Honoring the 2013 Inductees into the CE Hall of Fame

Tuesday, October 22, 2013
Los Angeles Ballroom
Hyatt Regency Century Plaza | Los Angeles

7-8 p.m.
Dinner Service

Menu
First Course
Asian Pear and Arugula Salad with Goat Cheese, Roasted Pumpkin Seeds and Honey Lemon Dressing

Second Course
Baked Stuffed Shrimp and Roast Rack of Lamb with Madeira Peppercorn Reduction
Warm Potato Gratin and Haricots Verts

8-9 p.m.
Presentation of the Inductees
Master of Ceremonies
Gary Shapiro
President and CEO, Consumer Electronics Association (CEA)®

Please join us for a dessert reception in the hospitality lounge following the Hall of Fame ceremonies.
Tonight we celebrate the stars in our industry at our annual CE Hall of Fame dinner. These visionaries develop, market and report on the products, services and technologies that inform, educate, entertain and connect consumers. Founded in 2000, the CE Hall of Fame is the venue to recognize these leaders who advance the $203 billion consumer technology industry as well as to honor our rich history. The members of this prestigious group will expand to 197 with the addition of 15 new honorees.

The 2013 class includes inventors with a vision, business executives and retailers with innovative strategies to bring products and services to market and a journalist that influenced the industry. For example, Dr. Samar Basu discovered the material that enabled the development of rechargeable lithium-ion batteries that now power many CE devices. And it was Dr. Ted Hoff’s idea for a “computer on a chip” that led to the Intel 4004 chip, the world’s first microprocessor. Another invention that has shaped the industry was developed by Dr. Ching Tang and Steven Van Slyke while at Eastman Kodak. The team’s work resulted in the creation of organic light emitting diode (OLED) displays used in smartphones, digital cameras and HD and Ultra HDTVs.

Three teams of founders and corporate executives are also being inducted. Sharp’s Katsuhiko Machida and Mikio Katayama saw liquid crystal display (LCD) as the future of HDTV. Machida transformed Sharp into a market leader in the LCD flat-screen TV category while Katayama’s work made the large screen technology possible. Two of the teams being inducted founded start-ups that are now iconic industry brands. Jim Barton and Michael Ramsay created TiVo, the first commercial hard drive-based DVR, whose success turned the name of the company into a verb. And Gary Burrell and Dr. Min-Hwan Kao founded Garmin, the first and largest commercial GPS receiver maker worldwide.

In the retail arena, the father/son team of Len and Jim Tweten discovered Magnolia Audio Video and then grew the local chain into a national high-end audio and video retailing giant pioneering the store-within-a-store retailing concept. Another highly successful team created the concept of the electronic marketplace when Pierre Omidyar founded eBay and hired Meg Whitman to help grow the company to $8 billion in annual revenue. And Manning Greenberg was one of the most significant trade journalists of his time while working at Home Furnishings Daily.

SELECTING THE HONOUREES
The class was selected on March 6, 2013, in New York City, by media and industry professionals, who judged the nominations submitted by manufacturers, retailers and journalists. The judges used the democratic process of the majority of votes to select the new class. We thank the following judges for volunteering their expertise:

Jim Barry
Rob Calem
Peter Fannon
Corinne Iozzio
Zach Honig
Janet Pinkerton
Seth Porges

Robin Raskin
Richard Sherwin
Greg Tarr
John Taylor
Jack Wayman
Gary Yacoubian

CARRYING THE TORCH
Do you know a trailblazer who should be in the CE Hall of Fame? Nominate the leader that you believe has had a significant impact on the CE industry. Visit CE.org to submit a nomination form online or submit your form tonight using the box in the lobby.

Please join us at the 2014 International CES, the global gathering place for all who thrive on the business of consumer technologies and home to innovative entrepreneurs, inventors with bold ideas and top leaders on January 7-10. Come to CES to see the magic of technology.

Gary Shapiro
CEA President and CEO

Cindy Stevens
CEA Senior Director, Publications
Congratulations

to the new inductees to the CE Hall of Fame. We thank you for your contribution to the advancement of the consumer electronics industry.

Jim Barton
Dr. Samar Basu
Gary Burrell
Manning Greenberg
Dr. Marcian Hoff

Dr. Min-Hwan Kao
Mikio Katayama
Katsuhiko Machida
Pierre Omidyar
Michael Ramsay

Dr. Ching Tang
Jim Tweten
Len Tweten
Steven Van Slyke
Meg Whitman

Nominations are now open for the 2014 CE Hall of Fame. Submit your nominations now at CE.org/HallofFame.
DISTINGUISHED MEMBERS OF THE CE HALL OF FAME

2013
Basu, Dr. Samar
Greenberg, Manning
Hoff, Dr. Marcian
Team: Jim Barton and Michael Ramsay
Team: Gary Burrell and Dr. Min-Hwan Kao
Team: Katsuhiko Machida and Mikio Katayama
Team: Jim Tweten and Len Tweten
Team: Steven Van Slyke and Dr. Ching Tang
Team: Pierre Omidyar and Meg Whitman

