire protection, hydraulic, gases and oils, chemistry, electricity and signals, casualty, aviation, and label service.

UL Diversifies from Fire Prevention and Suppression

Indeed by the 1920s, Underwriters Laboratories could look back on a remarkable generation of activity, having established itself as the leading safety testing laboratory. Merrill's founding vision had taken shape with the help of organizations from the fire insurance industry to the National Bureau of Standards. Merrill's humor, well-articulated and tireless sense of mission, and engaged demeanor inspired devotion among his employees. UL partnerships and consultations with associations and city and federal officials had resulted in voluntary registered standards including the electrical installation fire code, the National

Electrical Safety Code, and UL's own electrical standards code, the *Underwriters' Laboratories' Code of Standards for Construction and Test of Electrical Appliances*. Volume One alone of UL's national standards took up over 500 pages.

Officers and Board of Directors, 1923

Chairman: A.G. Dugan, Chicago

President: William H. Merrill

Vice President: Dana Pierce

For some time, the U.S. economy grew after the First World War. Westward expansion, continued immigration, population growth, and housing shortages all spurred business growth in commercial building, residential housing, and heavy industry. With better building and electrical codes in place, builders and manufacturers needed UL's intermediary role to help innovate new "safe" devices and components—and to test them when produced as well.

For UL, there would be no resting on laurels nor standing still, not while business and science pushed technological progress forward. "No sooner does some safety problem approach solution than there may appear on the market a new material or a new device that upsets calculation," Brearley observed in *Symbol of Safety*. "Of course, people do not set out to invent hazards. They are working for useful results, and the hazard is incidental, often unrecognized, until it discovers itself."



W.H. Merrill and W.C. Robinson had a vision for nationalizing the Lab's testing role. Here, unidentified engineers complete pioneering work in sprinkler testing (ca. 1910s).

Behind the lab doors of UL's fireproof fortress, the white-coated engineers tackled ever-increasing challenges. Over at the Department of Gases and Oils, UL engineers were dealing with how to safely produce, store, and use hazardous substances. This included testing primitive and dangerous acetylene generators and re-engineering gasoline storage at service stations. In the Department of Chemistry, engineers investigated the durability and resistance of fire hose and insulated wire. Burglary Protection certified new alarms and probed their resistance to break-ins. The Casualty Department verified dangerous devices for minimum acceptable hazards and determined whether safeguards were acceptable. It tested ladders, laminated glass, safety stairs, punch presses, and fire escapes. Additional departments were busy testing automobile parts and the hazards of aircraft operation and flight.

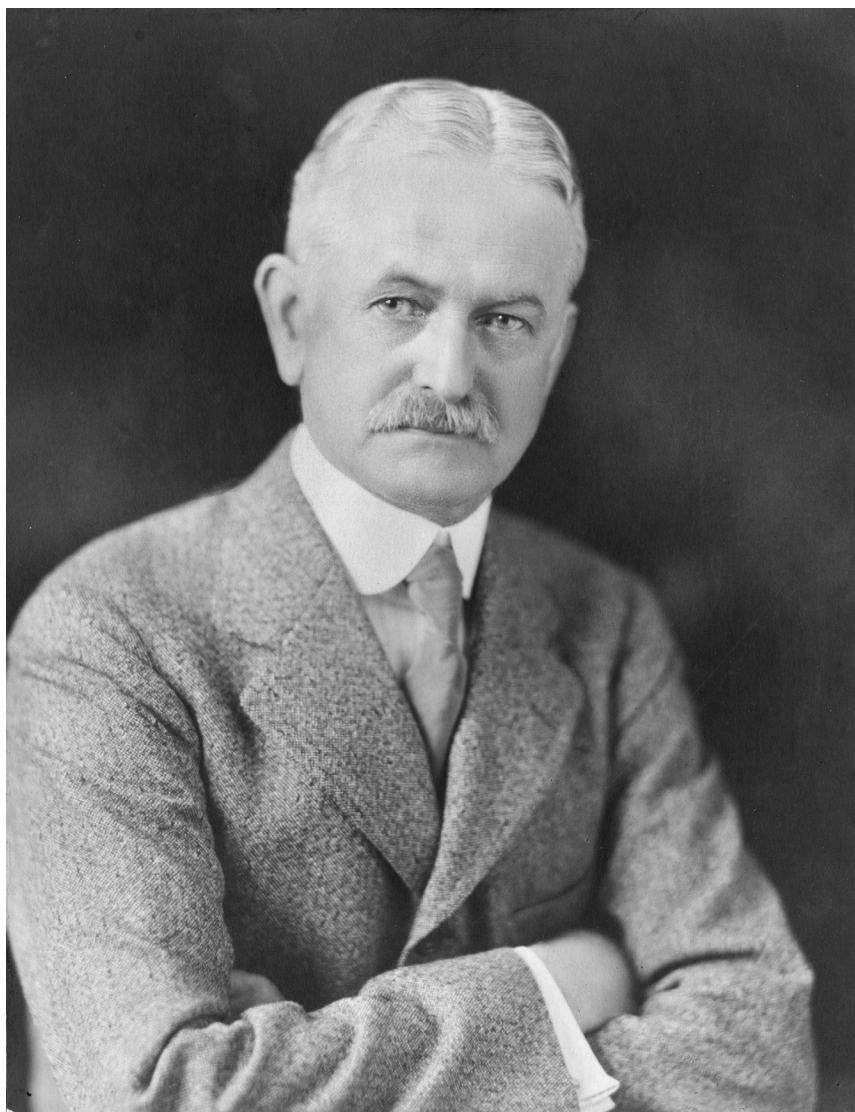
UL's national reputation spurred these diverse new assignments—many linked to the great challenge that defined UL's founding: the immense propensity of fire to consume life and property at terrifying speed in the presence of combustible conditions.



In 1900, Merrill relocated the Lab to a two-story, former brick schoolhouse at 67 East 21st Street, Chicago, Illinois (1901).



In 1912, Underwriters Laboratories established an office in New York City. By 1923, the office had moved to 100 Leonard Street.



A.G. Dugan was elected Chairman of UL's Board of Directors in 1921.



Bernard M. Baruch, an American businessman and philanthropist, thanked W.H. Merrill for his service on the Fire Prevention Section of the War Industries Board (1918).



Employees hard at work in the New York Office (1923).

—CHAPTER TWO—

The Inconvenient Menace

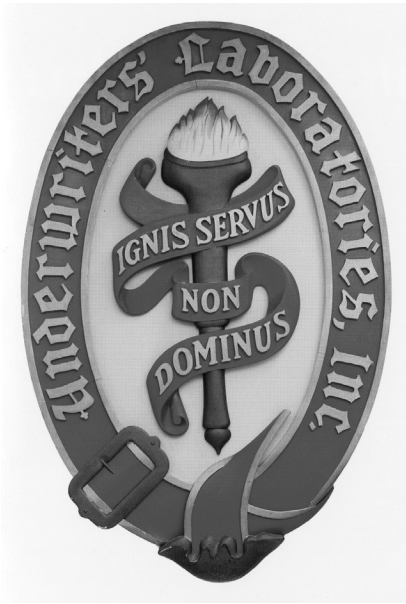
UL BRINGS SCIENCE TO THE PREVENTION AND REDUCTION OF FIRE

This electric laboratory is a museum of floating specimens of the latest phase of mankind's ingenuity. The primary function of the laboratory is to prevent fires by eliminating their possibility as far as it is practicable. ... with perhaps a thousand new protective or hazardous devices submitted to the electrical department alone each year, the work in [UL's] laboratories is one of the most important factors in the development of the newest phase of civilization.

—“Fire Risk in New Devices Cut Down by Inspection”

NEW YORK TIMES, MARCH 25, 1923

“The staggering, incessant and expanding total of the American fire loss is one of the outstanding facts in our civilization,” Vice President and later third UL President Alvah R. Small said in a 1922 speech. “It is inexcusable and utterly disgraceful.” Small, with leaders of the NBFU and other fire prevention experts, observed with great frustration that many Americans had resigned themselves to living with the risk of frequent and devastating fires that destroyed large swaths of



UL's early motto: Fire is servant, not master.

their poorly built neighborhoods. In that same speech, Small said:

"I am patriotic and am proud that I am an American and am glad to be of this generation. I believe that we Main-Streeters are not without our good points, but our characteristic fire carelessness certainly is not one of these. Suppose history should tell us of a great, free, and otherwise enlightened nation of supposedly level-headed citizens, at a time of struggle to restore economic prosperity after a great war, throwing into a bonfire nearly \$500,000,000 worth of

material resources in a single year. Would we not think it absurd? Could we regard that nation as civilized according to modern ideas?

"Sane people are not supposed to act in that way; yet, shameful as it is, that is exactly what we did in the United States in 1921. We not only sacrificed pretty close to \$500 million in outright burning loss, but other hundreds of millions in business demoralization and various incidental expense connected therewith. And, worst of all, we did it in a light-hearted, casual way, as though a most natural, if not necessary thing to do."⁴⁶

Ordinary people had little power in the early twentieth century to enforce building codes that developers often ignored out of haste and greed, or to punish those responsible. Unfortunately, for many decades, while a menace to life and property, urban conflagrations were an inconvenient concern for elected officials and powerful real estate interests who made promises about building fireproof cities and then failed to make good.

The vanguard of fire protection experts made it clear they weren't going to stand for this negligence. UL's role was essential. It applied the "mighty and resourceful hand of science" through constant testing of building materials, industrial, and consumer products.

Small and his engineers liked to frame the challenge in terms of two variables where UL could offer the most leverage in reducing conflagration: fire causes and burnable conditions. People can cause fires, whether by good intentions, accident, negligence, or criminal motive. UL could do little about the last cause. As fire was first used by humans to cook and warm themselves, some fire causes are legitimate and necessary. But as Small said in 1922, "Most of the recognized fire causes are illegitimate and serve no useful purpose."⁴⁷

Burnable conditions typically relate to building materials and fire's access to accelerants such as gasoline or kerosene, as well as exogenous elements such as wind and temperature. "The tiniest flame is ambitious to become a conflagration and will do so if it has a chance," Brearley wrote in *A Symbol of Safety*.⁴⁸ The notorious fire disasters of the nineteenth and twentieth centuries exposed the deadly interplay of these two factors. Reviewing even a small sampling of these illustrates the scope of the challenge facing UL and the fire prevention experts in this era.

When Fires Menaced the City

The Chicago Fire of 1871 destroyed an area four miles long by three-quarters of a mile wide, consuming more than 17,500 buildings, killing 300 people, and leaving 100,000 Chicagoans homeless.

Historians agree the likely cause was related to the knocking over of a lantern in a hay barn (some blame Mrs. O'Leary's cow). What began as a small accident quickly grew given the burnable conditions that contributed to the disaster. The city's builders and leaders contributed to these conditions by allowing residential and commercial builders to use wood as a predominant material in a style called the *balloon frame*,

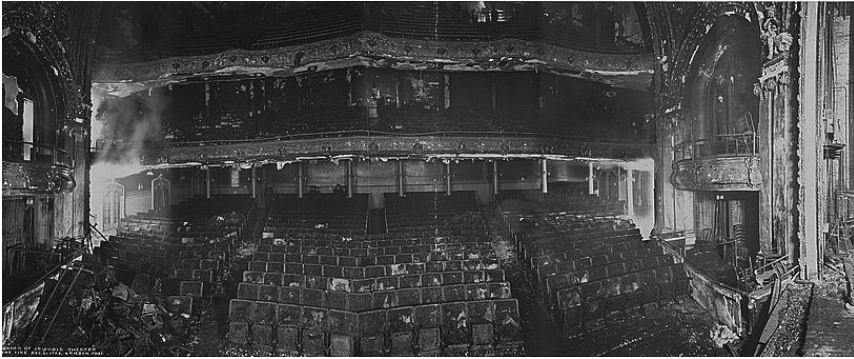
as well as highly flammable tar or shingle roofs—against the advice of many experts. All of the city’s sidewalks and many roads were made of wood.

As Chicago native Bessie Bradwell Helmer wrote in the eyewitness narrative she donated to the Chicago Historical Society: “My coat had been on fire two or three times. People would run up to me and smother the flames with their hands. Then we hurried on, the fire madly pursuing us. After going a long way, we finally concluded it would be best for us to turn and go west, and early in the morning we crossed to the west side. . . . It seemed as if the ground itself was on fire—which in fact it was, since the streets, sidewalks, and bridges were made of wood... there was no place of guaranteed safety.”⁴⁹

Later, Small observed about the fire and the Chicago Tribune building, “it involved a building that most people believed to represent the last word in modern ‘fireproof’ construction. This building had a splendid framework, walls, and floors that came through the fire with little structural damage. Nevertheless it suffered seven separate simultaneous fires—upon many of its upper floors—when exposed from an outside fire. Could this two million [dollar] loss have been avoided? Most emphatically, yes!”⁵⁰

The Great Boston Fire of 1872 consumed 65 acres of Boston’s downtown, 776 buildings, and much of the financial district, causing \$73.5 million in damage and killing at least 30 people.⁵¹ While the cause is not known, flammable wooden mansard roofs common in Boston construction provided the burnable fuel, spreading the fire down city blocks, and across streets and alleyways.

The 1903 Iroquois Theater Fire, which broke out in a Chicago building advertised as “fireproof,” exacted a ghastly toll of 602 lives in less than 15 minutes. The electrical malfunctions and flammable materials that caused the fire, and gave it the fuel to burn, are a murderers’ row of items that would fail UL certification today. And UL would be responsible for making them far safer in the decades to follow.



The 1903 Iroquois Theater Fire, which broke out in a Chicago building advertised as “fireproof,” exacted a ghastly toll of 602 lives in less than 15 minutes. Photograph Credit: Panorama of [Iroquois] Theater after the fire, Dec. 31, 1903 by Henry Albert Ericson (1903)

The fire began when a stage light short-circuited and ignited a muslin curtain. The primitive fire extinguishers could not stop the flames. Within moments the fire roared above the stage, burning the theater’s suspended painted canvas scenery flats. The asbestos “fire curtain” malfunctioned but it wouldn’t have helped because tests later showed it was composed of highly flammable wood pulp and asbestos.⁵²

Wooden construction, flammable roofs, highly degradable wiring, unenforced building codes, inadequate firefighting equipment, and lack of fire extinguishers all contributed to conflagrations in Hoboken, New Jersey (1900), Baltimore, Maryland (1904), and Chelsea, Massachusetts (1908).⁵³ These factors also contributed to the Triangle Shirtwaist Fire (1911) in New York City where 146 garment workers lost their lives in part “[b]ecause the owners had locked the doors to the stairwells and exits, a common practice used to prevent workers from taking unauthorized breaks and pilferage. Many of the workers who could not escape the burning building jumped from the eighth, ninth, and tenth floors to the streets below.”⁵⁴

The 1906 San Francisco earthquake, which destroyed 25,000 buildings, also served to further expand UL’s activities, as UL helped the National Board of Fire Underwriters to develop building codes.



After the San Francisco earthquake, UL and the National Board of Fire Underwriters (NBFU) partnered to establish building codes that would minimize the risk to human life and property in the event of another natural disaster. Photograph credit: Ruins after San Francisco earthquake, 1906 by Arnold Genthe

Fighting Fires Was Not Enough

As Scott Knowles documents in *The Disaster Experts*, “fire in industrializing America presented a threat encompassing every aspect of urban life, including the grave possibility of exterminating entire cities.”⁵⁵ The unpredictability of these conflagrations resembled the spread of infectious diseases such as tuberculosis, where authorities could not predict the speed or direction of their growth and did not understand the scientific causes. At the time of the Chicago Fire, few institutions had even begun to make the massive effort to understand “the science of fire and materials, construction history and vulnerabilities across the urban landscape, and comparative success of fire mitigation techniques from city to city.”⁵⁶

City fire officials lacked not only the power but the expert infor-

mation on fire standards to overcome the greed and clout of developers and builders. If a fire disaster struck, citizens tended to blame elected officials rather than the builders—who were well aware of this. These factors inform us why people tolerated fire risks in the nineteenth century. They had “relatively low expectations of strong government action toward public safety, and high hopes for rapid construction and economic growth.”⁵⁷

American cities had established professional firefighting companies, but no matter how heroic, firefighters could not contain the new types of urban fires. As the twentieth century moved forward, American citizens expected that something more had to be done. Threatened consistently with massive losses and bankruptcies, the fire insurance industry took on the twin challenges of fire: understanding it and bringing about the reforms necessary to prevent it.⁵⁸ “Such considerations led at last to the inception of a movement that is among the most remarkable of the present generation—the great campaign of fire prevention,” Harry Chase Brearley wrote in *A Symbol of Safety*.⁵⁹ “Originally promoted chiefly by the fire insurance interests, it soon grew into a nationwide cooperation of individuals and organizations working by many methods, but to a common end.”

UL took on the most important scientific role of all: moving fire safety into the laboratory. This held implications not only for the growth of knowledge about fire safety but also the ability of the fire insurance industry to work toward preventing or at least mitigating fires in a climate of reactionary and sporadic government attention to fire risk.⁶⁰

UL built its leadership in applying science to this threat to human life and property on four fundamentals. In the decades to follow, these keystones made far-reaching positive impacts on community safety, and continue in various aspects to the present-day:

1. Fire cause prevention: reducing the human and material causes of fire;

2. Preventing burnable conditions: reducing the spread of fire in the presence of a cause;
3. Public demonstration and education: UL opens its fireproof office and laboratories in Chicago to public tours and begins a label service for products and devices that earn it; and
4. Civic awareness: education about fire prevention, lobbying for municipal fire codes, and knowledge dissemination to public leaders and technical experts.

Fire Cause Prevention and Reducing Burnability

Under Vice President William Robinson, by 1920, UL's Protection Department advanced the use of fire resistant design and materials that would eventually be integrated into millions of buildings. Robinson's engineers tested the fire resistance of various building columns, identified what is required of fire resistant floors, walls, interior partitions and wall and ceiling finishes. As for the typical construction of urban tenements, UL had the hard data to close the case against reckless construction practices of the past.

As Robinson reported in a paper read to the UL Fire and Electrical Councils, Inspectors, and friends of Underwriters' Laboratories, "[O]ur investigations show that the fire resistance of wood lath and plaster finish of average construction is about five minutes after the fire has reached the stage where the contents of the building are thoroughly involved, and that the fire resistance of the substitute for lath and plaster most commonly employed *is less than two minutes under the same conditions*. This is in addition to the fact that that the latter finish also serves to rapidly convey fire to all parts of the building."⁶¹

No laboratory had undertaken repeated, controlled experiments of building materials' flammability until UL's work in this era. Among the experiments performed, as explained by Robinson: investigation of 10

types of exterior wall finishes, fire stopping in hollow walls and ceilings, reducing fire hazard in wooden shingles, fire sprinkler reliability and safety (“an average of 300 sprinklers” tested each month).⁶²

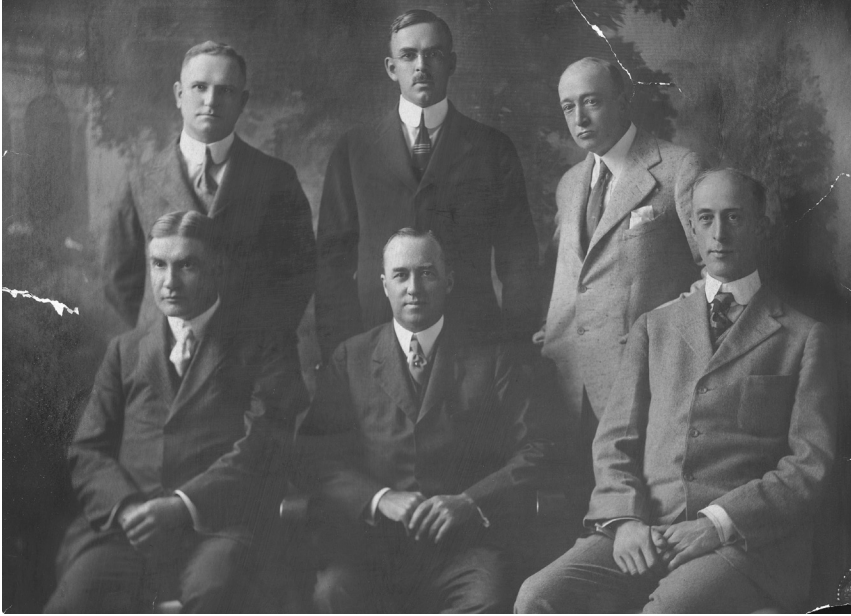
In 1910, testing began on building columns, which were becoming important factors in building construction as more of the new skyscrapers were erected. A 1919 report presented landmark findings on the effect of fire on building columns, and the following year UL’s Standard Time-Temperature Curve became a U.S. standard. That curve made it possible to give a fire rating to just about every type of construction. UL began testing roofing materials by directing the flames from 36 burners on a mock-up of a complete roof and dropping red hot discs on the material. In 1924, tests began on a new roofing material: asphalt.

UL’s pioneering work in reducing conflagrations in the built urban environment expanded into electrical consumer products, which presented the next generation of fire threats to private homes and small businesses.

Electrification had great benefits, of course. It powered lights, furnaces, and appliances. It also powered a faster-growing and more productive U.S. economy where labor-saving devices freed families for more wage-earning work outside the home, improved transportation, and gave rise to a new focus on leisure and development for children. Two major engineering innovations for electric homes—resistance heating and small, efficient motors—led to electric stoves and irons, vacuum cleaners, washers, dryers, and dishwashers.⁶³

The New York laboratory, run by Dana Pierce, became well-known for its importance to the electrical product industry. A tour of the lab in 1923 found engineers testing permanent hair wavers, clothing irons, circuit breakers, and vending machines. “The public has not yet learned how to use electricity in the household,” Dana Pierce told *The New York Times*. “We have had to get used to the hazards of each new invention.”

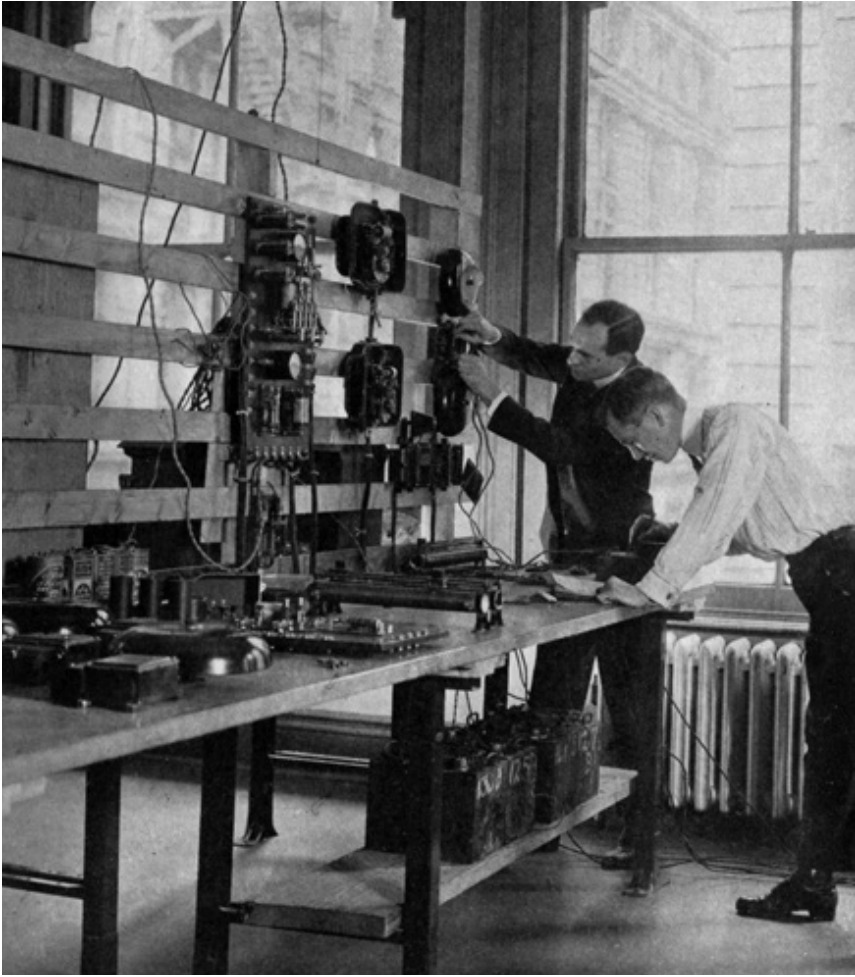
Another example of how UL campaigned to reduce electrical fires in homes: the organization’s crusade for Americans to “rip out the ‘home



The officers of UL in 1920 included (front row, left to right): William C. Robinson, Vice President; William H. Merrill, President; Dana Pierce, Vice President; (back row) L.B. Headen, Treasurer; Alvah R. Small, Vice President; D.B. Anderson, Secretary.

brew' wiring," such as running extensions with lamp cord, which caused so many home fires. Through *Laboratories' Data* and public demonstrations, UL exhorted electricians and contractors to spread the word: "real results will come from a friendly explanation by the electrical man to the customer, of just what the possibilities of trouble are with these amateur wiring jobs, and why they should be replaced with standard wiring."⁶⁴

Hazards weren't contained to the home. Industrial, energy processing, and chemical fires remain a tragic element of human and technological failure even as recently as April 2013 in the United States, when a fertilizer plant in West, Texas exploded during a fire, killing 15 and injuring more than 160. With the primitive regulations of early twentieth century America, developing industrial safety was an urgent matter. By 1920, UL was already investigating a range of



Two engineers from the New York office test an automatic fire alarm system (1923).

industrial materials and flammable liquids to reduce fires and explosions, including fire hose and hose couplings, chemical fire extinguishers, oil tank vents, hazardous liquids, hazards in phenol, dye, and cotton seed manufacturing plants, and the safe storage of oxygen under pressure.

Fire extinguishers work. That was a fact that few people in the United States and the developed world ever question. The employees



Sprinkler heads (ca. 1882-1905)

at the Iroquois Theater in Chicago in 1903 also thought their fire extinguishers would work. But their units were nothing more than ten cents' worth of baking soda in a five-cent tube. While the fire could have been put out at first with a few buckets of water, by the time the extinguishers were used per instructions, it was too late. Fortunately, engineers at the Gases and Oils Department at UL would establish production and chemical standards that finally made the fire extinguisher industry synonymous with reliability.

Not only that, UL engineers experimented with innovative methods and combinations of chemicals to make better performing fire extinguishers. Combined with UL's inspections of fire hoses (of such importance, at the time, that it fell under the "100 percent inspec-

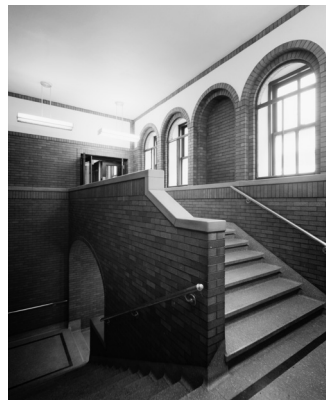


Engineers in the Gases and Oils Department at UL would establish production and chemical standards that finally made the fire extinguisher industry synonymous with reliability (ca. 1886-1970s).

tion” system, where every section was inspected and tested), as well as sprinklers, valves, standpipes, and construction materials, UL helped make accidental and malicious fires easier to control and put out.

Public Demonstration and Education

UL's decision to build a newly constructed office-laboratory complex in 1904 on East Ohio Street in Chicago, just north of downtown, became a turning point in UL's capability and impact in educating the general public and peer experts. The UL facility was three stories high, with a yard for large furnaces and destructive tests. UL expanded the labs incrementally, growing to 45,000 square feet by 1916, and 55,000 by 1923, extending over the entire 266-foot frontage.⁶⁵ The long, low, academic-looking building was made of brown brick and terra cotta and institutional windows of a uniform



In 1904, Argyle Robinson, architect and brother of William Robinson, designed UL's East Ohio Street facility to marry form and function. Photographs credit: Historic American Buildings Survey (1933), Library of Congress

character. Argyle Robinson designed the facility to marry form and function. Robinson gave great care to the selection of materials used on the interior. He combined warm toned tapestry brick, red tile, and terra cotta so artistically that the offices of UL compared favorably with the leading-edge buildings of the day.

As a center for fire safety, UL's headquarters also served as a standing advertisement for fireproof construction methods. Compared to other Chicago structures at the time, the Underwriters' Laboratories building at 207 East Ohio Street was a fortress. In 1924, when a fire started in a barn across the alley from UL, heat-sensitive automatic shutters closed door openings in the UL buildings while employees closed others by hand, effectively insulating the building from its flammable neighbor. The building was apparently so well built that when it was finally razed decades later, it wasn't easy to demolish. After two Chicago architects failed to achieve historic landmark status for the building, it was knocked down in 1981. Norman Mandell of the National Wrecking Company commented to the *Chicago Tribune* in the midst of the wrecking job: "This is one of the toughest suckers I've seen . . . Normally a building this size would go down in five or six weeks . . . but this could take twice that long." Civil Defense rations were discovered in the basement, to which Mandell commented, "I guess they had a fallout shelter here. I'll tell you one thing, if a bomb dropped anywhere around here, I'd want to be in that basement."⁶⁶

UL employees referred to the organization's headquarters as "The City Unburnable," or "The One Place Where It Pays To Play With Fire." The East Ohio Street building was state of the art in fireproof construction.⁶⁷ The architects used brick, terra cotta, concrete, stone, steel, and iron as building materials. They constructed window frames and sashes of metal with wired glass; they designed metal doors and steel desks. Automatic sprinklers hung at the ready, and machines, heating, lighting, and power equipment were "safeguarded with every known precaution." UL



In 1905, UL moved its headquarters to a new 15,000-square-foot testing station at 207 E. Ohio Street in Chicago, Illinois.

had, in effect, “adopted in their own property all the measures they . . . recommend in the property of others.”⁶⁸

The National Fireproofing Company honored UL’s demands for a fire-safe showplace, using UL as an example of a model for making the myth of the fireproof city a reality. “Can you imagine a city in which the buildings could not burn?” the company asked prospective clients. “Do you realize that it is not only possible but practical to build such a city?... Neither is there any need of the people attempting to devise some new and extraordinary construction—they have but to look about them and they will find that the Insurance Companies have already provided the model in their Fire Insurance Underwriters’ Laboratory in Chicago.”⁶⁹

Merrill’s genius showed in how he made the new building accessible. Visitors were presented with a vision of the elusive fireproof structure made real, and importantly, made affordable, practical, and beauti-

ful for the modern businessman. The most important visitors were treated to a guided tour of Merrill's office, a fireproof inner sanctum, built of masonry and steel and no wood except for the chairs. Merrill explained to visitors that "instead of concealing poor masonry under mahogany wainscotting and paneling, an equally agreeable result may be secured by the use of good masonry that needs no concealment."⁷⁰

In the spring of 1920, a 300-member assembly of National Fire Protection Association members made a trip to Chicago to tour the headquarters of Underwriters Laboratories...UL was by this time the largest fire-testing laboratory in the world. The NFPA visitors—a varied group of fire officials, manufacturers, and fire protection engineers from across the country—had come to see the results of UL's efforts...Merrill relished the opportunity to show off his so-called "City Unburnable" lab complex and to demonstrate the striking variety of work carried out by a workforce of more than 100 engineers. Underwriters Laboratories—more than any other fire expert institution—promoted an idea that acceptable levels of safety from fire could be achieved through scientific experiment and testing.⁷¹

Visitors were treated to a sort of Dante's Inferno tour of the labs. Moving from room to room, they were invited to see the engineers at work, testing products submitted by manufacturers who hoped to receive a listing among the thousands of "approved" products. With this listing and its accompanying "UL Label," manufacturers were in a position to sell a guarantee of product safety and trust to customers, with the additional promise of lower insurance premiums for property owners.

One of the more popular stops along any tour of the labs was the Hydraulic Department. Here, visitors might see, according to business writer and enthusiastic UL promoter Harry Chase Brearley, "a typical testing engineer with a frown of concentration between his eyebrows, [a] smooth-faced, spectacled, youngish-looking man" at work on a fire hose-testing machine, a device that stretched hose out until the rubber interior snapped. Sulfur content in the rubber itself was measured.

Hoses were heated to see how long they would operate before being consumed by fire; then they were filled to the bursting point. Each of these stress tests was conducted before a hose could pass inspection and earn a UL listing.⁷²

The Hydraulic Lab also had the ability to test different types of water: fresh, salt, clear, muddy, alkaline, and soft. “A valve or pump might work perfectly with the clear Lake Michigan water of Chicago,” Brearley observed, “but give trouble with the more substantial fluid used by St. Louis or Cincinnati. . . . The hydraulic laboratory . . . has facilities for producing imitation Mississippi River water or any other kind that has to be reckoned with.”⁷³

In another room, a “miniature device like a tiny pile-driver” dropped a weight on the heads of matches. If the match ignited, it failed the test.⁷⁴ The next stop revealed roofing tests, involving a large burner hanging down over a composition shingle roof built on a sloping framework. This “radiation test” was followed by the “conflagration test.” Here, the roof was pushed into the opening of a blower-duct, a burner was lighted, and a wind machine supplied a 45-mile-per-hour gust, to simulate the



In spring of 1920, a 300-member assembly of National Fire Protection Association members made a trip to Chicago to tour the headquarters at East Ohio Street.

conditions a roof might face in the midst of a rapidly advancing urban firestorm.⁷⁵

The NFPA visitors witnessed demonstrations including oxy-acetylene blow-pipe tests, fire extinguisher tests, the combustion of motion picture film, and a comparison of fire sprinklers.

Finally, the tour ended outside in the testing yard.⁷⁶ Here the guests were treated to the “drop test” of a burning safe. UL engineers frequently tested safes, sometimes filling them with papers and magazines to simulate a cache of important documents, then setting them on fire in an open field “lab,” trying to precipitate an explosion caused by gases building up inside the safe. Safes that received the UL listing had to stand up to such treatment, leaving the documents inside undamaged.

Similarly, the drop test was a destructive test, and by virtue of this fact it was a true crowd-pleaser, a meeting of science and spectacle. The safe had been heating up in one of the furnaces for some time, and the visitors now gathered around to watch as UL engineers and technicians assessed whether the time was right, if the safe was “done.” Once they verified the temperature inside the furnace, several technicians in coveralls wheeled the safe out into the yard. White hot by this point, the safe

UL in the News

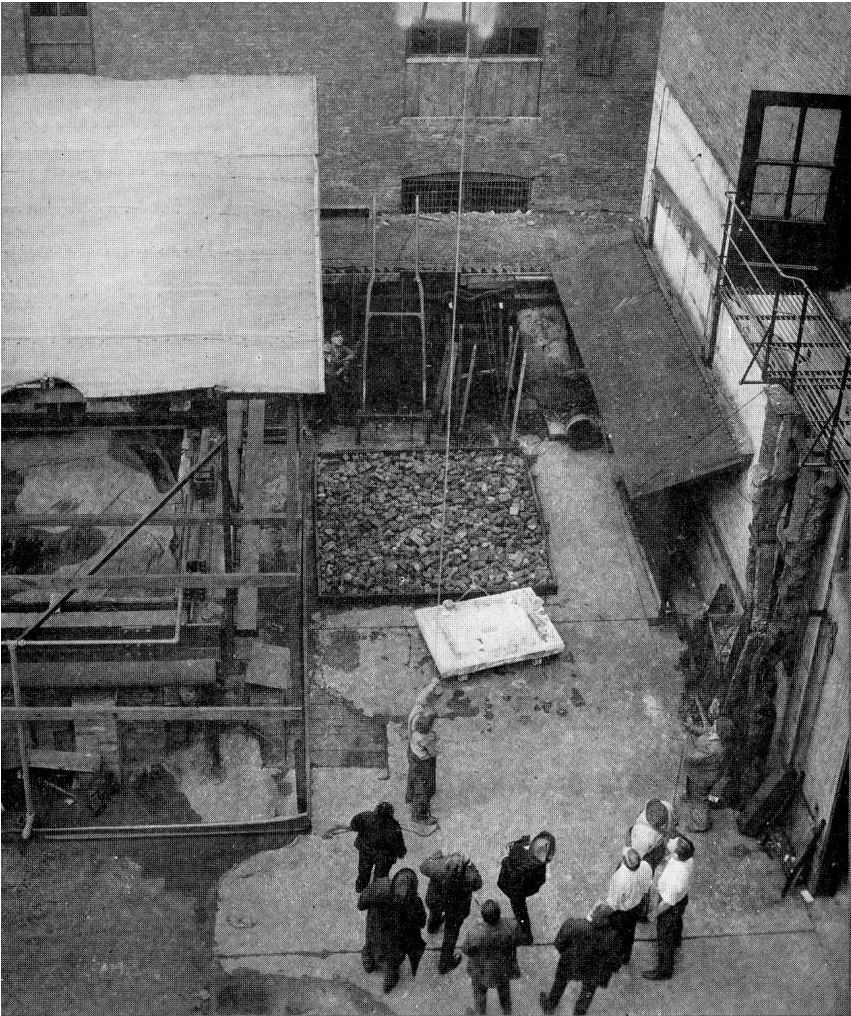
New York Times, December 22, 1921

HARDING ABANDONS CHRISTMAS CANDLES

Told by Underwriters' Laboratories It Would Invite Fatal Fires, Cancels Arrangement

UL's clout reached the White House and President Warren Harding in 1921. *The New York Times* reported on December 22nd of that year: “The plan of President and Mrs. Harding to place lighted candles in the windows of the White House on Christmas Eve, following a custom they once revived in their home town, Marion, Ohio, was abandoned yesterday after the President had been informed in a telegram from George E. Muldaur, General Agent for the Underwriters' Laboratories, that the scheme was fraught with danger.” UL feared Harding's example would lead to thousands of American homes catching fire as they picked up the White House tradition.

was about to go through what the engineers reasoned was a close approximation of the conditions it might face if it were to tumble through the buckling floor of a burning office building. The crowd closed in, jostling for a good view, the safe was attached to cables and secured for lifting, and it was finally time for the test:



This safe was heated for one hour by a gas-fired furnace and then was dropped on a pile of bricks from a height of 30 feet. It was subjected to another round of tests the very next day in a bid to receive an Underwriters Laboratories label (1923).

The hoist motor hums, the steel cables tighten, the pulley creaks and the safe rises into the air. . . . Down comes the safe whizzing from the height of a fourth floor-window and landing with a crash on . . . [a] pile of bricks. The bricks being purposely uneven to represent the chaotic debris of a real fire. . . . When the safe has cooled, examinations are made as to its stability and strength. . . . Then an autopsy is performed; workmen take the safe apart, dissecting it as a coroner would a corpse.

The scene, captured on film by a motion picture camera, reveals what almost certainly qualified as the most unorthodox scientific research experiment conducted in all of Chicago that day...[including] an expectant crowd of diverse fire safety experts, the crash landing of a superheated safe, the eager and smiling inspections after the fact, of safe, of contents, of furnace, and the work of the note-taking testing engineers transforming a dramatic, and planned, failure into a replicable standard.⁷⁷ Demonstrations became an effective tool for public dissemination of fire-risk information, as well as mailings, newsletters, speeches, and news articles. UL distributed lists of “Inspected Mechanical Appliances” and “Inspected Electrical Appliances” to principal Boards of Underwriters and Inspection Bureaus, the general offices of insurance companies, insurance firms, and federal, state, and municipal agencies.⁷⁸

Civic Awareness

Through its massive outpouring of technical listings and publications, and through use of an open-door policy at its many nationwide offices, UL worked to cultivate good relations with commercial clients and the broader community of fire safety experts.⁷⁹ UL also focused on achieving broader awareness about fire safety with public and local officials nationwide.

