

National Historic Chemical Landmark Site

By Vivian Walworth

The American Chemical Society celebrated its designation of the historic building at the northeast corner of Main and Osborn Streets in Cambridge as a National Historic Chemical Landmark. It is the site of the office and laboratory of Dr. Edwin H. Land, founder of Polaroid Corporation and inventor of Instant Photography. Dr. Land's contributions span a wide range, from the invention of sheet polarizers and their application to display of stereoscopic images to onestep photography, innovative imaging chemistry, and new insights into color perception. The celebration took place on August 13 at the nearby MIT Museum which holds the major collection of Polaroid photographic images and materials from the early experimental stages onward. On August 14 the MIT Museum hosted a public celebration that included both Land's work and contemporary instant photography. A session on August 16 during the ACS National Meeting in Boston centered on the chemistry and production of Polaroid's SX-70 film.

The historic building is recognized by the City of Cambridge as a landmark, the oldest intact industrial complex in the city. First constructed in the early 1800s as a brick store, the building was occupied by the Davenport Car Works in 1842. Soon afterward the company added six one-story workshops, and in 1848 added two 2-story brick wings behind the front building. Davenport pioneered the design and construction of railroad passenger cars with center aisles and reversible seats, and constructed freight cars and a few steam locomotives. A plaque on the Main Street face of the building commemorates the Davenport plant.

The next occupant was an iron foundry, Allen & Endicott, which rented out space to others, including J.J. Walworth & Company, early manufacturer of plumbing fittings and the iconic Stillson wrench. On October 9, 1876, Alexander Graham Bell and his assistant, Thomas Watson, used the Walworth telegraph line between the Cambridge plant and the Walworth office in South Boston to make the first long-distance telephone call. The Telephone Pioneers of America later mounted a celebratory plaque on the Main Street face of the building.

In 1927 the Kaplan Furniture Company, maker of fine furniture, purchased the building. That company rented some of its space to the Polaroid Corporation during the early 1940s. Founder Edwin Land opened a laboratory there and also established a training school on the second floor to train military personnel to make Polaroid Vectograph

stereoscopic images in the field. Polaroid provided field kits, and Vectograph images were used throughout WW2 in support of aerial reconnaissance.

Dr. Land conducted the first experiments in one-step photography in his Kaplan building laboratory, and he continued work in his office and laboratory there until his retirement from Polaroid in 1982. Polaroid had occupied the entire building by 1960, and facilities there included black-and-white and color research labs, a projection room, and several additional research laboratories and darkrooms. Supporting research facilities, offices, workshops, engineering departments, and a research library occupied nearby buildings. Polaroid purchased the Kaplan building in 1988 and sold it to MIT in 1998. In 2014 the Polaroid Retirees Association added a plaque commemorating Dr. Land's achievements.

MIT has fully preserved the external facade of the building, renovated the interior, and constructed an 80,000 square foot addition. Completed in 2002, the project received a Preservation Award from the Cambridge Historical Commission in 2003. The building is now managed by MIT and occupied by modern Pfizer biotech research and several development laboratories.

The ACS plaque, which commemorates Dr. Land's highly productive research contributions, will join the earlier plaques on the building.

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75 Years of Polaroid Chemistry

Spoken In Honor of Dr. Edwin Land at the August 13, 2015 dedication of the first National Historic Chemical Landmark in Massachusetts

By Michael P. Filosa

I am highly honored to be speaking at this dedication of the first National Historic Chemical Landmark in Massachusetts. I want to thank the ACS for creating this program 20 years ago and the National Historic Chemical Landmarks Subcommittee for recognizing the important contributions of Edwin Land.

I think it pretty amazing that this program had yet to dedicate an NHCL in Massachusetts despite all the iconic chemists who have spent their careers here. Although Land was by training a physicist, he inspired and employed a legion of chemists. His ideas, whether the sheet polarizer or instant photography, required chemists to reach fruition. Much as Pharma and Biotech are magnets for talented scientists in today's Cambridge, Polaroid

was a similar magnet and employer of first choice for several generations of chemists and chemical engineers.