2012
Briskman, Robert
Citta, Richard
Dybdahl, Bjorn
Engelbart, Douglas
Ergen, Charles
Finley, Larry
Koo, In Hwoi
Lee, Byung-chull
Team: Willard Boyle and George E. Smith
Team: Maurice, Norman and Philip Cohen
Team: David Sarnoff, John A.
Team: Dr. Karlheinz Brandenburg, Dr. Heinz Gerhäuser and Dr. Dieter Seitzer

2010
Christopher, Dr. Lauren
Kraft, Richard
McCann, Frank
Mondry, David and Eugene Philips, Frederik
Sotoloff, Al
Upson, Cynthia
Weber, Dr. Larry
Team: Rachelle and Joe Friedman
Team: Dr. Ivan Getting and Dr. Bradford Parkinson

2009
Team: Maurice, Norman and Philip Cohen
Team: David Sarnoff, John A.
Team: Karlheinz Brandenburg, Dr. Heinz Gerhäuser and Dr. Dieter Seitzer

2008
Abt, David and Jewel
Clayton, Joe
Donlavey, Dean
Fante, Hans
Hartenstein, Eddy
Kutner, Ken
Liebergard, Warren
Sennheiser, Fritz
Sharp, Richard
Team: Martin Cooper and Donald Linder

2007
Allen, Paul
Bose, Dr. Amar
Crutchfield Jr, William G.
Day, James Edward
Mcdonald, John
Sasson, Steven
Schulze, Richard
Weinberg, Art
Team: Dr. Karlheinz Brandenburg, Dr. Heinz Gerhäuser and Dr. Dieter Seitzer

2006
Doyle, Jack
Galvin, Robert
Heilmeier, George
Holonyak Jr, Dr. Nicholas
Ladd, Howard
Richard, Alfred J.
Roach, John
Team: Dr. Donald Bitzer, Dr. Gene Slottow and Dr. Robert Willson
Team: Andrew Grove and Gordon Moore

2005
Crane, Ken
Donahue, Joseph
Elis, Harry
Fæzell, George
Gold, Saul
Levis, Art
Luskin, Jack
Matshushita, Masaharu
Winegard, John
Team: William Hewlett and David Packard

2004
Blundell, Alan Dower
Brief, Henry
Gerson, Robert E.
Kai, Ken
Kalov, Jerry
Klipsch, Paul
Ohga, Norio
Paik, Dr. Woo
Woźniak, Steven
Team: Richard Friend and Joel Engel

2003
Borchardt, Herbert
Feldman, Leonard
Immink, Kees A. Schouhamer
Kassga, William
Kent, Atwater
Steinberg, Jules
Tokayashagi, Kenjiro
Tashinsky, Joseph
Wurtzel, Alan

2002
Alexander, Ernst F.W.
Appel, Bernard
Baker, W.G.R.
Bass, William E.
Ekstrakt, Richard
Fisher, Walter
Gates, Raymond
Lear, William Powell
Polk, Sol
Sauter, Jack K.

2001
Berliner, Emil
Fleming, Sir John Ambrose
Gernsback, Hugo
Jensen, Peter Laurits
Mantz, Earl
Paulsen, Valdemar
Westinghouse, George

2000
Abrams, Benjamin
Adler, Robert
Armstrong, Edwin
Baird, John Logie
Balderson, William
Bardeen, John
Bell, Alexander Graham
Blay, Andre
Bratzaan, Walter
Braun, Karl Ferdinand
Bushnell, Nolan
Crosley Jr., Powel
DeForest, Lee
Dobly, Ray
DuMont, Allen
Edison, Thomas
Eilers, Carl
Fararsworth, Philo T.
Fessenden, Reginald Aubrey
Fisher, Avery
Freimann, Frank
Galvin, Paul
Ginsberg, Charles
Goldmark, Peter
Harman, Dr. Sidney
Hertz, Heinrich
Ibuka, Masaru
Johnson, Eldridge
Kilby, Jack
Kloss, Henry
Koss Sr., John
Lachenbruch, David
Lansing, James B.
Marantz, Saul
Marconi, Guglielmo
Matsuoka, Konosuke
McDonald Jr., Cndr. Eugene
Morita, Akio
Noyce, Robert
Pomiatoff, Alexander M.
Roberts, Ed
Sarnoff, David
Scott, Alphonso Hynner
Shibazaki, Yuma
Shockley, William
Siragusa Sr., Ross
Takeo, Shizuo
Teisa, Nikola
Wayman, Jack
Zworykin, Vladimir
CE Hall of Fame 2013

CE Hall of Fame Gallery

Benjamin Graham
James A. Fitzgibbon
Joseph B. E. White
Zvi Feigelson
Paul Allen
Reginald A. Farrow