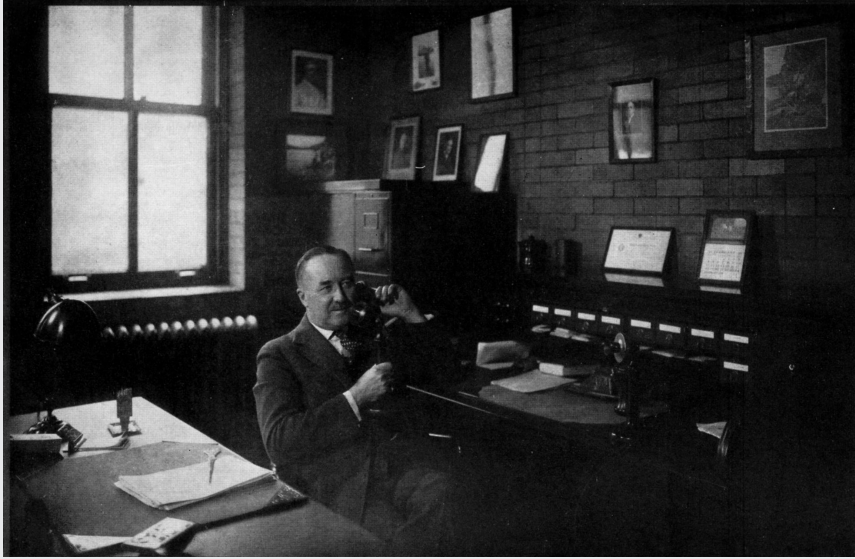
By the early 1920s, consumers in fact were beginning to recognize and trust the UL label, alongside the *Good Housekeeping* seal and the

Consumers Union rating. UL also promoted its work through radios and the movies, and encouraged guest visits to their facility. By the 1920s visitors were arriving at the Chicago office in droves, touring the labs, watching “drop-tests,” and viewing the charred metal beams that were kept in the testing yard, evidence from the “Fire Test of Building Columns” project. Sometimes visitors virtually took over the labs, as with the NFPA assembly in 1920, or when 160 members of the Western Association of Electrical Inspectors visited in 1922. This group saw an elevator door test, the hydraulic lab, a fire in a portable moving picture booth, a fire stream test on a door, and the automatic sprinkler test.

In 1925, 100 members of the Chicago section of the Society of Automotive Engineers toured the labs; and the same year a 500-member assembly of the National Fire Protection Association made an inspection visit...visitors hailed from Belgium, China, Czechoslovakia, England, Germany, Holland, India, Japan, Norway, and Sweden. The fire chief of Berlin, for example, turned up in 1925, as did a senator from California, and W. E. Mallalieu, President of the National Board of Underwriters. In 1926, two actors, one from Al Jolson’s company, came by to tour the hydraulic lab. In 1929 fire sprinkler magnate Russell Grinnell took the tour with nine directors and members of his staff. Visits from the press were common, with editors of *Popular Mechanics*, *Engineering News-Record*, and *Electrical World* stopping by, among others. And, of course, engineering and architecture students were common sights, especially the Armour Institute students, some of whom worked at the labs as part of their degree programs.⁸⁰

UL supported the national fire prevention educational campaigns begun by the fire insurance companies and the NFPA. In 1920, President Woodrow Wilson proclaimed October 9 to be National Fire Prevention Day, making it a matter of national interest. This was later expanded into National Fire Prevention Week by President Calvin Coolidge in 1925. The day was originally conceived by the NFPA to commemorate the Great Chicago Fire and the Wisconsin Peshtigo Fire. States

UL People



William H. Merrill on the phone in his fireproof office at UL's East Ohio Street building in 1923.

UL founder William Henry Merrill passed away in 1923.

According to one memorial, "William Henry Merrill, electrician, founder of Underwriters Laboratories, was a man of high principle and foresight, the right man for his time, Merrill early on set a standard for business social consciousness rare in its day.

"Insisting on development of rigorous but realistic safety standards, Merrill advanced basic safety principles that are as alive today as they were in 1894, stating them often, insisting on them every day:

'Know by test, and state the facts.'

'Testing for public safety. Our only function is to serve, not to profit.'"

UL had begun with Merrill and a few associates. By the time of his death, UL had well over 400 employees.

began to require that all public schools teach the basics of fire safety to students. UL contributed ideas and materials to countless education campaigns over the decades.

“The Right Man for His Time”

UL's innovations in fire protection and prevention rank as one of William H. Merrill's most influential legacies. In a tragedy for the organization and UL's many associates and supporters, Merrill passed away from a cerebral hemorrhage and pneumonia in 1923. He was succeeded by Dana Pierce, Vice President of laboratories and Director of the New York office, and whom Merrill had hired in 1906. As Pierce was a key associate to Merrill during UL's formative years, the Board trusted him to advance the organization's mission and protect its values. As Chairman of the Electrical Committee of the NFPA, which drew up the National Electrical Code, Pierce also understood that nothing UL did was more important than its science-based approach to reducing the scourge of urban fires that had become a national menace to people and property.

City, home, and industrial fires challenged UL, its partners and associates, and American society for many decades. Fire remains a frightening possibility whenever unscrupulous landlords or business owners take short cuts or skirt building and fire codes. Of course, citizens make mistakes in keeping their homes and apartments as fire-safe as possible. In the twenty-first century, hundreds of millions of children around the world learn fire safety in school and the community every year, while the public takes for granted that the multitude of household appliances and gadgets meeting UL standards will not start a fire. (Cooking was the leading cause of residential fires in 2012, as is the case most years.) In recent U.S. history, the number of fires decreased 21.6 percent between 2004 and 2013, the number of fire deaths fell 21.0 percent, and dollar losses declined 10.1 percent in that same period. William H. Merrill would be encouraged that the world is

much safer from fire destruction today, but he surely would not be fully satisfied. UL's dedication to this work will carry on for many decades into the future.

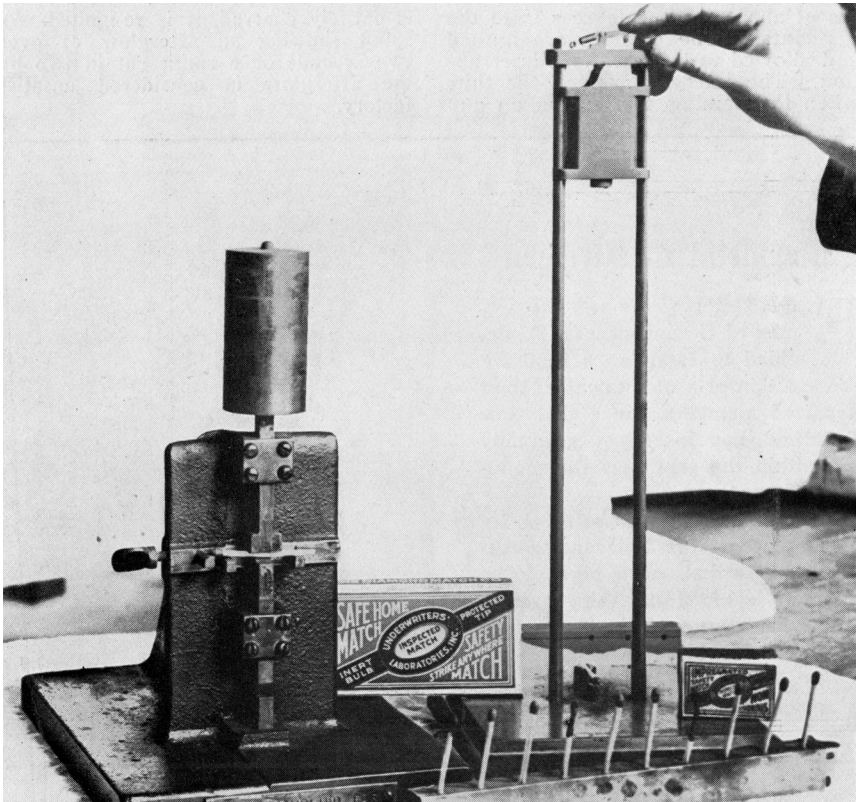
UL Officers, 1924

Dana Pierce, President

Alvah Small, Vice President

D. B. Anderson, Secretary

L. B. Headen, Treasurer



UL engineers used these three appliances to test the strength and safety of matches (1924).



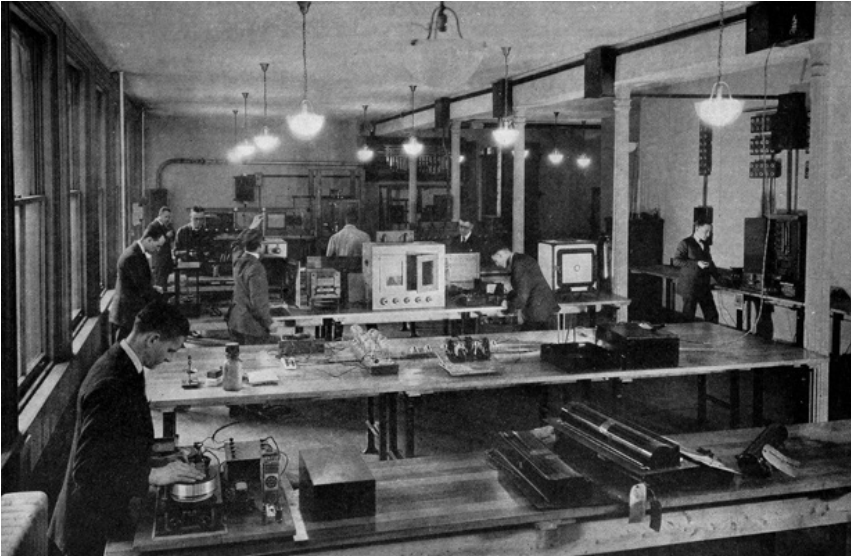
After removing a fire door from a testing oven, UL employees subject the door to a hose stream test (1915).



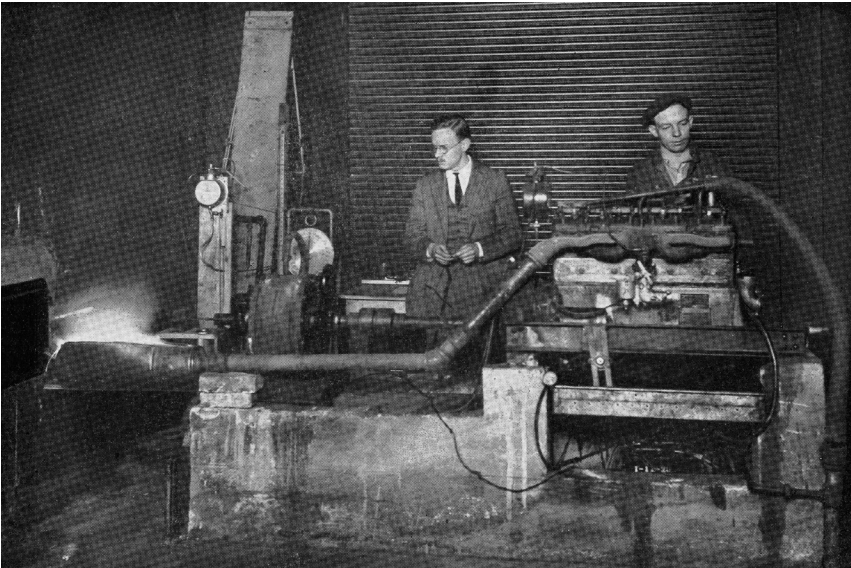
During a fire, a UL-labeled safe dropped from the sixth floor to the basement of a building. The safe contents were then checked for damage and found to be in normal condition (1922).



UL employees test fire-resistant roofing (1923).



New electrical appliances receive their first examinations and tests to determine their safety, reliability, and mechanical strength (1923).



This automobile muffler received a longitudinal rupture during a test conducted at UL (1923).

—CHAPTER THREE—

American Protector

THE ROARING TWENTIES AND UL'S GROWTH INTO A NATIONAL INSTITUTION

[Underwriters Laboratories] are unique. Nothing like them exists anywhere, and an idea of their service may be had from the fact that last year, their label, the index of safety, appeared on more than 700 million separate items of merchandise.

It is plain to see, then, why the automobile manufacturers called upon the laboratories to put the seal of safety on cars.

—GEORGE MULDAUR, APRIL 5, 1925

General Agent, Underwriters Laboratories, *The New York Times*

When Dana Pierce was elected President of UL by the Board of Directors on November 10, 1923, he inherited an organization with strong recognition and respect among U.S. business, educational, and commercial interests. And under Pierce's leadership, UL would become an even more trusted guardian of consumer safety.

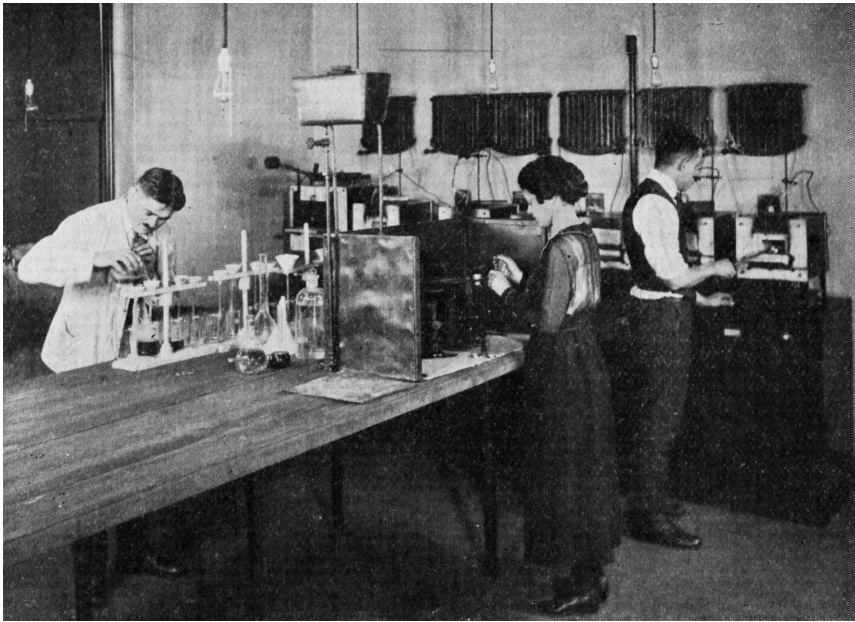
In the early decades of the twentieth century, UL and its leaders both shaped and were shaped by the economic and social shifts of a nation growing in power, population, and political sophistication. The U.S. had entered the First World War late, somewhat reluctantly, and with vague national purpose. It was a total war in which scientific expertise had been turned against humanity in the form of vile weapons. More than 53,500 American service members lost their lives at a cost of more than \$100 billion, a debt that would hurt the U.S. economy until the next World War. The war also accelerated advances in automobile and aircraft production, wireless and radio communication, and countless other industrial processes. In part due to UL, many of these products were safer and better made and, most importantly to a rising consumer class, much more readily available.

America boomed in the Roaring Twenties, a brief, gilded era between the Great War and the Great Depression. The decadence and promise of the decade—as well as its ultimate demise—was famously captured in F. Scott Fitzgerald’s novel *The Great Gatsby*. The nation’s wealth doubled during this period, manufacturing and mass production soared, and for the first time a majority of the population lived in urban areas.

“Yet in the pulsing industrial cities, virtually all Americans dramatically improved their standard of living over the course of the post-World War I decade,” historian David M. Kennedy summarized in his commanding book, *Freedom from Fear*. “While farmers’ living standards eroded through the 1920s, real wages for industrial workers rose by nearly 25 percent. By 1928, average per capita income among non-agricultural employees had reached four times the average level of farmers’ incomes. For urban workers, prosperity was wondrous and real. They had more money than ever before, and they enjoyed an amazing variety of new products on which to spend it: not only automobiles but also canned foods, washing machines, refrigerators, synthetic fabrics, telephones, motion pictures (with sound after 1927),

and—along with the automobile the most revolutionary of the new technologies—radios.”⁸¹

Women had fought for and won the vote in 1919 and moved in greater numbers into the workforce, including UL's. Women made up 18 percent of the U.S. workforce in 1900 and 22 percent in 1930. As a result, many women had more income for purchasing the consumer goods that would benefit their families. The radio became a household fixture, crossing boundaries to connect people to the same music, entertainment, and news, opening up a new frontier for advertisers and merchandisers.



A UL chemist (center) is conducting a test to determine the percentage of sulphur in rubber (1920).

Americans were ready to cut loose, embracing cinema, jazz, dancing, and drinking (despite the restrictions of Prohibition). They felt great excitement about modern progress and the promise of new inventions and technologies from rural electricity to the motor car. As figures such

as Thomas Edison and Henry Ford became symbols of American ingenuity, UL established itself as a national public laboratory that worked without compromise, hype, or shortcuts to serve and safeguard businesses and the American public.

UL's Role as an Educator

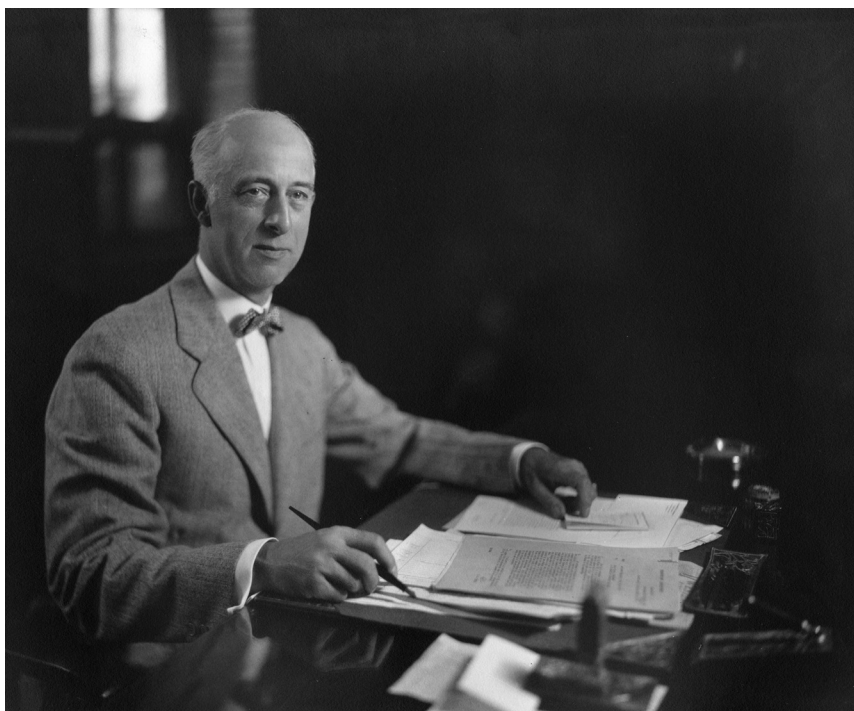
Pierce worked closely with Merrill in UL's early years, starting at UL in 1906 as head of the electrical department in Chicago. When Merrill needed a supervisor of the new electrical testing station and lab opening in New York City in 1912, he turned to Pierce, who moved to New York while maintaining direction of the entire electrical department. In 1916, Pierce was also named UL's Vice President in addition to his other duties. In 1923, Pierce was elected as UL's second President.

Under Pierce's leadership, UL became a more powerful and trusted national presence through the execution of five strategies: focusing on transparency and expanded public communication; acting as a convener of experts; stepping up its role as a consumer advocate; filling a critical role in the value chain of the auto and aviation industries; and investing in new facilities.

"In sum, by the 1920s, UL had established a nationwide network of clients, with regional labs to serve them. The lab had around 200 engineers and 'inside' employees, 250 outside inspectors," in Chicago, New York and California, a Canadian organization (established in 1920), and offices in 141 cities.⁸² UL also took a strong institutional interest in improving higher education and career preparedness for engineers.

Now, with the relevance of UL's work expanding, it needed to be in even more places and speak to more people.

Pierce and his colleagues understood William Henry Merrill's strategy in compiling a large mailing list, starting a subscription newsletter called *Laboratories' Data*, giving journalists access to their laboratories, hosting tours in UL's Chicago fireproof fortress, and empowering



Dana Pierce started at UL in 1906 and was elected president after Merrill's sudden passing in 1923. Pierce served in this capacity until his passing in 1934.

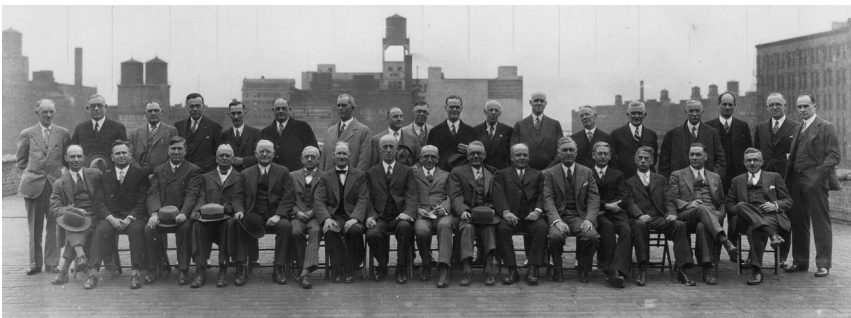
peers and experts in UL's methods through the Laboratories' Councils. At this time, the United States government lacked a meaningful agency to regulate national construction and product safety, and state and city laws where they existed were typically weakly enforced. This was a gaping void in modern society the private sector needed to fill with scientifically sound standards. To do that a national, not a piecemeal, plan was required. UL was up to the challenge.

One pillar of this approach came into its own during the 1920s: bringing independent experts together with the insurance industries and manufacturers to organize themselves into councils and committees. In this way, the experts developed a grassroots system of voluntary national regulation that included fire-standard setting, as well as national electrical and building codes.

The message of “testing for public safety” gained more influence as “the fire experts of one organization lent their credibility to their peers by serving on their councils. The experts at UL wrote articles for the *NFPA Quarterly*, and NFPA representatives appeared in the pages of UL’s *Laboratories’ Data*.”⁸³ In 1930, Pierce even presided over a special issue of *Laboratories’ Data* dedicated to essays written by leaders of its convening cohorts including the NBFU, the National Safety Council, and the Bureau of Standards. “It is believed that the articles presented will be of interest as authoritative descriptions of the history, functions, and activities of certain organizations of national importance in insurance, standardization, and inspections...” Pierce wrote to his readers.

By the 1920s it was likely that every person in a given room full of fire experts had attended a major American engineering school—perhaps even fire protection engineering at the Armour Institute—and/or had worked either in the fire service or the fire insurance field, and was serving on one of the committees or councils of a local fire insurance association, the National Fire Protection Association, Underwriters Laboratories, National Bureau of Standards, Associated Factory Mutuals, National Board of Fire Underwriters, or even several of these at once.⁸⁴

UL’s 1914 memorandum of understanding with the NFPA and NBFU directed that the three would “continue to co-operate in pre-



An early Electrical Council meeting held in Chicago in 1929. Dana Pierce is seated in the middle of the first row.

UL Evolution: Early Telephone Etiquette

Notice that phone manners are in short supply in the twenty-first century? Excerpts from UL's guidance to employees in how to use the office telephone in 1922 are still helpful (and quaintly illustrative of how new this all was):

Answer your telephone promptly. Never say 'Hello.' Answer by giving your name and department. If the call is received directly from the outside without coming through a company switchboard, give the name of the company first, followed by your own name.

Give close attention. The party calling has the right to expect that you are listening to him. Don't force him to repeat, due to your inattention.

Keep your mouth close to the telephone and talk in an ordinary tone of voice. Shouting will blur your speech and talking too low will make your words difficult to understand.

Use a pleasant tone. Your voice is your only means of impressing the client that you are at his service. Make it courteous. . . . When desired information cannot be given without undue delay, request the name and telephone number of the client and say you will call as soon as possible.



UL operators Lorraine Woehr (left) and Grace Twist (right) work at the newly installed exchange switchboard at the Chicago office (1924).

paring regulations for the installation of devices and apparatus having a bearing on the fire hazard.” The three organizations divided the work; UL alone determined the technical “suitability” of “devices and apparatus.”⁸⁵ Once established through repeated testing, these technical standards were sent to UL’s oversight councils, which had grown to seven by 1928: casualty and automotive, burglary protection, hydraulic, gases and oils, fire protection, chemical, and electrical.

Additionally, UL established industry conferences, through which leading manufacturers could work directly with UL engineers to establish minimum standards. Through the industry conferences, manufacturers had a voice in the testing process, yet another way UL could simultaneously enrich its technical abilities while also presenting itself as an honest broker.⁸⁶ The industry conferences were critical during these early years to get the manufacturing and business sector *buying into* (as corporate-speak would describe it today) UL’s requirements and testing standards.

UL’s relationships with expert partners remain fundamental to its success at the time of this writing. These insights are marbled into the rigorous processes by which UL tests and certifies products and technologies. Nearly every UL executive can testify to meaningful, career-defining work in the convening arena. Retired UL Senior Vice President and Public Safety Officer Gus Schaefer recalled in a 2014 interview: “As I started to work with more organizations that collaborate with UL, one I got especially close with is the International Association of Electrical Inspectors, the IAIE. And I learned over time that it actually had its first offices at UL, when they were started back in 1928....I spent quite a bit of time with that community, would go to their annual meetings and their chapter meetings. And that helped educate me on another dimension of UL, the way that codes and the ‘Authorities Having Jurisdiction’ community interacts with UL.”⁸⁷

Through the establishment of oversight councils like those at UL, or the over 100 committees of the NFPA in place by World War II,

and by sitting on one another's committees, the experts created an interconnected network through which they could establish by consensus the standards, codes, and suggested policies that made most sense to them. Likewise, these committees always included representatives of the fire service, and state and municipal fire bureaucracy, as well as representatives from the building trades and industry groups, academic researchers, and of course fire protection and fire insurance engineers. There could be disagreement in the councils and committees, but in the end they, by necessity and design, always reached a consensus. Through this process the fire experts began to speak with one voice in the 1920s, though it emanated from several interconnected institutions.⁸⁸

UL in the Media

George B. Muldaur was "general agent" of UL during the 1920s and ably filled the role of what is known in most firms as a press secretary or vice president of corporate communications. On October 8, 1923, during the first national Fire Prevention Week, Muldaur delivered a radio address on fire safety from WJZ radio in Chicago, simulcast on 18 radio stations across North America. It was estimated at the time that he had an audience of 10 million. The Associated Press ran a national story, reporting that "Muldaur, general agent of the Underwriters' Laboratories, has prepared an address which is to be broadcast tonight from 16 different radio stations in this country and Canada. . . . The address reads in part as follows: 'The time to put out a fire is before it starts; in other words, prevention. While the use of improper building material is doubtless the cause of a large proportion of our industrial fire loss, it is certainly true that bad house-keeping, both in the home and industrial establishments, permits the starting of an enormous number of fires which could never take place if simple rules of order and neatness were observed. How much do you know about the home? One of the most dangerous things in a house is the common match, because it is apt to be left carelessly about, within the reach of children or where it may be dropped and stepped upon. Matches carelessly thrown away after lighting, are alone accountable for many millions of dollars of fire loss.'"

“It must be borne in mind there is no legal authority [behind] the findings of the Laboratories,” UL’s Assistant to the President W.D.A. Peaselee said in an address to a group of political scientists in 1928. This factor did not limit UL’s reach, but gave it bedrock of influence. Or as Peaselee said, “a democratic method of standardization giving each of the parties interested a representation in the establishment of the minimum requirements and sufficiently flexible to keep pace with the changes and developments in our industrial life.”⁸⁹

Deft Defenders

While the phrase “public relations” doesn’t appear in UL literature until the late 1930s, Merrill and Pierce and their teams became quite adept in answering their critics. They also understood the value of being transparent and proactive with the newspaper reporters of the day. The credibility of UL’s standards did not rest on the merits of its methods alone. It also had to allay public fears that UL was only out to generate money for insurers. The organization’s skill in disarming these criticisms further solidified trust in UL and would, over the decades, endear its experts and spokespeople not only to members of the media but to members of Congress as well.

As early as 1916, UL engineers filmed safety tests and demonstrations and furnished them to insurance organizations, state and municipal officials, churches, schools, chambers of commerce, and other civic groups. Frequently, UL sent a lecturer to present and discuss the material. UL viewed public communications as a vital tool in promoting its integrity and competing for business—a practice that continued throughout its history.⁹⁰ The critics and skeptics could obtain any of UL’s data or observe any of its tests by visiting a laboratory or one of its branches.

Under Dana Pierce, UL surely had fresh institutional memories of why William Henry Merrill severed financial ties with the NBFU. Merrill worried intensely about the perception among critics that the

connection between the fire insurance industry and the labs was too close. This concern went all the way to a consideration of how UL described itself in the letterhead on its promotional materials. Merrill corresponded with NBFU officials frequently in 1917, wanting to change the language describing the labs from “Under the direction of” the National Board of Fire Underwriters to “established by” the NBFU. In his letters to the underwriters, Merrill explained the reasons for his level of diligence over appearances of independence for the labs. First, he thought a political shift could cause “severance of our friendly relations with the authorities at Washington.” In such an instance, “an ably or even intelligently presented case against us” might arouse the attention of the Attorney General.

UL Evolution: The Rise of the Engineers

As the nineteenth century ended, engineers in the United States were in the midst of turning their craft into a profession. By this time, the major branches of engineering—civil, mechanical, electrical, and chemical—had established professional societies, begun to publish journals, and held regular conferences. UL was instrumental in supporting this rise of the engineering class, largely through its collaboration with Armour Institute.

Many reasons are cited for the growth of the engineering profession; the most important was the expertise demanded by the technology and cities. In the past, installation work for large, integrated systems was performed by skilled craftsmen who inherited their trades from traditional shop education and promotion. With the volume of such work on the rise, engineers with degrees began to promote themselves as better-qualified candidates for these jobs. Technical colleges provided the foundations in scientific theory and the hands-on education associated with traditional training in the mechanical trades. The Armour Institute began to turn out electrical engineers every year, beginning with its first graduating class in 1897.

In 1903, Armour responded to the call from insurance companies for specialists in the modern techniques of fire prevention; the Institute launched a degree program in Fire Protection Engineering. Established in partnership with UL, it was the first program in the nation. The key figure in this initiative was Professor Fitzhugh Taylor, who pioneered the curriculum at Armour and went on to head UL's Fire Protection Department.⁹¹

Having the Justice Department merely begin an anti-trust suit against UL could, he worried, cause the loss of millions of dollars in “injury to our goodwill.” And he had an additional concern: the danger of a firm hostile to UL or the NBFU bringing a lawsuit simply for the “advertising value” it presented.⁹²

UL was similarly deft in rebutting one of its critics in 1922, when UL addressed doubts from some in the burglary protection industry. According to the claim, UL was “one laboratory testing products that required multiple types of installation, without having any experience in installation. The accusation painted UL’s testing engineers as too far removed from the specifics of on-the-job improvisation and the realities of fire safety on the ground to have the real expertise possessed by the burglar-alarm technician, or by extension the builder, the electrician, and the firefighter. UL’s response to this criticism was to build a case for the power of its generalized approach to fire safety, aiming to apply standard setting and laboratory practice on all facets of manufacturing and installation:

We have the same answer for this industry that we have had in the rubber-covered wire industry, the automatic sprinkler industry and some ten thousand others with which we have an intimate point of contact; that is, that we do not assume to know all details of the manufacture and installing end of the game as well as those who have been in the business for years, but our staff is composed of technically trained engineers, and the fundamental principles involved in the proper performance of burglary protection appliances are the same as those of any other industry. It is only natural to assume that where an engineer has had opportunity of examining a large number of systems of any particular class and has the engineer’s perspective, he can readily perceive the good and bad qualities of any individual system.⁹³

UL trained its agents to rely on the rigor of UL’s methods. In one

field case: “UL New York agent C. J. Krieger addressed the sort of problem that might arise when the sanctity of the label came into question. A town of 30,000 people decided to purchase UL listed 2-inch hose for its fire department. The city officials had never used labeled hose, and so were skeptical, watching a test of the hose closely. The city lodged an ‘indignant protest’ as a length of the hose failed at low pressure, 180 pounds. Krieger ran up to the town to investigate. He found that cotton threads surrounding the rupture points had been burned. “A casual mention of the fact by the writer,” Krieger recalled, “nearly caused a riot. How could the hose burn? It had never been near a fire or spark.” Chemical tests indicated that it had indeed burned. The fire chief was asked to repeat his test so that

Krieger and the city officials might observe. Water was pumped out of a canal and discharged back into the canal, but to avoid stretching the hose over a railroad track it was stretched over the top of a heavy fence, topped by rough timbers. The hose touched the wooden beams in three places. And, at each, smoke was seen once the pumping was underway. Krieger was vindicated, arguing that, “The evidence was complete; all the city officials who had witnessed the test agreed that

UL in the News

New York Times, April 5, 1925

**“MOTOR CAR SAFETY TESTS
DEMAND CONSTANT VIGILANCE;
Mechanical Appliances Rigidly
Inspected by Underwriters’
Laboratories to Lessen Collisions,
Fire and Theft Hazards.”**

Special feature by George Muldaur,
General Agent, Underwriters Laboratories

“Household appliances, toilet accessories, matches, flatirons, curling tongs—every conceivable thing suspected of potential hazard—goes through this process of creative destruction [so] that lives may be saved or property conserved. The laboratories are unique. Nothing like them exists anywhere, and an idea of their service may be had from the fact that last year, their label, the index of safety, appeared on more than 700 million separate items of merchandise.

an abnormal and abusive test condition had ruined the hose, and that there was consequently no justifiable criticism of labeled hose under the circumstances.” The writer took two morals from this episode: a fire chief is not a testing engineer; and, criticisms of labeled hose, and by extension any criticism of the UL label, should always be thoroughly investigated.⁹⁴

Consumers, Cars, and Crash Test Dummies

As consumer goods flooded the market, unscrupulous companies exploited the demand by selling unsafe or fraudulent goods. What’s more, a booming market meant even well-meaning companies rushing to fill demand could sell products that fell short of UL standards. America’s consumers would need a tough watch dog. UL engineers learned from the start to test products in ways that mirrored consumer behavior—“irons left on for weeks at a time in contact with flammable materials, simulated broom handle whackings of television picture tubes . . . And, judging from the bounty of fire narratives that UL collected featuring hapless and forgetful consumers, and from the advice they gave to consumers through their films, lectures, and publications, UL saw the consumer” needed to be protected from his or her own naiveté.⁹⁵

The manufacturing boom of the 1920s also marked the rise of that most American of obsessions: the automobile. Henry Ford’s Model T was first unveiled in 1908, and with the introduction of the assembly line more than 15 million Model Ts were produced between 1913 and 1927, priced to sell at \$260.

To Americans with more money to spend and more leisure time thanks to the influx of time-saving consumer goods, the automobile came to represent freedom, mobility, and modernity. The 1920s was marked by a dizzying growth in automobile ownership. By 1929, there was one car on the road for every five Americans. Ford’s genius was to pay workers the kinds of wages so they could afford cars, while he

cut prices to expand Ford's market. A December 3, 1927, *New York Times* article based on Ford's rollout of the "new Tudor sedan" and other new Ford models reported, "motorists both in and out of the trade expressed complete surprise yesterday at the low prices announced by Ford for his new car models."⁹⁶

But, despite American enthusiasm for the automobile, accidents, fires, and malfunctions were common. In 1915, with two million automobiles on U.S. roads, UL established a Casualty and Automotive department.

Writing in 1920, Label Service Superintendent (and future UL President) Alvah Small described the "great satisfaction" UL took "in the fact that its service to the underwriting fraternity in... fire protection and prevention prompted the delegation...of the engineering and technical phases of automobile underwriting."⁹⁷

UL knew the automobile was the most important consumer good to emerge since the refrigerator and the organization had to be involved—as it would with the rise of the television during the 1950s.

UL evaluated fire risk in automobiles by looking at component systems, including: fuel storage, fuel feed systems, fuel line and fittings, carburetor, electrical equipment, exhaust line, and other miscellaneous elements like workmanship and stability. In sum, 85 different components were considered.⁹⁸

In 1921, UL saw an upswing in demand for testing services by auto manufacturers who were competing with one another by offering fire



A car engine catches fire during a test (1920s).

and collision safety and theft protection. As a result, UL added bumper tests and radiator guard tests to its services.⁹⁹ By 1924 the labs reported ongoing growth in the auto testing business, having expanded its services to include vacuum tanks, generators, starting motors, ignition systems, mufflers, exhaust heaters, wiring, and locks.¹⁰⁰

UL likely designed the first crash test dummy in the world of auto safety testing. P.A. Adam, an assistant engineer in the Casualty and Automotive Department, reported in 1929 that to test the impact of car fenders if a pedestrian is unfortunately struck, his team built a six-foot tall, 140-pound dummy built of a steel frame, a wooden head, with bricks to simulate the centers of gravity in the human body, padded throughout with excelsior. "The performance of this dummy when struck by a safety fender was gratifying in that the action was very realistic," Adam wrote with the pride of the schoolboy showing off an award-winning science project.

In 1921, UL entered the area of aircraft testing—another technology that would change the world. UL determined that engineering concerns in aircraft safety were paramount, and with the organization firmly established by this point, the National Aircraft Underwriters Association began recognizing UL reports "covering the design and equipment and the insurance classification of aircraft." "The most skillful pilot," one report observed, "cannot avoid crashing, if his machine is unreliable or defective either in design or through faulty assembly or indifferent upkeep."¹⁰¹

UL was the first national organization in the world to certify airplanes for use. Aircraft testing represented a change in direction for UL from product safety to environmental and performance testing—a decision that would lead to many new areas of work for UL over the decades ahead. Still, by this point the labs were experienced in using the voluntary standards network to gather information and establish testing protocols and standards of safety. Engineers drew upon specifications of the Airplane Engineering Division of the War Department as published



Socialite Vincent Astor had his amphibian plane certified by UL in 1922.

by the Bureau of Aircraft Engineering and of the International Aircraft Standards Board. UL also took advantage of the research performed by the Bureau of Standards for the National Advisory Committee on Aeronautics as well as the U.S. Navy, U.S. Postal Service, and other divisions of the federal government.

By the mid-1920s, the labs registered 10 private planes and 25 commercial planes, and issued 39 pilot certifications. To test and certify, the labs employed 32 “aviation engineers” who worked at factories and airfields across the nation. UL’s success in this approach set the stage leading up to introduction and passage of the federal Air Commerce Act in 1926. With this bill, aircraft safety and pilot certification was centralized within the Department of Commerce, and would eventually grow into the Federal Aviation Administration.

New Facilities Give Access to New Markets

The UL branch office opened in New York in 1912 and focused on electrical testing to service the predominant segment of electrical manufacturing that took place on the East Coast. The New York office was supervised by Dana Pierce. Here UL performed the first electrical work involving the Reexamination and Label Service by engineers who were working from the “offices of local civic authorities and local insurance underwriters. With increase in volume and variety of products to review, though, the work increased and grew to encompass Trenton, New Jersey, Bridgeport, Connecticut, Syracuse, and Buffalo.”¹⁰² Many of the early engineers in the New York office were from the area and were educated locally. A review from 1928 reveals the reach of the New York office’s inspection work. In that year alone, the employees visited 92 cities, developing a network of regional contacts. Engineer C. J. Peacock summarized his activities for the year:

On account of the distance between the various cities in this section, the municipal people do not get in touch with each other as frequently, hence they welcome contacts from outside sources. . . . Besides contacts established with municipal and rating authorities, there has been opportunity to get in touch with jobbers, electrical contractors, clients, state officials, power men, secretaries of electric leagues, members of the staff of the Bureau of Standards, as well as the engineers and inspectors of Underwriters Laboratories. The total number of interviews in these various contacts has been well over 800 this year.¹⁰³

A network of manufacturers, insurance companies, and civic fire authorities similar to those on the East Coast and in Chicago existed on the West Coast as well. Yet, manufacturers were reluctant to send their products east to Chicago for testing, considering that it was a five-day train ride away, which took even longer for freight shipments.¹⁰⁴

By March 1923, UL gave the green light to opening a testing station in San Francisco, California. Alvah Small told the San Francisco



The San Francisco office was opened in 1923.