By the time I joined Polaroid in the fall of 1979, Polaroid chemistry was 40 years old and Polaroid was at its peak as a company. The “Chemistry Set” was immense with hundreds of chemists working in the research labs at 730-750 Main Street, Osborn St.; the 10X, pilot, and process groups at 600 Main Street, and chemical manufacturing facilities in Freetown and Waltham.

The bulk of Polaroid’s research, development and manufacturing were in eastern Massachusetts. Land’s visionary ideas and their development into successful commercial products had an enormous impact on the local community.

I mentioned to Keith Lindblom that Land was responsible for the creation of a Disneyland for chemists. I thought it a bit of a trite comment, but it was very true. We had great infrastructure, great colleagues, a great history, quite a bit of freedom, and an environment tuned to creativity and problem-solving.

The chemistry set started slowly. Black and white instant film was done fairly quickly and did not require a complex set of chemicals. However, the effort to create color instant photography required a great increase in the synthetic chemistry capability of the company. This took many years and the first instant color film was not introduced until 1963.

Among the first generation of Polaroid-affiliated chemists were R. B. Woodward of Harvard and his student, friend and protégé, Elkan R. Blout. Woodward won the Nobel Prize in 1965 and was a consultant extraordinaire to Polaroid right up to his death in 1979. Blout was a prolific scientist in multiple fields.

The fundamental invention of the dye-developer, which led to color instant photography, is rightly credited to Howie Rogers, but on many of those dye-developer patents you will also find the names of Woodward and Blout. That Polaroid chemistry was both complex and sophisticated in no small part stems from the contributions of these men, and one of Woodward’s first Ph.D. students, Myron S. Simon. Also among these early chemical contributors was Vivian Walworth. She joined Polaroid in 1944 two years after receiving her B.S. in Chemistry from University of Michigan.

Vivian worked in research at Polaroid starting with Vectograph images during WW2. She has maintained a passion for Vectograph images which you can see at tomorrow night’s

event here at the M.I.T. Museum. She also presented a Vectrograph image of the SX-70 sheet as evidence in the landmark Polaroid/Kodak lawsuit.

Just as Victor McIlheny is Land's pre-eminent biographer, Vivian has been, and still is Polaroid's scientific biographer. She co-authored with Land and Rogers the chapter "One-Step Photography" in "Neblette's Handbook of Photography and Reprography". She was also an author of sections on instant photography in several editions of the Kirk-Othmer Encyclopedia of Chemical Technology, and she served for several years as editor of the IS&T journal Imaging Science and Technology.

Polaroid was very supportive of the involvement of its scientists and engineers in professional societies whether it was the ACS or the IS&T. Many Polaroid chemists have been important leaders and contributors to the Northeastern Section as chairs and as heads of committees.

You can't mention these early Polaroid chemists without mentioning Saul Cohen. In 1945 Land hired Saul Cohen, a recent Ph.D. from Paul Bartlett's physical organic chemistry group at Harvard. A recent tribute by Professor Irving Epstein describes Saul's pathway, which far transcended his time at Polaroid: "In 1950, Saul left Polaroid to join the faculty of Brandeis. By 1966 Saul had already served as Brandeis' first chair of the School of Science, first dean of faculty, and first University Professor. He had played a key role in transforming a tiny college with uncertain prospects into a thriving research university."

After this first generation of Polaroid chemistry we had a second generation come and grow Polaroid and the chemistry at Polaroid. One such was a Smith College professor and Woodward Ph.D. student, Stanley M. Bloom. Stan was, along with Myke Simon's group, the prime inventor of the opacification system, which was the most critical new chemical invention necessary for Land's ultimate creation, Instant Integral film and the SX-70 camera.

Other significant second generation chemists were Marty Idelson, Frank Meneghini, Alan Borrer, James W. Foley, David Waller, and Lloyd Taylor.

Lloyd Taylor was an eminent polymer chemist from BC and MIT who was a mentor and inspiration to his colleagues both young and old. Lloyd was honored by Polaroid in 2000 at an event held at the Museum of Science for having over one hundred patents. Lloyd was not the only one with a raft of patents. Polaroid was not only a patent machine for Dr. Land, but for many of his coworkers, not the least of which were the chemists.

However, soon after I started at Polaroid and Land departed for the Rowland Institute, Sony demonstrated the Mavica digital camera with a Dye Diffusion Thermal Transfer printer (D2T2) and many felt the death of instant photography was certain.