Herbert Borchardt
Dr. Amar Bose
Willard S. Boyle
Lance Brathwaite
Dr. Karlheinz Brandenburg
Karl Ferdinand Braun
Robert Briskman
Gary Burrell

H. R. Davis
Dr. James A. Farley
William E. Boss
Daniel B. Carter
Dr. Donald Bitzer
Emile Berliner
André Blaï
Samuel Bloomberg

John Bardeen
Ralph H. Bear
Jim Barton
Dr. Samar Basu
Alexander Graham Bell
Alan Dowler Blumlein

Joe Clayton
Maurice Cohen
Philip Cohen
Norman Cohen
Martin Cooper
Ken Crane
William G. Crutchfield, Jr

Dr. Lauren Christopher
Powell Crosley Jr.
Richard W. Citrin
Nolan Bushnell

C. L. Anderson
Paul Allen
Bernard Appel
William Balderston

John "Jack" Doyle
Allen Dumont

Carl Eilers
Terry’s Photography

Reginald A. Farrow

Bettman/Corbis

Temple University, Paley Library, Urban archives

Consumer Electronics Association (CEA)®
How many times do you bump into someone before you realize karma may be at work? It seemed wherever Jim Barton worked, Mike Ramsay was already there. After the third such coincidence, Barton finally realized there were forces larger than himself at work, so he called Ramsay. Over a series of lunches, the pair created TiVo, which forever changed the way we watch TV.

Barton was born in Denver in 1958, where his parents, both college graduates, had met after his father’s Navy stint in the Pacific during WWII. Barton grew up in a suburb of Denver, graduated from high school and went off to college at the University of Colorado at Boulder, where he earned a degree in electrical engineering and computer science in 1980. While in school in the late 1970s, Barton worked for the University Computing Center, first as a computer operator and later as a systems programmer, when computers were big, bulky mainframes occupying vast air conditioned machine rooms.

After graduation, Barton began working for AT&T Bell Laboratories in Denver as a systems programmer while earning a master’s degree in computer science in 1982. At Bell Labs, Barton wrote software for the then-new UNIX operating system (OS) running on the new VAX 11-780 minicomputer from Digital Equipment Corp. He was responsible for the development of computer networking software components for Bell Labs’ vast array of computing systems during the expansion of the UNIX-based ARPA-Net, the foundation of the Internet.

In October 1984, Barton moved to Silicon Valley to work for Hewlett-Packard, as a part of a team implementing a new UNIX-based desktop workstation computer based on HP’s new RISC computer architecture. The system promised lower cost and higher performance than mainframes and minicomputers.

It was at HP that Barton first met Ramsay, who was a high-level manager in charge of the project Barton worked on. In mid-1986, Barton moved to Silicon Graphics (SGI), where again he bumped into Ramsay. At SGI, Barton led the software development of a multiprocessor OS for SGI’s new line of RISC workstations based on the MIPS microprocessor developed at Stanford.

But perhaps Barton’s most important experience at SGI was gleaned from his involvement in the inception and development of Time-Warner Cable’s “Full Service Network” in Orlando, Fla., the first video-on-demand system.

Barton left SGI in 1996 to explore opportunities to develop new kinds of services arising from the expansion of the Internet. After he’d heard that Ramsay had left SGI, Barton called him for lunch. The two decided to form a company initially called Teleworld in August 1997 to pursue consumer-focused products based on digital forms of content. After abandoning the idea of an expensive home network server, the pair decided to narrow their focus to a device that would use sophisticated software and inexpensive hardware to allow consumers to pause live TV and to schedule the recording of TV programs. This device became the first commercially available consumer digital video recorder (DVR). They then changed the name of the company and device to the more TV-flavored TiVo.

As the primary technical designer, Barton chose Linux, a re-implementation of UNIX, with which he had ample experience, as the operating software. Using open-source software wherever practical allowed Barton to focus on the real innovation needed to construct the recorder.

Barton also wanted to make controlling TiVo as easy as possible. During the early stages of hardware design, the hardware manager asked Barton, “Where do you want to put the power switch?” Barton replied, “There will be no power switch or reset button on a TiVo.” Barton and Ramsay wanted to make TiVo work reliably all the time, like a television, designing it so even Barton’s mother could use it.

Unfortunately, Barton and Ramsay weren’t the only DVR developers. TiVo and a company called ReplayTV both announced their products at the 1999 International CES, each promising products within a year.

In early March 1999, however, TiVo was behind its promised end-of-the-month delivery date. After working 24-hours a day during the final weeks on what was named Project Blue Moon, TiVo shipped its first product on March 31, 1999, beating ReplayTV into the market.

The idea of pausing live TV and easy one-button recording caught on. TiVo went public in September 1999 and grew rapidly through its own retail efforts and through strategic relationships with DirecTV, Sony, Philips, Comcast and many other CE and TV provider companies.