Electrical Development League, “I left Chicago on this present trip to the West Coast with instructions to look over the field and ascertain the sentiment here as to Underwriters Laboratories establishing a branch testing station for local service. This was by no means a new idea but its formal consideration was delayed by the war situation and the reconstruction effort.

“... During a brief stay I seem to have acquired some of your much-advertised optimism, and it accordingly has been determined that a testing station shall be established here, operating on the general plan of the relations of the New York station to the main shop in Chicago.”¹⁰⁵

UL hired an electrical engineer named R. J. Larrabee to open the San Francisco office. A graduate of the University of California, Larrabee had worked with fire underwriters and inspectors in Michigan and at the Board of Fire Underwriters of the Pacific doing reexamination, label service, and electrical testing. In 1923 a UL electrical testing lab was established on Commercial Street in San Francisco under Larrabee’s direction. Work on the West Coast quickly picked up speed. Products were submitted for

testing from Vancouver all the way to Tijuana, with the lab developing special expertise in electrical heating equipment, elevator equipment, and gas tube electric signs. In fact, within a few years, both Portland and Los Angeles adopted “sales control ordinances,” which required that all electrical products sold in these cities be listed by Underwriters Laboratories.¹⁰⁶

By 1930, the San Francisco office was operating at full productivity. One UL visitor reported that “the equipment at the station now consists of all necessary office furniture and supplies and practically all the testing equipment that is necessary to carry on the type and kind of work required by the Pacific coast.”¹⁰⁷ Soon, however, the weaknesses of the U.S. financial system and misguided decisions by federal policymakers would accelerate the Great Depression and the threat it presented to every aspect of American life.

Laboratories' Data, A Political Cartoon



This cartoon by Edmund Waller Ted Gale ran in the *Los Angeles Times* and drew attention to the importance of fire and accident prevention and included a caricature of UL's George Muldaur.

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Baron Whitaker, UL's sixth President, is pictured conducting tests on electric fences in 1939. Whitaker's work was featured in the Bulletin of Research entitled *Electric Shock as it Pertains to the Electric Fence*.



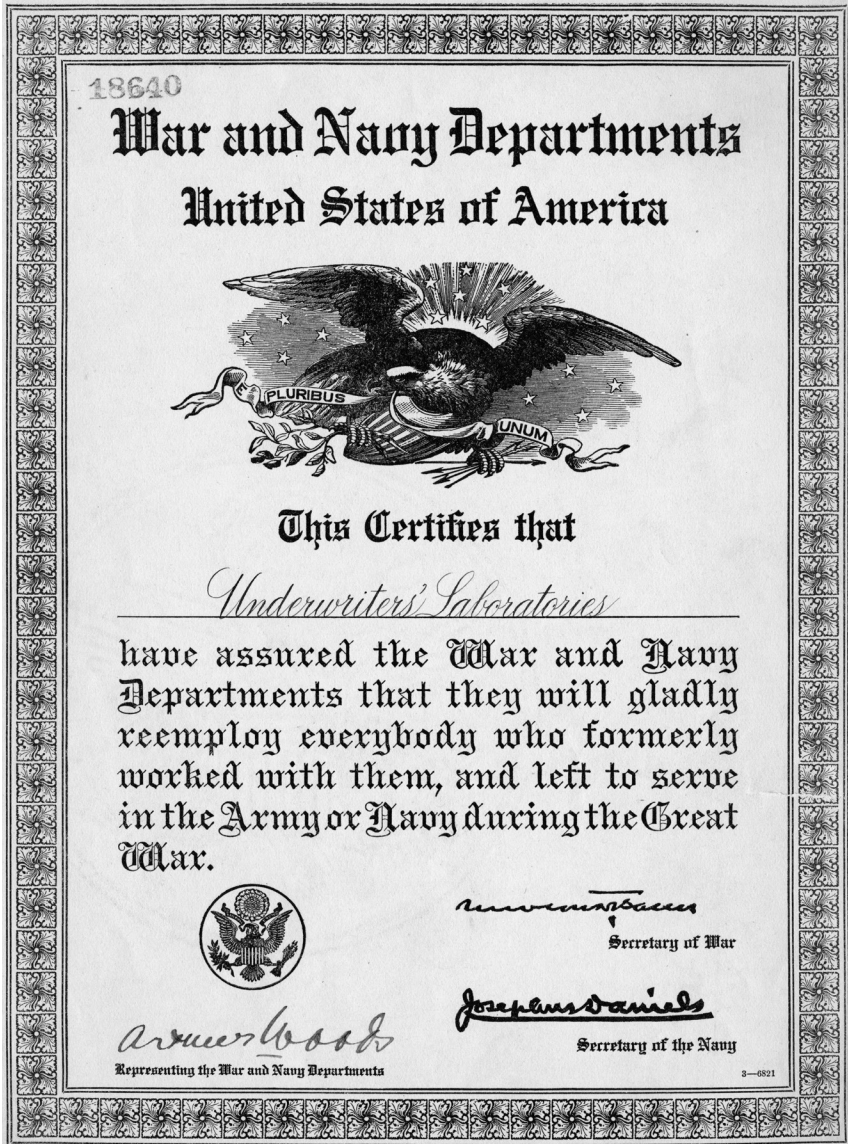
On July 1, 1924, UL established its Aircraft Register program.



WWI flying ace, 1st Lt. Charles Rudolph d'Olive, became the Superintendent of Label Service (ca. 1918).



UL expanded into California in 1923. The first office was located at 615 Commercial Street in San Francisco.



UL was a strong supporter of the war effort and guaranteed reemployment to those employees who left to serve.

—CHAPTER FOUR—

Serving Safety Through Hard Times

UL OVERCOMES ECONOMIC DEPRESSION, WAR, AND LEGAL CHALLENGES

**It is something of a satisfaction to realize that whether
it be in peace or in time of war our chartered objectives are
for a fundamental public service.**

—ALVAH SMALL, 1943

As the Roaring Twenties came to a close, UL was humming along. Much of the organization's operations closely resembled the firm known to the world 75 years later: The billions of product labels gave consumers confidence their appliances were safe, ongoing policy and standard-setting work with expert associations, consulting work on innovative approaches to manufacturing design, and the public role as consumers' safety guardian, spokesperson, and fire-prevention advocate.

UL FLIES MINUTE MAN FLAG



More than 90 percent of UL employees bought war bonds through the payroll savings plan.

But as early as 1928, the U.S. economy was already in crisis. As historian David Kennedy summarized:

Deep down in the bowels of the economy, small but fateful contractions had already set in. The agonies of agriculture had long been apparent. Now other sectors began to feel similar pain. Automobile manufacturing slowed its prodigious rate of growth as early as 1925. Residential construction turned down in the same year. A boom in Florida real estate drowned in a devastating hurricane in September 1926. Bank clearings in Miami sank from over a billion dollars in 1925 to \$143 million in 1928, a chilling adumbration of the financial clotting that would soon choke the entire banking system. Business inventories began to pile up in 1928, nearly quadrupling in value to some \$2 billion by midsummer of 1929.

Most ominous of all was what U.S. President Herbert Hoover bluntly labeled the “orgy of mad speculation” that beset the stock market beginning in 1927. Theory has it that the bond and equity markets reflect and even anticipate the underlying realities of making and marketing goods and services, but by 1928 the American stock market had slipped surly bonds of reality. They catapulted into a phantasmagorical realm where the laws of rational economic behavior went unpromulgated and prices had no discernible relation to values.¹⁰⁸

UL Evolution: The Label Service...thriving

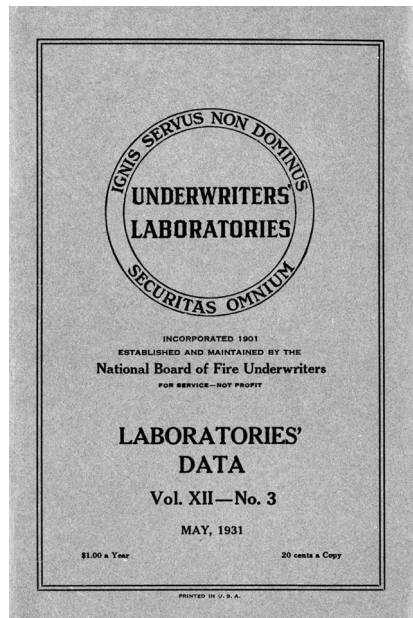
The sophistication and scale of the Label Service was maintained during the worst of the Depression years. Under the supervision of G.E. Manning, the service operated in 110 industry classifications including four new areas, wiring materials, elevator appliances for hazardous locations, and metallic and non-metallic pipes for water mains.

The number of labels used by subscribers exceeded 408 million that year. Over 63 thousand inspections were carried out in 2,150 factories; the inspections were carried out by 290 part- or full-time inspectors in 171 U.S. cities, 17 cities in Canada, one in Honolulu and one in England. The two mobile field laboratories saw a 55 percent increase in samples tested.

One enduring trait has been essential to UL's survival over more than a century: Because it operated in the foundational, basic marketplace of supply and demand, it never got too far ahead of the economics of everyday consumers. When goods and services were in demand, UL's services were in demand. When the global economy came to a standstill in the 1930s, when consumer spending dried up, and construction projects were abandoned nationwide, UL had already felt the effects and made rapid adjustments.

UL's Annual Report for 1933 detailed how income from the Label Service had declined by 45 percent between 1929 and 1932, but this "was as to be expected, as UL's work has shared in the general decrease of business activity." UL had already briskly set about simplifying standards, eliminating unnecessary mandatory provisions for certification, and cutting costs while avoiding layoffs and pay reductions. UL eliminated all unnecessary travel and cutback on nonessential services. One victim of UL's cost-cutting in 1931 was UL's subscription newsletter *Laboratories' Data*, a treasure to corporate archivists and historians in the present-day, which described the bad, and some perhaps unexpected good news amid the gloom:

"The prevailing business conditions naturally affected the work of the Laboratories and this appeared in two principal ways. The decrease in volume of manufacturers resulted in a very marked corresponding decrease in the demand for factory inspection and labels. On the other hand, the test-



The last issue of *Laboratories' Data* was released in 1931, after a 16 year run.

ing of new devices and new models of articles already listed increased over that of any previous year and was nearly twenty five per cent greater than the average of 1928 and 1929. This increase undoubtedly resulted in part from the fact that manufacturers during a period of reduced production turn to the development of new patterns.”¹⁰⁹

Alvah Small – A Wartime Leader

After Dana Pierce died suddenly of a heart attack while on vacation in Atlantic City, New Jersey, at the early age of 63, the Board of Governors named Alvah R. Small President of Underwriters Laboratories in 1935. Small was born in South Portland, Maine, in 1882, and graduated with an engineering degree from the University of Maine in 1904. Small worked as an insurance inspector in New York before joining the UL workforce as an assistant engineer in the Electrical department. In the following years, he served as a special inspecting agent and, in 1910, he headed the Factory Inspection department. Small helped establish the signature UL label service whereby products needed to pass UL tests to determine they meet UL standards before being given a UL Mark and certification—with follow-up re-certification taking place on a regular basis.

Becoming a vice president in 1916, Small directed the New York Testing Station until he returned to Chicago to lead the organization. As with other UL officials in these years, Small was extremely active in electrical and fire protection associations, serving as an ASA (American Standards Association¹¹⁰) board member, NFPA president, and head of the NFPA’s Electrical Committee for many years—the committee that produced the National Electrical Code.¹¹¹

Alvah Small presided over UL at a time of great national peril: economic crisis, scrutiny of the consensus code system from the courts, and the demands of military service in wartime. Under Small, UL survived years of litigation challenging its tax-exempt or not-for-profit

status including an appeal to the U.S. 7th Circuit Court of Appeals, begun when Small registered UL in Delaware under that designation. Ultimately, UL emerged from the Second World War with a contested tax status yet with the same glowing national reputation.

Merwin Brandon (UL President, 1959-1964) remembered Small as willing to instigate changes when necessary, as when he brought in a Chief Engineer John Neale to “set . . . operations on a more practical basis” in the Fire Protection department, which resulted in increased business. In the midst of the Depression, President Small boosted morale by moving hourly workers to semi-monthly payment with “the same rights and privileges as the engineering and clerical employees,” while also developing for the first time in the organization’s history a funded pension plan.¹¹²

Though it had always operated under a not-for-profit model, in 1936 UL applied for and formally chartered itself as a [not-for-profit] corporation in Delaware. Despite the formal status, the IRS did not accept UL’s claims to being a [not-for-profit] company, leading to a case in tax court decided against UL, and finally an appeal brought by UL to the U.S. 7th Circuit Court of Appeals in 1943. The issue before the court was whether UL could claim tax-exempt status as a 501(c)(3) organization, based on claims to its status as a “charitable, education or scientific” organization, or whether it was an exempt “business league.”

The court characterized UL as an organization conducting “research and investigations as to insurance risks and hazards for the National Board [of Fire Underwriters].” It “conducts tests, experiments and investigations,” mostly for insurance companies, but “data are also made available to a wider group of the general public through publications, movies, and the radio, all of which agencies of publicity extol the work and services of the petitioner.” The following facts were worthy of note by the court. At the time of UL’s application for nonprofit status it had \$1.15 million in assets. Seventeen regular members controlled its

governance. The National Board of Fire Underwriters carried as many votes as it had member companies, whereas other members had one vote each; UL had 15 trustees elected by members, all but two of them officers of stock insurance companies. Though UL operated in a not-for-profit manner, and never paid dividends, in 1937 it earned a profit of \$183,000. This was the amount in dispute, the amount UL claimed should be tax exempt.

The court found against UL, and in its decision it called into question the core claims to authority of fire experts across the board, even by extension those working in government, so long as what they did benefited fire insurance companies. The decision is worth quoting at length:

This does not sound like charity to us . . . It was not the public interest that prompted the establishment of the petitioner. It was financial gain and business advantage. The primary concern of the petitioner was that of its membership, made up almost entirely of insurance companies, and the manufacturers who paid its ample fees. Whatever benefit inured to the public was only incidental to the primary concern. . . . [UL did] enable someone to sell something to the public by giving to the public something better than it otherwise would have received. That may be good business, but it is not charity . . . It did not operate on the basis of science for the sake of science. It was science for the sake of business . . .¹¹³

While the decision did not sit well with President Small, the Board, and surely most of UL's employees, the decision only reinforced the firm's commitment to what William H. Merrill identified early in UL's history: "far beyond any particular interest of the underwriter which we may be serving, we are doing something for manufacturers and buyers and users and property owners everywhere—we are doing something for humanity."

UL saw more bad legal news the next year, when "the Supreme Court overturned the longstanding precedent set by *Paul v. Virginia* in 1869

barring federal oversight of the insurance industry. In *United States v. South-Eastern Underwriters Association* the court found the insurance business to constitute ‘commerce,’ therefore falling under congressional oversight. The end of an era seemed to be at hand. A long period of evolution through which fire experts had gained authority in a novel realm of public-private governance was halted by a new way of conceptualizing insurance and a rejection of ‘nonprofit’ as a fair description of UL, and by extension its peer institutions.”¹¹⁴

In reality, very little changed for UL by the end of the war. Congress passed the McCarran-Ferguson Act in 1945, exempting insurance companies from the Sherman Anti-Trust Act so long as they were under state regulation, as all of them were by that time. Fire insurance remained under the control of states, leaving intact the power of the state fire bureaucracies that had emerged in the Progressive Era (1890-1920).¹¹⁵ This gave Congress little incentive to create a federal fire insurance regulatory agency or set in motion sweeping federal land use restrictions. In 1954, Congress amended the 501(c)(3) tax code to write in UL’s non-for-profit status which UL retained. The “democracy of experts” ultimately had retained their authority.

Of equally pressing concern to UL during the Great Depression was how UL could do more with less—which indeed it did. In December of 1936, Small moved the New York office and testing station to new quarters in the Butterick Building at 161 Sixth Avenue. By collecting testing facilities and office space for engineers and the clerical force onto one floor, UL not only saved on rent, but upgraded its facilities and workspace. “The improved facilities and service have been the subject of much favorable comment from manufacturers and others,” UL noted in its 1937 Annual Report.

In 1935 Small also introduced a fleet of mobile labs, using specially equipped cars to test products in the field. One truck covered territory east of the Mississippi River, while the other traveled through Texas and northward in California from the Mexican border. UL contacted fire

UL People of the Greatest Generation

By 1944, 51 UL employees were in uniform. Twenty-one sons of UL employees were in service, and two daughters of ULers became Army nurses. The U.S. placed many UL employees in branches of the services that benefited from their technical skills, such as the Signal Corps, Chemical Warfare, Army Engineer Corps, the Air Corps, and Coast Artillery. In addition, Norrine Beerman of the Chicago office enlisted as a marine trainee at Hunter College, New York.

As UL reported in 1945, the firm would have one gold star on its service flag. Chicago-based employee Lt. Andrew Karkow was killed in action during a flying mission over Austria in 1944.

Two prisoners of war returned to full and rewarding careers at UL. Robert Derek Barton was captured at Bataan and held at the Mukden prison camp in the Philippines. He retired as a Senior Vice President in 1978. Ralph L. Karkow, second lieutenant and brother of Lt. Andrew Karkow, served aboard B-17s with the Army Air Corps in Germany and was held at Stalag Luft 1 Barth Vogelsang Prussia 54 for 16 months until June 1945. Returning, he served UL and its safety mission for 46 years.



Lt. Andrew Karkow (top row, far left) was a member of the Illustrations Department in the Chicago office.

department and other municipal officials in advance of a visit to set up follow-up testing with dealers and clients, mostly electrical. “The returns thus far from this new enterprise indicate a valuable educational feature,” UL reported in 1937, “this in addition to its influence as a further countercheck on the factory inspection and labeling work.”

UL continued to receive favorable attention for its media and public education activities during these years. In 1937 alone, UL was featured in *Readers' Digest*, in a half-hour NBC radio feature and in conjunction with an appearance by Assistant Secretary B.P. Caldwell, Jr. during NBC's “Science in the News,” and numerous activities during Fire Prevention Week in October. *The New York Times* and Associated Press syndicated photos from the labs, and UL employees wrote or were quoted in numerous articles in magazines, newspapers, and journals including *Safety Engineering*, *The New York Journal of Commerce*, *Business Week*, and *Modern Mechanics*.

UL and the Insurance Industry During Wartime

Insurance companies possessed information about factories that proved invaluable to anti-sabotage planning during World War II. Historians have documented this little-understood role. “For the first time in many years,” wrote one observer, “the fire protection work of fire insurance companies received real recognition from the public and from authorities.”¹¹⁶ Early in the war, the fire insurance industry established the Insurance Committee for the Protection of American Industrial Plants, headed by the President of the NBFU, Henry E. Newell. The committee acted as a clearinghouse of reports on every type of property in which the government might be interested. It received reports from all sources—companies, rating bureaus, engineering firms, inspection companies—correlated them, and made them available to any government agency which needed information about a particular war plant or any other property.¹¹⁷

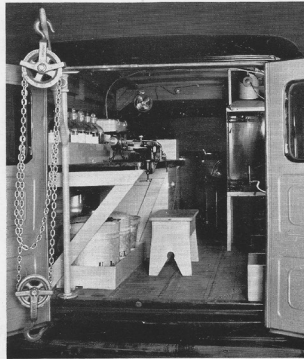
America needed the nation's fire and safety experts to protect facilities during the rapid wartime re-industrialization and civil defense mobilization. Much of UL's most important work from 1941 to 1945 was related to winning the Second World War. UL devised protection standards for the new and upgraded factories turning out the armaments, vehicles, and supplies for the war. It also tested and rated many

UNDERWRITERS' LABORATORIES *Goes Visiting*



THE PHOTOGRAPHS illustrate one of the traveling laboratories which were fitted out by Underwriters' Laboratories and placed in service on July 29, 1935. It is the expectation that these field laboratories will serve to acquaint electrical jobbers and dealers, as well as electrical inspection authorities, with the inspection and test work regularly undertaken by the inspectors of Underwriters' Laboratories at the factories of manufacturers subscribing to the Label Service.

The scope of the field laboratory work includes physical tests of rubber insulation, flame tests of flame-retarding finishes, copper sulphate tests of zinc coatings, tension tests, flexibility tests, etc. The equipment is such that it is possible to duplicate factory tests on rubber-covered wires and cords, rigid conduit, armored cable, flexible non-metallic tubing, etc.



or reel and forwarded to the Chicago Office of Underwriters' Laboratories for countercheck tests under standardized laboratory conditions. . . .

Advantage will be taken of the opportunity afforded by these contacts with jobbers and dealers to obtain additional samples from their stocks of labeled materials for regular market sample countercheck tests at the Chicago testing station.

Each laboratory will be in charge of an experienced inspector who will visit electrical jobbers, dealers, and retailers of electrical supplies to obtain representative samples of labeled products. The samples will be tested on or near the dealers' premises, and the results reported to the manufacturers of the labeled goods. If a failure is obtained for any item of the specifications, another sample will be procured from the same coil

President Alvah Small introduced a fleet of mobile labs, using specially equipped cars to test products in the field.

of the materials used in production as substitutes for materials made scarce by war. Once the war started, the rush to build massive plants and the strain on living facilities introduced dangerous working and housing conditions for workers.¹¹⁸

In 1944, UL had 51 employees in military service (23 percent of male employees), while other members of the technical workforce joined non-uniformed service. Four employees went to work for the War Production Board.¹¹⁹ UL's work during the war was critical,

UL in Wartime

With a quarter of UL's male employees serving in the military, female chemists and engineers saw more employment opportunities. Frances Joyce McArdle (left) and Marie H. Lynch (right), chemists, here analyze synthetic and rubber compounds for use in fire hose linings and also analyzed fireproof wood samples.



During WWII, women stepped up to replace the UL men who entered military service.

given the rapid shift in industrial processes and the risks in opening new factories and training workers quickly.

UL became deeply involved in evaluating substitute materials. Production standards for fire doors, extinguishers, hose, and other similar products had to be modified, and UL issued emergency specifications covering many products.¹²⁰ For example, the War Production Board cut the rubber content in a hose by 50 percent. Brass was also restricted, affecting fire-hose couplings—saving several thousand tons of copper. In 1942, UL's Electrical Department issued 60 emergency requirements on issues ranging from “the use of steel instead of copper for certain electric current-carrying parts, the use of emergency insulations for the conductors in non-metallic sheathed cables and in open wiring, enamel coatings as a corrosion protection on electrical conduit.”¹²¹

Another major project involved materials testing in constructing training camps, flying fields, ordnance plants, shipyards and defense housing projects. UL-trained inspectors performed the field testing at 187 different factory sites across the country. As the government revamped federal purchasing rules, officials consulted UL Standards for insulated safes, food-mixing machines, vegetable or meat-slicing machines, safety cans, explosion-proof motors, knife switches, synthetic-insulated wire, fire hose, fire extinguishers, watchman clocks, and steel scaffolding, among many other

UL Emerges into the Post-War Era

In the words of Alvah Small, 1946:

“Military victory has rewarded the vigorous and capable direction of the allied military forces . . . nearly every person in every allied land assisted. The war's startling finale was by no means the only contribution of scientific and applied research to the glorious result.

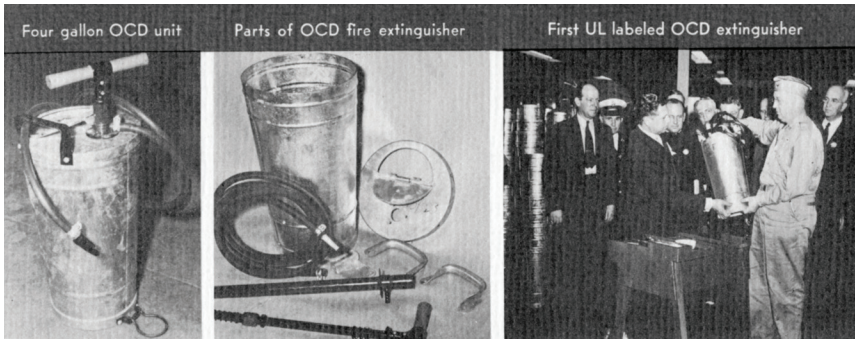
“It is not surprising that re-conversion is confused, and by some forecasts, delayed. Many wartime lessons remain to be learned. But no doubt exists as to the destruction which fire can accomplish and there are no grounds for challenging the effectiveness of careful planning for safety to life and property.”

products. UL engineers also investigated munitions plants and storage depots, looking for hazards such as: fire and explosion in manufacturing synthetic rubber; safeguards against flying glass; testing flammability of camouflage materials; and fire-retardant qualities of flameproof wood.

Another pressing challenge was on civilian defense, which included preparing for the possibility of German or Japanese air raids over American cities. The military charged UL with designing a “rugged fire extinguisher which would perform well and safely when used by unskilled persons under all sorts of conditions and which could be made economically even in large numbers without employing critical materials.” This fire extinguisher was intended for air raid wardens and block captains.



The War Department urgently needed UL's services during WWII, to develop safety standards during the rapid expansion of factories and new manufacturing processes. Here a technician sets up an explosion test for a flame arrester.



At the request of the Office of Civil Defense (OCD), UL and manufacturers designed a water-filled extinguisher to be used during WWII.

UL's engineers produced a water-filled extinguisher with a galvanized iron tank, holding four gallons. It included a ten-foot hose—all made of reclaimed materials—weighing 45 pounds. The government ordered more than two million of these civil defense fire extinguishers; UL was responsible for testing them. UL also researched lightning rods for munitions plants and depots. At the Chicago labs, UL conducted classes for “security specialists,” in areas such as building codes, electrical hazards, and plant fire protection.¹²²

Despite the grim news from abroad and the constant disruption, UL employees felt exhilarated and validated during the war years because their work demonstrated the value of UL's expertise in protecting the nation. As President Small wrote in UL's annual report on the 50th anniversary, “we joined...all good and loyal Americans in bending every effort towards the coming Victory. It is something of a satisfaction to realize that whether it be in peace or in time of war our chartered objectives are for a fundamental public service.”

Historian Christopher Tassava of Carleton College noted, “[S]cientific and technological innovations were a key aspect in the American war effort and an important economic factor in the Allies' victory. While all of the major belligerents were able to tap their scientific and technological resources to develop weapons and other tools of war, the Ameri-

can experience was impressive in that scientific and technological change positively affected virtually every facet of the war economy.”¹²³

UL's Role and Influence at the End of the Second World War

When the 7th Circuit Court made its decision in 1943 denying UL's request for 501(c)(3) status, UL had been in business for 50 years. During this time, UL “estimated it had tested 375,000 products. With a 50 percent failure rate for its tests, this still meant that every year 5,000 manufacturers in 5,500 factories were producing half a billion UL ‘approved’ goods across the country.”¹²⁴

The federal court found it hard to classify whether UL was a scientific, educational, or charitable entity. UL's unique organization defied precedent. The federal court's opinion did not open the door to Congress taking action to establish federal agencies, federal oversight or develop national credentials for a single powerful fire disaster organization.¹²⁵ Instead, UL continued to work as an enlightened not-for-profit, leading a field of disaster experts who came from different disciplines. These disaster experts had variable legal and advisory authority across jurisdictional boundaries, and they were embedded in multiple sectors (from private to government to not-for-profit). By the 1940s, however, they were trusted by the public.

Fire risk and fire disasters in the United States were not completely eliminated by the end of World War II, of course. Numerous types of products were much safer, however, and urban firestorms were greatly reduced. UL's standards grew from obscurity to wide acceptance by experts and the general public. City center business districts stopped burning and unsafe electrical products claimed fewer lives, marking the end of the American conflagration era.

UL with other fire risk and safety experts had established their

research, knowledge dissemination, and standard setting methods as a successful compromise between industrial control and government regulation. It provides us one crucial model for understanding how disaster knowledge and disaster policy coalesced over time into an effective system for risk and disaster control—in this instance for fire.

By World War II, American fire experts including all of UL's senior executives participated in a powerful network, conducting costly risk research and quickly implementing knowledge into the manufacturing sector, the built environment, and public policy directed at preventing fire disasters. Many of the experts that came of age during the Great Depression and Second World War held influential positions. They were insurance commissioners, fire marshals and building inspectors, fire protection engineers, urban planners and architects. They also worked in interdisciplinary teams in major institutions like the United States National Bureau of Standards, the National Fire Protection Association, and Underwriters Laboratories.

UL eagerly participated in a standard-setting process enjoying both *de facto* and in many cases real legal authority over fire protection across the United States. These standards informed municipal and state building codes and code enforcement and decided the winners and the losers in manufacturers' arguments over the safety and reliability of their products. These standards succeeded in lowering the overall annual urban fire loss by the end of World War II, achieving a brief moment when the pace of risk-taking and the knowledge and power to take risk were in a rough equilibrium—a rare condition in modern United States.

The most notable features of fire expertise by the mid-century were that it was not the purview of one single discipline or profession, nor was it controlled by government or by the private sector. Fire experts worked across disciplines, in both public and private settings, with claims to authority that stretched across state and municipal boundaries. In addition, fire experts had achieved, and would continue to achieve, their greatest success in both knowledge creation and control over the built

environment. They did this not by capturing one industry or by regulation or public policy, but instead through a “consensus code” system, or “voluntary standard-setting system.”¹²⁶ No single organization better exemplified the rising power of safety experts in the overlap of technical, business, and policy realms than Underwriters Laboratories.

By the 1940s urban conflagrations were mostly a memory of a receding era, the great wave of urbanization and industrialization. By this time it was the automobile and the airplane—not the railroad—that defined technological progress. The fire experts had made it through depression and war far stronger than they could have imagined—powerful with their knowledge base and also in the system they had established to use their knowledge to shape building and fire codes, city plans, and product specifications.

UL Officers, 1945

J.C. Harding, Chairman
 Alvah Small, President
 Curtis Welborn, Secretary
 H.F. Duncan, Treasurer



Electric irons and heating pads are tested for their flammability risk (1937). Photograph credit: Associated Press



In December 1936, President Small moved the New York office and testing station to new quarters in the Butterick Building at 161 Sixth Avenue.



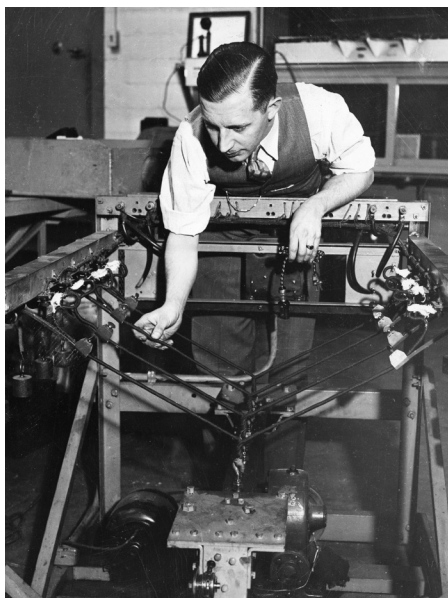
The Chicago office mail department employees in 1938. Kay Clowry (far right) worked at UL for 59 years.



Alvah R. Small became the third President of Underwriters Laboratories in 1935 and served the organization until 1948.



During WWII, Norrine Beerman of the Chicago office enlisted as a marine trainee at Hunter College, New York.



A technician tests the strength of electric toaster cords. Photograph credit: Associated Press

—CHAPTER FIVE—

UL Goes Mainstream

AMERICA'S "DANGER SLEUTH" FILLS KEY ROLES DURING THE POST-WAR BOOM

No conceivable method of testing is overlooked. Much of the test equipment is of U. L.'s own design and they dream up diabolical plans to subject samples to the meanest treatment possible.

They try to anticipate all of the mistakes that could be made by a consumer. Appliances are left on for weeks and electric heater cords are twisted and untwisted thousands of times....Good will and impeccable honesty is the main stock-in-trade of this organization. U. L. never solicits business, but industry has learned that it is well worth the effort to make sure its products deserve the U. L. label.

—E.D. MORGAN

Popular Electronics, 1955

During the post-war period, UL established its value to daily American life and its symbol became synonymous with commonsense safety and dependability in the household. UL's post-war evolution is also a story

of an iconic, reassuring American brand, one rooted in its success as a trusted consumer watchdog and expert.

From early days, William Henry Merrill believed consumer safety was critical to public support for the Laboratories' mission. As consumers began seeking better safeguards after the Industrial Revolution, UL took part in numerous campaigns to make the home and workplace safer during several turning points in U.S. history.

Using its power to regulate interstate commerce, Congress passed the first consumer safety laws during the late nineteenth and early twentieth century to address widespread health dangers in meat, food processing, and commercial drugs. The activism of ordinary citizens, particularly women seeking to protect their homes and families, as well as a growing breed of investigative muckraking journalists sparked many of these reforms. (As will be seen, over the course of the twentieth century, the rise of consumerism affected women's roles in the economy, as many household purchases during the pre- and post-war era were made by women).

Upton Sinclair published *The Jungle*, his scathing critique of the meat-packing industry, detailing practices that mangled workers and passed off sausage containing rat meat and tripe disguised as ham. The next year, Congress passed the Pure Food and Drug Act, after a 13-year campaign led by Harvey Wiley, a government chemist who later became the first Commissioner of the Food and Drug Administration. "After assisting Congress in their earliest questions regarding the safety of the chemical preservatives then being employed in foods, Wiley was appropriated \$5,000 in 1902 to study the effects on human volunteers of a diet consisting in part of the various preservatives. These famous 'poison squad' studies drew national attention to the need for a federal food and drug law. Wiley soon became a crusader and coalition builder in support of national food and drug regulation. His work and that of Alice Lakey spurred one million American women to write to the White House in support of the Pure Food and Drug Act."¹²⁷

“Pure food was a female issue,” author Laura Schenone wrote in her history, *A Thousand Years Over a Hot Stove*. “National women’s organizations and local women’s clubs had helped work for its passage, and women’s magazines took a leading advocacy role. ... In 1915, local chapters of the National Housewives League organized to seek out and rectify unsanitary conditions of grocers and food makers.”¹²⁸ The activism of wives, mothers, and homemakers played an essential role in the later consumer movements of the 1970s and 1980s that so affected the prominence of UL in reform efforts.

In the 1920s and ’30s, other consumer advocacy groups such as Consumers Union (CU) launched their own campaigns. These organizations called for consumer education and protection from unsafe, unreliable products. During the Great Depression, Americans struggling to feed and clothe themselves and their families again called on their elected officials to force manufacturers to take action on “dangerous medicines, impure foods, and shoddy electrical goods.”¹²⁹ Consumer advocates and agencies waged a bitter legislative battle that culminated when over 100 people died in 1937 after taking an untested, toxic drug sold as an antibiotic.¹³⁰ President Franklin D. Roosevelt signed the new Food, Drug, and Cosmetic Act into law the following year, replacing the Pure Food and Drug Act and significantly increasing federal regulation over these areas.¹³¹

Like the fire safety experts that preceded them, the consumer safety experts used multi-disciplinary investigations, information sharing among a network of testing and standard-setting bodies, and laboratory research as means by which to capture authority over a specific body of knowledge—the efficiency, value, and safety of consumer products.¹³²

However, Americans’ attention shifted during World War II. As part of the war effort, the government rationed basic products such as food, gas, and clothing. Americans were asked to conserve everything and millions of people answered the call to establish “victory gar-

dens” to grow their own fruits and vegetables. During the war, UL made organization-wide efforts to employ women and give seniority credit to employees while serving their country during times of war. Indeed the consumer movement slowed during this period, but the post-war population boom would soon change everything.

A Booming Middle Class Rebuilds

It is no wonder many economists look back with awe at the U.S. economy from the end of the Second World War up through the early 1970s, a time that came to define the American middle class. It was a period of economic growth and prosperity unprecedented in human history. When returning soldiers came back, the women who had been

filling wartime jobs working in factories and building ships and munitions were strongly encouraged to go back into the home and focus on raising families. The 1944 G.I. Bill provided veterans with money for college education and new homes. Between 1950 and 1970, suburban populations in the United States swelled by more than seventy percent, and overall population grew by more than 30 percent. The single-family home became a sacrosanct cornerstone of the American dream. Thanks to the availability of Federal Housing Administration loans, homeownership surged among American

UL Evolution—Oddities and Gadgets

UL engineers must have smiled at some of the less serious gadgets and consumer oddities that ended up in the labs for testing during the '50s and '60s. After all, America was entering the “space age” and movie goers loved those high-tech James Bond movies. Some examples:

- ▶ “tracer” golf balls that trailed a red smoke screen
- ▶ electrically illuminated burial caskets
- ▶ wireless remote controls for television receivers
- ▶ electronic “computing machinery”
- ▶ an electrically heated “canary perch”

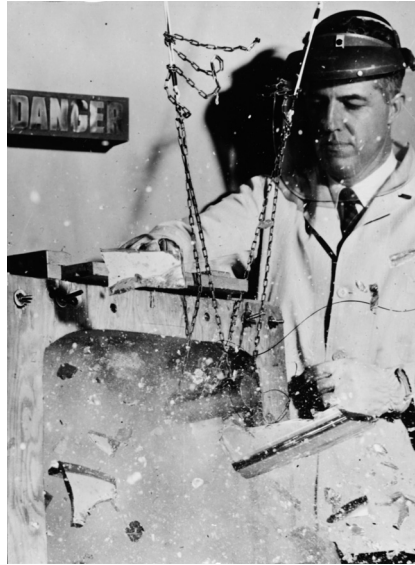
workers who took their new families in droves from city streets to suburban driveways.

“When the war ended in August 1945, Americans were ready and able to consume,” wrote historian Gary Cross. “In 1946 personal consumption was 20 percent higher than in 1945 and 70 percent higher than in 1941... While Western Europe and Japan recovered from the ravages of war, the United States faced no serious competition... In 1940, telephones were owned by only 36 percent of American families. By 1954, however, 80 percent of households had a phone.”¹³³

America’s optimistic new middle class invested in automobiles, consumer goods, and the conveniences of post-war living—including the most powerful medium in human history: the television.

Most historians agree “no phenomenon shaped and united American culture in the 1950s more than television. At the end of World War II, the television was a toy for only a few thousand wealthy Americans. Just ten years later, nearly two-thirds of American households had one,” and *TV Guide* was the biggest-selling periodical in the nation. “In a nation once marked by strong regional differences, network television programming blurred these distinctions and helped forge a national popular culture.”¹³⁴

UL performed numerous investigations into television safety and innovations that gained national attention during the post-war decades. Many of us recall being warned by mom or dad that sitting too close to



UL performed numerous investigations into television safety and innovations that gained national attention during the post-war decades.

the television damages your eyes, and to keep a lamp turned on behind the television. It became as accepted a safety tip as waiting an hour after eating to swim (another falsified myth).

It was UL's safety advocacy that planted this seed. On April 5, 1951, Mildred Sommer, assistant to the Secretary of Underwriters Laboratories, addressed the twenty-first annual convention of the Greater New York Safety Council and announced that "television programs presented in darkened rooms are a danger to children's eyesight... the strain of gazing too long is likely to impair the vision of youngsters, particularly those less than 5 years old."