We had some notable successes in the following years and we had many talented people. However, the death of the instant imaging cash cow was inevitable. I often like to say that to survive the death of chemical-based imaging, Polaroid or Kodak would have had to become a smart phone manufacturer like Apple or Samsung and a social network like Facebook. That is how photos are taken and shared these days.

Land's instant photography legacy does live on in the efforts of ZINK Imaging and the Impossible Project. You can see examples of ZINK's latest technology at tomorrow night's event at the MIT Museum. ZINK's future has brightened significantly under new ownership.

Impossible Project CTO Steve Herchen will also be at tomorrow night's event to discuss the latest with Impossible. They truly did tackle the impossible just as Dr. Land would have. They have had to rebuild Land's chemistry set from scratch. This has presented huge challenges.

Land's legacy also lives on in third generation chemists who, like the first generation chemists, started their careers at Polaroid, but then moved on to bigger and better things. A few examples are: Steve Telfer, Steve Sofen, Judy Giordan, Ken Waterman, and John Warner.

ACS meeting attendees will have the opportunity to hear from some of these individuals at Sunday's symposium on Edwin Land and Instant Photography, presented by the ACS Division of the History of Chemistry and co-presented by ACS President Diane Grob Schmidt.

Edwin Land certainly had a profound effect not only on chemistry, but on science. This NHCL is a tremendous recognition of his impact and significance.

And as a final comment: Vivian added in an email yesterday what I was missing in the previous sentence: "Land's interest in art, his friendship with Ansel Adams, Ansel as a consultant, Land's support of outstanding photographers and the Polaroid Collection.

What a guy!"

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National Historic Chemical Landmark Designation

By Vivian Walworth

NESACS is proud to celebrate the ACS designation of the historic building at the northeast corner of Main and Osborn Streets in Cambridge as a National Historic Chemical Landmark, the site of the office and laboratory of Dr. Edwin H. Land, founder of Polaroid Corporation and inventor of Instant Photography. Dr. Land's contributions span a wide range, from the invention of sheet polarizers and their application to display of stereoscopic images to one-step photography, innovative imaging chemistry, and new insights into color perception. The celebration will take place at the nearby MIT Museum, which holds the major collection of Polaroid photographic images and materials, from the early experimental stages onward.

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The NHCL plaque will commemorate Dr. Land's highly productive research contributions, which included the introduction of instant photography, from sepia one-step photographic prints in 1947 to the fully automatic SX-70 camera and integral color film in 1972.

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National Historic Chemical Landmark - Edwin Land Office and Laboratory

By Vivian Walworth, NESACS Board of Publications and
Jack Driscoll, NESACS Public Relations and Chair NHCL Subcommittee

Keith Lindblom of the American Chemical Society's National Historic Chemical Landmarks Program informed NESACS that the Edwin H. Land Office and Laboratory nomination had been approved as a National Historic Chemical Landmark (NHCL) www.acs.org/landmarks for 2015. The ACS Board of Directors Committee on Public Affairs and Public Relations approved the nomination during its meeting on December 4, 2014.



Dr. Edwin Land was a very creative scientist responsible for the development of the sheet polarizer, its application to stereoscopic display, and numerous innovations in optics, as well as materials and processes for instant photography and research into human perception of color (The Retinex Theory). There have been 75 sites designated as NHCL's since 1993. It is surprising, with all the technology development in this area, that this is the first NHCL in Massachusetts. The site is at 700 Main Street (at the corner of Main and Osborne Streets) in Cambridge and was Dr. Land's office and research laboratory. This is a building with quite a history. It is protected as a historical site by the City of Cambridge.

There in the early 1800s the Davenport Carriage Company produced fine coaches, then the first railroad coaches. From 1852 to 1892 the building housed the Walworth Co., a manufacturer of plumbing fittings and tools. That company had a telegraph line to its offices in South Boston, and in 1876 Alexander Graham Bell arranged to use those wires at night to make his historic first long-distance telephone call.

Plaques now on the building commemorate The Davenport Carriage Company, Bell's first long-distance phone call, and Edwin Land's contributions. The building is now owned by MIT and occupied by Pfizer laboratories.