By 2013, a DVR was present in 46 percent of U.S. homes. The time-shifting TiVo enabled has become so prevalent it has changed television advertising models and pushed Nielsen to change its TV ratings methodology to compensate for viewers no longer watching programs when they originally air.

Barton left TiVo in March 2012 and re-joined Ramsay to form InVisioneer. The pair hopes to revolutionize video entertainment all over again.
Jack Fischer was working on graphite intercalation compounds pursuing cathode materials under W orrell, fellow researcher flow of electrons for discharging and recharging. While Basu electrodes – or, technically, cathodes and anodes – to direct the All batteries include plus/positive and minus/negative cahdotes. Basu then immigrated to the U.S., where he joined a team at the University of Pennsylvania doing research work on lithium batteries, studying titanium and tantalum sulfides for use as electrodes.

After he earned his B.S. in metallurgical engineering from Bengal Engineering College, Howrah, in 1966, and his master’s (1968) and Ph.D. (1972) in chemical metallurgy from the Indian Institute of Technology (IIT) in Kanpur, Basu returned to Bengal Engineering College to teach metallurgy until 1975. Basu then immigrated to the U.S., where he joined a team at the University of Pennsylvania doing research work on lithium batteries, studying titanium and tantalum sulfides for use as cathodes.

All batteries include plus/positive and minus/negative electrodes – or, technically, cathodes and anodes – to direct the flow of electrons for discharging and recharging. While Basu pursued cathode materials under Worrell, fellow researcher Jack Fischer was working on graphite intercalation compounds (GIC) with an objective of replacing heavyweight copper cables in transformers or heavy electrical equipment. Fischer wanted to combine lithium, the lightest solid element, with graphite to produce the simplest GIC to serve as a model material for physicists to conduct fundamental studies. However, there seemed to be no way to combine the two elements to create a pure compound.

Basu, while working on intercalation compounds at Penn's Laboratory for Research on the Structure of Matter (LRSM), found a solution: he would synthesize the pure material by dipping solid graphite into a pool of molten lithium under circulation argon in a glove box at -200 degrees Celsius. After removing the solidified lithium around the edges, Basu had successfully synthesized the pure compound LiC6.

Sure enough, LiC6 satisfied Fischer’s needs, and many enhanced physical properties were reported, but one in particular: its high electrical conductivity, which was measured to be about half that of pure copper. Basu began to focus more of his research with Worrell on cathode materials and occasionally experimented with LiC6, to prove the compound could serve as a lithium battery anode exhibited by its properties.

The main problem with lithium batteries was the thick surface coatings of lithium oxide, hydroxide or carbonate eating away the lithium electrodes after multiple charging/discharging cycles. Several attempts were made during the late 1970s to replace pure elemental lithium by lithium alloys and compounds, but none seemed to work until LiC6.

In 1978, Basu was recruited to join Bell Labs’ Battery Development Department, in Murray Hill, N.J., to try and solve these problems and further develop the technology toward a commercially viable anode material. Initially, Basu ran into problems with poor interaction between LiC6 and the battery’s organic electrolytes. But during the second half of 1978, he found that a molten inorganic salt (LiCl-KCl) mixture worked at elevated temperatures. It took another year to demonstrate cells with an organic electrolyte worked at room temperature and a real cathode material to work with the LiC6 anode. Bell Labs’ researcher Gunther Wertheim proved that lithium existed as lithium-ion in the LiC6 solid, which is how the name “lithium-ion battery” was assigned by the industry.

But all was not smooth sailing for recognition of his work. After the patent applications were approved, Basu faced a corporate gag order against publication of the research results in journals until the end of the 1980s. It wasn’t until the U.S. Department of Energy’s Sandia National Labs approached Bell Labs in 1992 to develop a product based on Basu’s two patents – and forceful arguments from Basu himself – that the gag order was lifted and Basu’s paper was published in 1999.

In 1990, engineers at Sony Energy Technology converted Basu’s patents, together with the cobalt oxide cathode material of John Goodenough, into the first commercial lithium-ion battery, which powers most modern rechargeable portable electronic devices.

For recognition of his contributions to the invention of the lithium-ion battery, Basu received the Lucent Technologies’ Patent Recognition Award in 1998.

Basu took early retirement from Bell Labs in 2000 and accepted the invitation for the Tata Chair Professorship from his alma mater, Bengal Engineering College, to pursue his lifelong dream of developing lithium-ion-based electric vehicle batteries. Subsequently, he moved to the Indian Institute of Technology, Kharagpur, in 2003, to set-up an R&D facility on campus. Basu retired in 2008. He now spends summers in Hawley, Pa., with his wife Soma and two sons, Samik and Avik, and winters in Calcutta, India.
Experiencing first-hand the need for a new technology has always been an innovation driver or in the case of Gary Burrell, an innovation pilot.

As a certified pilot in the early 1980s, Burrell saw the usefulness of developing a product that used the still under-construction global positioning system (GPS) network to help guide flyers, boaters and other adventurers. This led Burrell and co-worker, Dr. Min Kao, to co-found Garmin, which launched the GPS phenomena.