To safeguard the eyesight of those of all ages, she suggested that a small lamp be lighted behind the television set. "[Unless there is a small light], small children should not be permitted to watch their favorite programs, as their eyes are still growing," Miss Sommer told the home safety session at the Governor Clinton Hotel."¹³⁵

In a far more serious event, a young boy in Chicago was electrocuted in 1957 when he plugged in a portable television set. Moving forward, UL led an investigation into preventing further such tragedies, resulting in new recommendations for using polarized electrical plugs on all home appliances—although UL had already published standards recommending this technology. *Popular Mechanics* ran a major feature in 1947 on the safety issues involving television sets, praising UL for its finding: "One recommended method for eliminating the hot chassis danger is the installation of polarized wall outlets in all locations where the set is likely to be plugged in, and the use of a correspondingly polarized plug on the end of the receiver line cord."¹³⁶

By 1947 the UL Electrical Department was regularly testing television receivers combined with other radio broadcast equipment.¹³⁷ In fact, television-related business alone drove increases in UL's hiring during the late 1940s and early 1950s. UL Vice President Gene Bockmier documented in his personal history of the organization, that "a fascinating new product was the television receiver. Two Los



Television-related business drove increases in UL's hiring during the late 1940s and early 1950s.

Angeles manufacturers, Packard Bell and Hoffman, began submitting TV receivers in 1947. This was a thriving activity for years.”¹³⁸

Testing consumer electronics was only one of many new roles UL filled during the epic economic expansion of the “American Century” that lasted from the end of the World War II to the late-1970s. UL was challenged during this time to meet ever-evolving consumer needs and protect American well-being without compromising its critical values of getting the science right, focusing on results, and collaborating for the greater good and safety of consumers. As the U.S. enjoyed its most



Fire extinguishing tests being conducted by ULC at Camp Borden.



A ULC technician conducts a signaling test.

prosperous times, so did UL. In one telling statistic the UL Electrical Department reported in 1948 that the number of their active projects at year's end were nearly four times more than in 1943.

Canada's industry and economy also grew rapidly after the war. Underwriters Laboratories of Canada (ULC) saw the post-war era as a decisive time. The officers believed it was no longer feasible to continue to depend on an agency outside of Canada for carrying out tests and investigations on equipment and materials made in Canada for Canadian consumption. The Dominion Board of Insurance Underwriters

assumed sponsorship of ULC, and selected a newly appointed board of directors. In 1949, ULC's Directors approved the purchase of property to build a new headquarters and testing station. ULC hired two former employees of UL to help organize and train an engineering employees and establish a testing facility. By 1958, ULC succeeded for the first time in showing an operating surplus of \$7,085.97.¹³⁹ ULC completed building a fire hazard tunnel furnace and conducted its first full-scale tests in 1958. During this time ULC also added testing facilities including a chemical laboratory, an electrical laboratory, and a tower room for tests requiring a high ceiling. By 1959, ULC financed yet another expansion, building a 6,000-square-foot extension to its headquarters. It was a major goal of the Canadian leadership to operate independently of the U.S. offices including the ability to fund testing facilities.

Back in the U.S., five major areas of UL's impact on consumer life and safety, and therefore American society, can be documented during the post-war baby boom:

1. Mass consumer education;
2. Consumer advocacy;
3. Further expansion into global markets;
4. Protection of UL and its Mark; and
5. Providing a scientific basis for home economics or "domestic engineering."

UL upgraded its workforce and reorganized its facilities to keep up with these new challenges in the early years after the war. UL would not have had the positive impact in the roles noted here without investing in its people and their skills, as well as their physical plant.

In 1948, Curtis Welborn became UL's fourth president. Born in Mississippi in 1894 (the year UL was founded), Welborn graduated with an electrical engineering degree from Mississippi State University (Mississippi A&M at that time) in 1920—delayed by serving as an officer in World War I. He started as an assistant engineer in the Gases and Oils department directly out of college. By 1924, Welborn became Superintendent of the Label Service, a post he held until 1935. Under Alvah Small's presidency, Welborn served as Secretary and Executive Vice President.¹⁴⁰

The dramatic growth of military-industrial engineering positions that became available during the four decades of the "Cold War," when the United States and Soviet Union built up their military and nuclear forces as enemies in an undeclared non-shooting war for global power and influence, became one of the major postwar challenges UL faced in retaining its top technical talent. Welborn moved immediately to offer

technical and administrative employees' more competitive salaries.¹⁴¹ Concurrently, Welborn knew that the growing sophistication of a manufacturing economy required greater specialization in UL's engineering.

As his friend, colleague, and successor, Merwin Brandon, who served as president of UL from 1959-1964, later wrote in his 1964 book *Reminiscences of Underwriters' Laboratories*, "Welborn inaugurated a program of specific training by deliberately shifting promising young engineers from one department to another and having them work there until familiar with that department's operations."¹⁴²

Welborn also had to attract more qualified engineers. UL showed the foresight to diversify its workforce with African-American professionals long before many other mainstream U.S. companies were fully integrated. Welborn included African-Americans in the UL workforce at the Chicago labs where, unlike the integrated New York office, none had worked to that point.

UL also invested in new physical facilities for the work coming its way. Welborn realized that Chicago's growth and population density meant expanding the Chicago lab would be particularly expensive and

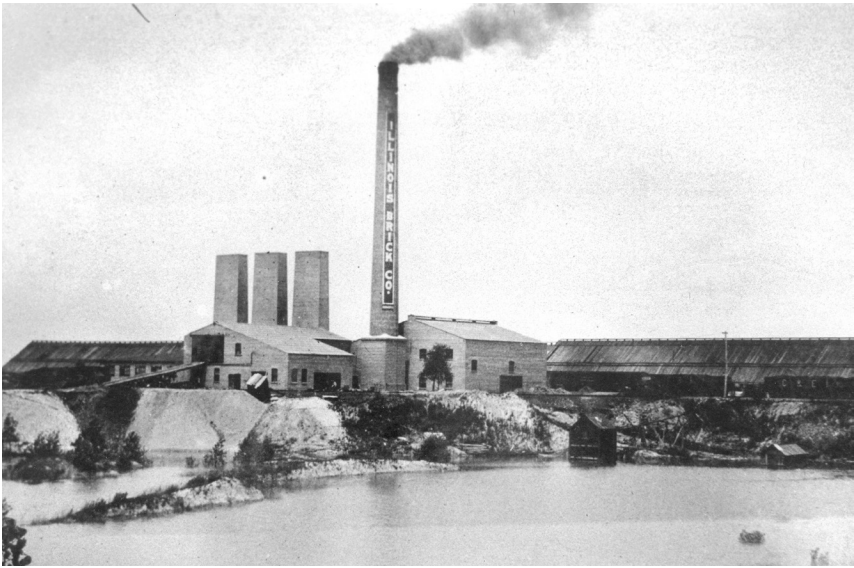
UL in the News—Lightning Rods

Today, at the White House, newly installed lightning rod equipment was certified by attachment to the building of a Master Label of Underwriters Laboratories, Inc.

—from an October 17, 1951 UL news release

When President Eisenhower's mansion was labeled for lightning protection, UL inspectors pored over the White House grounds, from flagpole to T.V. antennas, making certain both materials and installation measured up to the Laboratories' standards. After fifty-some years of service, UL was clearly emerging as the recognized leader in the field. UL would also Master Label certify the Washington Monument and Sears Tower in Chicago for lightning protection.

—*Yesterday, Today, Tomorrow*



UL purchased 153 acres in Northbrook, Illinois where the Illinois Brick Company was once located. The land was developed for use as the new headquarters.

difficult—in large part because of regulations regarding the safety of smoke and fire tests in Chicago’s urban setting. Welborn purchased one property on Grand Avenue just behind the East Ohio Street labs—it had been a livery stable—that was used for air conditioning and refrigeration testing.¹⁴³ At the same time, UL publicized that the organization was looking for a more spacious location, out of the city if possible. Hydraulics engineer O.L. Robinson located a property about 25 miles north of the city in Northbrook, Illinois, where UL purchased 153 acres where the Illinois Brick Works had made many of the bricks that rebuilt Chicago after the Great Chicago Fire of 1871. Brandon recalled, “The property . . . had a deep clay pit which had been dug for making bricks and this not only gave us a protected area for testing, it also gave us a small spring-fed lake and ample water for fire protection purposes before the large water mains . . . were laid.”¹⁴⁴

This lake was eventually named for Curtis Welborn in honor of his efforts setting up UL’s operations in Northbrook. Lake Welborn is

used to absorb excess heat from the Northbrook buildings. In addition, naturalists and landscape architects consulted with UL in order to add features to the lake supporting several species of fish and a living ecosystem. The slopes of the lake were treated with natural prairie grass and seeded with native Illinois plants to preserve the prairie south of the property.

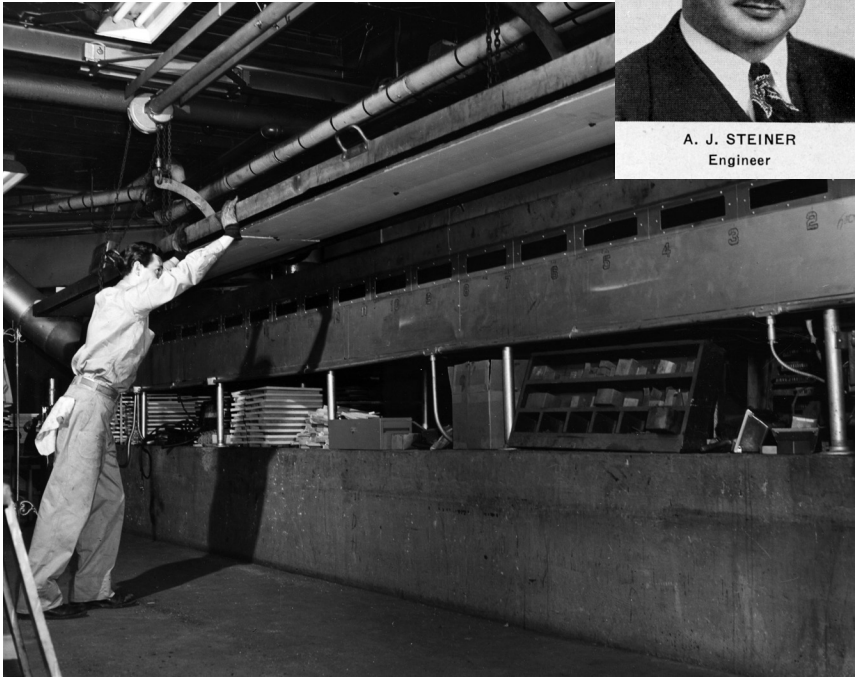
On the West Coast, due to the demand for expanded testing operations beyond what was then possible at the San Francisco office, Welborn sought and received the go-ahead from the UL Board to secure “seven acres of land in the midst of a pear orchard at Santa Clara, California, and then built a modern testing laboratory with space for expansion.”¹⁴⁵

Welborn also wanted to consolidate UL’s electrical testing. First these discussions focused on the Northbrook location, but the significant volume of East Coast business made this impossible. An idea arose for a New York testing station, and with the help of H.E. Collins, a property was located on Long Island, New York. With 60 percent of the New York engineering workforce already in Long Island, the Melville lab was established. Beginning with Welborn and continuing through Brandon’s years, UL expanded its operations in both Melville and Santa Clara, and opened a major fire protection laboratory at Northbrook with the capacity to test floor and roof assemblies.¹⁴⁶

Mass Consumer Education

During the 1950s and ’60s the ubiquity of national print media, radio and television both reflected and raised American consumers’ expectations for safe, reliable technology.

UL probably more than any other private institution had laid the foundation for these expectations and earned consumers’ trust. UL engineers were “present at the revolution,” during the post-war era, testing and consulting on critical safety and product innovations. During these decades, UL tested and certified remote TV controls, oil-burning home



Fire Protection engineer Albert Steiner developed the Fire Hazard Classification Furnace, which was later renamed the Steiner Test Tunnel. It is still in use in 2016, more than 50 years after its initial design.

UL Evolution—Responding to New Industry in California and the Sun Belt

The Santa Clara electrical division continues to grow with industrialization of the Pacific Coast, particularly California. While a majority of the investigations conducted at Santa Clara are on electrical equipment, tests are also conducted on oil and gas-fired equipment, and with the installation of a Steiner Test Tunnel, fire hazard tests will also be conducted in 1963.

—UL Annual Report, 1962

heaters, fire and electrical safety in RVs, as well as advances in air conditioning, heating, and home wiring. It also certified lightning rods at the White House and in neighborhoods everywhere.

News organizations widely published UL's advisories on fire and electrocution hazards of Christmas trees. As UL stated in 1947, "a special bulletin of this annually lively topic was circulated to the entire mailing list and received wide attention in the country's non-technical press."¹⁴⁷ UL was cited as a source every holiday period on Christmas tree decorations and safety in the decades that followed.

In 1962, UL reported that "for the first time, a submittal of automobile seat belts was made and a thorough investigation of the product is under way. In view of the many casualties from the throwing of passengers from car collisions this activity is likely to be of considerable significance in the field of public safety."¹⁴⁸ This statement underscored how UL performed its role in America's growing consumer economy.

The power of mass media fueled public opinion and changed the rules of the game for trusted institutions such as UL. Under the leadership of Presidents Welborn and Brandon, UL focused more aggressively on education and public relations. UL speeches, films, television appearances, and published articles reached millions annually. Among

the significant advances in UL's media and public education operations after World War II:

UL People—President Brandon Knew the Value of a Dollar

Known far and wide throughout UL as "Money" Brandon, UL's fifth president was a fanatic frugal rooted in the tough times of the Depression and World War II. UL engineers needing a new pencil actually had to turn in their pencil stub to receive a new one.

- In 1947, UL expanded their public relations department, hiring two new employees and retraining "six career women employees for public relations assignments."¹⁴⁹ UL's film, *Approved by the Underwriters*,



In 1962, UL reported that tests on automobile seat belts were underway.

screened to 175,000 people in 1,400 different audiences.

- In 1952, UL reported it made over 100 speeches and its leaders were quoted in many national magazines and newspapers. *Approved by the Underwriters* was featured in 26 additional TV broadcasts. Theaters showed the documentary film about fire prevention, *Danger Sleuths* over 5,000 times. What's more, an increasing number of local school Boards of Education required their students to see the films before graduation.¹⁵⁰ In hundreds of small towns and big cities during the 1950s and 1960s, fire departments, summer fairs, civic organizations, and local schools viewed UL's films.
- In 1959, newly elected President Brandon launched another major grassroots initiative, criss-crossing the country meeting with city building inspectors to determine if they were using UL listed building materials in their work. According to UL,

“Surprisingly few inspectors had even heard of the listings. Back in Chicago, Brandon tackled the problem and within a short time an ambitious public information program took place. Ultimately, fire protection engineer Albert Steiner was sent on a nationwide tour armed with a comprehensive package of information on the how and why of UL building materials testing.”¹⁵¹

- In 1962, UL films reached about 150,000 people, television appearances and features were seen by an audience in excess of two million, 74 articles appeared in popular, technical, and corporate magazines, and 20 articles appeared in newspapers. The total number of visitors to UL’s various offices exceeded 20,000.

While established as one of America’s most trusted institutions, UL needed to respond to skeptics and activists who scrutinized UL’s role in certifying and “signing off” on potentially unsafe goods. UL had to protect its decades of credibility and scientific standards and educate an increasingly active Congress and White House hungry to pass major laws.

UL worked hard in the post-war years to steer a steady course—to support consumer rights while standing firm on UL’s place as the leader of private product safety standards organizations. The mainstream press and civic and safety organizations regularly urged consumers to look for the UL label on appliances, children’s toys, and many other products as consumerism soared.

Managing this balance became even more complicated as UL stepped up into a new role as a more visible and forceful public advocate for consumer safety.

Consumer Advocacy

In the post-war decades, consumer safety and public health became increasingly politicized as journalists and investigators revealed new threats and unseen pollutants at home and in the environment. During the 1940s and early 1950s, the dangers of flammable fabrics drew national attention. A series of highly publicized deaths resulted from the flammability of the children's play cowboy chaps and women's rayon sweaters. In 1953, Congress passed the Flammable Fabrics Act, giving the Federal Trade Commission the authority



UL tested thousands of new household consumer goods during the post-war period, such as electric blankets.

to regulate and ban clothing fabrics that failed to meet federal non-flammability standards.¹⁵²

During the late 1950s, scientists from the Greater St. Louis Citizen's Committee for Nuclear Information discovered evidence of atmospheric radiation by testing baby teeth for high strontium-90 levels, publishing their results in 1961. These findings played directly into President John F. Kennedy's decision to negotiate a partial test-ban treaty in 1963.¹⁵³ The United States of America, Great Britain, and the Soviet Union signed the treaty which prohibited the testing of nuclear weapons in outer space, underwater or in the atmosphere.

About that same time, marine biologist and nature writer Rachel Carson turned her attention to the effects of pesticides in the environment, particularly the effects on bird populations. Despite attempts to discredit her work and her character, Carson's 1962 book *Silent Spring* won wide acclaim and praise from President Kennedy, ultimately leading to a national ban on the pesticide DDT.

President Kennedy's administration responded to these high-profile findings by calling upon Congress to initiate a sweeping overhaul of federal consumer safeguards. In 1962, Kennedy articulated four consumer rights: the right to safety; the right to be informed; the right to choose; and the right to be heard. He also outlined major reforms in food and drug protection, transportation safety, financial protection, and housing.¹⁵⁴

Baron Whitaker became UL's sixth president in 1964 during this time of intense federal interest in science, exploration, technology, and public safety. Whitaker was a World War II veteran who started his career before the war and returned to UL in 1946. He ascended the ranks over the next decade, working in the Casualty and Automotive and Gases and Oils departments. In 1957 he was named Assistant to the Vice President and became Chief Electrical Engineer in 1959.¹⁵⁵

Under Whitaker, UL advised and assisted Congress and the White House in negotiating new legislation for the consumer. Landmark bills



Baron Whitaker was UL's sixth president.

passed and signed into law during this time included the National Traffic and Motor Vehicle Safety Act of 1966 and the Fire Research and Safety Act of 1967, amended to include the concept of a National Advisory Commission on Fire Prevention and Control. That same year, President Lyndon B. Johnson also signed into law a Flammable Fabrics Act and a Radiation Control for Health and Safety Act, areas where UL had a wealth of knowledge built on long testing experience. Whitaker testified at a number of hearings associated with the legislation, including those on flammable fabrics such as blankets, pajamas, drapes, and upholstery.

President Johnson also called for the creation of a National Commission on Product Safety that would be charged with assessing:

- The scope and potential of voluntary industry efforts to develop safety standards and to engage in self-regulation;
- The relationship among federal, state, and local laws and regulations;
- The proper identification of products, which present undue and unreasonable hazards to consumers' health and safety; and
- The question of responsibility and enforcement, particularly of manufacturers' liability for injuries caused by hazardous products.¹⁵⁶

The 1967 agenda was a defining moment in UL's history. Johnson's push to establish new federal agencies and commissions in the standards area directly challenged UL to defend the best of the current voluntary system while retaining its powerful role in providing technical assistance and guidance to policymakers and manufacturers.

As UL President Baron Whitaker testified in 1967 hearings before the House Subcommittee on Commerce and Finance on the proposed legislation: "If the Congress sees fit to create a National Commission on

Product Safety, we would hope that those chosen to serve would include representation from authorities having public safety responsibilities, electrical shock experts, electrical fire experts, casualty experts and, of course, representatives of the electrical manufacturers.”

UL Chief Engineer E.N. Davis Before Congress

This period of landmark reforms and increased federal oversight raised several important questions for UL: Would government be capable of organizing and carrying out science-based tests? Would federal action serve to undermine more effective local regulations, and would government agencies be able to coordinate effectively with industry? UL Chief Engineer E.N. Davis also testified before Congress a number of times, addressing the complexities of consumer-product testing and the need to ensure that industry would be prepared to meet new demands without imposing high costs on the consumer.

Davis appeared before the House Subcommittee on Commerce and Finance to testify on Congress’s plan to expand the Secretary of Commerce’s role in the areas of fabrics testing and standard setting. Not long after, Davis represented UL before the House Subcommittee on Science, Research, and Development to discuss the proposed Fire Research and Safety Act of 1967. The bill made its way through Congress in 1967 and was signed by President Lyndon Johnson on March 1, 1968.

The bill set out to address the distressing resurgence of high profile fires in the United States, including the Our Lady of the Angels School Fire in Chicago (1958, killed 95); the Surfside Hotel Fire in Atlantic City (1963, killed 25); the Golden Age Nursing Home Fire in Fitchville, Ohio (1963, killed 63); and the urban conflagrations that had swept the Bronx, Cleveland, Philadelphia, and Los Angeles. Specifically, Congress aimed to establish “a fire research and safety center” within the National Bureau of Standards. Appearing before the



Janis Farr was hired by UL to help run the Consumer Advisory Board and the organization's Home Economics Laboratory.

subcommittee, Davis cautioned against exaggerated fire statistics, suggesting that the problem was real, but did not approach the scale that Americans faced in the Conflagration Era, well before WWII.

The bill established a National Commission on Fire Prevention and Control. In his testimony, Davis said such a commission could “permit the marshaling of individuals and organizations . . . in both the public and private sectors to carefully analyze all aspects of the fire safety problem and develop joint industry-government recommendations as to how these problems might best be solved in the public interest.”¹⁵⁷ When asked if UL worried that with such a law the government would compete with fire safety organizations, Davis clarified what he saw as an ideal relationship between organizations like UL and government agencies like the National Bureau of Standards. “The work that is now being done

by the Government,” Davis explained, “is helpful to us in our private industry work because we are an empirical testing organization. We take the product and subject it to fire. It is in the basic sort of research that we need the support of organizations that develop basic theory.”¹⁵⁸

UL Decides to Engage Consumers

The National Commission on Product Safety was formally created in November 1967, and in 1972 Congress recommended creating the Consumer Product Safety Commission (CPSC). Through all the testimony and trips to Washington, Whitaker knew UL had preserved its primary role as the credible, scientific setter of product safety standards. But UL could not afford to simply follow events; it needed to work with consumers directly to ensure its internal standards satisfied changing expectations.

Therefore, at UL’s 1968 annual meeting Whitaker announced a major reorganization plan. “The increase in our volume of testing new products,” according to Whitaker, “and the current interest in consumer product safety, dictates a broadening of our membership base.” UL would now extend membership to “representatives of consumer interests, governmental bodies, safety experts, standardization experts, and public utilities, in addition to the insurance industry.”¹⁵⁹ Another key point: the balance of membership, with a new stipulation that “no more than one-third of the Members of the Board of Trustees can come from any one interest. This safeguard insures that UL cannot be utilized to serve the interests of a single category of users.”¹⁶⁰

“The whole question of consumer safety is tremendously complex,” Whitaker explained to UL employees in 1969, as the organization entered its 75th year. “As national committees investigate consumer safety and industry makes technological advances, it’s up to us at UL to make our place in this continuing effort. Times are changing. We must change with them.”

In 1969, UL welcomed new trustees and corporate members from diverse backgrounds, including:

- National Bureau of Standards Director, Allen V. Astin
- Academic Vice-President of the Illinois Institute of Technology, James J. Brophy
- Consumer information columnist, Margaret Dana
- General Services Administration Assistant Commissioner, George W. Ritter

UL People: On Being Hired by UL During the Early 1970s

When we had interviews and talked to UL management that was going to hire us eventually about the job, the stress that was put forward was, this is a safety organization. We're here to protect people. And if that is the kind of thing that you are interested in, this is the kind of company you want to work for. And so, it was impressed through the interview process that this is what the company did. It wasn't that you were going to get rich here, but if you've got a strong sense and feeling that you want to make a contribution, this is how you can do that with the company called UL.

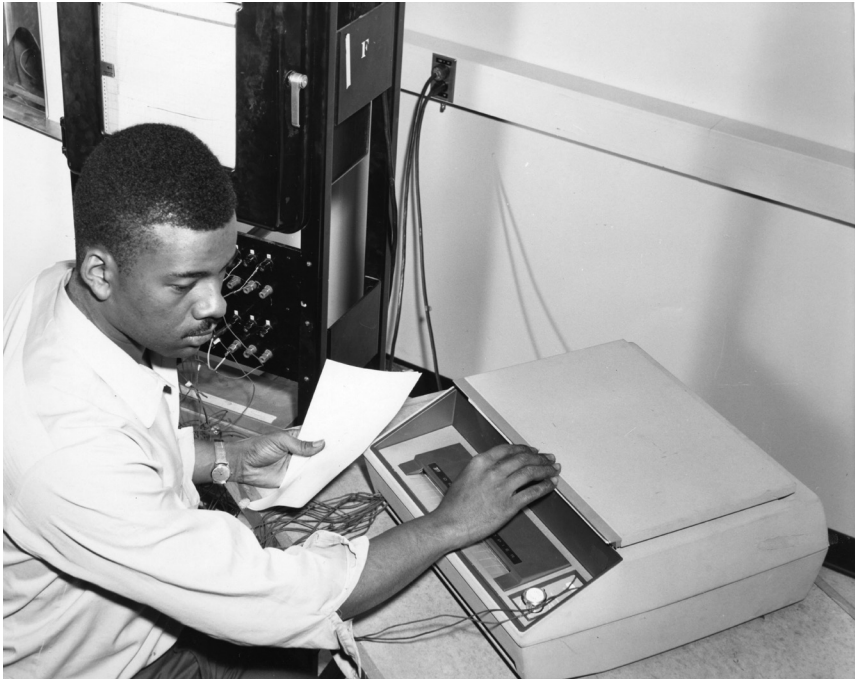
—Jim Velander, Follow-Up Services Engineer

- Commandant of the United States Coast Guard, Willard J. Smith

The new members represented a remarkable influx of new talent. The 1969 Annual Meeting also saw the first meeting of the newly established Consumer Advisory Council. Whitaker remarked that the “reorganization . . . was not intended to be just an exercise for our legal people. It was intended rather to make the Laboratories a truly public service organization responsive to the needs for public safety as defined by our membership.”¹⁶¹

The reorganization Whitaker recommended also included the “Advance Program.” As part

of the Advance Program, UL gathered input on consumer product safety from many internal and external sources including surveying the Consumer Advisory Council and the Commercial and Industrial Equipment Users Advisory Conference. The survey results convinced Whitaker that action was warranted: Increased oversight and rigor was added to product sampling, label service, and follow-up service, with factory follow-up inspections boosted from one to four per year.¹⁶² UL widely advertised its reforms in 1969, taking out advertisements in *Life*, *Reader's Digest*, *Better Homes and Gardens*, *Time*, *The New York Times*, *The Washington Post*, the *Chicago Tribune*, and the *Los Angeles Times*.



Consumer products such as typewriters and adding machines were tested by UL technicians.

Further Expansion Into Global Markets

It wasn't long after the Second World War, that the first tentative steps toward UL's role as a global safety guardian had taken place. In 1947, UL welcomed visitors to Chicago from Central and South America "considering regulation of personal injury and fire hazards on the basis of the National Electrical Code and other American standards," it was reported. The representatives expressed interest "as to how listings can be secured for products to be locally assembled in the countries of sale and use."¹⁶³ UL saw many difficulties in this notion but global attention only grew.

Soon technical experts from around the world became regular visitors. In 1948, UL guests represented nations including Argentina, Australia, Canada, England, France, Holland, India, and Sweden. China contacted UL with interest in having Chinese-made electrical goods

UL People—"We were all like a family."

Memories of UL's Workplace

Sandra Collins, Executive Secretary

Circa 1965: "You would get your work from the front of the office, from Agnes who was the boss. She was the assistant secretary. And she would give you your work and we would do one week of transcription which meant that you would get a folder with a disk in it that came from an engineer with a letter that he wanted you to type. And you would put it in a Dictaphone machine and put your headphones on and you'd do that for a whole week.

"Back in those days, you weren't allowed out of the steno department, they didn't want you fraternizing with the engineers, because it was all strictly women in there. So it was very interesting and it was very strict. Agnes had a buzzer that she used to let everybody know when the breaks were over. . . .

"There was a social life. We were all like a family [then]. It was really great, because we all would go on Friday nights over to the local restaurant and get a drink or hang out and listen to music."

tested by Chinese laboratories to receive UL certifications in America.

It wasn't until 1955, however, that Underwriters Laboratories launched its first major new international program, far more extensive than its previous operations. At that time, 10 years after World War II, European industry was still undergoing massive reconstruction, and struggling economies needed all the business they could get. European manufacturers' products weren't reaching the mammoth U.S. market because they lacked the UL label. So, in 1956, at the U.S. government's request Vice President Merwin Brandon toured Europe with auspicious results.

Within two months Brandon had carried his investigation to each country, interviewing manufacturers, as well as various European testing agencies already familiar with UL procedures. Several of these were ultimately authorized to conduct a European factory follow-up service, while the initial testing would be done in the United States. Japanese manufacturers entered into a similar agreement a few years later, thereby extending UL's influence to the complete circle of the free world's major industrial nations.

Protection of UL and its Mark

ULers throughout the organization's history value how important the ubiquitous UL labels and their "symbol of safety" are to manufacturers and consumers. Consumer trust in UL as an institution is inseparable from trust in its mark. Over the years, engineers and field inspectors have used factory follow-up visits to determine compliance with the safety standards that first earned the UL label.

The Label Service Department then and Field Services now supervises all factory inspection work to assess whether equipment certified as a result of the original investigation continues to retain the characteristics originally justifying the certification. As part of this activity, the local factory inspectors located throughout the United States are regularly visited by Service Engineers who assist the inspectors in

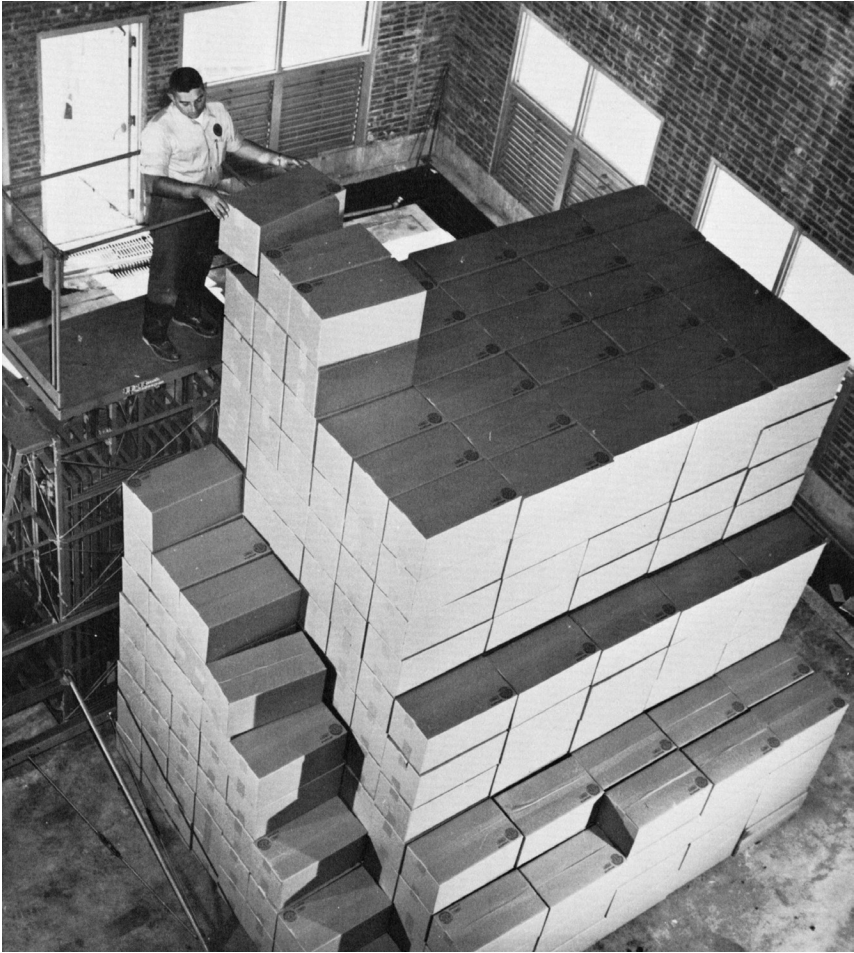
making uniform inspections so that all sections of the country will be interpreting the requirements alike. They also check on any reports of misuse of labels or the Reexamination markings and maintain contacts with the inspection authorities so that any criticisms of certified materials can be quickly investigated.¹⁶⁴

Counterfeit marks posed a threat to the organization because of lost revenue and damage to UL's reputation—if the marks were associated with shoddy, dangerous products. In 1946, welcome news arrived when Congress passed the Lanham Act. The law provided strict federal protection for certification marks like UL's.

Congress passed its first trademark protection law in 1870, but as noted in a 1996 history of The Lanham Act, “that first foray into trademark protection proved unsuccessful; in the Trade-Mark Cases, the Supreme Court declared the 1870 statute unconstitutional because it was based on the wrong congressional power.” The Court held that Congressional power in this area was connected to its right to regulate commerce. When Congress passed subsequent federal laws in 1881, 1905, and again in 1920, it based their regulations on the Commerce Clause.¹⁶⁵

The Lanham Act repealed the tangle of earlier laws and established a clear distinction between trademarks and certification marks. In the statute, a certification mark is described (in part) as “any word, name, symbol, or device, or any combination thereof—used by a person other than its owner . . . to certify regional or other origin, material, mode of manufacture, quality, accuracy, or other characteristics of such person's goods or services.”¹⁶⁶ The protection of the law is contingent upon “strict standards of enforcement and control” imposed by the owner.¹⁶⁷ Although this would not end UL's counterfeiting concerns, the Lanham Act was welcomed because it offered a clear set of protections against infringement of the UL Mark in the United States.

In 1969, President Baron Whitaker and UL leadership announced stricter guidelines aimed at protecting the Mark. In remarks at UL's annual meeting that year, Whitaker explained that in the past it was



In 1966, UL completed construction of a new High Rise Fire Test Building on the Northbrook campus. Here a UL engineer applies a simulated high-rise structural load on the horizontal furnaces.

“optional whether or not our name or registered marker appeared on the product. Today the only manner in which a product may be identified as meeting our requirements is by the presence of our name or symbol on the product or, in some cases, on the shipping carton.”¹⁶⁸ UL also introduced a *hold harmless clause* where a manufacturer was expected to reimburse UL for losses the organization might sustain by marking a product that does not measure up to UL standards.¹⁶⁹

Providing a Scientific Basis for Home Economics

In October 1973, UL brought forward another innovation: a testing lab for its Consumer Advisory Committee. *Lab Data* described the scene: A conference room was emptied, a living room and kitchen were built, along with a laundry room, and then, “mix in carpeting drapery, and wallpaper in ‘warm, earthy colors,’ and you will have the makings of a new UL testing center at the Chicago Lab.” With a home economics degree from Oklahoma State University, Janis Farr was named to head the domestic lab. Farr had come to UL in 1972 to help run the Consumer Advisory Committee.

Farr’s “domestic engineering” included vacuuming, cooking, laundry—it was a place where “domestic work will be done in the interest of safety.” Farr’s goals were to develop safer standards for appliances for consumers due to more extensive testing of products and by approaching testing from a new angle.¹⁷⁰ The domestic lab shows how UL adapted to reach consumers and particularly female heads of households with new services. The lab provided a service that helped UL find “better ways to communicate with the consumer and also better ways for the consumer to communicate with us,” as Farr phrased it in 1973. It was indeed a major departure for the organization, in a dynamic period of American governmental activity and reform.

This era brought UL employees stability that was challenged during the 1960s and early 1970s when the organization faced the possibility that its central place in testing for public safety would be curtailed or eliminated.

UL doubled its business over the decade, expanded its test-

UL Officers, 1961

Clarke Smith, Chairman
 Merwin Brandon, President
 K.S. Geiges, Vice President
 G.E. Manning, Vice President and
 Chief Engineer
 H.B. Whitaker, Vice President and
 Chief Electrical Engineer
 W.S. Austin, Secretary
 T.F. Ramsey, Jr., Treasurer

ing operations, and responded aggressively to a shifting regulatory playing field with a new outlook focused on consumer engagement.



In October 1973, UL brought forward another innovation: a testing lab for its Consumer Advisory Committee.



In 1960, ULC labeled its first fire truck.



UL's Chemical Laboratory (ca. 1940s).



In 1967, a safe is prepped for a fire test at ULC.



An engineer prepares for a Burnout Room Test at the Santa Clara office (ca. 1950s).



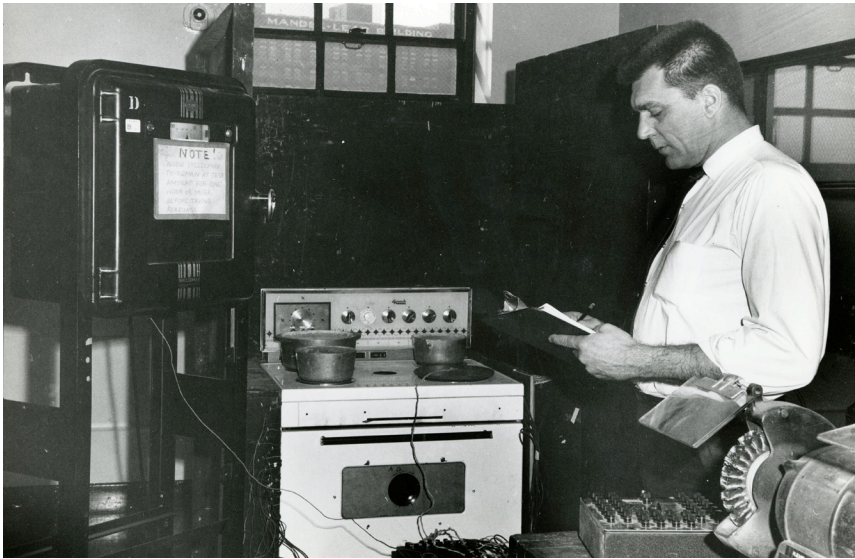
A Casualty & Chemical Hazards employee works in the Balance Room at the Northbrook campus (ca. 1960s).



Testing a wheeled dry chemical fire extinguisher (1954).



Employees at work in UL's Analytical Laboratory (ca. 1960s).



UL engineer Ray Lubeck conducts an Electric Range Under Test at the Chicago office (ca. 1960).



Pictured: Baron Whitaker, UL President (left); Paul W. Wycoff, President of Chrysler Airtemp (kneeling); William Love, International President of the International Association of Electrical Inspectors (standing on left); John C. Hewitt, Department of Labor and Industries (right). The group examines the first UL-labeled commercial and industrial air conditioning unit (1967).



Testing bullet resistant glass in 1968.



Testing sprinkler heads (ca. 1970s).



A UL employee volunteers to be a test subject for a permanent hair waver machine (1950).

—CHAPTER SIX—

Recharging the Mission

GLOBALIZATION AND COMPETITION CHALLENGE UL

In the sixties, we had to adapt to the consumerism movement . . . In the seventies . . . we had to ward off misguided attempts to have the federal government supplant or restrict the safety efforts of the voluntary sector . . . Now we have globalization, and UL is deeply involved with the problems, conflicts, and hopefully the successes precipitated by this economic and social phenomenon. Whatever adaptation will be required of UL, we will meet this challenge as we have other challenges.

—JACK BONO, 1978

During the 1960s, UL ultimately adapted to and embraced the rise of consumerism. The next three decades presented an even more systemic challenge. As with other large American monopolistic institutions

UL Evolution—Testing for a Trusted Brand, Sears Roebuck

Founded in 1886, Sears Roebuck & Company began as a mail-order catalog for general consumer goods and expanded into retail stores in 1925. The Sears catalog and the goods it delivered anywhere were known and trusted through every town and territory of the United States, from the Western frontier to the foothills of Appalachia. By the post-war suburban era, Sears department stores anchored hundreds of small towns and cities. Sears remained the highest grossing department store chain in the United States until it was surpassed by Walmart. UL tested and certified thousands of products sold in Sears pages and on the shelves of their stores—and still does. Sears executives also served for many years on UL's Consumer Advisory Board.

that saw their mastery contested during the early 1970s—whether Bell Labs, AT&T, or Ford Motor Company—UL needed to change its strategies, upgrade its workforce, expand into global markets, respond faster and focus more on customers. The U.S. market no longer offered a safe harbor for even the most accomplished and ethical institutions. More important, UL needed to become a global enterprise to fulfill its mission to public safety.

Jack Bono became the seventh president of UL in 1978 as these tides were shifting. Economic and social currents were at work, such as the offshoring of labor and opening of trade markets, a shift in consumer preferences to discounted goods, and the consolidation of national safety standards and practices in Europe. Furthermore, the United States

was recovering from the casualties and social disruptions of the Vietnam War.

The big question that began to take shape at this time was: How would UL make itself more responsive to external changes and the growing needs of manufacturers and stakeholders, while maintaining its standards and values as a true engineering organization? Among UL's emerging internal issues as an organization: new competition, a legal



UL's international involvement helps manufacturers cross borders into markets around the world. Here a UL engineer and a German engineer check computer components for compliance with safety requirements of the Verband der Elektrotechnik (VDE) organization in Germany.

weakening of its quasi-monopoly position, and a workforce that had strong internal values yet had become in some areas insulated and averse to customer service.

Through Jack Bono and its next three presidents, UL restructured its business, made painful workforce changes, improved its working relationship with the Consumer Product Safety Commission (CPSC), and hired executives from outside UL. Despite the upheaval, UL never lost its inner compass, a purpose-driven mission to keep people safe. This was a mission embraced by generation after generation of employ-

ees through the transitions of war and peace, the best of times and the worst of times. Electrical engineer, UL spokesperson, and five-decade employee John Drengenberg recollects a moment that resonates with most former and current UL employees:

It just so happened that I slowly moved out of the lab and started handling projects in 1966. I began working on a series of projects for a small company—or so I thought—in southern Indiana. They made radios, clock radios, table radios, AM-FM radios, all kinds of radios...So I was the UL engineer on the project, and I had a technician in the lab, and it seemed like almost every day, I would bring another project up to the technician and say, ‘look, here is another clock radio.’ He said ‘Well, it’s pretty much the same as the one we finished last week, but we did all the testing on it to make sure that it did meet all the requirements.’ It was for a company called Arvin...who also made all the radios for Sears Roebuck.

At one point in time, one of the products failed. We did an impact test on the bottom of some radio and it cracked open to the extent where you could reach in and touch a live part. So of course, as an engineer, I notified the manufacturer. In turn, they reinforced the bottom of the enclosure. One day, several months after that, I was in a Sears store and I saw all the radios, and of course I was interested. I looked at them. Sure enough, I looked at the bottom of that style of radio and there was the reinforcing piece on the bottom. I thought, wow, I actually had a hand in getting that change implemented. So I know that there are some people or even young children who didn’t get hurt, and I felt good about that. At that moment in time it seeped into my being that I was actually helping people.¹⁷¹

These values played a role in ensuring that, excepting a few bumps during recessions in the early 1970s and early 1980s, UL grew its business, expanded its certification services, and improved its value



UL technicians tested many generations of radios over the years.

to customers. UL responded with major initiatives which included expansion of product and system testing up and down the product supply chain by opening into new markets such as environmental, health, and sanitation services. UL also invested in talent by diversifying UL's workforce, hiring non-engineers with different

skills, taking a more external focus, and broadening global experience. Additionally, UL instilled greater customer responsiveness and leadership training at all levels of UL's organization. UL internationalized its expertise—bringing its inspections, processes, and knowledge of U.S. and global product standards in satellite offices to businesses worldwide, particularly Asia. Finally, UL also focused on organic growth and global acquisitions—moving aggressively into Europe and South America to acquire existing firms and compete in other economies.

UL Raises Its Profile During the Me Decade

The reorganization of UL under Baron Whitaker during the late 1960s realigned UL with the new people and power in the consumer movement. UL worked closely with the CPSC on a range of issues and consulted with other federal agencies advocating for consumer safety and the safety of commercial goods and services. When the Consumer



UL employees and Consumer Product Safety Commission (CPSC) members discuss the need for a mandatory standard for television receiver safety in 1977.

Product Safety Act passed in 1972, and the commissioners were sworn in in 1973, Baron Whitaker explained to employees how UL would play a central role in the growing consumer safety industry:

In testifying before Congress in connection with the Consumer Product Safety Act, I said that in my view the greatest gain for public safety would come not from federally regulated products but rather from the catalyst provided by the mere existence of the act, and which would prove to be the motivation that would cause industry to want to do it themselves. . . [but accident information is the] missing link which has tended to retard more rapid strides toward improved product safety. Attempts to upgrade product performance in the interest of increased safety invariably encounter the resistance of manufacturers unless it can be shown that accident experience is causatively related to involved product design.¹⁷²

Retired Senior Vice President and Chief Engineer Jim Beyreis recalled that an “important relationship for UL was the Consumer Product Safety Commission. Even though there existed some degree of tension, as often exists between government agencies which answer first to Congress and the Executive Branch and private testing companies which operate independently, each recognized a needed role to play and respected one another.”

The CPSC began an “offeror” system to develop standards for products it believed posed unreasonable risk of injury to the public, according to a fascinating article published in *The Journal of Consumer Affairs* in 1978 by S. David Hoffman, who was Vice President of Legal and Standards at UL and Chairman of the Consumer Advisory Council at the time. The offeror agreed to address the hazard the CPSC identified and to develop a proposed mandatory standard that would result in safer design, manufacture, and operation. In 1975, the CPSC published notice that it was accepting proposals for the development of consumer product safety standards addressing the hazards

UL Evolution: Testing and Inspection Services in 1977

- ▶ UL Listing: Products evaluated with respect to “reasonably foreseeable hazards to life and property,” where such hazards have been safeguarded.
- ▶ UL Classification: Products evaluated to defined research, i.e., electric shock and fire, where other hazards, e.g., radiation, were not investigated.
- ▶ UL Recognition: Recognition program established so components were evaluated for use within end-product equipment.
- ▶ UL Field Evaluated Certificate: Products comprising field-installed system at a specific location, or to specific quantities of certain products where it is impractical to apply the Listing Mark or Classification Marking.
- ▶ UL Inspections: Authorized, unannounced visits to manufacturers of UL labeled products.
- ▶ 254,000 factory inspections, 2 billion UL Marks issued.

news briefs

UL MUSEUM OPENS

Friday, November 26th marked the official opening of UL's museum at the Northbrook office. The ribbon cutting ceremony was performed by President Baron Witaker and Vice President Ed Davis, who is Officer-In-Charge of the Northbrook facility.

An open house was held in conjunction with the unveiling of the museum, and was attended by more than 600 persons. In addition to viewing the museum the guests were given a walking tour of the testing facilities, and UL's movies were available for viewing.

Through the use of graphics, models, and some test equipment, the museum tells the story of the founding and growth of Underwriters Laboratories. The plaque at the entrance of the museum reads, "This museum exhibit tells the story of UL, a unique organization that dedicates its existence to testing for public safety." Neither a commercial enterprise nor a government agency—but a part of the public sector, whose only function is to serve, not to profit."

The museum is open to the public during regular business hours.



Ed Davis, VP and Officer-In-Charge of the Northbrook facility, assists President Baron Witaker (right) in ribbon cutting ceremony.

From the Fall 1976 issue of *Lab Data*.

of television receivers, including “fire, electric shock, picture tube implosion, and external mechanical failure.” UL submitted a proposal to develop the standard and became the first “voluntary standards developing group... to be given the task of developing a proposed mandatory

standard.”¹⁷³ UL found it challenging to secure enough consumer volunteers to join the project but eventually did so. UL employees contributed 7,000 hours in engineering time analyzing, correlating, and developing the material. Interestingly, UL eventually concluded “in light of available information, in its opinion there was no need for a federal mandatory standard for television receivers at that time.”¹⁷⁴

The products were found to be reasonably safe.

Whitaker and his successor Jack Bono directed numerous facility expansions as UL's workforce grew. In 1970, a new safe-column and panel furnaces were built in Northbrook. The Santa Clara facility was expanded in 1971, Northbrook in 1973, and Melville in 1976. UL opened its Museum at Northbrook in 1976 followed by its new Standards Reference Center in 1977.

In 1977, UL finished the building of a new six-level fire test building at Northbrook to accommodate testing for fireplaces, fireplace stoves, vents, and chimneys. UL also completed a new hydraulics lab and by 1978 built the offices required at Northbrook to allow UL to complete the move from its Chicago city corporate headquarters.¹⁷⁵

The high-tech products passing through the gauntlet of UL testing spoke to the firm's adaptability and technology leadership. UL certified the first microwave, personal computer, CAT scan machine, and video game console. By the early 1980s, UL engineers were testing and designing industrial robots. Other tech items—many which became fixtures of daily life in nearly every nation—UL investigated during this era: electronic test equipment, analytical laboratory equipment, computers and peripheral equipment, laser disk video players, laser grocery checkout scanners, automatic bank tellers, and radio frequency pocket pagers.



A UL technician prepares a glass block wall for a fire test (1977).

UL Evolution

In 1987, 11 new UL standards were developed and more than 200 were revised and updated. That was an important part of UL's commitment to consumer safety.

As noted in UL's 1987 annual report, "in development of each of its 534 Standards for Safety, UL includes input from people who have a stake in the safety of a particular product—consumers, government organizations, manufacturers, jurisdictional authorities, retailers, insurance representatives, academicians, and others."

In one special project, UL was asked to build an electromagnetic interference (EMI) test site, with the capability to test to the regulations of the Federal Communications Commission (which was given statutory authority in 1982 to regulate the susceptibility of consumer equipment to EMI), the International Special Committee on Radio Interference/American National Standards Institute (CISPR/ANSI), and other regulatory agencies. These agencies sought UL's expertise to respond to the need for more EMI testing and

requirements. The proliferation of consumer technology from toaster ovens to electric blankets to automobile ignition systems had led to increased interference with the safe operation of electrical products and other safety concerns.

During this time, UL's engineers continued to test all manner of household appliances. They ranged from the quirky to the innovative, such as a Christmas-tree light controller that included an integrated circuit chip that stored eleven Christmas carols, a radio clock that announced the time, a showerhead with an instantaneous water heater, and a device that made garden compost from wastewater discharge.

Committed to Customer Responsiveness and Reform

The scrutiny of the consumer safety battles in Washington, D.C. made it clear to UL leaders that they had to examine their own competitive



UL physicists prepare a sensitive fire-security system for testing in an interference-free atmosphere laboratory in 1986. U.S. and international agencies sought UL's expertise to respond to the need for more EMI testing and requirements.

practices, in order to become more responsive to manufacturers' concerns. UL needed to take steps to increase the capacity of its workforce and instill greater customer responsiveness to manufacturers' needs.

UL was seen by its clients as a national institution of technical

UL Evolution: Snapshot of the Organization in 1977

It was over 80 years after its founding and making successful transitions from the Great Depression through World War II and the rise of the consumer and media-driven America of the 1970s. What was the state of UL in 1977?

- ▶ 5 engineering councils:
 - Burglary Protection
 - Casualty
 - Electrical
 - Fire
 - Marine
- ▶ Consumer Advisory Council
- ▶ 2 women on Board of Trustees: Margaret Dana, Consumer Relations Counsel, and Dr. Aurelia T. Miller of the University of Massachusetts Amherst
- ▶ 10 officers: H. Clay Johnson, Chairman; Baron Whitaker, President; W.A. Farquhar, Vice President and Chief Engineer, Electrical; E.N. Davis, Vice President and Chief Engineer, Fire Protection; D.L. Breting, Vice President, Follow-Up Services; Derek Barton, Vice President and Secretary; W.H. Farrell, Vice President; S.D. Hoffman, Vice President, Standards and Legal; L.B. Kinports, Jr., Treasurer; Harold Bond, Assistant Secretary.
- ▶ 2,331 employees nationally:
 - 2,067 full-time
 - 264 part-time
- ▶ 185 inspection centers including 49 overseas centers;
 - Over 100,000 Product Directories and semi-annual Supplements furnished to jurisdictional authorities and other interested parties.
 - 11,583 investigations covering products manufactured in other countries for import to the United States, a 28.2 percent increase over 1976.
 - 15 new standards; 11 recognized by American National Standards Institute.
 - 3 major television networks telecast UL's public service messages at least 75 times.
 - 300,000 UL booklets and brochures distributed to the public.

► New Work Engineering Departments:

- Burglary Protection and Signaling (BP&S)
- Casualty and Chemical Hazards (C&CH)
- Electrical
- Fire Protection (FP)
- Heating, Air Conditioning and Refrigeration (HAC&R)
- Marine Department (M)

expertise that was uncompromising in upholding standards and science-based evaluations. UL engineers valued their relationships with their clients, which were typically characterized by long-standing associations built on trust, respect, and independence. UL had to answer the question: While this was a comfortable model, did it need to do more to respond to its customers?

Engineering established pricing, test protocols, managed evaluations, and granted the coveted UL Mark when the product was found in compliance. Manufacturing customers often visited engineers in their offices to discuss what needed to be done for their product. Engineering analysis and problem-solving shaped management culture because the science of UL's methods could never be compromised. One of UL's current senior employees remembered from that era, "Each team had a

UL in the News— Everyday Ideas

In the late 1970s UL wrote and syndicated two newspaper columns for consumers and homemakers, *Timely Tips* and *Successful Homemaking*. These were reprinted in hundreds of local newspapers.

lot of independence. Client relationships were based on familiarity and trust and that was that.”

UL had a close-knit workforce of engineers and administrative employees. Employees regularly reached the 25-year mark in employment service. “People got married here, worked here for decades and then their kids worked here. If businesses were restructured, you tried to find a place for people to stay at the company if they lost a position. We were a family,” recalled one UL employee. “There was a real pride in longevity, retaining people, and finding a role for them that benefited from their skills and met the company’s needs.”

Many of these observations could similarly be made about global corporations such as General Electric, General Motors, and AT&T during this era. UL didn’t have a sales force until the late 1980s. While it is hard to imagine today, employees had no Internet, fax machines, or cell phones. Being available 24/7 was an unknown and unattainable concept given the lack of technology. People stayed in their roles longer, expected loyalty from their employer, returned the same, and therefore tended to view their jobs as secure. Management approaches such as cross-functional work teams, continuous improvement, and total quality measures did not start becoming well-known until the 1980s. Nonetheless, the world was getting smaller for many of UL’s clients. More than ever, UL needed better flexibility, adaptability, accessibility, and transparency.

As the 1970s drew to a close, Germany, Japan, India, and other countries were competing in many markets once controlled by U.S. manufacturers from autos to steel to household appliances. These companies saw that the combination of high U.S. labor costs, monopoly practices, and lack of innovation had made them slower to market. They wanted shorter product development cycles and a certification system that worked with faster product-to-market introductions. UL leadership during this period began to seriously address customer responsiveness.

As early as 1977, President Baron Whitaker called for focusing UL on improving service to manufacturers through better communica-

tions and improved operating procedures “arrived at through cooperative efforts with our clients,” in a continuing operation known as Operation Bootstrap.¹⁷⁶

“All appliances should be submitted to testing for electrical safety before they go on the market. ... However, until this happens, home-makers must consider safety when they buy. The UL ‘symbol of safety’ can be a good guide.”¹⁷⁷

Vice President Gene Bockmier wrote in his history of UL’s Santa Clara office, that during the 1970s, as the office grew bigger, support departments as well as engineering employees were repeatedly reminded that providing good client service was just as important as when the office was small. UL trained its engineers in the importance of timely client service as essential to the promulgation of product safety: “Management believed in delegation, yet had to balance it against expected performance. As long as work assignments were carried out satisfactorily, delegation was left alone.”¹⁷⁸

By 1986, new initiatives were gaining traction with clients. UL

UL in the Media—Looking Out for American Consumers Everywhere

Many articles during the 1970s and 1980s educated U.S. consumers on the direct link between the UL label and their own safety. Here is an excerpt from one example published March 13, 1971 in *The Chicago Tribune*, *UL Label Is Dependable Guide to Product Safety*:

“Underwriters’ Laboratories, on the other hand, is not as interested in which of two toasters gives better toast as in whether both will be free of fire or injury hazards. *Good Housekeeping* and *Parents* magazines investigate and label only brands advertised in their respective magazines, and certify the products are ‘as advertised.’

“Many people think the federal government has certain requirements that manufacturers have to meet in order to market a new product. For most appliances this is not true. For example, a range does not have to meet any test for electrical or thermal safety before it can be sold to a family. The consumer would have more assurance of safety in a product which voluntarily has been submitted and has successfully passed UL testing...”

declared that, “the most important aspect of UL’s flexibility is its ability to listen and respond—to manufacturers, trade associations, consumers, and to anyone who has a stake in public safety. UL listens and learns what clients and other have to say about improving services. Nowhere has this been more evident than in UL’s changing approach to service delivery.”¹⁷⁹

Under UL’s Recognized Component program, manufacturers could speed through testing and evaluation by choosing preselected, “precertified” materials and components for use in products they intended to produce, using a special Mark created for the program. UL also initiated response time programs implemented throughout all UL offices to improve results in meeting manufacturers’ deadlines.



Under UL’s Recognized Component program, manufacturers could speed through testing and evaluation by choosing preselected, precertified materials and components for use in products they intended to produce.

By 1992, even stronger quality management approaches were under way such as “Q PLUS,” an internal UL program based on W. Edwards Deming’s “zero defect” quality control. All employees participated in Q PLUS meetings that were held weekly. Trainers taught quality approaches such as the “and not or” equation—re-design processes to achieve quality and customer satisfaction with-

out tradeoffs. Another principle: Do it right the first time and avoid setting up wasteful new procedures to find and correct errors.

Training and Recruiting a World-Class Workforce

During the 1970s and 1980s, UL made new investments in recruiting and training its workforce. The emergence of a high-tech, high-skills technology sector increased the competition for engineers and scientists.

Partnerships such as UL's co-op programs with the University of Pacific and Illinois Institute of Technology helped recruit talent. Hundreds of employees each took advantage of UL's tuition assistance program to return to university to sharpen their skills and earn needed professional and managerial degrees. UL also offered in-house training through local college partnerships, began on-campus recruiting, and during the 1990s launched an employee referral reward program.

UL strongly encouraged engineers to participate in standard-writing and code-making committees where technical employees learned new ideas from their peers and solidified UL's competitive position as an industry leader in this area. UL's historical role as a convener of experts remained a foundation of worker development. Most engineers became involved with organizations such as the American National Standards Institute (ANSI), National Fire Protection Association (NFPA), American Society for Testing Materials (ASTM) and National Society of Professional Engineers (NSPE), as well as UL's own Industry Advisory Councils, Consumer Advisory Council, Conference of Technical Users of Consumer Products, and similar groups.

President Bono and his successor Tom Castino pushed hard for UL's sprawling nation of technical experts to meet consistent standards and practices in the field. Everyone needed to learn the "UL way." A special emphasis was placed on training. Experienced UL field representatives, were brought together periodically to share their experiences and learn new techniques. UL needed to deliver its services consistently: How it did an inspection in Illinois needed to be the same as how it did an inspection in the UK.¹⁸⁰

UL's Emerging Growth and Globalization

In his final years as President, Baron Whitaker strengthened UL's involvement in a range of global roles that established a foundation for the UL's expansion in the decades ahead. These roles included

improving international safety standards through Standards Development Organizations (SDOs), the expansion of UL test labs outside the United States, and participating and shaping global certification regulations and protocols through Certification Organizations (COs). Whitaker was most involved in sharing UL's findings with SDOs. He was a member of the U.S. delegation that attended the International Conference on Laboratory Accreditation held in Denmark in 1977. In that year alone, eight members of UL's workforce spent 125 days overseas attending 25 meetings, which required 64 prior meetings with U.S. industry, consumer, and technical experts to prepare for developing international standards in 19 different categories.

UL's engagement in standards and accreditation continued throughout the 1980s and 1990s. UL held numerous positions in the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO). In 1982, Jack Bono observed that UL needed more help from its U.S. industry counterparts and associates: "It has often been difficult to put together a U.S. delegation to a meeting and delegates have changed so frequently that continuity is lost and U.S. positions are passed over in favor of those supported by other countries. This is unfortunate because U.S. standards often include new technology, are more practical and provide flexibility of design, but you cannot sell these attributes if U.S. representatives are not present in working group and committee meetings to propose them."¹⁸¹

These efforts did bear fruit eventually. For example, in 1986 UL reached agreements with both the Canadian Standards Association (CSA) and Underwriters Laboratories of Canada (ULC) to expand existing working relationships and to promote trade between the U.S. and Canada. The agreements established a long-term goal of harmonizing U.S. and Canadian safety programs and standards.

In November of 1986, UL published a *Directory of Appliances, Equipment, Construction Materials, and Components Evaluated in Accordance with International Publications*, as a valuable resource tool for manufac-

turers and purchasers operating in the international market.

Without question, UL's leadership, workforce, organization culture, and public safety overall benefited from UL's ongoing international standards engagement. Further, this prepared UL for its acquisitions and expansion into Europe and Asia during the 1990s and 2000s, and ability to respond to new competition after the passage of liberalizing trade agreements.

Whitaker retired in 1978 and was succeeded by Jack Bono. Jack Bono had graduated from Northwestern University, and began his career at UL in 1946 in the Gases and Oils department. By 1976, Bono had worked his way up to Assistant Chief Engineer in Melville before returning to Northbrook as Baron Whitaker's assistant in 1977. Bono's presidency spans two different eras for UL: one defined by the traditional work of U.S. product testing, safety certification, and standard-writing; the other defined by the increasing need to spot opportunities abroad and build the infrastructure to serve foreign clients and public safety globally.

Building Test Labs Outside the United States

In 1959, UL's business in other countries was 0.5 percent of its U.S. operations; in 2016, well over half of UL's business is conducted outside of the U.S.¹⁸² Under Jack Bono, UL made its first major investments in becoming a global testing and certification organization. Globalization defined the leadership of every UL President to follow Bono—Tom Castino, Loring Knoblach, and Keith Williams. Each of these leaders realized that if UL did not embrace globalization, it would be left behind. UL saw the strategic need for its clients to reach new global markets with their products, which required meeting a dizzying number of standards and Marks. Meeting the challenge required risk taking, new technical competencies, new global presences, and new strategies with a continued commitment to the public safety mission.

UL People—Spokesman John Drengenberg, a Long-Trusted Source for the Media

Engineering manager John Drengenberg received his role as official spokesman at UL after serving for decades as an engineer. By late 2015 Drengenberg has given more than 2,000 print, radio, and television interviews including network morning shows. How did it start? John recounted:

“I became UL’s spokesperson quite by accident, and actually resisted the idea at first...What happened was one day, I don’t remember what the occasion was, but I know I was sitting at a table eating a piece of cake. Carole Feil of UL’s communications department was sitting next to me, and across the table was one of our senior engineers, Bob Horvath, who had a conflict and said, ‘You’ll have to get someone else.’ He looked at me and said, ‘Have John do the interview.’

“I looked at them like they were crazy and said, ‘No, I’m an electrical engineer. I would get way too nervous going to a radio station or whatever.’ Carole said to me, ‘You don’t have to go. We do this by telephone. We’ll find a quiet room and we’ll talk on the phone and it’s just two and a half minutes. [It was around the holiday season and holiday safety.] All you have to do is tell them to water their tree. Check your lights for broken wires and buy new UL-approved lights, and so forth.’ I said, ‘No, I don’t want to do that.’ She said, ‘Okay, I’ll look for somebody else,’ and we went our separate ways. But a day or two later, she called me back. She said, ‘I can’t find anybody else. Could you please just do this one?’

“I said, ‘Okay.’ So I did the radio interview live while she sat with me pretty much holding my hand. That was over 30 years ago. Little by little, one interview led to the next and now it’s a full-time position.”



John Drengenberg has served UL for over five decades—first as an electrical engineer and then as the UL spokesperson.

UL first began establishing offices outside the U.S. to perform in-country inspections of manufacturers' facilities, and later to conduct UL testing. In a second phase, UL started acquiring established safety testing and standards companies—organizations that were the ULs of their nations. This allowed UL to become more influential in product safety science and standard-setting within various nations.

UL Officers, 1977

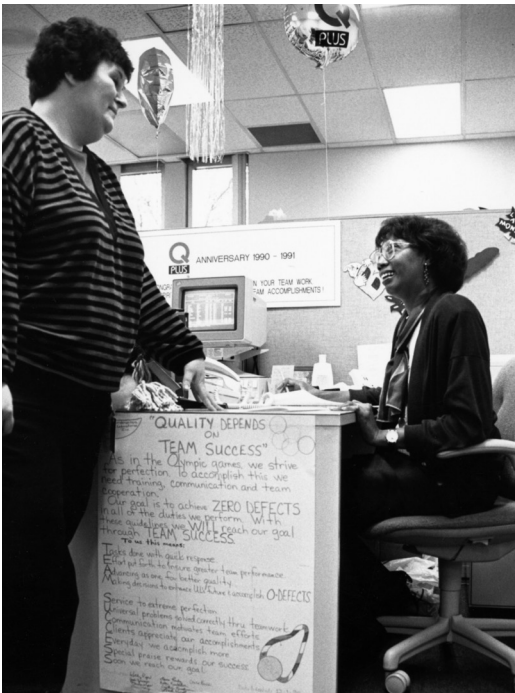
Frederick Watkins, Chairman
 Baron Whitaker, President
 William H. Farrell, Vice President,
 Engineering and Inspection Services
 R.D. Barton, Vice President,
 Administrative Services
 Donal L. Breting, Vice President,
 Follow-Up Services
 Jack Bono, Vice President, External Affairs
 S.D. Hoffman, Vice President,
 Standards and Legal
 Henry Collins, Vice President,
 Governmental Affairs
 A.D. Lutgens, Vice President
 L.B. Kinports, Jr., Treasurer
 Harold E. Bond, Secretary



A UL technician measures oily water samples to determine compliance with U.S. Coast Guard regulations for water pollution (1979).



A technician tests a flotation device in the 1970s.



Switchboard employees Jackie Henderson (left) and Laura Roudez were members of the spirited Q PLUS team (1991).



A UL technician prepares an electric motor for a test (1979).



A UL employee places rubber and plastic materials into ovens to accelerate aging and conditioning (1980).



Technicians at UL's Northbrook laboratory conduct tension and compression tests on appliance wiring material (1983).



In 1984, UL Marks were appearing on 11,000 different types of products.

—CHAPTER SEVEN—

The Global Mega-Shift

EXPANDING UL'S GLOBAL MISSION

Many U.S. manufacturers in recent years have recognized globalization as a key to continued innovation and growth. They have also seen quality assurance systems becoming increasingly crucial to doing business internationally. Because of its historic leadership in U.S. safety, UL has had an international presence for over 70 years. Today, however, UL plays an expanded and proactive role in the international safety arena to respond to clients' growing need for certifications on a global scale.

—TOM CASTINO, 1990

Howard Kontje, who rose at UL to become Executive Vice President and Chief Engineer, noted in his white paper, a *Historical Outline of Underwriters Laboratories Overseas Activities*, that UL's first request from an overseas manufacturer took place as early as 1902: "The products were unlined fire hose, made in factories primarily in Scotland, and acetylene fittings made elsewhere in Great Britain. A letter from the British insurance industry, dated approximately 1905, suggested



Tom Castino served as UL President from 1990 until 2001.

that Underwriters Laboratories, Inc., set up an office and laboratory in England.”

During the first half of the twentieth century, overseas manufacturers and government officials regularly made the pilgrimage to tour UL's offices and facilities in the United States. Then after the Second World War, UL cooperated with U.S. policy under the Marshall Plan to reconstruct and restore the economic and social well-being of Europe and Japan. The recovering manufacturers of these countries worked closely with UL as they turned to U.S. markets in order to support economies which had been devastated, even annihilated, by the destruction of war. By 1948, the first imports of Japanese products joined the small, but ever growing stream of consumer products entering U.S. markets and bearing the UL Mark.

“Pressures from many sources forced UL to reconsider limiting inspections at factories [outside the U.S.] to those in Great Britain,”

Kontje wrote of this time. “Most important was the possibility of anti-trust action by the Department of Justice. In 1955, management was authorized to establish inspection programs where needed overseas. The Board of Trustees stipulated that overseas inspection activities were to be self-supporting, and not subsidized by U.S. activities. Also, the methods, tests, frequency of inspections and supervisions of inspectors were to be done in the same manner as the United States.”¹⁸³

Other important UL milestones advanced globalization, such as Merwin Brandon’s European tour in 1956 to solidify relationships with various private inspection agencies, Vice President Karl Geiges’s first trip to Japan, and UL’s ongoing leadership in global safety certification associations such as the International Electrotechnical Commission (IEC).

By the 1980s, after more than 70 years of international work, UL had earned a reputation of assisting manufacturers from around the globe with safety certification. UL employees knew international standards, understood marketing and safety concerns in other countries and often could speak the language of the country involved. A decisive period had arrived for UL’s global expansion. This transformation ultimately made UL the multinational leader in science and safety that is trusted worldwide today. From the late 1980s to the late 1990s, UL faced many challenges in emerging to truly become a global conformity assessment provider. Regardless of those challenges, and opportunities, UL’s ultimate goal was to offer services for imports and exports to, from, within, and between countries.

The globalization era had two distinct stages. During the first, UL offered its services through generally indirect means, partnering with other certifiers or national organizations in countries around the globe through various agreements to provide inspection and other services. In the mid-1990s, that changed and the second stage began. UL offered new options as it began acquiring overseas companies to offer a direct, local presence in major world markets.

The decision that turned the global flywheel decisively came when Jack Bono developed the Overseas Inspection Service (OIS) department in 1982.

The Overseas Inspection Service

In 1982 President Jack Bono and Vice President of Follow-Up Services Howard Kontje launched UL's Overseas Inspection Service (OIS) department, in order to develop a worldwide structure to systematically help clients in numerous countries meet international safety requirements.

Bono appointed Managing Engineer John Bubany to direct the OIS and announced that the new department would oversee 63 overseas inspection centers and approximately 200 inspectors involved in UL work. The OIS opened an office for Technical Assistance to Exporters (TATE) and set up a Technical Information Center with an international standards library, codes and acceptance pro-

UL Evolution—Upshifting to Global Market Access (GMA)

The evolution of the TATE program tracks UL's change from a national to a global brand. In its early years, TATE provided Technical Assistance to Exporters for complying with national and international certification requirements, standards, and practices—before they obtained overseas product certification. In 1990, following an employee naming competition that awarded the winner with a handheld TV, TATE was renamed International Compliance Services (ICS).

ICS added services, forming partnerships with manufacturers and exporters to navigate international and in-country certification procedures and serve as agent on behalf of a partner or client. From 1993 to 2002, ICS published the monthly internal newsletter, *The Global Mind*. The publication was the first to update employees exclusively on UL's international services and strategy.

In 2008, ICS upgraded to Global Market Access (GMA) reflecting UL's second phase of globalization. By 2015, GMA was located in 15 countries in order to provide assistance based on local knowledge. GMA experts work with clients to find the best, cost-effective compliance option to meet their needs, and then guide them through the process every step of the way. Like its predecessors, GMA aims to increase UL's global footprint and helps exports comply with standards.

cedure information for each country involved. The TATE operation's evolution into the twenty-first century mirrored UL's shift from a U.S.-based provider of international services to a global network of national and regional companies.

UL's global services first anchored in Asia, launching in China in



John Bubany (center) was named the Executive Manager of UL International Limited, in Kowloon, Hong Kong. Bruce Eng (left) served as Project Engineer and Howard Hopper (right) was the Resident Manager.

1980, Japan in 1981, and Hong Kong and Taiwan in 1988. OIS pioneers surmounted many of the notorious barriers of expanding internationally. They waded through party politics in China, agreed to treat the workforce as a long-term asset in Japan, and learned the work culture of the people they hired. Everything clicked, as Jack Bono's successor President Tom Castino said: "Well, China jumped right on it. So did Japan. So did Korea. ... They immediately said, 'Underwriters Laboratories is a place we can go and receive the halo of acceptability in the United States,' and we rode on that."¹⁸⁴

Bono also tasked OIS with carrying out inspection services for other safety-testing organizations based in Germany, France, Italy, and Australia. By late 1983, plans for new overseas information centers had been further elaborated, with openings in Arnhem, the Netherlands; Frankfurt, Germany; Stockholm, Sweden; and Zurich, Switzerland. The center's coordinators were hired from European testing laboratories and trained at UL's Melville office.

By 1986, the OIS workforce had grown from 3 to 22. Engineering group leader Bob Schlegel described the work of the OIS as "technically interesting, politically exciting and professionally rewarding."¹⁸⁵ Schlegel took pride in working on translating UL's brochure *Submitting Products to UL* into eight languages.

By 1989, UL operated inspection services that spanned Asia, Australia, New Zealand, Pakistan, Malaysia, Indochina, India, and Canada, as well as Europe, the Middle East, Africa, South and Central America, and the Caribbean. The overseas centers provided information on UL's programs and services and follow-up inspection services to manufacturers in these areas. Some overseas centers also distributed UL labels to manufacturers in their parts of the world. UL stressed that inspections were handled with the same rigor overseas as they were in the United States. Also, OIS employees performed inspections in the United States for non-U.S. certifiers.

Jim Velandier, retired Chief Engineer, explained how the idea devel-

oped over time into a strong unit: “We already had had folks overseas. Paul Lee had been in Japan. Steve Coen and John Kretzmer had been in Taiwan. . . but we found out quickly that having one or two individuals in a country that produces as many products as Japan at the time and Taiwan eventually, just isn’t enough. We had to work with a number of agencies to provide our inspection services. We had to train people all over the globe to do the work the same way that we did it in the United States, because we wanted a level playing field everywhere.”¹⁸⁶

Finding Partners in Asia

By the 1970s, East Asian manufacturers had entered the American consumer market in a serious way. Doing so required major commitments to increasing American consumer confidence in foreign goods, and the UL Mark was seen by them as central to this strategy. The UL Mark had become so well-known and highly regarded by consumers that it became a standard that other testing and certifying initiatives would compare themselves to throughout the 1970s, 1980s, and beyond.

In 1981, UL signed a reciprocal test agreement with the Japan Electrical Testing Laboratory (JET), a non-profit organization created by the Japanese Ministry of International Trade and Industry (MITI), to test electrical products for compliance with Japanese law. As part of the agreement, UL engineers spent two months at JET learning details of Japanese requirements on toasters, flatirons, power tools, and refrigerators. By developing expertise in Japanese standards UL could therefore test U.S. manufacturers’ products to Japanese requirements and write detailed test reports. Manufacturers could then send the report to JET in order to assist in getting approval of their products for sale in Japan.

In 1986, UL received accreditation as a MITI-designated testing laboratory outside of Japan. This designation authorized UL to test electrical products that were manufactured in the United States for sale in Japan. To gain MITI’s confidence, UL produced an exhaus-



In 1986, under UL's new program with the Japan Ministry of International Trade and Industry (MITI), a liquid-core skillet produced by The West Bend Company, a division of Dart Industries, receiving Japanese "type approval."

tively detailed document written in Japanese, showing that UL possessed the technical capability and employees to test American-made products to Japanese requirements, translating and applying Japanese test requirements. Much credit was handed to UL's Paul Lee. "When I was hired my language capabilities weren't important," Lee recalled in 1986 when the MITI deal was announced. "Now they're certainly being fully utilized."¹⁸⁷

In 1978, China embarked on an aggressive economic reform program under Communist Party leader Deng Xiaoping. Two years later, the government founded the China Certification and Inspection Group (CCIC), the first product safety and quality certifier established in China. UL signed an agreement with CCIC in 1980 to conduct inspection work in Chinese factories where UL marked goods for sale in the United States were being made. Shortly after that in 1988, UL established affiliated laboratories in Hong Kong and Taiwan for local testing of products intended for shipment to the U.S.

UL Japan Company Limited followed suit in 1993 in response to the need to maintain control of the UL Mark on products manufactured overseas. These offices provided follow-up inspection work and product safety evaluations for categories including appliances, toys, portable lamps, decorative lights, fans, and fixtures. UL named John Bubany as executive manager of UL International Limited, in Kowloon, Hong Kong, while Jim Velandar was responsible for UL International (Taiwan)

Limited in Taipei, Taiwan, which also opened a branch office in Singapore in 1989. John was one of UL's first *expats*—an American working for his or her employer outside North America.

UL took advantage of information technology to strengthen culture and productivity across so many subsidiaries and offices. When UL opened Taipei and Hong Kong in the late 1980s, although it trained local employees, there was no Internet. Engineers transferred test reports and data via a thermal-paper fax machine. Colleagues communicated through phones, faxes, and telexes.

Castino Prepares UL for the Global Information Age

Tom Castino was born and raised in Chicago, and remembers seeing the UL film “Testing for Public Safety” when he was in grade school. When he graduated from the University of Illinois at Urbana-Champaign he had offers from multiple firms, but according to Castino, “[UL] brought me in to see the fire tests . . . it just blew my mind.”¹⁸⁸ He worked in the Fire Protection division and helped calibrate the fire testing furnace in the new Northbrook laboratory before assuming a position in Santa Clara and a research appointment at the National Bureau of Standards. Castino returned to UL as Chief Engineer in 1980.

During Castino's tenure as eighth president of UL that began in 1990, UL added environmental and public health, and sanitation testing services in response to increasing national and international concerns about the environmental impacts of product materials and manufacturing. UL also prepared for evaluating computerized and electronic products with the rise of consumer electronics and automation. Under Castino, UL continued strengthening its services in the global marketplace to help clients meet international requirements.

Castino made the case to further globalize UL activities in a report to the UL Board in 1997. He pointed out that UL's international business was growing faster than its U.S. work, and that UL's compet-

itors overseas were at an advantage. Castino claimed that if UL did not establish subsidiaries overseas and our competitors were there, we would be at a disadvantage to serve the world market, and in turn, a disservice to our global mission.



The UL Mark of Canada (1992)

In fact, UL competitors in Germany, Japan, Korea, Canada, and elsewhere offered new testing services and their own Marks for certified products sold in the United States. They applied to Occupational Safety and Health Administration (OSHA) and other government agencies and got authority for their Mark to be deemed equivalent to the UL

Mark. As these firms chipped away at UL's dominant role, the Board supported Castino's plan for global expansion, which eventually resulted in 24 subsidiaries that increased UL's international reach.

Many of that era agreed with the words of retired Chief Public Safety Officer Gus Schaefer: "Tom was very dynamic, very energetic, and did huge things to globalize the company....He brought on UL's first Vice President for sales and marketing. He equipped the company to really go global, and he equipped the company to really become more competitive."¹⁸⁹

UL and the Opening of Fortress Europe

By 1994, UL offered service from a record number of locations, including five U.S. laboratories and nine local engineering service offices; 193 inspection centers worldwide; UL subsidiaries in Mexico, Hong Kong, Japan, Korea, Singapore, and Taiwan; a representative office in China; liaison offices in Malaysia, Thailand, and Canada, and expat

engineers stationed in Germany and the Netherlands.

In 1994 with the passage of the North American Free Trade Agreement (NAFTA) and the entry of Canada's testing business into the United States, Castino also mobilized a organization-wide effort to establish a UL Mark for Canada.