Gary Burrell was born in 1937 in Stilwell, Kan. He was interested in aviation and aerospace from a young age. He earned his electrical engineering B.S. degree from Wichita State University, then a Master's degree at Rensselaer Polytechnic Institute (RPI), in Troy, N.Y.

During his career, Burrell worked in various positions including director of engineering and vice president of engineering at marine and aviation electronics companies including Lowrance Electronics, King Radio Corp. and Allied Signal.

It was while Burrell was working at King Radio that was later acquired by Allied Signal in Olathe, Kansas, that he recruited Taiwan-born engineer Dr. Min-Hwan Kao, who was working at defense contractor Magnavox.

By the late 1980s, the talk of the engineering world was the GPS network that was under construction by the U.S. government. Following Kao’s development of the first aviation GPS receiver, Allied Signal squeezed research funds for GPS receivers, especially the marine-focused products Burrell envisioned.

Over dinner at a Red Lobster in Olathe, Kao asked Burrell if he'd ever thought about starting his own company. Half-jokingly, Burrell replied he'd only do so with Kao.

They met around a card table at Kao’s home in Olathe to plot strategy. Within months, the two left Allied Signal, committing their personal savings to the new venture. In October 1989, after quickly putting together a business plan, they raised additional funds from families and friends, eventually raising $4 million. The two then flew to Taipei to find manufacturing partners, established an office in nearby Lenexa, Kan. and hired a dozen engineers to build a prototype.

At first, the company was called ProNav. Unfortunately, that moniker already had been claimed by another company, so Burrell and Kao resorted to simply merging their two first names – Gar and Min: Garmin. In 1995, the company moved back to its home town of Olathe, where the company is still headquartered.

Among the company's first customers were coalition forces that used Garmin GPS products to navigate the desert during the first Gulf War. In mid-1992, the company unveiled the GPS 100 Personal Navigator, a $2,500 panel-mounted GPS navigation receiver for boaters and the first consumer GPS device.

An immediate success, the GPS 100 generated a 5,000 unit backlog as soon as the prototype was unveiled and before it went on sale in October 1992. This strategy of stoking demand by showing off prototypes didn't slow Garmin. The co-founders believed in vertical integration, which keeps all design, manufacturing, marketing and warehouse processes in-house to maintain greater control over timelines, quality, and service and maintain high profit margins.

Burrell and Kao ran their growing business conservatively – they never needed to raise additional capital again. They reinvested in the company and established disciplines such as having cash in the bank, maintaining sufficient inventory levels and staying debt-free. Those practices helped avoid a lot of hurdles. Burrell was particularly keen on pleasing the end user, often known to say, “We live and die by customers' perception of our products.”

Garmin also pioneered new products in new markets and systems that integrated a variety of technologies, enabling the company to supply complete glass cockpits to airplanes, full lines of electronics for boats and in-dash “infotainment” in cars. The company also developed deep relationships with some of the world’s leading OEMs such as Cessna, BMW and Chrysler. In December 2000, the company went public. By 2002, Garmin was selling more than half of all consumer navigation devices. In 2003, the company launched its first GPS-enabled PDA, the iQue 3600.

Burrell served as Garmin’s president from January 1990, then as co-CEO from August 2000 to August 2002. Burrell retired from Garmin in 2004, but remains as chairman emeritus.
Manning Greenberg was not a reporter to be trifled with. When a co-worker casually mentioned how great a singer Bing Crosby was, the devoted classical music lover Greenberg exploded, accusing Crosby, Elvis and Sinatra, of destroying the Western musical tradition. It was this zeal that made Greenberg one of the most influential and respected consumer electronics trade journalists of his time, and a beloved mentor to dozens of today’s trade reporters.

Greenberg was born in 1927, in Bridgeport, Conn., to Benjamin, best known for making pickles and delivering them to delis all over Bridgeport, and Fannie, a voice and piano teacher. At the age of 17, during the last year of World War II, Greenberg joined the Navy; and served as a pharmacist mate in Quantico, Va. Returning home, Greenberg attended New York University, initially as an English major, on the GI Bill. Later Greenberg switched to journalism because he thought it was more practical, and he liked rooting around getting information and talking to people. He received his degree in 1953.

Greenberg first saw his future wife, Hattie as a teenager dancing on a table top at a family party. Eight years later, Greenberg was reintroduced to now grown-up Hattie at a family gathering. While courting her in a row boat, he whistled the entire first movement of a Beethoven string quartet. The tactic was successful – the two married, living first on Bleeker Street before moving to a two-family house in Stamford, Conn. Alex, Michael and Abby soon followed.

Greenberg began his journalism career as a copy editor at Home Furnishings Daily (now HFN), published by the legendary Fairchild Publications, publishers of Women’s Wear Daily. He eventually joined HFD’s TV & Appliances section, first as a reporter and then as section editor. During that time, he worked with future CE Hall of Famers Henry Henry Brief, Frank McCann and Aaron Neretin, covering the nascent color TV business, the emergence of electronics/appliance retailers and Japanese CE suppliers.