NAFTA also meant UL expertise came to Mexico as UL signed an agreement with the Asociación Nacional de Normalización y Certificación del Sector Eléctrico (ANCE) on December 8, 1993. This allowed UL to work with ANCE to establish a private product certification program in Mexico and jointly manage a Mexican product testing laboratory.

In this same year, UL also signed a memorandum of understanding with India's Standardisation, Testing & Quality Control Directorate (STQC) to enable U.S. manufacturers to obtain the STQC Mark and for manufacturers in India to obtain UL Marks for television, high-voltage video appliances, information technology equipment, and other electronic products.

Despite all these changes, by the mid-1990s as Castino had warned the Board in his President's Report, UL needed to make international acquisitions in Europe or it would lose ground to competitors then using UL's existing standards and granting their own certification Marks in the U.S. European manufacturers sought the efficiency of European not U.S. standards—creating a demand for changing, harmonized safety criteria and expanded certification capacity.

In Europe, the early 1990s was the most dynamic period of history since the victory over the Axis powers in World War II. The end of the Cold War led to a reunified Germany and a liberated Eastern Europe, allowing these countries to get involved with European politics and economic development. The 1992 Maastricht Treaty created the European Union (EU) and the euro as a common currency in 1993.

UL sought acquisitions that offered co-located regional and local expertise with European manufacturers serving European and global



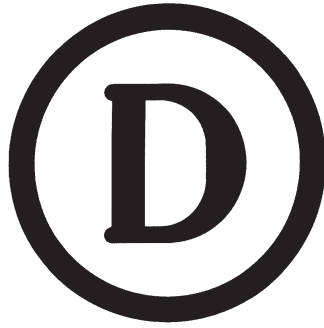
Gerald L. Maatman (second from right), Chairman of UL's Board of Trustees, visits DEMKO to meet with the transition team: (left to right) Helge Birkbo, Finance Director, Henning Østerbye, Managing Director and Barbara Guthrie, Director of European Operations (1996).

markets. This turned a fateful corner in the organization's development.

"The real change came when we moved to local leadership and began to decrease the number of expats," explained Barbara Guthrie, 30+ year UL veteran, electrical engineer, Vice President, and Chief Public Safety Officer. "This meant we as an organization now had to trust the know-how, decisions and work of folks that didn't speak as we spoke and didn't live as we lived. It didn't happen overnight and, as with any relationship, trust comes over time. Frequent visits, late night/early morning conference calls and great patience and understanding from one another and our customers—the manufacturers—was an essential part of making this work. As technology evolved, and our labs and people off U.S. soil expanded, we grew from an international organization (doing U.S. things the U.S. way in other parts of the world) to a global organization (doing things in Denmark, for Denmark, as Denmark does)."

DEMKO Makes Its Mark

UL's European acquisition team settled on a decision after exploring a number of options. On July 15, 1996, UL acquired the Danish national testing and certification organization, DEMKO. Since 1928, DEMKO had evaluated products for safety at its full-service laboratory in Herlev, a suburb of the Danish capital Copenhagen. Now, as its first overseas acquisition, UL authorized manufacturers to use the DEMKO Mark, i.e., D Mark, recognized as Denmark's national safety Mark and known and respected throughout Scandinavia, Europe, and the world.



The DEMKO Mark, or D Mark, was recognized as the national safety mark of Denmark. DEMKO was founded in 1928 by the Kingdom of Denmark.

Senior Vice President Don Mader, a key player in the acquisition, said at the time of the announcement, "DEMKO's active participation in European certification schemes offers the type of access UL has been pursuing for its clients all over the world. DEMKO's Notified Body status in the European Union, its role in European certification schemes such as CENELEC's CCA Scheme and its involvement in the European standards development process, combined with UL's extensive services for North America, give UL clients conformity assessment services for these critical export markets."¹⁹⁰

Under EU regulations, most products sold in Europe had to comply with one or more European Commission (EC) Directives and bear the European CE Mark based on verification from an authorized EU Notified or Competent Body based in Europe, such as DEMKO. Therefore the DEMKO acquisition meant UL had achieved its goal. It could provide companies with the support they needed to use the CE Mark on their products so those products could move freely and efficiently



UL launched its second U.K. subsidiary office in Guilford in 1997. This facility served as head office, and housed administrative and engineering departments.

throughout Europe. Additionally, through DEMKO, UL could grant a valued and coveted European third-party certification Mark—the D Mark.

Navigating EU regulations was notoriously complicated from the beginning. Cornelis Brekelmans, a European Union standards official, told *The New York Times* in 2000 “that the CE Mark criteria were established to harmonize regulations among the union’s 15 member nations, not validate products for consumers, and that meeting them can be just as trying for European as for foreign manufacturers.”¹⁹¹ UL became a highly productive force working with manufacturers worldwide to untangle many of the compliance hurdles presented by the CE Mark.

The DEMKO acquisition involved several trips to Denmark by Barbara Guthrie and Chief Financial Officer Larry Newman to conduct due diligence and meet with DEMKO executives including Henning Østerbye, Executive Director, Helge Birkbo, CFO, and Gitte Schjøtz, Marketing Manager. When UL put in a bid to pursue DEMKO, Don Mader asked Guthrie to serve as Executive Director of DEMKO and Director of European Operations and move her family to Denmark.

UL DEMKO fairly seamlessly became an expert voice and facilitator in European market accreditations and standards. Guthrie began working to expand services, programs, and opportunities outside of national borders. During the late 1990s, through organic growth and acquired companies, UL opened seven European labs, establishing data acceptance, reciprocity, and trans-global safety certification.

Recalling the DEMKO acquisition later, Tom Castino described it as, “a bargain, because we got all the accreditations and acceptances in Europe which would have taken decades to get.”¹⁹² From 1996 onward, UL’s infrastructure in Europe developed rapidly. In 1996, UL opened an affiliate office in the UK and another in Sweden in 1997. In 1998, UL acquired Electro Services in Italy, renaming it UL International

Italia, S.R.L. In 1999, UL established affiliate offices in Germany, the Netherlands, and France; a Spanish affiliate office was opened in 2001. Affiliate offices opened in Ireland and Switzerland in 2002.

Don Talka (later becoming UL's Senior Vice President and Chief Engineer) took over UL's European operations after Guthrie returned to the United States, and moved the business center from Denmark to Germany, where he relocated from Melville with his family for three years.

Similar growth was occurring across the UL organization globally. Focus shifted from functional to regional management. With the advent of the regional structure, UL was better suited to pursue global expansion strategically and operationally.



UL and the U.S. Customs Service partnered in a five-month anti-counterfeiting effort, which resulted in the seizure of 1.8 million commonly used electrical products bearing counterfeit UL Marks (1997). Brian Monks (on left), now Vice President of Anti-Counterfeiting, and John Smith (right) inspect items with counterfeit marks.



UL introduced holographic labels to help prevent the counterfeiting of labels in 1993.

Protecting the Mark

Extensive counterfeiting led to a shadow criminal economy that has paralleled the rise in global trade since the 1980s. The International Trade Commission found that the cost of counterfeiting to the United States exploded from \$5.5 billion in 1985 to \$60 billion in just six years. According to the Taxation and Customs Union of the European Commission (EC), the number of counterfeit articles detained in EU member states rose from under 25 million in the late 1990s to nearly 200 million within a decade.

Counterfeiting is not a victimless crime. These crimes impose costs on brand owners, regulators, threaten the safety of consumers, doom child workers and other exploited workers involved with the production of counterfeit goods, and also fund organized crime and terrorist activities. As with responsible manufacturers and consumer brands around the world, UL could not afford the thriving skullduggery of counterfeiting to tarnish the integrity of the UL Mark.

The U.S. Lanham Act of 1946 first provided UL with federal protections against infringements and copies of its Mark. This law successfully protected UL's customers and American consumers within U.S. borders. By the 1990s, UL's role in a global economy presented far more vulnerabilities in the supply chain.

UL introduced holographic labels to help prevent the counterfeiting of labels in 1993. Then in an ambitious strategy UL launched a partnership with U.S. Customs in 1995 designed to combat counterfeiting of the UL Mark at U.S. ports of entry. By October 1997, UL had trained more than 1,000 Customs agents, import specialists and inspectors at 24 of the most active U.S. ports of entry. In May of that year, Customs agents began targeting shipments of electrical imports from China that posed the greatest threat to American consumers. During 1997 alone, U.S. Customs seized more than two million products with a retail value of more than \$40 million, and hit counterfeiters in their pockets by destroying those products and limiting any chance of their reaching the marketplace. Although counterfeiting represented a minuscule less than 1/100 of one percent of the 14 billion UL Marks that appeared on new products during 1997, UL's approach was zero tolerance.

UL expanded its campaign against counterfeit Marks with its own internal security program. In 2016, UL's Global Security & Brand team led by Vice President Brian Monks oversaw UL's efforts to prevent counterfeit UL marked products from entering the stream of commerce.

The objective of the program is to protect UL assets everywhere while helping to safeguard people, products, and places from counterfeit UL Marks. UL's initiatives support two critical goals. One is to protect UL assets on a global basis and work in partnership with stakeholders to identify and help neutralize threats against these resources; second, to protect the UL brand while striving to create safe living and working environments by working with stakeholders to remove counterfeit UL marked products from the stream of commerce and hold legally accountable those responsible for the manufacture, distribution, and sale of these illegal goods.

By the late 1990s it was clear UL's turn to globalization had forced yet another corporate reinvention, requiring risk-taking, new technical competencies, new strategies, and a continued commitment to the

public safety mission—translated for manufacturers, governments, and consumers around the world.

Nonetheless, this describes only one part of UL's perilous journey through political change and corporate transformation as it entered the last decade of the twentieth century.



UL International Services Ltd. celebrates the holidays in Pei Tou Office, Taiwan (1998).



UL Engineer Glenn Woo (left), discusses automobile refrigerant recovery and recycling equipment with members of the Japan Automobile Manufacturers Association (JAMA) (1991).



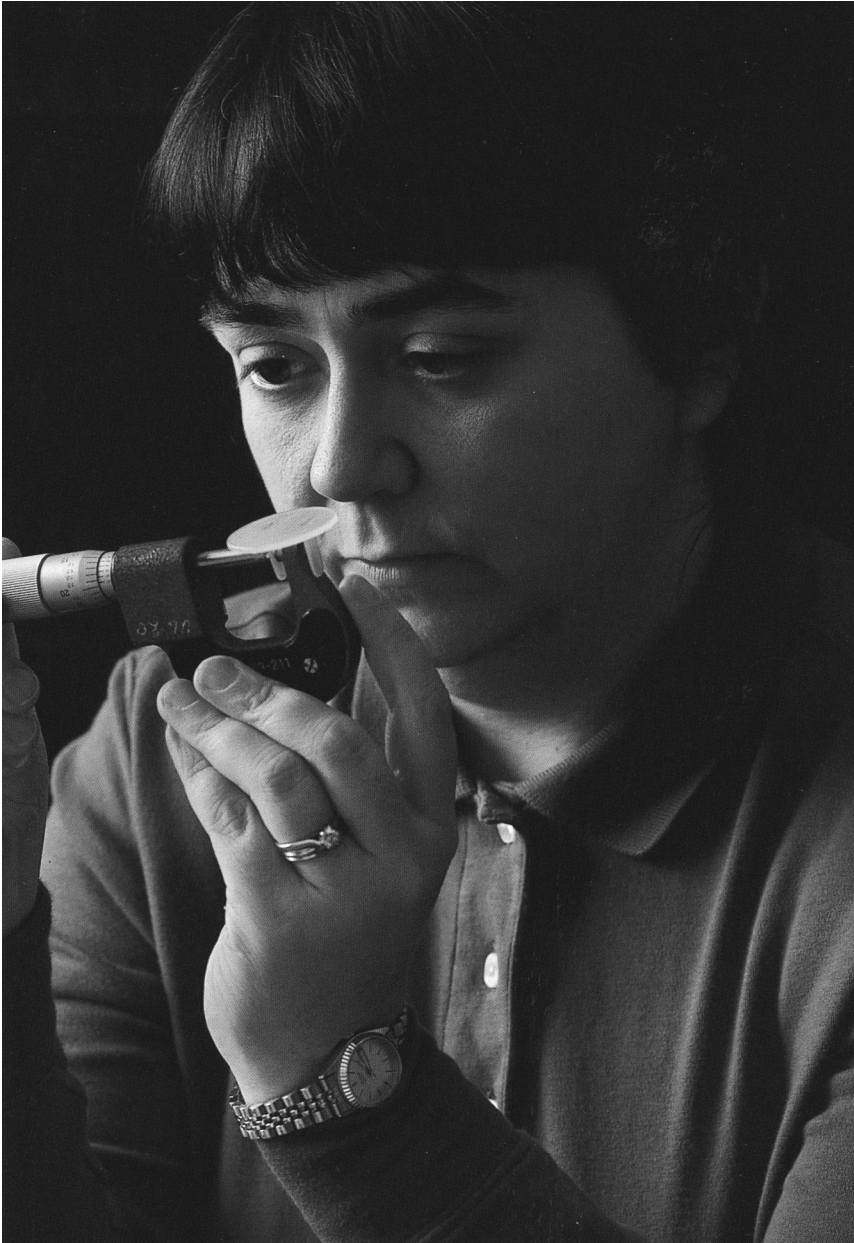
In 1992, UL engineers applied UL's Field Evaluated Mark to the heating elements for the tram system track at Chicago's O'Hare International Airport.



UL played an important role in the evolution of kitchen appliances. A classic mixer is tested in the Home Environment Lab by Naomi Bee Hoffman in 1994.



The Hong Kong and Taipei laboratories were staffed by UL employees who relocated from the United States and recruited employees from the local populations (1990).



UL Engineer Susan Porter oversaw the Standard development process for UL 2255, the Standard for Safety for Receptacle Closures (1998).

—CHAPTER EIGHT—

The Break-Up and the Shake-Up

UL PASSES ITS BIGGEST TESTS

Markets are linked worldwide in patterns never dreamed of before. The pathways to product access and acceptance are ever-increasing. Which pathway to take? No matter which one you choose, it's a tough journey.

—UL Annual Report, 1998

By the early 2000s, UL confronted enormous pressures from both outside and within the organization. Two challenges in particular required the organization to undertake additional, often painful organization-wide changes to preserve its global leadership and mission of public safety. The first was a landmark lawsuit brought by a competitor, resulting in a federal ruling that made UL's testing standards available to other labs and ended the firm's undisputed reign in the field. The second was an internal shakeup initiated by

President Loring Knoblauch (who served from 2001 to 2004) that led to massive workforce changes and the closure and restructuring of a number of UL facilities. And, like many around the world, UL and its people also coped with the stress and fears related to the 2001 terror attacks and the wars in Iraq and Afghanistan that traumatized families and communities.

As the twentieth century gave way to the twenty-first, globalization and deindustrialization had permanently and fundamentally rearranged production and job creation in the U.S. economy. UL continued to adapt to these transformations. Traditional manufacturing continued its steep decline. Between 1980 and 2005, the

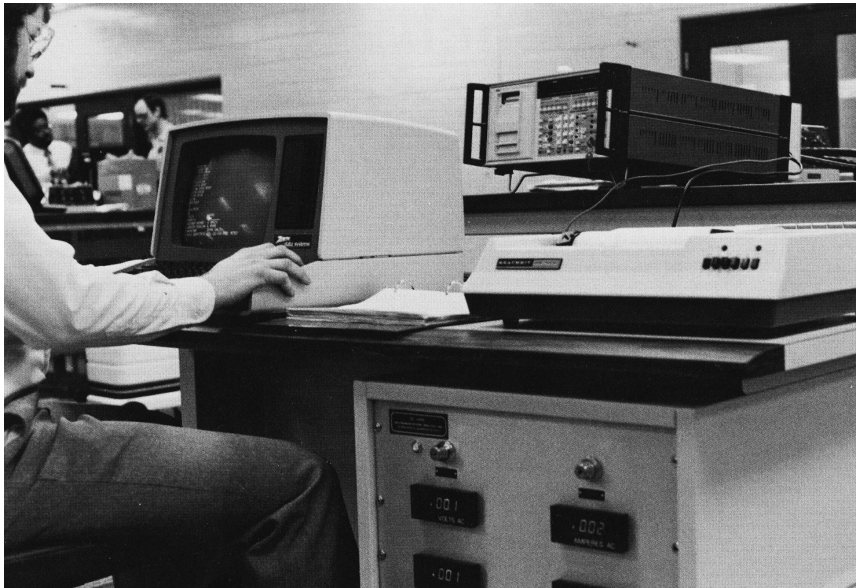


UL 2001 Annual Report

United States lost approximately 4.5 million manufacturing jobs, according to the Brookings Institute.¹⁹³ This era was marked by the rise of another behemoth—the technology industry. The transfer of military innovations to the private sector (such as the Internet) and a concentration of the world's best engineering and scientific talent in a number of elite U.S. universities spurred waves of advances in technology. Overseas labor made it cheaper and easier to manufacture micro-

computers, soon to be known as personal computers. In 1975, two young programmers named Bill Gates and Paul G. Allen formed a company called Microsoft. The following year, Steve Jobs and Stephen Wozniak, engineers from Silicon Valley, built a homemade computer that launched the PC revolution. In 1982, *Time* magazine named the personal computer its Man of the Year.

And just like the invention of the assembly line more than half a century earlier, the information technology revolution altered the economic landscape and dramatically shifted consumer behavior. While jobs in goods-producing industries declined, service-producing industries such as healthcare, communications, and finance accounted for nearly 90 percent of job growth in the 1990s, according to the U.S. Bureau of Labor Statistics. Businesses transformed their systems to meet the demands of a new digital age, and computer technology was applied to all sectors of the economy.¹⁹⁴ The technology boom fueled the economic expansion of the 1990s, the longest recorded in American history. UL, again, began new divisions, hired additional talent, and expanded globally to remain at the forefront of these emerging technologies, testing pioneering products in consumer technology.



A lab technician monitors the progress of a leakage test in a newly computerized test room in 1982.

UL Snapshot, 2000

Countries with UL customers: 92

Consumers reached with UL safety messages: 120 million

UL inspection centers: 190 in 72 countries

Number of UL employees: 5,938

Number of manufacturers producing UL certified products: 61,869

UL selected services:

- Safety evaluations
- Performance testing
- Energy efficiency
- Environmental and public health
- Electromagnetic capability
- Management System Quality Registrations
- UL Commercial Inspection and Testing Services
- Trade facilitation and global market compliance

For UL, Change is Not a Stranger

After all, rapid change was hardly a new reality for UL and its workforce. Engineers and scientists continued to write new standards as industries adapted to globalization, wireless communication, and the automation of consumer services such as banking. During the late 1990s, management worked to improve customer service and internal communications with a range of programs. UL global employees from China to Italy played critical roles in the advancement of product manufacturing and safety. As Tom Castino said in 2000, his final year as UL's president, "After more than a century, UL continues to be a workplace where people are committed to safety. It remains at the heart of our organization's ideology. In an increasingly global and complex marketplace we must support our public safety work by being savvy about business and technology, for these are the keys to successfully carrying out our safety mission."¹⁹⁵

Examples of UL's progress at the millennium abound. In 1999, UL registered the first Chinese telecommunications company to achieve the global TL 9000 quality standard, working with Koide H.K. and the QuEST Forum industry quality association to advance a new certified provider to the global economy. UL also initiated a co-creative standards development process during the late 1990s. It required that engineers write new UL Standards from the earliest stages with the involvement of a diverse panel of experts representing all UL constituencies. Called Standard Technical Panels (STPs), these teams ensured that UL received a spectrum of input and perspectives. UL had incorporated outside experts into the standards-writing process for a century, but not always at such an early stage. Reflecting UL's increasing involvement in environmental safety, in 2000 the Brea, California, office introduced a triangular EPH Mark, to denote that the product met environmental and public health (EPH) requirements. Through this Mark authorities could tell at a glance if a UL Mark displayed on a product indicated that it complied with relevant EPH standards.

UL's media and marketing teams also used the broadcast media to inform consumers. UL produced a national public safety announcement (PSA) about the greater protection from electric shock offered by ground fault circuit interrupter (GFCI) outlets and why it's important for consumers to test their outlets at least once a month. Marketers asked Public Broadcasting Service personality Beverly DeJulio to act as spokesperson for this PSA. UL also added direct-to-consumer outreach by seeking retailers who shared its commitment to safety on GFCIs and other household concerns. The consumer affairs team developed a holiday safety tips sheet that millions of consumers found in the U.S. stores of a major retailer, Lowe's Home Improvement.

The Break-Up and the End of UL's Quasi-Monopoly

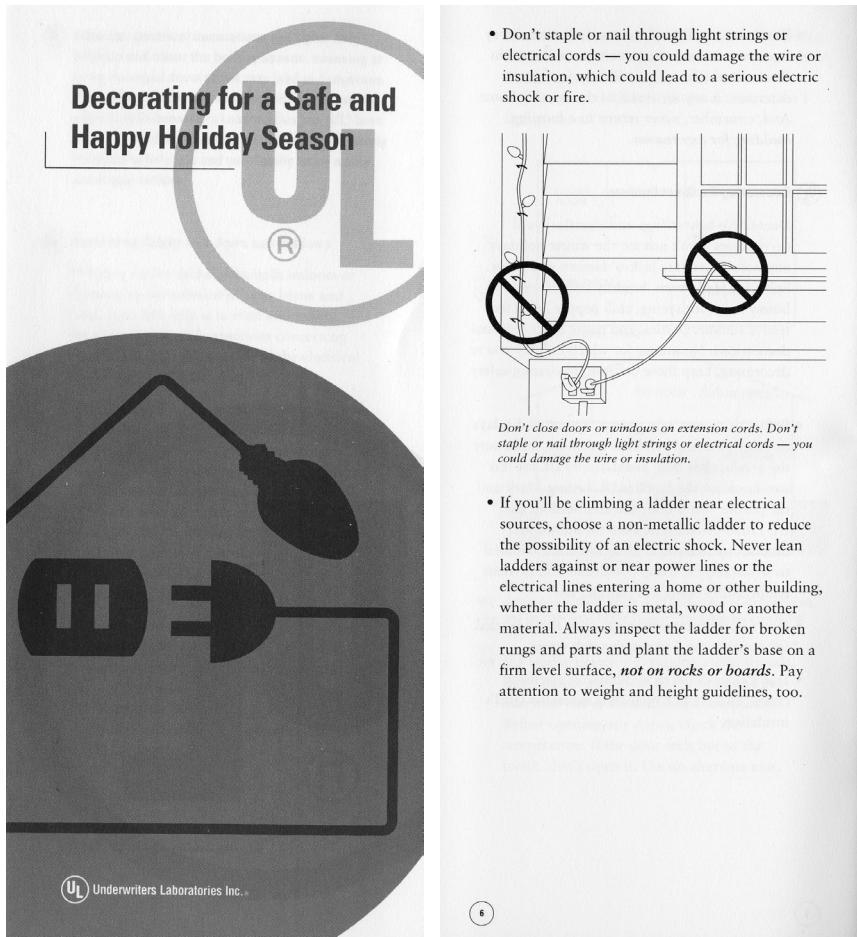
Although UL had expanded into a global organization, with new markets and offices established in Asia, Europe, Australia, and elsewhere, the organization continued to fight for U.S. market share during the 1990s and 2000s. Much of this was due to a proliferation of competitors that had gained the designation of Nationally Recognized Testing Laboratory (NRTL) for testing and certifying products to UL safety standards. Because UL had literally written the book on product testing standards, it had enjoyed a near monopoly for the majority of the organization's existence. In 1970, when Congress created the Occupational Safety and Health Administration (OSHA) to "assure so far as possible every working man and woman in the nation safe and healthful working conditions," regulations adopted by the agency named UL specifically as a NRTL with the ability to certify that workplace products had met acceptable safety standards.¹⁹⁶ It did not specify consumer products, but this was indirectly understood.

At roughly the same time, MET Laboratories Inc. began product safety certification services. Founded in 1959 in Baltimore as Maryland Electrical Testing, the company up to that point had focused on testing high voltage electrical transmission and distribution systems. In the 1980s, MET successfully sued OSHA to remove the specific references to UL in its NRTL regulations. The federal agency—with UL's assistance and expertise, a fact known only to a few—subsequently established a program to recognize other labs under its designation, and in 1989 MET became the first laboratory to be certified as an NRTL under the new program.

Opening the door to other labs to seek and obtain the federal designation altered the testing landscape irreversibly. Because UL had spent decades developing and refining the standards that had made it the nation's leading consumer safeguard, rival firms would now be able to capitalize on this work to enter the field more easily and inexpensively.

Another major shift occurred in 1992 when the U.S. entered the IECEE Certified Body (CB) Scheme—an international system established by the International Electrotechnical Commission (IEC) for mutual acceptance of test reports in over 30 countries dealing with the fields of electrical and electronic equipment.

The competition and pressure from other firms increased with the U.S.'s entry into the CB Scheme. UL's competitors now included all



An example of a holiday tips brochure (1994).

testing organizations and certification organizations that participated in the scheme from dozens of countries. And during the 1990s these rivals were aggressive in announcing their entry into the U.S. market.

By revamping and updating its processes to address growing competition, UL also dealt with criticism from some outside experts and competitors that UL was “too close to the companies whose products it tests and too slow to investigate and correct any problems.”¹⁹⁷ UL conducted investigations on specific claims that a number of [UL certified] products were unsafe such as halogen lamps, fire prevention sprinklers, smoke detectors, and pop-up toasters. In each of these cases, UL worked closely with its critics including the CPSC and fire experts to retest and ultimately revise its recommendations to the satisfaction of all involved.¹⁹⁸

The Shake-Up: Knoblauch Empties the Restructuring Toolbox

In 2001, UL named Loring Knoblauch as its ninth president. Knoblauch was born and raised in Minneapolis, Minnesota. He graduated from Yale and Harvard Law School, and received an MBA from Stanford. In 1974, Knoblauch started at Honeywell, where he worked for 20 years, serving as Vice President for International Business Development. Knoblauch gained significant international experience with Honeywell, especially in East Asia. When Knoblauch joined UL, he became the first president in the organization’s history who had not risen through the UL ranks. He was not an engineer and had never served in the organizations affiliated with the U.S. product safety system or manufacturers associations so commonly associated with UL. As one UL executive observed of this time, “UL understood it needed to change to grow and the decision to hire Loring, also was a decision to change tradition and hire in a President from the outside.”

The Board had given Knoblauch a mandate to reshape aspects of UL's operations to improve customer service, returns on investment and competitive advantage with the younger, nimbler NRTL labs cutting into UL's business. The Board expected Knoblauch to hire new talent and make strategic changes to the workforce.

By 2004, Knoblauch consolidated all West Coast facilities under a unified U.S. West Division in San Jose, and closed the Santa Clara facility. A similar process took place when a U.S. East Division was formed in 2005. "Change management" initiatives proliferated in what looked like a greatest hits collection of bestselling business book theories, from balanced scorecard to process re-engineering to Jack Welch's "up or out" performance management system.

Knoblauch downsized 2,400 people from UL's existing workforce through a variety of measures, while eventually hiring 2,500 new employees. As a result of these changes, nearly half of UL's workforce had less than four years of experience at the organization by 2004.

Many of UL's veteran employees lost their jobs in the sudden, massive downsizing. While antiquated performance management approaches needed to be reformed, Knoblauch's downsizing was done by his own admission with cursory consultation with line managers and department heads. The loss of UL veteran employees amounted to a "brain drain" that organization leadership had to reverse a few years later by rehiring some of the laid-off ULers.

These disruptions also changed UL's customer service traditions. With the workforce upheaval, UL customers were dealing with many new faces in the engineering and testing areas. Knoblauch also added 400 customer-service agents to take orders and provide quotes for jobs, largely isolating engineers from their long-standing and typically highly-valued customer relationships. He added to the sales force, which was still relatively new to UL and lacked sufficient training to step in for the veteran engineers. It would take UL a few more years to fully transition to a customer service organization comprised of

collaborative engineering and sales teams.

Additional customer service measures modernized and shortened turnaround times for consumers including a fast-track option end-product certification program. New measures cut through delays in certification requests among manufacturers selling their products in new national markets globally.

UL Sharpens Competitive Advantage

Loring Knoblauch retired as UL president in August 2004, the same year UL celebrated its 110th anniversary. “I was well aware of what I was getting into,” he recalled in 2014, “but I love change management... and I think it is... true... that the most popular you ever are as a change manager is the first day you come in the door. And then your popularity is going to go down every single day from then until you leave the company.”¹⁹⁹

Despite the controversy of Knoblauch’s tenure, UL had sharpened its competitive edge in a number of strategic areas going forward to the 2000s. UL continued to represent the gold standard in quality and safety while improving market efficiency and customer sensitivity. Revenues grew between 2000 and 2004 and global market share increased.

UL made strategic global expansions during Knoblauch’s presidency. In 2002, it acquired A-Pex International Company, Limited, a major player in Japanese product testing and certification, and merged it with UL Japan, giving a more prominent place in competing for the Japanese market. During that same year, UL Italia acquired Sicur Controls, a company specializing in the research, design, and implementation of safety management systems for wireless communications, broadband, and optical fibers.²⁰⁰ In 2003, UL created a new joint venture with its longtime Chinese counterpart CCIC. The partners invested \$15 million to build state-of-the-art testing facilities in Suzhou and Beijing, China, and to recruit, train, and qualify a local certification team.

The organization also overhauled its outdated system for personal technology devices and connectivity. UL invested hundreds of millions of dollars in new computers and laptops and installed new business process software including an organization-wide customer relationship management (CRM) platform. UL digitized employee newsletters, held online media presentations, and added global remote access for laptop users worldwide.²⁰¹

UL expanded its work with major retailers during the 2000s, directly marketing the consumer sales value of the UL Mark to Lowe's, JC Penney, and other major companies. Lowe's approved UL as its preferred certification agency in 2003, indicating in the words of UL's employee newsletter, "the need for a strategy to cultivate relationships with retailers that drive the greatest demand for products requiring certification."²⁰² UL enhanced its value as a trusted source for the media through its annual public information campaigns on critical home safety concerns such as the popular trend of frying turkeys outdoors

UL in the News: Restoring Public Faith in Smoke Detectors

When a national news program aired a story in 2000 reporting that Underwriters Laboratories of Canada (ULC) certified smoke alarms used in many Canadian homes did not meet ULC Safety Standard requirements, ULC employees leapt into action to restore public faith in these life-saving devices for which its Mark was so universally regarded. Bruce Paterson of Underwriters Laboratories of Canada's Signal Section and his employees were confident that the smoke alarms in Canadian homes met the national safety standard of Canada written and published by ULC.

ULC joined with public agency Health Canada to test the alarms in question. ULC enlisted the support of the Canadian fire protection committee and consumer groups to act as independent observers during the tests. The ULC team put the alarms through 192 tests over a two-week period as the expert group looked on. All 11 models of smoke alarms evaluated passed every test. From beginning to end of the effort, the phone never stopped ringing. Paterson spoke to hundreds of media and organizations during that time, calming public fears. He said, "I wanted to make sure that they had confidence in these safety products and were adding smoke alarms to their homes, rather than taking them out. We know that lives can be saved if people use smoke alarms."

and use of holiday lights.

In many respects, the early 2000s had turned UL upside-down. A workplace known for stability and loyalty saw more than half of its employees leave. Dozens of global operations had to be integrated via technology, language, and—far more importantly—culture. Competitors, experts, and reporters had asked plenty of tough questions and fired broadside attacks at the practices and processes that made up the UL way. Even the very nature of safety in the Western world had literally been attacked by global terrorists. But not surprisingly to most who knew UL and its history, the organization kept its balance through these gale force winds of change. UL's historic focus on public safety and scientific rigor had survived numerous wars and economic upheavals. No UL executive had ever corrupted its standard-writing and inspection processes for financial gain or sold the UL Mark for a briefcase of money. Literally billions of UL certified products were used



Innocenzo La Pietra, Senior Project Engineer in Lighting, evaluates a LED driver board at UL International Italia S.r.l.

safely on a daily basis. UL had built its house on the soundest structure possible—incorruptible values taught and shared through the generations. They were the constant for UL employees as the organization turned with confidence to the twenty-first century. For UL, the center continued to hold.



In 2003, UL created a new joint venture with its longtime Chinese counterpart CCIC. In 2014, CCIC members visited the Northbrook campus.

UL Officers, 2003

Loring Knoblauch, President and
Chief Executive Officer

Jim Beyreis, Vice President Engineering

Joe Bhatia, Executive President and
Chief Operating Officer, International

Jane Coen, Corporate Secretary

Al Cotrone, Vice President and
General Manager, US West

Ted Hall, Senior Vice President and
Chief Technical Officer

Sajeev Jesudas, Vice President and
General Manager, East Asia

Philip Kaes, Vice President and
General Manager, Europe

Don Mader, Executive Vice President,
Public Safety and External Affairs

Ken Melnick, Senior Vice President and
Chief Administrative Officer

Andy Moschea, Vice President and
General Manager, Northbrook

Susan Rochford, Vice President,
Government, Regulatory, and Industry Affairs

Michael Saltzman, Executive Vice President
and Chief Financial Officer

Gus Schaefer, Senior Vice President and
Chief Operating Officer, U.S. and Canada

Howard Simon, Vice President,
Human Resources

Mark Sklenar, Senior Vice President and
Chief Operating Officer

Ole Sorensen, Vice President and
General Manager, Melville Division

Kathy Szczech, Treasurer

Ken Ueshima, Vice President International
Business Development

Sara Ulbrich, Vice President Sales
and Marketing

Stephen Wenc, General Counsel (Acting)



UL conducts fire tests on cable to help protect vital communications and electrical services (1989).



The Chicago Fire Department participates in a simulated living room fire test in 1989.



In 1990, UL conducted light perception tests on hearing-impaired individuals to determine the light signal intensity necessary for manufacturers to design an effective fire-alarm signaling device.



A technician examines each sprinkler sample before it is subjected to any tests (1992).



Field Representatives from the UL San Francisco Inspection Center countercheck continued compliance of an automated storage library system (1997).

—CHAPTER NINE—

The 100-Year Start-Up

UL PREPARES FOR A SUCCESSFUL 2ND CENTURY

**Wherever you are in the world, whatever country
you live in, whatever citizenship you have, you know the
one kind of commonality we all have is that you have a
safe place to live and a safe place to work.**

—KEITH WILLIAMS,
UL President and CEO, 2014

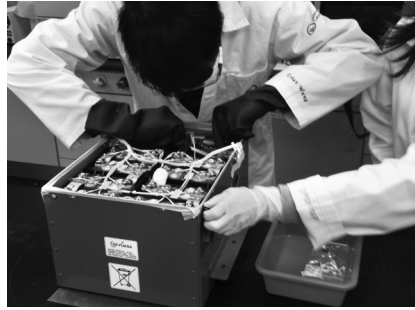
Since its founding, UL has grown and changed through boom and bust economic cycles. The average American home now contains more than 125 UL Marks, and around the world there are 22 billion UL Marks on 21,000 varying product types. From its earliest days, UL never wavered in maintaining its credibility. In 1912, government investigators found evidence of price fixing by the Wire Inspection Bureau, whose members began fleeing the country to avoid prosecution. This booming new electrical industry appealed to President Merrill, and he agreed to assume the inspections and



UL President Keith Williams addresses the inaugural session of the India Product Safety Summit 2010 in New Delhi.

quality testing work done by the Bureau. When consumer interest advocates criticized UL for being too close to industry during the 1970s, UL defended its methods to Congress and created a consumer advisory council to ensure that industry voices were not overrepresented. During the 1980s and 1990s, the organization fell short of meeting high customer service standards. New competitors energized UL's leadership to close the service gap.

With over a century of successes and struggles, the fact remains that the UL spirit that founder Merrill lit, and the organization's mission to safeguard people, are as strong as ever. Merrill's passion for science, "to know by test, and state the facts," endures as the unshakeable core of UL's heritage and equity. UL helped ensure the public adoption of electricity and improved building construction. It certified the first auto-



UL was asked to provide technical expertise and testing for an investigation of the safety of lithium-ion batteries aboard Boeing 787 aircraft after three incidents occurred involving overheating of the batteries (2014).

motive seat belt and personal computer. Now, under President Keith Williams, UL has pioneered new revenue by diversifying into emerging testing markets such as supply chain verification, water products certification, lithium-ion battery safety, environmental sustainability monitoring, and electronic transaction security thus expanding UL's role in delivering a safer world.

The US National Transportation Safety Board (NTSB), which is the sole legal authority for investigating plane accidents, launched an investigation of the Boeing 787 Dreamliner after the aft APU battery caught fire in January 2013 at Logan International Airport. The NTSB did not have the requisite battery expertise in their laboratory and asked UL to provide technical expertise and testing services. UL conducted a comprehensive, three-phase investigation for the NTSB, utilizing teams from UL's Taiwan, Northbrook, and Melville locations.

Adding to the challenge was the fact that this work was part of a US Federal investigation and had to be performed under strict confidentiality and secrecy. When the team completed their work in June 2014, they were able to determine the root cause of the incident. The team published seven reports, totaling more than 1,000 pages and all of their reports are available on the NTSB Public Docket website.

The NTSB now regards UL as their primary external resource for battery research and testing needs. This body of work is now being referenced in peer-reviewed journals and public presentations. The NTSB's selection of UL for the Boeing 787 Investigation provided profound recognition of UL's technical expertise, unquestionable independence and integrity and timely relevance to new and evolving technologies.

In another project, UL partnered with the New York City Fire Department and the National Institute of Standards and Technology to test how fires spread in homes and to determine the most effective and efficient way to suppress the fire and save potential occupants. In an unprecedented series of controlled burn experiments at abandoned buildings on Governors Island in New York City, researchers sought to safeguard firefighters by determining how they can apply water to fires while coordinating the opening of doors to limit the size of the fire and improve conditions throughout the structures for occupants that may be trapped.

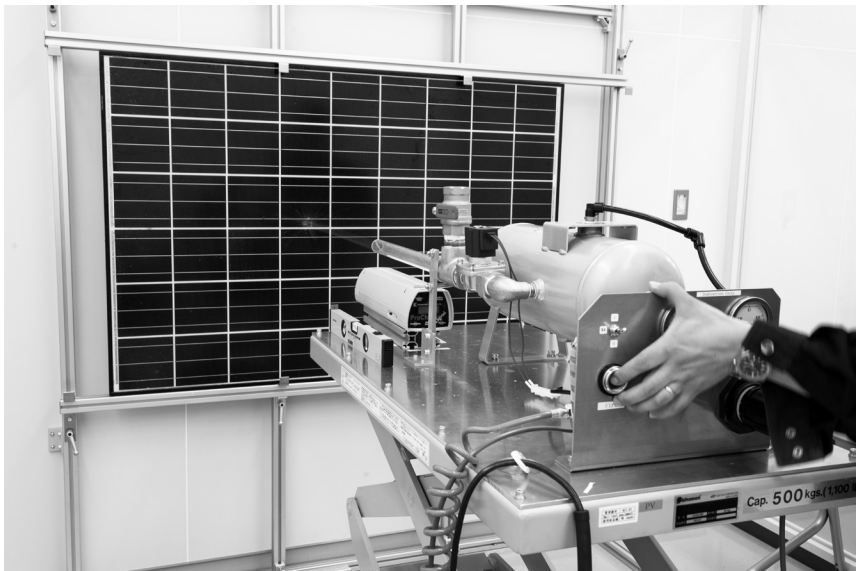
UL outfitted the buildings with video and thermal cameras that



In an unprecedented series of controlled burn experiments at abandoned buildings on Governors Island in 2012, UL partnered with the New York City Fire Department and the National Institute of Standards and Technology to test how fires spread in homes and to determine the most effective and efficient way to suppress the fire and save potential occupants.

transmitted images to a command center nearby. The engineers wrapped the sensors in ceramic fibers and foil to protect them from the flame. The sensors measured the flow of gases, the temperature, and the pressure at various points inside. In another building, engineers monitored carbon dioxide concentrations on the higher floors.²⁰³ The firefighters learned a number of techniques for dampening fire intensity before entering rooms, thereby potentially saving firefighter and civilian lives.

In 2016, UL continued to emphasize the primacy of science in advancing safety and keeping pace with innovation. UL's engineers and scientists are using research to knock down barriers to innovation in trending industries such as renewables and environmental technology. UL's work in solar technology is just one example. UL operates solar panel testing facilities in California, China, Germany, and Japan. When the solar industry saw a slowdown due to concerns from fire inspectors that untested solar panels could lead to roof damage, fire or other safety problems, UL responded. Now, in addition to testing solar panels



This apparatus tests the durability of solar panels by shooting hail balls at it at a high rate of speed.

for durability (with an apparatus that shoots hail balls at panels), UL runs a certified program that sets the standard for proper installation of solar panels taking into account the roof and panel systems, electric energy captured by the panels, environmental conditions, and the longevity of the panel materials.²⁰⁴

“Our mission is to promote safe living and working environments for people. For the last century, we’ve been primarily focused on electrical and fire safety. But the world’s safety needs are always changing and evolving,” UL President Keith Williams has said of UL’s forward-leaning approach.²⁰⁵

In 2016, the state of UL is strong. It is profitable with a track record of organic growth and successful acquisitions. UL’s people and opera-

UL People: The 10th President

Keith Williams was born in Hastings, Nebraska, and grew up in Mechanicsburg, Pennsylvania. He developed strong interests as a child in science and engineering, and attended Case Western Reserve, where he earned an engineering degree. Williams joined General Electric in medical equipment sales in 1974.

Over his 23 years with GE, Williams rose to serve as president of Medical Systems China in the 1990s. He worked for Medtronic before arriving at UL, serving (among many roles) as president of Asia-Pacific Operations.



Current UL President Keith Williams was elected to the role of president by the Board of Trustees in 2005.

tions are supported by strong pillars known as the 2nd Century strategy. Building these pillars to last wasn't easy and will require UL's constant commitment.

The 2nd Century Strategy

UL's 2nd Century story begins with its 10th president. Loring Knoblauch retired in 2004 and UL's Board of Trustees managed the firm for a few months. When the Board hired Keith Williams as President in 2005, he had a mandate to restore confidence and direction after a significant period of change involving mass layoffs—the first in its history—a shaken workplace, and critical media coverage. Williams began building bridges to UL's employees, expressing his and the Board's confidence in UL's legacy and history. Williams reflected on that time, saying, “the psyche of the organization was injured pretty badly. We had very successful and aggressive competition that treated business a little bit differently. Whereas UL had become like a government service in some ways, our competition was very commercially oriented, very client oriented, and very flexible.”²⁰⁶

UL's problems were augmented by the onset of the Great Recession in 2008. The bursting of the real-estate bubble and subsequent collapse of major U.S. financial institutions caused massive reverberations throughout the economy. The U.S. unemployment rate peaked at 10 percent in 2009, stock prices tumbled, and American families saw their net worth decline by 40 percent from 2007 to 2010. The global recession also hammered other industrialized democracies worldwide. UL was not immune to the financial crisis, and delayed its strategy briefly.

In one of the boldest moves in UL's history, Williams and the UL Board ultimately restructured the organization into a for-profit entity, wholly owned by the not-for-profit UL parent. As stated in the April 6, 2011 Meeting Report of the UL Board of Trustees, “Now therefore be it resolved that: The Board determines that the restructuring referred to

as 2nd Century and as approved by the Internal Revenue Service is in the best interests of and directly and substantially furthers the charitable purposes of ULI.”²⁰⁷ This pivotal decision in UL’s history serves UL’s mission to promote safe living and working environments for people around the world by fueling business growth and ensuring long-term leadership and relevance; providing the flexibility and resources needed to achieve UL’s strategy; preserving UL’s independence; and funding expansion of the mission.

To make the restructuring possible, UL developed and implemented the 2nd Century Strategy:

- To preserve and advance our Public Safety Mission was at the core, just as it was over a century ago.
- To provide structure flexibility; access to capital; ownership culture; and attract and retain employees.

The not-for-profit parent was dedicated to advancing the mission. The for-profit entities provided the commercial services that were unique and invaluable in pursuing the Public Safety Mission. Standards development, research, education and advocacy remained with the not-for-profit parent organization, while the testing, inspection and certification businesses, along with the corporate support functions were placed in the for-profit.

UL leaders were very intentional and deliberate in creating a for-profit subsidiary. The conversion process took five years, Williams explained, with strategically rolled-out communications to employees and external stakeholders aimed at building understanding and consensus. “Often in America when companies have done conversions from not-for-profit to for-profit one of the consequences has been that the directors and the officers have made a lot of money,” Williams said. “So, there’s a natural suspicion where people say ‘oh, well you’re

just doing that so you will get rich.”²⁰⁸

The move was structured so that 100 percent of the shares of the new for-profit company were owned by the not-for-profit parent, which enabled UL to better serve customers and continue its mission, rather than enriching its directors or officers.²⁰⁹

Leading with Lean

Williams spent much of his first year learning more about UL's people and processes in order to understand what would revive and renew its people in sustainable change. He hired executive talent from outside UL, communicated through his own organization-wide email missives, and surveyed UL's workforce to learn more about how people viewed their own work, and how they evaluated the effectiveness of their team and their organization in achieving its mission. Williams and his team arrived at two big goals: 1) to improve how UL managers lead and engage their people, and 2) how the organization serves and delights its clients.

Williams's experience in advanced manufacturing and knowledge services at Medtronic and GE convinced him that using Lean management principles popularized by Toyota and many best-in-class manufacturing firms could be applied successfully to UL. The Lean model

UL Evolution: Common Lean Management Terms

Kanban is a system to control the logistical chain from a production point of view, to reduce inventory costs and delays.

Kaizen is the practice of continuous improvement.

Visual management presents information and organizes parts and workspaces in an easy-to-understand way by using visual signals instead of text, so that directions and processes can be easily followed.

Jidoka roots out defects at the earliest possible moment by stopping work immediately when a problem first occurs.

Andon is a visible sign that a defect has occurred or is about to occur.

is centered on improving productivity and quality of service through the elimination of waste. The philosophy was initially derived from the Toyota Production System and *kaizen*, the practice of continuous, incremental improvement. The ultimate goal of Lean is to provide perfect value to the customer with no wasted resources.

Lean would not only improve operations and customer satisfaction, but also engage everyone at UL in catalyzing change. For too long UL did not take full advantage of its people's capacity to solve problems.

"It took us a year to actually figure out how to apply Lean[ness] to our business," Williams later reflected, "but we're getting better and better at it. Lean for us has always been about being faster, easier to work with, and more client-friendly."²¹⁰

To "lead the world in creating safe living and working environments for people," UL began to consider new platforms for growth to broaden UL's definition of safety and expand UL's sphere of influence. In addition to safe buildings, safe workplaces, and safe products, UL began thinking of safe food, safe water, and human health. Businesses began to explore safer, cleaner, and more affordable energy. National governments and companies needed to address the enormously complex security and safety challenges around wireless, interoperability, and cyber security issues. UL showed diligence and strategic patience in identifying its role, responsibility, and mission within these emerging and growing technology concerns. UL looked to both organic growth and mergers and acquisitions to quickly broaden and heighten UL's service portfolio to stay ahead of the world's safety needs.

UL prepared itself for its next century of public service. It defined a strategy that fueled business growth and ensured long-term leadership and relevance. 2nd Century provided the flexibility and resources to achieve the strategy with a strong perseverance to UL's independence and a new structure that funded and sustained UL's expansion of its mission.

Increasing Employee Engagement Through Training

William Henry Merrill valued continuous learning, saying in a speech in the organization's early days that, "UL Inc. is the technical school of the university of fire and accident prevention. Education is the one underlying and essential element in the fight against the nation's appalling loss of life and property from fire and accident and the Laboratories afford means of studying machinery, devices and apparatus in their relation exclusively to safety."²¹¹

According to a recent article in *Chief Executive*, "Before Williams' tenure, UL had no formal training process. Now the company earmarks two percent of its revenue for internal training. While the bulk of those funds go toward technical training, [UL] also holds two [to three], four-week, leadership development programs each year." There is also one six-week advanced leadership development program every year. "Traditionally, when you became a manager at UL, you were given a business card and a desk, and everything you needed to know about leadership was contained in one of the two," Williams told *Chief Executive*.²¹²

As of 2016, UL University's offerings include technical training courses, Management Essentials, an introductory program in leading people through engagement and continuous learning, the Global Leadership Program, which has graduated well over 400 managers by 2015, and the Executive Leadership Program managed and delivered through the Yale School of Management for UL's top executives.

UL Evolution: The First Council - A Look Back

Originally UL created only one council, the **Council of Underwriters Laboratories**, that was created by UL's Board of Trustees on December 9, 1910. The Council was made up of three engineering sections which soon spun off on their own, establishing the Fire Council, Electrical Council, and Casualty Council.

Whether in formal training or the workplace, employees are encouraged to practice openness and total employee involvement in the work of UL teams. Williams's weekly email updates, town halls, and UL's training curricula resonate with the importance of core organization values as well as hard business truths.

UL's historic role as a convener continues as an essential ingredient of professional development as well as operational excellence. Council members are chosen from public authorities, government agencies, consumer groups, and thought leaders. They provide UL with expertise in the development and maintenance of standards, installation and use of UL certified products, and investigations of products, as well as management systems and other conformity assessment-related activities. The process of selecting members varies from Council to Council but each Council seeks to maintain a balance in the various areas of interest in its corresponding field. Council members are appointed to serve three-year terms. Members serve without compensation and must adhere to standards of conduct that include acting in the public interest, avoiding and making transparent conflicts of interest, maintaining confidentiality, and never acting as a representative of UL except as required by Council meetings.

The William Henry Merrill Society

In 2006, UL established the William Henry Merrill Society to ensure its founders' values are not only words in speeches and books, but also protected and disseminated through the dedication of select Corporate Fellows nominated to the Society. The William Henry Merrill Society selects no more than a few technical professionals annually who have been recognized by both UL and other organizations as leading authorities in their fields of expertise.

Members of the William Henry Merrill Society are designated as UL Corporate Fellows and given the autonomy and authority to lead activities that empower them to influence the future of product safety certification and UL's overall business direction. They discuss important safety certification issues and help identify new initiatives where UL can play a leadership role as it engineers the continued progress of a safer world.

Carrying on UL's Mission

As the world evolves, new technologies and product advances arrive one on top of another at a dizzying pace. As any citizen of the world knows



UL established the William Henry Merrill Society in 2006 to ensure that UL's values are protected and disseminated through the dedication of select Corporate Fellows nominated to the Society. The Inaugural Fellows, Class of 2006, are (from left, front): Don Mader, Lee Dosedlo, Jim Beyreis, Dr. Tom Chapin, Walter Skuggevig, Michihisa Yamazaki, Dr. Hsiang-Cheng Kung.

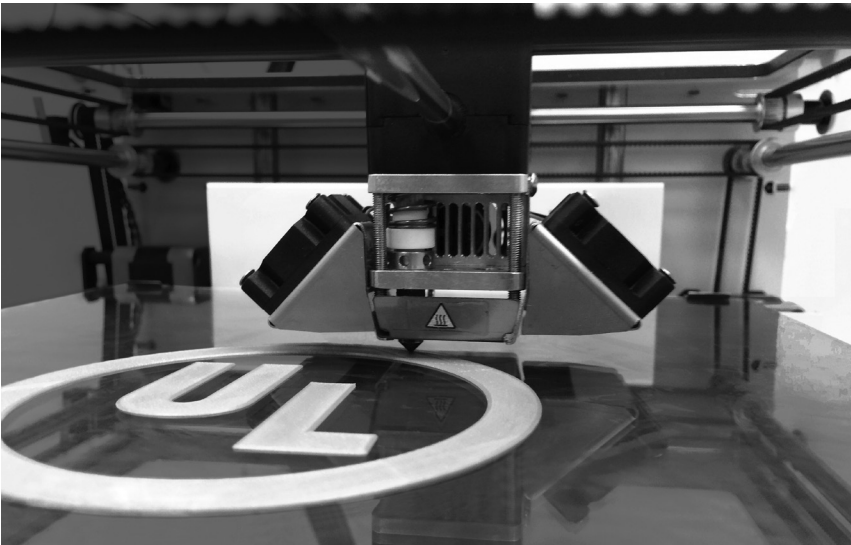


2015 William Henry Merrill Society Inductees with Corporate Fellows. From left, back row: Don Talka, Dr. Tom Chapin, Dr. William Hoffman, Kerry Bell, David Dini, Dr. Anne Bonhoff, Gus Schaefer, Jim Beyreis. Front row: Barbara Guthrie, Tom Lanzisero, Ken Boyce, John Kovacik, Dr. Marilyn Black, Dr. Pravin Gandhi. Not pictured: Don Mader, George Fechtmann, Tom Blewitt.

all too well, in this environment of constant change, risks are emerging hand in hand with advancements. UL has always been at the forefront of mitigating risks, given its mission of working for a safer world. The



Employees work in the new lab at UL India (2009).



Presently, UL engineers are evaluating 3D printers for chemical effects on users (2016).

history told in this book shows how UL uses science to answer the complex challenges of the past, and how its people will solve the new issues of the world as the twenty-first century progresses. Protecting people, products, and places is UL's priority and science gives UL's people the ability to make the world a safer place.

Some critics wondered if UL's new operating structure, global expansion, and service diversity could have overwhelmed its values and sense of mission. But that simply has not been allowed to happen. "For us, it always comes back to the mission," Keith Williams said in his McCord Lecture at Bradley University, "without mission, there is no money, and without money there is no mission."²¹³

Core UL mission values of dedication to science, loyalty, and relevance are seen in major initiatives across the organization. UL supports applied research in India to address the nation's public health crisis of motor vehicle accidents, which kill hundreds of thousands of people per year. In 2014, UL brought together 23 organizations in Gurgaon, India, to discuss improving road safety and explore collaborative solutions. UL sponsored a "Safer Roads, Safer India" competition and the four winners received support from UL to expand their solutions to road safety in India. These included a medical emergency system that aids India's emergency services, an "on call" chauffeur service in New Delhi to help citizens get home safely at any time, and a program that positively reinforces good road use behavior through volunteers that watch and commend other drivers' good behavior.

UL is also conducting basic research to address developing-world dangers in home and workplace fire safety, to help prevent further tragedies such as the 2012 Dhaka garment factory fire in Bangladesh that killed 117 people.

The organization's mission is also seen in its Safety Smart partnership with Disney. In 2003, UL in cooperation with Walt Disney Parks and Resorts developed the Disney Wild About Safety program. The program engages guests visiting Disney theme parks and resorts around

the world in storytelling that promotes safety behavior and demonstrates Disney's commitment to delivering fun and safe experiences. UL also worked with Walt Disney Parks and Resorts to create the Test the Limits Lab exhibit at Innoventions at *Epcot*. The organization's mission is also seen in its Safety Smart collaboration with Disney Educational Productions. This initiative aims to improve the awareness and understanding of children by teaching them how to manage themselves and their surroundings as safely as possible. The activities include

field trips to UL laboratories (where students see safety engineers at work and participate in their own hands-on safety experiments), and safety knowledge competitions at schools and community events.

UL and Disney Educational Productions produce curricula to educate primary and middle



UL worked with Walt Disney Parks and Resorts to create the Test the Limits Lab exhibit at Innoventions at Epcot®.

school kids on safety in all manner of topics such as internet use, transportation, and health and wellness. Animated characters, Timon and Pumbaa from Disney's *The Lion King* movie, provide an incredibly powerful medium for the content. The program's offerings are translated into 34 languages reaching students in over 25 countries. UL's Safety Smart program empowers youth to make smart decisions through games and videos (such as how to keep safe while skiing and snowboarding), and provides easy to use classroom guidance and tips.

UL's website also offers consumers up-to-date newsletters and online advice that people view as highly credible and science-based. Topic areas are health and wellness, indoor air quality, responsible living, safety and security, sustainable energy, and water quality.

Diversifying the Business and the Mission

As the needs for UL's services expanded globally in the post-World War II decades, so too did the needs and definitions of safety. UL maintained its core business of testing for fire, electrical and mechanical hazards, but with the rise of technology UL also has responded to the rise of newly identified threats and hazards. Fire retardants that made



UL's state-of-the-art testing lab located in Suzhou, China.

fabrics safer need to be understood for their potential chronic health effects such as asthma and birth defects. Where mobile devices introduced us to a world where we can talk anywhere, anytime, we need to consider the effects of electrical waves on our brains and interference with other complex wireless devices, such as pacemakers. Where the Internet of Things connects all, we need to consider privacy issues, identity theft, financial theft, and, unfortunately a whole new yet possibly unconceived type of terrorism.

Under the leadership of Keith E. Williams, the 10th president since its founding, UL rejuvenated its mission to achieve improved public safety and social outcomes around the world wherever major threats are identified. UL is committed to promote safe living and working environments for all people, everywhere. This includes drawing on its engineering excellence and entrepreneurial savvy to exert business, social, and civic leadership in emerging areas of safety including digital security, environmental stewardship, public health, and all that truly enhances the quality of life and the quality of our planet.

Under Keith Williams, UL embarked on a strategic and long-range plan of acquisitions and mergers to meet these admittedly lofty goals. It has been said around UL that to be the best, you must get the best. In the same manner William Henry Merrill sought to bring the best talent into UL, Keith and his leaders are doing the same.

UL's mergers and acquisitions strategy is built on using the resources of its for-profit division to finance acquisitions that extend UL's portfolio of services and clients, while adding the strategic filter that acquisitions provide synergy with UL's Mission. UL not only considered what additional services it could offer, but how it could address relevant problems the world is facing. UL acquisitions have incorporated expertise in industries and products such as mobility, wearable devices, software security, the safety of soft lines and hard lines, food and nutrition, chemical compositions, human health, iHealth, forensics, smart devices, air quality, fenestration, and renewables.

Strengthening the Core

As basic building blocks of all matter, UL knows how chemicals impact the composition and safety of products. Already the world safety standard in the plastics/chemical business through its UL 94 and UL 746 standards, UL faced internal capacity constraints for laboratory testing. To meet the need, UL acquired Thermoplastics Testing Center from Bayer in 2009, thereby adding proprietary technology and qualified engineers for low-cost, high-integrity testing to its lab capacity.



An Additive Manufacturing Machine Technician at work.

From incandescent bulbs, to fluorescents to neon and phosphor tubes to light emitting diodes (LEDs) and compact fluorescent lights (CFLs), the lighting industry has undergone numerous changes through industrial history. Facets of luminance, brightness, color, intensity, design, safety, efficiency, and environmental disposal all play roles in UL's approach to serving the lighting industry.

UL acquired Luminaire Testing Labs in 2010 and Lighting Sciences Inc. in 2011. These companies added not only independent photometric testing to UL's portfolio but also the design and manufacturing of goniophotometer test equipment. Further in 2013, UL acquired Testtech Laboratórios de Avaliação da Conformidade Ltda (Testtech)—the largest testing laboratory in Brazil providing electrical safety testing and energy efficiency services for appliances, lighting, and automotive spare parts.

Adding to its investments in energy efficiency, UL acquired Springboard Engineering in 2011. Springboard was founded in 2007 by Maytag's R&D team to provide service performance, energy verification, and reliability testing. Springboard received accreditation for performance testing for the United States and Canada under the Energy Star Program. By adding performance testing to its service mix, UL gives consumers the transparent performance testing information they want in the twenty-first century retail economy.

UL expanded into testing new forms of energy through the acquisition of DEWI in Germany a leader in providing wind turbine and component certifications and offshore wind energy solutions. With more than 1,300 customers in 47 countries, UL became a valued service solution provider for renewable energies. In 2016, UL acquired AWS Truepower, a global leader in renewable energy. AWS Truepower maintains a presence in over 80 countries and offers expert advice, accurate assessments, and innovative tools that have helped renewable energy projects evolve into durable operating assets, which are reducing humanity's global carbon footprint. Through UL's existing expertise and the acqui-



UL Dewi Wind Farm—Germany (2013)

sitions of DEWI and AWS Truepower, UL is positioned to be a market leader in renewable energy consulting, engineering, and safety services.

To expand its core business offerings, in 2012, UL acquired Jabil Test Lab (JAVA). Located in Singapore, JAVA is one of the few state-of-the-art consumer electronic testing laboratories. It is fully accredited with capabilities in climatic testing; performance and reliability testing; vibration testing; shock testing; radiated emissions (CISPR/FCC) measurements; radiated, conducted, and magnet immunity testing; harmonic, flicker, life and power consumption testing. This acquisition gave UL a regional testing hub for serving ASEAN and Asia Pacific clients. In 2013, UL acquired EMC Kashima Corporation—a provider of general and automotive EMC testing in Japan where car components are required to be tested.

Human Health and the Environment

To promote safe living and working environments for people everywhere, UL must concern itself with people. When UL was founded, all its employees considered the factors which affected safety and resulted injuries, deaths, and property losses. These tended to fall within the categories of acute incidents—a short-term view of cause and effect. Time showed us that there exist often long-term effects to decisions we make. Modern science has proven the existence of chronic health outcomes for multiple types of human exposure, whether voluntary or involuntary. These include the effects of smoking on lung cancer or the effects of ozone and global warming on climate and human settlement.

As a devoted participant in the science and engineering of human health and safety, UL acquired MDT Services and MDRS Services in 2011. These firms are leading suppliers of health sciences with the mission “to promote the safe and effective use of medical devices used around the globe.”²¹⁴ MDT provides testing and analytical services in accordance with various medical device directives and laws including physical testing, clinical research, mechanical testing, biocompatibility testing, microbiology, cytotoxicity testing, virology testing, and other analytical services. MDRS offers advisory services enabling UL customers to meet medical device registration requirements.

UL also acquired Wiklund. This consulting firm specializes in human factors engineering (HFE), the applied science that coordinates the design of devices, systems, and physical working conditions of the users. Wiklund contributes and collaborates with the FDA and AAMI (Association for the Advancement of Medical Instrumentation) and leads standard development committees.

Environmental stewardship is a natural extension of UL’s mission. UL has taken various historical actions to implement environmentally proactive practices on its own properties including recycling, reducing carbon emissions, installing solar arrays, wind turbines, and

electrical vehicle charging stations. UL became involved in Environmental and Public Health (EPH) standards writing efforts during the 1990s but it wasn't until 2010 that UL re-emerged with an assertive strategy to become part of the environmental dialogue and community, signified by the TerraChoice acquisition. This was the first in a series of acquisitions that significantly expanded the size and capabilities of UL in the environmental space. Why did TerraChoice fit UL's mission? In 2007, TerraChoice released a publication "The Sins of Greenwashing," which became a guiding star for many Fortune 500 companies seeking to implement effective environmental manufacturing and sourcing practices. In 2008, TerraChoice published "Eco-Markets," which highlighted buyers' attitudes toward environmental purchasing.

TerraChoice's environmental standards and the high quality of its EcoLogo program aligned with UL's credentialing of safe processes and standards for consumers. UL's acquisition of GREENGUARD in 2011 was part of the same strategy.

Just as William Henry Merrill identified a problem, collected data, and introduced a sustainable solution, so too did the founders of the companies that through mergers and acquisitions have joined the UL family of companies, now referred to the UL Enterprise.

Dr. Marilyn Black is the creator, developer, founder, and president of Air Quality Sciences, Inc., a testing and research company focused on chemical and biological air pollution, known as UL Environment in 2016. Dr. Black is a respected national leader in the study of the impact of low doses of chemical exposure on human health, and in finding ways to reduce that exposure. She also pioneered the commercial development of environmental chamber testing to evaluate human health risks of indoor materials, furnishings, cleaners and electronic equipment.

In 2001, Dr. Black founded the GREENGUARD Environmental Institute, a nonprofit organization that oversees the International



The UL Environmental Testing Chamber located in Atlanta, Georgia, tests chemical emissions (2013).

GREENGUARD Certification Programs. GREENGUARD has a major share of the marketplace for educating about and certifying safer materials for construction and interior furnishings. Dr. Black leads and participates in numerous national and international scientific organizational initiatives, research projects, and community outreach programs. She is the recipient of many prestigious public service awards and has presented and published extensively in the indoor air quality field. She was named a UL Corporate Fellow in 2012—an obvious choice emulating our founder, creator, entrepreneur, and astute business man, William Henry Merrill.

Recognizing the importance of human health and its relationship to air quality, UL added eco-INSTITUT GmbH to its family in 2012.

Eco-INSTITUT delivers indoor air quality testing, air quality analysis, and textile testing to European customers with chambers located in Germany. It also complements GREENGUARD in solidifying UL's leadership position in furniture and the building products industries.

UL identified a missing element in its furniture and building products testing businesses, the mechanical testing for the safety of furniture. President Williams and the acquisitions team filled this gap in 2014 when it acquired Advanced Furniture Testing in Holland, Michigan, and Jasper, Indiana.

Quality Assurance Business and Consumer Confidence

On September 1, 2011, UL announced that it completed the acquisition of the Quality Assurance business of STR Holdings, Inc., an Enfield, Connecticut-based company. UL made a \$275 million all-cash offer to complete what is the largest single acquisition in UL's history. UL STR, as it was initially branded, complemented the organization's current electronics and electrical expertise and gave UL an industry-leading suite of quality assurance testing, inspection, auditing and responsible sourcing services. Approximately 2000 STR Quality Assurance employees based around the world joined UL.

"This acquisition demonstrates our commitment to providing manufacturers, retailers and raw material suppliers a full suite of quality assurance services that complements [UL's] capabilities and creates a combination of unparalleled strength," said Sajeew Jesudas, UL Senior Vice President. "We are excited about our improved ability to better meet our customers' increasing global demand for quality assurance services as they seek to improve the safety and quality of the products they develop for consumers."²¹⁵

UL added to its capacity for certifying and testing consumer products when it acquired three additional companies in 2012 – ICQ, Everclean, and Magnus Testing Services. ICQ was an independent certification

and testing company with laboratories located in Italy, Hong Kong, Conal, Tunisia, and the United States to service the makers of children's toys, furniture, clothing, and other products. It is the leader in toy testing in Italy with approximately 80-90 percent market share and an increasing strong growth in luxury goods including Gucci, Giorgio Armani, Ferrari, and many others. Although luxury goods make our lives, well, *luxurious*, basic human needs continue to inspire UL's growth in services. Everclean broadened the services UL offered to include food retailers. Through UL Everclean, UL was able to quickly offer quality and respected capabilities in the areas of inspections, audits, and food safety advisory services performing over 40,000 food safety inspections and audits on over 10,000 facilities annually.

The globalization of manufacturing and production facilities has been ongoing for decades as U.S. and companies shifted their supply chains



Mattresses are one of the most utilized items in a home, enduring six to nine continuous hours of use per day. With this equipment, UL can determine the safety and comfort of mattresses and bedding (2016).

to politically favorable nations with low-cost labor and, at times, lax regulatory regimes. In light of this trend, it was particularly critical for UL to acquire a textile testing and inspection business in Bangladesh, where many companies find themselves extremely concerned about quality, safety, and other issues. Magnus Testing Services maintains a reputation as an ethical and highly competent testing and inspection business in a region of the world marked by political instability, limited infrastructure, unreliable power supplies, and slow implementation of economic reforms. Fortunately, Magnus' growth and commitment to quality and service added excellence in portfolio and mission expansion to the growing UL Enterprise of companies.

Expectations of Accessibility, Mobility, and Digitalization

Throughout UL's history, it remained true to its founding principles "know by test and state the facts." Technological advances not only affected the products, systems, and services UL offered, they also radically changed the way UL needed to 'state the facts'. In the digital age, consumers and professionals expect information to be accessed instantly at one's fingertips.

The days of sorting through print technical journals, waiting to publish Listings of Certifications, sitting through lectures and symposiums, and buying time as one awaited postal deliveries, are clearly a relic of the past. UL must be agile—accessible, mobile, and digital—and sooner rather than later. UL again looked to its mergers and acquisitions strategy to quickly ramp up to meet these expectations. In a period of six years, from 2011–2016, UL acquired seven companies with information tools and digital assets complementing many service offerings and functional needs across the Enterprise in order to keep pace with those increasing, and rightfully placed, demands and expectations.

PureSafety addressed the part of UL's mission that specifically mentioned "promoting safe working places for people." PureSafety offered a

suite of learning and safety management system services in the occupational health and safety (OHS) market. PureSafety produced web-based, online training, and reporting tools available 24/7 via the Internet. Through a highly intuitive user interface, PureSafety's videos and software build integrated incident management and observation capabilities while offering robust reporting, surveys, and assessments. Another acquisition, Kaplan EduNeering, provided eLearning curricula addressing risk management and compliance with a strong emphasis on Life Science companies and FDA (Federal Drug Administration) compliance requirements. EduNeering complemented PureSafety's courseware and software capabilities.

UL's commitment to digitize and make easily accessible its 100-year storehouse of documents, photos, archives and testing data was accelerated through its acquisition of Integrated Design Engineering Systems Corporation (IDES).

UL obtained a comprehensive, parametric database of technical material datasheets for global plastics purchasers. Nicknamed the "Google of Plastics," IDES became the initial building block in UL's strategy to become a supplier of data and information to aid engineers in their design decision making process. In the continued effort to have information accessible to better public safety, Innovadex provided UL with a leading information platform and search engine to provide suppliers' technical information directly to thousands of chemists and scientists around the world.

GoodGuide is a San Francisco-based technology company that offered online and mobile tools to find and compare environmental, health, and social attributes for over 175,000 products and 5,000 companies. In time, UL began to strategically shift the tool's use from B2C (business-to-consumer) to B2B (business-to-business), aligning more with UL's mission.

UL's digital service and analysis enterprises required they share one true digital platform. In 2013, UL acquired The Wercs. The Wercs

and UL have a shared goal: to transform the supply chain by providing better information. The Weracs supply chain information system delivers regulatory data necessary for corporate compliance with complex regulations. It protects the confidentiality of supplier's critical business information, while helping suppliers and their customers meet their goals of putting safer products in the marketplace.

The Weracs tools and services help companies handle, store, transport, and dispose of products safely and in compliance with global regulations. The Weracs measures sustainability goals, and manages reputational risk. The Weracs also assists clients in the transition to new GHS Safety Data Sheet (SDS) requirements. The Weracs information tools address thousands of global regulations, numerous regional requirements, and are capable of producing documents in over 45 languages.

With software replacing hardware in providing functionality and safety, it was essential that UL reconsider its role in this area. The acquisition of Futuremark magnified UL's ability to support its clients with software testing and evaluation—after all, if the software is flawed, so will be the results. As hardware and software integration grows, the demand for software and security evaluation will increase exponentially. That is why UL made a purchase of cr360 in 2016. This company allowed UL to catapult its growth into a full service provider in the business of environment, health, safety, security and sustainability. With 200 customers in over 168 countries, multi-language platforms and programs, UL's portfolio of services now include environmental health and safety supply chain software, big data and Internet of Things analytics, safety and training content and advisory services related to workplace health and safety, air emissions and greenhouse gas, chemicals and hazardous waste, and supply chain and sourcing.

New Safety Threats

UL's founders recognized the hazards brought about by tangible threats: fire and electrical shock. One of UL's oldest motto's published in 1916 in Latin stated "Ignis Servus Non Dominus—Securitas Omnium" or in English "Fire is Servant Not Master – Security for All."

We now enter an era of things we cannot see, touch, feel, and possibly understand. They are all around us; they are the wireless technology that, in many ways, controls our lives.

What the threat of fire from the introduction of electricity was to the world in the late 1800s, wireless and all it brings forth may be the greatest threat of this century. The threat lies not in the impressive opportunities that wireless technology offers us, but in the threat of



One of UL's oldest mottos loosely translates to "Fire is Servant, Not Master—Security for All."

its misuse. Imagine public access to one's financial accounts, Social Security numbers, home security access codes, children's allergies, and cancer-treating prescriptions. Imagine a vulnerable population where whatever can hurt us, can do so simply by having access to what we cannot see, touch or feel, via wireless technology.

UL continues to flourish even as it remains true to the values of its founder William Henry Merrill, who stated: "Know by test and state the facts...with a purpose to serve public safety." UL did this. UL witnessed the ramparts of progress guarding safety and health. We are, after all, doing something for humanity. So, our newest and potentially greatest challenge facing the safety, health and security of the public today is wireless technology.

As scientists and engineers, we have to study, discover, learn, analyze, convene, and share. We don't know what we don't know. In 2010, UL conducted research that resulted in the acquisition of RFI Global. Based in Basingstoke, England, RFI Global provided EMC related and wireless interoperability services to technology, payments and security markets. This acquisition became an important first step in establishing a wireless knowledge-base, including technology and a skilled workforce along with a wireless testing platform available across the UL Enterprise. A U.S. West Coast presence was also part of the strategic plan and, as such, UL acquired Compliance Certification Services (CCS). CCS had a market reputation as the technical, quality leader in wireless EMC. It conducted testing and certification for regulatory compliance requirements and industry standards. CCS also offered a global footprint with customers in the US, Taiwan, China, Korea, and Japan.

With wireless becoming more and more prevalent in the security and payment services business, UL looked to provide evaluation, advisory services, training, and qualification of software and support devices through the acquisition of Witham in 2012. Headquartered in Melbourne, Australia, Witham secured 40 percent of the greater China

market for payment card industry services. Their teams of new UL employees were Qualified Security Assessors (QSAs)—performing on-site audits, training, and seminars on PCI (payment card industry) requirements, standards, cryptography, and evaluation of information leakage from a single integrated circuit chip to entire devices.

With locations and expertise in Singapore, Edinburgh, Dubai, Istanbul, Helsinki, and headquartered in the Netherlands, UL found Collis extremely attractive. Collis was led by a management team with an entrepreneurial spirit, driven for business results. Collis offered security solutions for credit card and bank payments, e-ticketing for public transportation, intelligent transport systems, mobile network systems confidence and ID management serving governments and providers of e-Passports and electronic driver's licenses. Collis brought UL test services, consultancy services, test tools, and a training academy providing courses in the technical and business practices for payment systems, banking infrastructures, mobile telecommunications, field communications, and smart cards. Eight out of 10 employees at UL Collis have master's degrees and 10 percent have PhD's. Again, practicing, that to be the best, you must get the best.

UL welcomed further expertise in the area of testing and validation of simulation software for transactional security when it acquired the Irish company Acquirer Systems. UL also gained entry into end-user scenario testing and mobile device and accessory evaluations including wearables, home automation and automotive accessory testing in North America and Europe through its acquisition of NAC (National Analysis Center—previously a department within AT&T Wireless) headquartered in West Palm Beach, Florida.

In 2015, UL acquired InfoGard to solidify its commitment to a more safe and secure world. InfoGard brought accredited security assurance services for the payment and healthcare IT sectors and federally mandated IT products. FIDO Alliance appointed UL InfoGard to develop the FIDO assessment program in biometrics.

As an independent, trusted third-party entity, InfoGard aligns the needs of the private and public sectors, with the assurance needs of the public to achieve IT security and industry approvals.

In 2016, UL acquired Consumer Testing Laboratories, Inc. (CTL), a recognized leader in quality assurance services for the retail industry, to expand UL's current testing capacity. CTL is a significant acquisition due to their innovative and intimate customer-focused operations.

Safeware Quasar Ltd., a privately-held company based in Nottingham, England, is a recognized leader in developing and providing chemical compliance solutions to assist customers in meeting regulatory demands. This company was acquired in 2016 to expand UL's supply chain data management and global regulatory compliance expertise.

The acquisition of LearnShare, also in 2016, strengthens UL's existing compliance, quality and performance solutions. LearnShare's talent management suite helps organizations address performance management, learning and competency development, and talent management across a distributed global workforce. This strategic partnership will allow UL to continue to deliver Learning and Talent Management solutions.

President Keith Williams piloted this era of expansion in order

2016 UL Core Team Officers

Keith Williams, President and CEO

Christian Anschuetz, SVP Chief
Information Officer

Patrick Boyle, SVP and Chief Learning Officer

Terry Brady, SVP Chief Commercial and Legal
Officer and Corporate Secretary

Adrian Groom, SVP Chief Human
Resources Officer

Sajeev Jesudas, SVP and President, Consumer

Clyde Kofman, SVP Chief Operating Officer, UL
Ben Miller, SVP and President, Commercial
and Industrial

Michael Saltzman, SVP Chief Financial Officer

Gitte Schjotz, SVP and President, International
Weifang Zhou, SVP and President, Ventures

to address emerging needs of safety, security, and sustainability in globally-significant industries including financial services, chemical processing, networked sensors, computer hardware and software, aviation, and telecommunications equipment. UL's enterprise strategy empowers the firm to maintain its safety leadership for the future. Through UL's acquisitions, the organization gains global clients in Europe, Asia, and South America as well as North America, and it also adds the assets—the people, the technologies, and the facilities—that will serve these industries and keep UL competitive in the technology verticals of tomorrow.

Williams remarked in his address at the 2016 Annual Meeting of the Members of Underwriters Laboratories Inc. that he was honored to be invited to a small dinner with President Barack Obama and Germany's Chancellor, Angela Merkel. During the course of the evening, Williams observed that the 40 guests included many CEOs that represented important UL client industries that, like UL, effectively dealt with major successes and challenges throughout their history.

Reflecting on that evening, Williams drew a parallel between the work of UL and financial services firm Blackrock. He stated in his remarks at the annual meeting that “while UL's business is far removed from the investing activities of Blackrock, our business is ever more closely tied to the financial services industry.” UL is working to safeguard and accelerate the global adoption of digital payments, advising clients on choosing security strategies, and helping clients verify the performance of their hardware and software.

Dow and its merger partner DuPont “are emblematic of UL's growing role in chemical safety and sustainability,” Williams remarked. “The twenty-first century is bringing more and more focus on chemical safety. UL acquisitions in the USA and Germany—and our recent acquisitions of cr360 in the UK—are enabling our clients to successfully address this challenge while maximizing their productivity.”

UL client Honeywell, Williams said, “has been a key player in the

development and adoption of UL 217—the new smoke alarm standard that will advance fire safety around the world.”

Microsoft was in attendance at the dinner hosted by President Obama, and, like many other companies, is becoming increasingly dependent on software-as-a-service (SaaS). UL is a large SaaS supplier with offerings in regulatory training, workplace safety training, management of occupational medicine cases, chemical safety, sustainability reporting, supply chain management, and performance benchmarking.

Then there was Motorola, “deeply involved with the fire service, providing vital communications other equipment,” Williams stated.

Also present at the President Obama dinner was technology powerhouse Siemens, a company that focuses on energy-efficient, resource-saving technologies. “Wind energy is a keystone in Germany’s move to carbon zero and wind energy will play a key role in the world reaching carbon zero,” Williams said. “UL is also a key player in wind energy. Our DEWI business, headquartered in Northern Germany, is a world leader in advisory services for siting and performance testing.”

Finally, UL’s work with Boeing serves as a recent example of UL’s contributions to aviation safety with the groundbreaking research into battery safety including the safety of lithium-ion batteries used on commercial aircraft.