Greenberg created HFD’s “Focus 200,” a list of the top 200 electronics retailers by annual sales volume, and a similar list for major appliance retailers, both of which were later adopted by TWICE. After a salary dispute in the mid-1960s, Greenberg joined Fedders Air Conditioning to head up its public relations department. After a brief stay with Fedders and then Muzak, Greenberg rejoined HFD in 1970 as editor of the renamed “Electronics” section. In the 1980s, Greenberg was made editor of a monthly spin-off Fairchild magazine called Electronics Retailing, profiling regional chains that became national players such as Best Buy and Circuit City.

Greenberg worked hard even while on vacation. While visiting his son Michael, who had relocated to Gothenburg, Sweden, he wrote an article on one of Sweden’s largest home-electronics retail chains, Siba, and its founder Bengt Bengtsson.

Greenberg considered Electronics Retailing the crowning point of his career. But the magazine eventually folded, and he returned to HFD’s Electronics section, this time as senior editor, where he helped cover compact disc players, personal computers, video games and VCRs.

Along with David Lachenbruch at Television Digest, Art Levis at Consumer Electronics monthly magazine and TWICE’s Bob Gerson, Greenberg became one of the most influential editorial voices in consumer electronics. For instance, Greenberg got two leading CE executives to conclude that only one, not two, CES shows were needed, which helped to lead to the elimination of the summer Chicago show. And his feature story about Nintendo of America attempting to enter the market with its first video game system in the 1980s helped establish it as the number one brand.

While other reporters cultivated sources with diplomacy, Greenberg was voracious, always looking to get the scoop – deadlines and polite niceties be damned. For Greenberg, breaking and reporting a story first and accurately was everything. While Greenberg could be gruff, he also could be quiet and generous. His lasting legacy may be the next generation of reporters he trained and worked with while at HFD, freely sharing expertise and sources. By dropping his name co-workers instantly got reticent company executives to take their calls.

Among his many honors is a Distinguished Electronics Media Award from the Anti-Defamation League of the B’nai Brith in 1986. After leaving HFD, he freelanced until he retired. Off the job, Greenberg liked to hike in the woods around his Chester, Mass., home, teaching his children about plants, trees and bird songs, before moving to Southbury, Mass., to be closer to his son, Alex. He was well-read and extremely conversant about art, especially abstract painters. He served for a period on the board of the Norwalk Symphony. And in his last years, Greenberg became a University of Connecticut Huskies basketball fan.
Electronic products are everywhere, most controlled by one or more microprocessors, tiny computers in the form of integrated circuits. Hoff helped launch this age by proposing a “computer on a chip,” which resulted in the world’s first microprocessor.

Marcian E. “Ted” Hoff was born in Rochester, N.Y. on October 28, 1937. He became interested in technology at an early age – chemistry from age nine and electronics from age 12 – inspired by an uncle’s gift subscription to Popular Science, from which he answered an ad for an Allied Radio catalog. When he was 15, Hoff won a $400 scholarship and a trip to Washington, D.C., from the Westinghouse Science Talent Search. By the time he graduated from high school he had built himself an oscilloscope and had done a bit of television set repair.

Later as a sophomore at Rensselaer Polytechnic Institute in Troy, N.Y., Hoff applied for, and was later awarded (1959), two patents for designing two circuits for General Railway Signal, where he worked summers and college holidays as a lab tech.

Hoff was awarded his bachelor’s degree in electrical engineering from Rensselaer in 1958, then his master’s degree (1959) and his Ph.D. (1962) from Stanford University’s Electrical Engineering graduate school. While at Stanford in 1960, Hoff and his professor, Bernard Widrow, studied neural networks and co-developed the LMS (least means squares) algorithm, a signal filter still used in many products such as modems, speech recognition systems and noise-cancelling systems. In 1968, former Fairchild engineer and integrated circuit co-inventor Robert Noyce invited Hoff to work for a new startup called Intel. Hoff, employee number 12 at the new chip company, wrote application information for Intel memory, and patented several memory concepts.

Intel initially designed custom circuits, the first for Busicom calculators. In June 1969, Hoff served as liaison between the Japanese Busicom engineers and Intel’s chip developers. Naturally curious, Hoff reviewed the specifications, which called for up to a dozen chips performing many functions, such as scanning a keyboard, operating a printer, displaying results on LED display devices, as well as performing regular calculator memory and calculation functions. The set proposed to use shift register memory, which used six transistors per bit and was relatively slow. Hoff was concerned the project might be too demanding for Intel and reported his concerns to Noyce, who asked if there might be a way to simplify the design.

Hoff proposed a more condensed solution, which would use programs to perform the functions of the dedicated chips in the original set. The shift register memory also would be replaced with dynamic random access memory (DRAM), which used three transistors per bit and was much faster to access.