“Over the past decade UL has substantially transformed to fit the needs of the twenty-first century,” Williams concluded.²¹⁶

President and CEO Keith E. Williams lives the Mission. He lives it thru UL’s core values of integrity, competitiveness, and collaboration. These values are embraced by UL’s colleagues and reflected in UL’s practices and its culture.

In Williams’ words, “We are honest in everything we do. We seek and speak the truth. We maintain fidelity to our Mission and the truth regardless of external political or commercial pressures. We act in ways that inspire people to trust us. We are open and transparent.”

“Our passions are for our Mission, for science and for helping our clients to be successful: knowing that when our clients win, our Mission wins. We love to win, hate to lose and always play by the rules. We continuously look for new ways in which we can solve clients’ needs and provide benefits to their businesses. We always aim to be the best.”

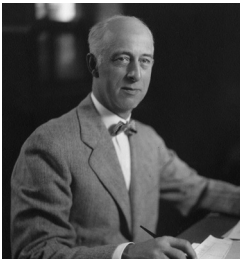
“We are one team, one family. We win or lose together. We care more about our colleagues’ success than we do about our own success. Our language embraces ‘we’ instead of ‘I.’”

Together, we are, UL—working for a safer world.

UL Presidents: 1894-2016



Backed by the stock fire insurance underwriters and some of the electrical equipment manufacturers, William Henry Merrill founded the Underwriters' Electrical Bureau in Chicago in 1894. He led the organization until his passing in 1923.



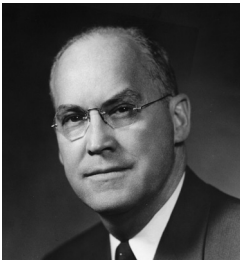
Dana Pierce
1923-1934



Alvah Small
1935-1948



Curtis Welborn
1948-1959



Merwin Brandon
1959-1964



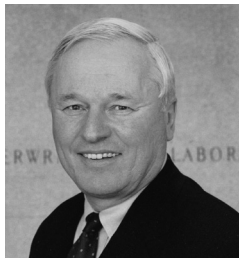
Baron Whitaker
1964-1978



Jack Bono
1978-1990




Tom Castino
1990-2001




Loring Knoblauch
2001-2004




Keith Williams
2004-Present



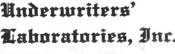
1911—Emblem with original UL motto.



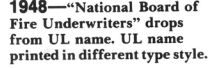
1916—Circular form of logo in use.




1937—Emblem and UL name.



Underwriters' Laboratories, Inc.




1948—"National Board of Fire Underwriters" drops from UL name. UL name printed in different type style.




Underwriters' Laboratories, Inc.

1959—Another new style for UL name.




Underwriters' Laboratories, Inc.

1964—Shaded type style is used again for UL name. In 1965, red is introduced in emblem.




UNDERWRITERS' LABORATORIES, INC.
TESTING FOR PUBLIC SAFETY

1968, 1969—UL in a circle appears on printed materials. Logo used with UL name printed in uppercase letters. UL motto appears below line. "An independent, not-for-profit organization" is added later.




1972—Double-circle logo appears on printed materials.



Underwriters Laboratories Inc.

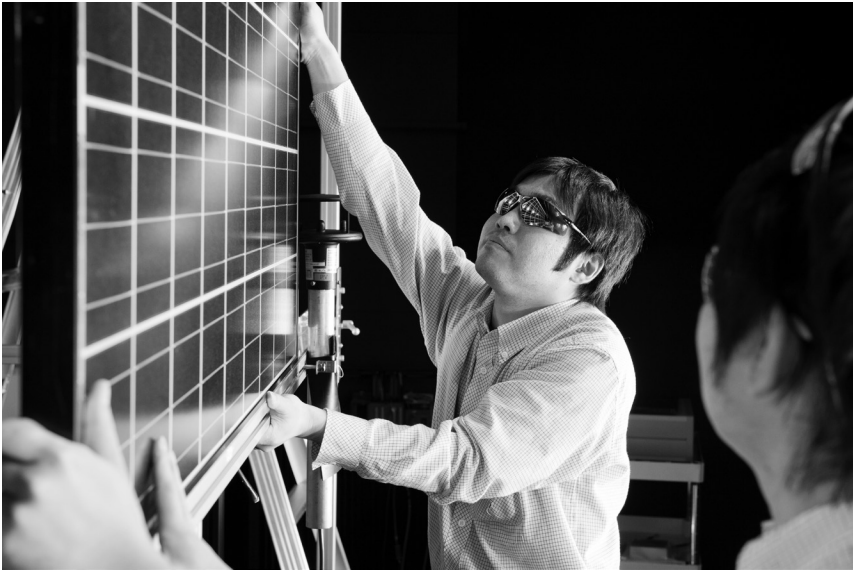
1973—The apostrophe is dropped from "Underwriters," the comma is dropped before "Inc." and the UL name is printed in lowercase letters. The traditional circular form of logo continues to appear in red. Other versions also begin to appear.



Underwriters Laboratories Inc.®

1989—The traditional UL name and Mark are updated for a more consistent corporate image.

Over the years, Underwriters' Laboratories visual identity has evolved into simply UL. The graphic above shows a snapshot of this progression from 1911 thru 1989.



Solar panels are prepared for testing.



UL Technicians use robotic arms to complete their work in the London (top) and Taipei offices (2012).



UL's accelerated analysis simulates long-term use and deterioration of materials in safety-critical applications.



In UL's Shanghai office, Benny Jiang (left), Toy Testing Lab Manager, conducts a toy torque test.



Bingtao Li (left), Assistant General Counsel & Deputy Affiliate General Manager, and Jianjun Lee, Affiliate General Manager, unveil the UL sign at the Beijing office.



Arthur Evans, Senior Project Engineer, examines an analysis computer that is used in the production of biopharmaceutical products for laboratory research purposes.



A technician from UL Italia Cabiante uses a portable coordinate measuring machine (CMM). This machine analyzes a product's quality by performing 3D inspections, tool certifications, CAD comparison, dimensional analysis, reverse engineering, and more (2016).

—EPILOGUE—

Over the past decade UL has substantially transformed to fit the needs of the twenty-first century. It has done so through major investments in the science of safety worldwide. Most importantly, it is UL's people who have consistently shown the willingness and ability to embrace the changes needed to improve. The annals of business history overflow with organizations driven by brilliant strategies and ambitious executives that nonetheless failed to survive and adapt to the world around them, often because they neglected the needs and concerns of their employees, customers, and communities.

The success of UL does not reside in the heroism of a few executives or the brilliance of its planning. Ultimately, only a full workforce committed to doing the daily work of UL's mission while keeping its values in mind kept it relevant for a century and more. UL's mission encompassed far too many challenges for any other way. UL needed the millions of products it tested to be safe, but also effective and usable. Few organizations have had the capacity or will to accept this responsibility. The Roman Stoic philosopher Seneca memorably said, "It is not because things are difficult that we do not dare, it is because we do not dare that they are difficult."

As Underwriters Laboratories looks toward the next decades of the twenty-first century, its people remain daring enough to work for a safer world.

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ENDNOTES

- ¹ Rydell, Robert, *Encyclopedia of Chicago*, <http://www.encyclopedia.chicago-history.org/pages/1386.html>. Accessed January 12, 2016.
- ² Massachusetts Institute of Technology, “*Technique 1887*.” (Cambridge, MA: MIT, 1889). http://web.mit.edu/technique/www/scans/1887_Technique.pdf. Accessed July 27, 2016. For information about history of the electrical engineering department, see: MIT Electrical Engineering and Computer Science Department, “MIT EECS Department Facts.” <https://www.eecs.mit.edu/about-us/mit-eecs-department-facts>. For information on Thomas Edison’s work at the Hinds, Ketchum & Co. business, see “Electrical Industries in the State of New York,” under “Report on Manufacturing Industries in the United States at the Eleventh Census: 1890, Part III, Selected Industries,” The Miscellaneous Documents of the House of Representatives for the First Session of the Fifty-Second Congress, 1891-92 (Washington, DC: Government Printing Office, 1896), p. 240.
- ³ Merrill, W. H., Jr., “Underwriters’ Laboratories, Inc.,” *The Spectator* (May 1, 1913), 17-23. See also: History of the NFPA, <http://www.nfpa.org/about-nfpa/nfpa-overview/history-of-nfpa>
- ⁴ Larson, Erik, *The Devil in the White City*, (New York: Random House, Vintage 2002).
- ⁵ Larson, Erik, *The Devil in the White City*, (New York: Random House, Vintage 2002).
- ⁶ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America*

(Philadelphia: University of Pennsylvania Press, 2011), 49. Stevens, Charles McClellan, "The adventures of Uncle Jeremiah and family at the great fair," by *The Adventures of Jeremiah and Family at the Great Fair: Their Observations and Triumphs* (Laird & Lee: 1898).

- ⁷ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 49-50.
- ⁸ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 49-50. See also: Burnham, Daniel, H. *Final Official Report of the Director of Works of the World's Columbian Exposition* (New York, NY: Garland, 1989).
- ⁹ Grant, Casey, "The Birth of NFPA," unpublished paper, September 17, 1996, NFPA, 4; available in a modified form in *NFPA Journal* (1996).
- ¹⁰ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 51.
- ¹¹ Brearley, Harry Chase, *Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service, Not for Profit*, (New York, NY: Doubleday, 1923).
- ¹² Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 50.
- ¹³ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 50.
- ¹⁴ Brearley, Harry Chase, *Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service, Not for Profit*, (New York: Doubleday, 1923).
- ¹⁵ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 54. See also: William H. Merrill, "Bill Rob," *Laboratories' Data* 2 (Chicago: UL, August 1921): 118, 120-21. Writing in memoriam after Robinson's death in 1921, Merrill gave Robinson the ultimate compliment from a fire safety expert: "He

- has passed the test; he is approved.” Brearley, Harry Chase, *Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service, Not for Profit*, (New York: Doubleday, 1923).
- ¹⁶ Boyd, William, “Early Days at Underwriters’ Laboratories,” *Laboratories’ Data* 10 (Chicago: UL, November 1929), 255-57.
- ¹⁷ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 54. UL Museum, Laboratory Record, March 24, 1894.
- ¹⁸ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 118. *Manual of Instructions for Preparation of Reports Issued by Underwriters’ Laboratories, Inc.* (Chicago: UL, June 1911), 1.
- ¹⁹ *Manual of Instructions for Preparation of Reports Issued by Underwriters’ Laboratories, Inc.* (Chicago: UL, June 1911), 3.
- ²⁰ Diamantes, David, *Principles of Fire Prevention, Third Edition*, (Boston, MA: Jones and Bartlett Learning, 2016), 54.
- ²¹ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 54. See also: Brearley, Harry Chase, *Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service, Not for Profit*, (New York, NY: Doubleday, 1923). Bezane, Norm, *This Inventive Century: The Incredible Journey of Underwriters Laboratories, 1894-1994* (Northbrook, IL: Underwriters Laboratories Inc., 1994), 6-9.
- ²² Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 54.
- ²³ Boyd, William, “Early Days at Underwriters’ Laboratories,” *Laboratories’ Data* 10 (Chicago: UL, November 1929), 255-57. Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 54.

- ²⁴ Boyd, William, "Early Days at Underwriters' Laboratories," *Laboratories' Data* 10 (Chicago: UL, November 1929), 255-57.
- ²⁵ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 55.
- ²⁶ Boyd, William, "Early Days at Underwriters' Laboratories," *Laboratories' Data* 10 (Chicago: UL, November 1929), 255-57. Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 55.
- ²⁷ Brearley, Harry Chase, *Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service, Not for Profit*, (New York, NY: Doubleday, 1923), 20.
- ²⁸ Merrill essay, "Bill Rob," UL Archives, 1921, 119.
- ²⁹ Boyd, William, "Early Days at Underwriters' Laboratories," *Laboratories' Data* 10 (Chicago: UL, November 1929), 255.
- ³⁰ Boyd, William, "Early Days at Underwriters' Laboratories," *Laboratories' Data* 10 (Chicago: UL, November 1929), 255.
- ³¹ National Park Service, U.S. Department of the Interior, "Historic American Buildings Survey," *Library of Congress Historic American Buildings Survey/Historic American Engineering Record/Historic American Landscapes Survey*, (U.S. Government Printing Office: Various dates.)
- ³² Interview with Mr. Shallcross, December 4-5, 1916, UL Archives, 2.
- ³³ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 130.
- ³⁴ Interview with Mr. Shallcross, December 4-5, 1916, UL Archives, 1.
- ³⁵ Business correspondence: Merrill to Shallcross, December 18, 1916, UL Archives, 4.
- ³⁶ Brearley, Harry Chase, *Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service, Not for Profit*, (New York: Double-

day, 1923), 30.

- ³⁷ Brearley, Harry Chase, *Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service, Not for Profit*, (New York: Doubleday, 1923), 20.
- ³⁸ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 117. See also: Underwriters Laboratories, "On the Safe Side," Program One, (Underwriters Laboratories: 1923), 9.
- ³⁹ Underwriters Laboratories, "Underwriters' Laboratories, a Contribution by Stock Fire Insurance to a Public Cause, Fire Protection and Prevention," *Laboratories' Data* 3 (Chicago: UL, July 1922), 144. Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 117.
- ⁴⁰ Brearley, Harry Chase, *Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service, Not for Profit*, (New York, NY: Doubleday, 1923). Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 117.
- ⁴¹ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 117-118. Underwriters Laboratories, *Manual of Instructions for Preparation of Reports Issued by Underwriters' Laboratories, Inc.* (Chicago: UL, June 1911), 1.
- ⁴² Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 118.
- ⁴³ W. H. Merrill, Jr., "Underwriters' Laboratories, Inc.," *The Spectator* (Chicago: UL, May 1, 1913), 17-23.
- ⁴⁴ Underwriters Laboratories, *The Organization, Purpose and Methods of UL*, 1916, UL Archives.
- ⁴⁵ "W. H. Merrill in War Work," *Electrical Data* 4 (July 1918), 14.
- ⁴⁶ Small, Alvah R., "Underwriters' Laboratories: A Contribution by Stock Fire

Insurance to a Public Cause, Fire Protection and Prevention,” *Laboratories’ Data* (Chicago: UL, July, 1922), 141-146.

⁴⁷ Small, Alvah R., “Underwriters’ Laboratories: A Contribution by Stock Fire Insurance to a Public Cause, Fire Protection and Prevention,” *Laboratories’ Data* (Chicago: UL, July, 1922), 141-146.

⁴⁸ Brearley, Harry Chase, *Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service, Not for Profit*, (New York: Doubleday, 1923).

⁴⁹ Helmer, Bessie Bradwell, “The Great Conflagration: Fire Narrative of Bessie Bradwell Helmer,” *The Great Chicago Fire and The Web of Memory*, 2011. <http://www.greatchicagofire.org/great-conflagration>. Accessed September 2015.

⁵⁰ Small, Alvah R., “Underwriters’ Laboratories: A Contribution by Stock Fire Insurance to a Public Cause, Fire Protection and Prevention,” *Laboratories’ Data*, (Chicago: UL, July, 1922), 141-146.

⁵¹ Boston Public Library, “Great Fire, Boston, Mass., 1872.” https://www.flickr.com/photos/boston_public_library/sets/72157624805421584/. Accessed December 22, 2016.

⁵² Hatch, Anthony P. *Tinder Box: The Iroquois Theatre Disaster, 1903*. (Chicago: Academy Chicago Publishers, 2003), 7–12.

⁵³ <http://www.nfpa.org/news-and-research/fire-statistics-and-reports/fire-statistics/fires-in-the-us/multiple-death-fires/deadliest-fires-and-explosions-in-ushistory>; For the Hoboken and Baltimore fires, see: <http://www.nfpa.org/news-and-research/fire-statistics-and-reports/fire-statistics/key-dates-in-firehistory>; Herwick, Edgar B., III, “Chelsea on Fire: 1908,” WGBH.org, (Boston: WGBH, April 11, 2014). <http://news.wgbh.org/post/chelsea-fire-1908>.

⁵⁴ Chabot College Fire Technology Program: “Fire & EMS News,” May 20, 2015. Occupational Safety and Health Administration, “The Tri-

gle Shirtwaist Factory Fire,” OSHA.gov, 2011. <https://www.osha.gov/oas/trianglefactoryfire.html>

⁵⁵ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 22.

⁵⁶ *Ibid.*

⁵⁷ *Ibid.*

⁵⁸ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 23.

⁵⁹ Brearley, Harry Chase, *Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service, Not for Profit*, (New York: Doubleday, 1923), 9.

⁶⁰ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 24.

⁶¹ William Robinson, paper read to the Fire and Electrical Councils, Inspectors and Friends of Underwriters’ Laboratories, given at the Mid-Day Club, Chicago, May 7, 1920. *Laboratories’ Data* 1 (May 1920).

⁶² William Robinson, paper read to the Fire and Electrical Councils, Inspectors and Friends of Underwriters’ Laboratories, given at the Mid-Day Club, Chicago, May 7, 1920. *Laboratories’ Data* 1 (May 1920).

⁶³ *Greatest Engineering Achievements of the 20th Century*, <http://www.greatachievements.org/?id=3768>. Accessed January 12, 2016.

⁶⁴ Brearley, Harry Chase, *A Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service—Not Profit* (Garden City, NY: Doubleday, 1923).

⁶⁵ Brearley, Harry Chase, *A Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service—Not Profit* (Garden City, NY: Doubleday, 1923).

⁶⁶ “An Impromptu Test,” *Laboratories’ Data*, 5 (Chicago: UL, June, 1924),

135. Michael Hirsley, "Dust Flew Long before Wrecking Ball Touched 'Landmark,'" *Chicago Tribune*, December 3, 1981, Section 3, 3-5. For other accounts of exterior architectural form as a visual representation of the activities going on inside a structure, see: Brandt, Allan M. and David C. Sloane, "Of Beds and Benches: Building the Modern American Hospital," in *The Architecture of Science*, Peter Galison and Emily Thompson, eds., (Cambridge: MIT Press, 1999), 281, 281-305; and Scott G. Knowles and Stuart W. Leslie, "Industrial Versailles: Eero Saarinen's Corporate Campuses for GM, IBM, and AT&T," *Isis* 92:1 (2001), 1-33.
- ⁶⁷ "Notes on Underwriters Laboratories Pertinent to its Fiftieth Anniversary, 1894-1944," UL Archives, 5.
- ⁶⁸ "The Organization Purpose and Methods of Underwriters' Laboratories," (Chicago: UL, 1916), 3.
- ⁶⁹ The National Fireproofing Co., "The City Unburnable, and the building on which it can be modeled," (Pittsburgh: National Fireproofing Co., 1920 ca.), 1-3.
- ⁷⁰ Brearley, Harry Chase, *Fifty Years of a Civilizing Force: An Historical and a Critical Study of the Work of the National Board of Fire Underwriters* (New York: Frederick A. Stokes Company, 1916), 181-182.
- ⁷¹ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 111-112. See also: Brearley, Harry Chase, *Fifty Years of a Civilizing Force: An Historical and a Critical Study of the Work of the National Board of Fire Underwriters* (New York: Frederick A. Stokes Company, 1916), 181-182.
- ⁷² Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 112-113. See also: Brearley, Harry Chase, *A Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service—Not Profit* (Garden City, N.Y.: Doubleday, 1923).
- ⁷³ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Phil-

adelphia: University of Pennsylvania Press, 2011), 113. See also: Harry Chase Brearley, *Fifty Years of a Civilizing Force: An Historical and a Critical Study of the Work of the National Board of Fire Underwriters* (New York: Frederick A. Stokes Company, 1916).

⁷⁴ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 113. See also: Harry Chase Brearley, *Fifty Years of a Civilizing Force: An Historical and a Critical Study of the Work of the National Board of Fire Underwriters* (New York: Frederick A. Stokes Company, 1916).

⁷⁵ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 113. See also: Harry Chase Brearley, *Fifty Years of a Civilizing Force: An Historical and a Critical Study of the Work of the National Board of Fire Underwriters* (New York: Frederick A. Stokes Company, 1916).

⁷⁶ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 113. See also: Underwriters Laboratories, "Members of the N.F.P.A. Visit the Laboratories," *Laboratories' Data* 1 (Chicago: UL, May, 1920): 76.

⁷⁷ Brearley, Harry Chase, *A Symbol of Safety: An Interpretative Study of a Notable Institution Organized for Service—Not Profit* (Garden City, NY: Doubleday, 1923), 163-64. Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 114.

⁷⁸ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 114. See also: Underwriters Laboratories, "The Organization Purpose and Methods of Underwriters' Laboratories," (Chicago: UL, 1916), 7.

⁷⁹ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 118.

⁸⁰ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern Amer-*

ica (Philadelphia: University of Pennsylvania Press, 2011), 119. See also: Underwriters Laboratories, "Visitors," *Laboratories' Data* 3 (Chicago: UL, January 1922): 31. Underwriters Laboratories, "Visitors," *Laboratories' Data* 6 (Chicago: UL, February 1925): 45. Underwriters Laboratories, "Players Watch Play of Automatic Sprinklers," *Laboratories' Data* 7 (Chicago: UL, February 1926): 47. Underwriters Laboratories, "Company Staff Members Inspect Laboratories," *Laboratories' Data* 10 (Chicago: UL, June 1929): 11.

⁸¹ Kennedy, David M., *Freedom from Fear*, (New York: Oxford University Press, 1999).

⁸² Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 129.

⁸³ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 130.

⁸⁴ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 130.

⁸⁵ "UL letter," December 4-5, 1916, UL Archives.

⁸⁶ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 131.

⁸⁷ UL Archives interview with Gus Schaefer, 2014.

⁸⁸ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 131-132.

⁸⁹ Peaslee, W.D.A. "The Standardization Activities of Underwriters' Laboratories," *Laboratories' Data* (Chicago: UL, March, 1928), 78-80.

⁹⁰ Peaslee, W.D.A. "The Standardization Activities of Underwriters' Laboratories," *Laboratories' Data* (Chicago: UL, March, 1928), 78-80.

⁹¹ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 57. See also: Kargon, Robert H., Knowles, Scott G., *Knowledge for Use: Science, Higher*

Learning, and America's New Industrial Heartland, 1880-1915, *Annals of Science*, January, 2002.

- ⁹² Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 155-156. See also: Merrill to Shallcross correspondence, January 17, 1917, 3-4, UL Archives.
- ⁹³ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 150. See also: Alling, C.R., "Why Is Underwriters' Laboratories?" *Laboratories' Data* (Chicago: UL, July, 1922), 147-150.
- ⁹⁴ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 151-152. See also: C. J. Krieger, "Another Case of 'Get the Facts'," *Laboratories' Data* (Chicago: UL, April 1926), 75-76.
- ⁹⁵ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 140.
- ⁹⁶ "Ford Car's Debut Jams Showrooms; 250,000 Block Traffic Swarming to See New Models -50,000 Orders in Day," *New York Times*, December 3, 1927.
- ⁹⁷ Small, A. "The Schedule Method for Automobile Classification," *Laboratories' Data*, (Chicago: UL, September-October 1920), 135-137.
- ⁹⁸ Ibid.
- ⁹⁹ Underwriters Laboratories, "Casualty Department: Classification of Automobiles," *Laboratories' Data*, (Chicago: UL, May 1921), 66.
- ¹⁰⁰ Underwriters Laboratories, "Casualty Department," *Laboratories' Data*, (Chicago: UL, January 1924), 10-11.
- ¹⁰¹ Underwriters' Laboratories Organizes to Classify Airplanes," *Laboratories' Data* (Chicago: UL, December 1920), 159-161.
- ¹⁰² Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 127.

- ¹⁰³ C. J. Peacock, "Review of the Activities of a Service Engineer During the Year 1928," *Laboratories' Data* (Chicago: UL, February 1929), 55.
- ¹⁰⁴ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 128-129.
- ¹⁰⁵ "Underwriters' Laboratories on the Pacific Coast," *Laboratories' Data* (Chicago: UL, March 1923), 54-57.
- ¹⁰⁶ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 129. See also: Bockmier, Gene, *History and Reminiscences of Underwriters Laboratories' on the West Coast*, manuscript June 1993, Underwriters Laboratories, 1-2.
- ¹⁰⁷ *Laboratories Data*, May 1930.
- ¹⁰⁸ Kennedy, David M., *Freedom from Fear*, (New York: Oxford University Press, 1999).
- ¹⁰⁹ Pierce, Dana, "The Year 1930 at Underwriters Laboratories," *Laboratories Data*, (Chicago: UL, January 1931), 2.
- ¹¹⁰ Wikipedia. "American National Standards Institute," https://en.wikipedia.org/wiki/American_National_Standards_Institute.
- ¹¹¹ Underwriters Laboratories' Archive, Alvah Small Collection. Various sources.
- ¹¹² Brandon, Merwin, *Reminiscences of Underwriters' Laboratories*, Self-published, 105-107.
- ¹¹³ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 157-158. See also: Underwriters' Laboratories, Inc. v. Commissioner of Internal Revenue, 135 F.2d 371, No. 8141, 8145, May 7, 1943.
- ¹¹⁴ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 159.
- ¹¹⁵ Ibid. See also: Kramer, Victor, "The Antitrust Division and the Supreme Court, 1890-1953," *Virginia Law Review* 40, no. 44 (May, 1954), 444.

- ¹¹⁶ O'Connor, James, "Fire Insurance in War Time," *Journal of the American Association of Teachers of Insurance* 10:1 (March, 1943): 41-45, 44.
- ¹¹⁷ Ibid.
- ¹¹⁸ Ibid.
- ¹¹⁹ Underwriters Laboratories, *Some Wartime Activities of Underwriters Laboratories*, UL Archives, 1.
- ¹²⁰ Underwriters Laboratories, *Some Wartime Activities of Underwriters Laboratories*, UL Archives, 3.
- ¹²¹ Underwriters Laboratories, *Some Wartime Activities of Underwriters Laboratories*, UL Archives, 5.
- ¹²² Underwriters Laboratories, *Some Wartime Activities of Underwriters Laboratories*, UL Archives, 10.
- ¹²³ Tassava, Christopher J., The American Economy during World War II. <https://eh.net/encyclopedia/the-american-economy-during-world-war-ii/>
- ¹²⁴ *Some Wartime Activities of Underwriters Laboratories*, UL Archives, 5-10. UL, "Fifty Years in the Service of Safety," 1944, 9.
- ¹²⁵ Underwriters' Laboratories, Inc. v. Commissioner of Internal Revenue, 135 F.2d 371, No. 8141, 8145, May 7, 1943.
- ¹²⁶ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 111.
- ¹²⁷ Wikipedia, "Harvey Washington Wiley." Accessed online at: https://en.wikipedia.org/wiki/Harvey_Washington_Wiley.
- ¹²⁸ Schenone, Laura, *A Thousand Years Over a Hot Stove*. (New York: W.W. Norton & Company, 2004).
- ¹²⁹ Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 141.
- ¹³⁰ Akst, Jeff, "The Elixir Tragedy, 1937," *The Scientist*, June 2013. <http://www.the-scientist.com/?articles.view/articleNo/35714/title/The-Elixir-Trag->

edy--1937/

- ¹³¹ U.S. Food and Drug Administration, "The 1906 Food and Drugs Act and its Enforcement," FDA History, FDA.gov. <http://www.fda.gov/AboutFDA/What-WeDo/History/Origin/ucm054826.htm>
- ¹³² Knowles, Scott, *The Disaster Experts: Mastering Risk in Modern America* (Philadelphia: University of Pennsylvania Press, 2011), 144.
- ¹³³ Gary Cross, *An All-Consuming Century: Why Commercialism Won in Modern America* (New York: Columbia University Press, 2000), 88-90.
- ¹³⁴ "Land of Television," ushistory.org. Accessed online at: <http://www.ushistory.org/us/53c.asp>
- ¹³⁵ "TV Called Threat to Child Eyesight," *New York Times*, April 6, 1951.
- ¹³⁶ Stern, Lothar, "Make Your TV Set Safe!," *Popular Mechanics*, November 1957.
- ¹³⁷ Underwriters Laboratories, UL Annual Report 1947, UL Archives.
- ¹³⁸ Bockmier, Gene, *A History and Reminiscences of Underwriters Laboratories on the West Coast*, 1993, UL Archives.
- ¹³⁹ Tabisz, Edward F., report on Underwriters Laboratories of Canada, 1971.
- ¹⁴⁰ Underwriters Laboratories, "President Welborn Retires," *UL News and Notes*, June, 1959, 5-6.
- ¹⁴¹ Brandon, Merwin, *Reminiscences of Underwriters' Laboratories*, Self-published, 61, April 1964.
- ¹⁴² Ibid.
- ¹⁴³ Ibid.
- ¹⁴⁴ Ibid.
- ¹⁴⁵ Ibid.
- ¹⁴⁶ Bezane, Norm, *This Inventive Century: The Incredible Journey of Underwriters Laboratories, 1894-1994* (Northbrook, IL: Underwriters Laboratories Inc., 1994), 50.

- ¹⁴⁷ Underwriters Laboratories, UL Annual Report, 1947.
- ¹⁴⁸ Underwriters Laboratories, UL Annual Report, 1962.
- ¹⁴⁹ Underwriters Laboratories, UL Annual Report, 1948.
- ¹⁵⁰ Underwriters Laboratories, UL Annual Report, 1954.
- ¹⁵¹ Underwriters Laboratories, *Yesterday, Today, Tomorrow* (Chicago: UL, 1999), UL Archives.
- ¹⁵² U.S. Consumer Product Safety Commission, 1953 Flammable Fabrics Act, October–November, 2015. <http://www.cpsc.gov/en/Regulations-Laws--Standards/Statutes/Flammable-Fabrics-Act/>
- ¹⁵³ Early, Rosalind, “How to Stop a Nuclear Bomb,” St. Louis magazine, September 20, 2013. <http://www.stlmag.com/How-to-Stop-a-Nuclear-Bomb-The-St-Louis-Baby-Tooth-Survey-50-Years-Later/>
- ¹⁵⁴ John F. Kennedy, “Special Message to the Congress on Protecting the Consumer Interest,” March 15, 1962.
- ¹⁵⁵ Underwriters Laboratories, “Our New President—H. Baron Whitaker,” Employees News Letter, Volume 6, Number 4, April, 1964, 4.
- ¹⁵⁶ “The American Presidency Project,” John Wooley and Gerhard Peters, housed at the University of California, Santa Barbara. Lyndon B. Johnson Special Message to Congress, “To Protect the American Consumer,” February 16, 1967. <http://www.presidency.ucsb.edu/ws/?pid=28638>
- ¹⁵⁷ U.S. House Subcommittee, Flammable Fabrics, 1967, 182–183. For information on the CPSC and the current voluntary standards system, see Consumer Public Safety Commission website: “Voluntary Standards,” <http://www.cpsc.gov/Regulations-Laws--Standards/Voluntary-Standards/>
- ¹⁵⁸ U.S. House Subcommittee on Science, Research, and Development, 1967.
- ¹⁵⁹ Underwriters Laboratories, “Underwriters’ Laboratories Announces Reorganization Plans,” *Employees News Letter*, May, 1968, 1.
- ¹⁶⁰ Underwriters Laboratories, “Underwriters’ Laboratories Enters Period

of Expansion,” *UL Eye*, September, 1968.

¹⁶¹ Underwriters Laboratories, *UL Eye*, June, 1969.

¹⁶² Underwriters Laboratories, “UL Adopts ‘Advance Program’ on product Labeling,” 1969, 4.

¹⁶³ Underwriters Laboratories, *UL Annual Report*, 1947.

¹⁶⁴ Underwriters Laboratories, *UL Annual Report*, 1962.

¹⁶⁵ Ethan Horwitz and Benjamin Levi, “Fifty Years of the Lanham Act: A Retrospective of Section 43(a),” *Fordham Intellectual Property, Media and Entertainment Law Journal*, 7: 1 (1996), 61-64.

¹⁶⁶ Lanham (Trademark) Act, USC 1127 (Section 45).

¹⁶⁷ “Creating Consumer Confidence or Confusion? The Role of Product Certification Marks in the Market Today,” *Marquette Intellectual Property Law Review*, 11:2, 416.

¹⁶⁸ Baron Whitaker, Remarks at the UL Annual Conference, 1969. 6.

¹⁶⁹ Baron Whitaker, Remarks at the UL Annual Conference, 1969. 8.

¹⁷⁰ Underwriters Laboratories, “In the Kitchen,” *UL Eye*, October, 1973.

¹⁷¹ Underwriters Laboratories, *UL Interview with John Drengenberg*, 2014.

¹⁷² “Whitaker,” *Laboratories Data*, 1973, 4-5.

¹⁷³ Hoffman, S. David, “Underwriters Laboratories Inc.’s Experience with Consumer Participation in Television Safety Standard Development,” *Journal of Consumer Affairs*, Volume 12, Issue 2, pages 343–354, Winter 1978. Article first published online: 3 FEB 2011.

¹⁷⁴ *Ibid.*

¹⁷⁵ Underwriters Laboratories, *Yesterday, Today, Tomorrow*, corporate report, 1980.

¹⁷⁶ Underwriters Laboratories, *UL Annual Report*, 1977.

¹⁷⁷ “‘UL’ Label Is Dependable Guide to Product Safety,” *Chicago Tribune*,

March 13, 1971.

- ¹⁷⁸ Bockmier, Gene, *A History and Reminiscences of Underwriters Laboratories on the West Coast*, 1993. UL Archives.
- ¹⁷⁹ Underwriters Laboratories, UL Annual Report, 1986.
- ¹⁸⁰ Underwriters Laboratories, UL Interview with Gus Schaefer, 2014.
- ¹⁸¹ Underwriters Laboratories, UL Annual Report, 1982.
- ¹⁸² Underwriters Laboratories, UL Annual Report, 1959.
- ¹⁸³ Kontje, Howard, *Historical Outline of Underwriters Laboratories Overseas Activities*. January 12, 1994, 2.
- ¹⁸⁴ Underwriters Laboratories, UL Interview with Tom Castino, 2014.
- ¹⁸⁵ "Eye On You: UL's Overseas Inspection Service Program," *UL Eye*, (May 1986), 6
- ¹⁸⁶ Underwriters Laboratories, UL Interview with Jim Velandier, 2014.
- ¹⁸⁷ Scangarello, June, "Paul Lee: Behind the Scenes," *UL Eye* (November, 1986): 5. Seagraves, Dixie, "How We Did It: UL's Historic MITI Pact," *UL Eye* (November, 1986), 3-5.
- ¹⁸⁸ Underwriters Laboratories, UL Interview with Tom Castino, 2014.
- ¹⁸⁹ Underwriters Laboratories, UL Interview with Gus Schaefer, 2014.
- ¹⁹⁰ Underwriters Laboratories, "UL Acquires the National Certification Body of Denmark," *PR Newswire*, July 15, 1996.
- ¹⁹¹ Zuckerman, Amy, "Sorting Out the Seals of Approval," July 16, 2000. Accessed online at: <http://www.nytimes.com/2000/07/16/business/personal-business-sorting-out-the-seals-of-approval.html>
- ¹⁹² Underwriters Laboratories, UL Interview with Tom Castino, 2014.
- ¹⁹³ Atkins, Blumenthal, Edisis, Friedhoff, Curran, Lowry, et.al. *Responding to Manufacturing Job Loss: What Can Economic Policy Do?*, Metropolitan Policy Program, Brookings Institute, June 2011.

- ¹⁹⁴ Hatch, Julie, and Clinton, Angela, *Job Growth in the 1990s, A Retrospect*, U.S. Bureau of Labor Statistics, December 2000.
- ¹⁹⁵ Underwriters Laboratories, UL Annual Report, 2000.
- ¹⁹⁶ United States Department of Labor, Occupational Health and Safety Administration. *OSH Act of 1970, Sec. 2: Congressional Findings and Purpose*. Accessed online at: https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=OSHACT&p_id=3356
- ¹⁹⁷ Mayer, Caroline E., "A Change of Pace for Underwriters Laboratories," *Washington Post*, January 2, 2002. Accessed online at: <https://www.washingtonpost.com/archive/business/2002/01/02/a-change-of-pace-for-underwriters-laboratories/9872768f-26ab-443c-880c-9b06d67afadc/>
- ¹⁹⁸ Mayer, Caroline, "UL: Still Safety's Symbol? Underwriters Laboratories Draws Fire on Product Tests," *Washington Post*, November 24, 1999.
- ¹⁹⁹ Underwriters Laboratories, UL interview with Loring Knoblauch, 2014.
- ²⁰⁰ Underwriters Laboratories, UL 120th Timeline, UL Archives.
- ²⁰¹ Underwriters Laboratories, *UL Eye* Employee Newsletter, Spring 2003.
- ²⁰² Ibid.
- ²⁰³ Newcomer, Eric, "Firefighters Set Buildings Ablaze, to Determine How to Extinguish Them Better," *New York Times*, July 2, 2012.
- ²⁰⁴ Wernau, Julie, "Underwriters Laboratories expanding reach into 'green' products," *LA Times*, (July 9, 2011). Accessed online at: <http://articles.latimes.com/2011/jul/09/business/la-fi-underwriters-20110709>
- ²⁰⁵ Ibid.
- ²⁰⁶ Underwriters Laboratories, UL interview with Keith Williams, 2014.
- ²⁰⁷ Minutes of the April 6, 2011 Meeting of Underwriters Laboratories, Inc. Board of Trustees.
- ²⁰⁸ Underwriters Laboratories, UL Interview with Keith Williams, 2014.
- ²⁰⁹ Underwriters Laboratories, UL Interview with Keith Williams, 2014.

- ²¹⁰ Underwriters Laboratories, UL Interview with Keith Williams, 2014.
- ²¹¹ Merrill, W.H., "Underwriters' Laboratories," *Proceedings of the Forty-Fifth Annual Meeting of the Fire Underwriters' Association of the Pacific*, (February 8-9, 1921): 167-173. Accessed online at: https://books.google.com/books?id=PH0YAQAIAAJ&pg=PA167&lpg=PA167&dq=%22technical+school+of+the+university+of+fire+and+accident+prevention%22&source=bl&ots=gFgqsxQU8l&sig=3naaEFK7tzO6_FZ5P4F3-nmSzpg&hl=en&sa=X&ved=0ahUKEwjwxr_LicnOAhWJMX4KHTf-CPQQ6AEIzAD#v=onepage&q=%22technical%20school%20of%20the%20university%20of%20fire%20and%20accident%20prevention%22&f=false
- ²¹² Pellet, Jennifer, "Leading a Cultural Revolution," Chief Executive, May 28, 2012. Accessed online at: <http://chiefexecutive.net/leading-a-cultural-revolution/>
- ²¹³ Bradley University, "Bradley University: McCord Lecture: Keith Williams, Underwriters Laboratories." *Bradley University: McCord Lecture: Keith Williams, Underwriters Laboratories*. 2013. Web. 16 Aug. 2016. <<http://www.bradley.edu/inthespotlight/story/?id=1bb0bb90-109f-4bbe-940c-3d5a6a054a66>>.
- ²¹⁴ Medical Device Testing (MDT). Intranet.ul.com. 2013. Accessed online at: [http://intranet.ul.com/en/Tools/DeptsServs/Acquisitions/Pages/Medical-Device-Testing-\(MDT\).aspx](http://intranet.ul.com/en/Tools/DeptsServs/Acquisitions/Pages/Medical-Device-Testing-(MDT).aspx)
- ²¹⁵ Underwriters Laboratories, "UL completes acquisition of quality assurance business of STR Holdings, Inc.," UL.com, (September 1, 2011). Accessed online at: <http://www.ul.com/newsroom/pressreleases/ul-completes-acquisition-ofquality-assurance-business-of-str-holdings-inc/>
- ²¹⁶ Underwriters Laboratories, Williams, Keith, "Corporate Members Meeting Speech," (2016).

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