These changes allowed primitive instructions to be executed quickly and allowed more complex operations to be performed rapidly enough to meet the calculator requirement. The resulting chip set consisted of only four different designs; only those in the CPU would be of higher complexity while the other chips would perform primarily memory functions.

This proposed architecture for the CPU included slightly more than 2,300 transistors, well within Intel’s manufacturing capability at the time.

After some initial pushback, Hoff’s computer-on-a-chip approach was accepted by the Busicom board in October 1969 and silicon fabrication began in February 1971.

Intel suddenly realized what it had on its hands, and acquired the rights for its custom chip from Busicom. In a November 1971 edition of Electronics News, Intel officially announced the world’s first microprocessor, the single chip 4004, a 4-bit chip comprised of 2,300 transistors.

After the microprocessor was launched, Noyce asked Hoff to look at the telephone industry to see if Intel might play a role. Hoff assembled a small group, and produced the first commercially-available telephone codec, a device for translating telephone communication between analog and digital formats. His group also produced one of the first digital signal processing (DSP) chips, critical steps in the move from analog to digital telephony.

Hoff also aided in the design of Intel’s first 8-bit microprocessors, the 8008 (1972) and the 8080 (1974), direct forbearers of the Intel 8088 chip used in the first IBM PC a decade later. In 1980, Hoff was named the first Intel Fellow, the highest technical position in the company.

Hoff left Intel in early 1983 to become vice president of corporate technology at Atari. When the company was sold the following year, Hoff began a consulting career with Teklicon, which provides technical assistance to intellectual property protection attorneys.

Hoff retired from Teklicon in 2007, but still dabbles in his own home electronics lab and a small machine shop, complete with a milling machine and a small metal lathe for turning out prototypes. He is married and has three adult daughters.
Dr. Min-Hwan Kao
Co-founder, Garmin
(1949 - )

Dr. Min Kao understands not only how to take advantage of an opportunity, but how to provide it. When what would become the global positioning system (GPS) was under construction in the late 1980s, he and co-worker Gary Burrell left their jobs to found Garmin, the first and largest GPS receiver maker. And once his fortune was made, Kao quietly provided funds to educate the next generation of engineers.

Min-Hwan Kao was born in 1949, in Jhushan, a small town in Nantou province in Taiwan. He graduated from National Taiwan University with a B.S. in electrical engineering, then emigrated to the U.S. in 1973 with his wife, Fan, and earned his master's degree and Ph.D. in electrical engineering from the University of Tennessee.

He initially did research for NASA and the U.S. Army. Then, he was hired as a systems analyst at Teledyne Systems where he worked on inertial Doppler radar, as well as other conventional radio navigation and fire control systems.

When Kao first learned of the GPS system being developed by the U.S. Department of Defense, he was intrigued by its accuracy and its potential, and joined Magnavox Advanced Products, which had received a government GPS contract. While at Magnavox, Kao designed the Kalman filter algorithms for Phase II GPS user equipment.

Kao was then recruited by King Radio, where he led a team of engineers who developed the first GPS-enabled avionics certified by the Federal Aviation Administration. Following Kao's development of the first aviation GPS receiver, Allied Signal, which had bought King Radio, squelched research funds for GPS receivers.

Over dinner at a Red Lobster in Olathe, Kan., Kao asked another frustrated Allied GPS receiver developer, Gary Burrell, if he'd ever thought about starting his own company. Perhaps only half-jokingly, Burrell replied he'd only do so with Kao.

The two met around a card table at Kao's home in Olathe to plot strategy. Within months of one another, the two left Allied Signal and committed their personal savings to the new venture. In October 1989, after quickly putting together a business plan, they raised additional funds from families and friends, eventually raising $4 million. The two then flew to Taipei to find manufacturing partners, established an office in Lenexa, Kan., and hired a dozen engineers to build a prototype.

At first, the company was called ProNav. But because that name was already claimed by another company, Burrell and Kao resorted to simply merging their two first names – Gar and Min – Garmin. As Kao later noted, Mingar didn't sound as smooth.

There were some early tense moments for the pair. In 1991, the company unveiled the GPS 100 Personal Navigator, a $2,500 panel-mounted GPS navigation receiver for boaters, and the first consumer GPS device that generated an almost immediate success when it went on sale in October 1992.

In 2006, the now public company opened its first retail store on Chicago's "Miracle Mile" Michigan Avenue. By late 2008, Garmin became the worldwide automotive navigation leader with about 37 percent of the market. By 2011, Garmin had sold more than 100 million GPS receivers, was generating nearly $3 billion in annual sales, and employed 9,000 people in 40 locations worldwide.

Described as a genuinely modest man, Kao is philanthropically – but privately – philanthropic. One well-publicized recipient of Kao's largess is education, especially STEM (science, technology, engineering and mathematics) programs.

For instance, in 2007, Kao established the $10 million Garmin Electrical and Computer Engineering Initiative, which each year provides 20 students with $5,000 undergraduate scholarships. In addition, this initiative offers hands-on engineering internships at Garmin, which not coincidentally ensures that the company is provided a steady stream of young engineering talent.

Also in 2007, Kao and his wife contributed $12.5 million to his alma mater, the University of Tennessee, for the construction of the 150,000-square-foot Min H. Kao Electrical Engineering and Computer Science Building on the university's engineering campus. The building opened in spring 2012. Kao and his wife also donated $5 million to create the Min H. Kao Scholars and Fellows endowments and the Kao Professorship.

In December 2012, Kao stepped down as CEO of Garmin and became executive chairman. His entrepreneurial success has rubbed off on his children. After attending New York University and the Parsons School of Design, his daughter, Jen, launched her own fashion line in New York, and his son, Ken, is a film producer in Los Angeles.

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In the late 1990s and early 2000s, Sharp was the acknowledged pioneer and market leader in liquid crystal display (LCD) TV research, development and sales. Sharp’s LCD dominance – in fact most large screen LCD technology for TVs – can be traced to Mikio Katayama.

Katayama was born Dec. 12, 1957, in Okayama Prefecture, and earned a degree in engineering from the University of Tokyo. Upon graduation, he immediately joined Sharp, in April 1981, assigned to the company’s R&D center, helping to push Sharp’s pioneering work on LCD technology.

Katayama enjoyed a swift rise through the Sharp ranks, serving in several LCD development positions. In the late 1990s, he played an important role in developing large LCD panels. He was appointed division deputy general manager of Thin Film Transistor (TFT) Division I, and then promoted to deputy group general manager of TFT LCD in October 2000. In February 2000, he was assigned group general manager of Systems LCD Development Group, where he helped to advance the development of system LCD.

It was Katayama’s job to transform a display technology that had been used for nothing larger or more grandiose than computer screens to challenge 42- and 50-inch plasma flat-screen TVs then taking hold of the public imagination around the world. Katayama led and worked with several Sharp teams to advance the art of big screen LCD, filing dozens of patents as work progressed to increase the brightness and resolution of LCD.

By March 1999, Katayama and his team succeeded and Sharp started selling what was then the industry’s largest LCD TV, a 20-inch model, jump-starting the LCD TV business. Katayama also developed manufacturing processes for TFT LCD, and established the manufacturing process for sixth-generation glass substrates, G6, as well as G8, and G10, which enabled the effective manufacturing of large size LCD panels.

Katayama’s efforts continued to push Sharp to develop larger LCD TVs with higher quality and faster response speed, while cutting costs so sets became more price competitive with plasma. In 2001, the company unveiled its AQUOS TV brand. By 2004, Sharp had captured 50 percent of the Japanese LCD TV market and was acknowledged as the market leader in both high-quality and large screen LCD TVs.

By 2002, Katayama and his cohorts developed integrated liquid crystal panels that molded substrate functional elements, such as sensors, drivers and peripheral circuits directly to the liquid crystal glass. This advance created an LCD display for mobile devices that was lighter and thinner than previous panels, with higher resolution and lower power consumption – key advances and characteristics of all mobile phones and smartphones to come.

In June 2003, Katayama was named a Sharp corporate director, in 2005 a corporate executive director, and in 2006 corporate senior executive director. In 2007, newly developed Sharp LCDs included the Mobile Advanced Super View LCD for mobile phones with an industry-high 2000:1 contrast ratio and one of the industry’s widest viewing angles (176 degrees) and fast response speed (8ms); the System LCD with embedded optical sensors, which offered input through touchscreen and scanning; and, ultra-thin LCD TVs boasting incredible image quality, ultra-thin 20 mm displays with advanced environmental performance in sizes up to 52-inches.

Katayama and his LCD teams received the 2009 Technical Award of the Okochi Memorial Foundation, presented annually since 1954 for “industrial engineering in Japan, research and development of production technology, and outstanding achievement for the implementation of advanced production method,” for contributing to “the developing and practical applications of LCD panel which is integrated with peripheral circuits using high-performance crystalline silicon TFT.” Katayama was named chairman after retiring as Sharp president in April 2012 and senior executive fellow on June 25, 2013.
Two years before Katsuhiko Machida became president of Sharp, the Grand Alliance high-definition television (HDTV) standards were adopted. Taking a big gamble on liquid crystal display (LCD) as the future of HDTV, Machida transformed Sharp from a struggling company into a market leader in the new LCD flat-screen TV category, and also helped resurrect Japan's economy.

Machida was born June 22, 1943, in Osaka, coincidentally, Sharp's home city as well. He graduated from Kyoto University with a degree in agriculture in 1966, and then joined Sharp in 1969. Machida quickly rose through the corporation, holding different positions across the company's divisions – including general manager of the TV systems division of the TV & Video Systems Group, group deputy general manager of domestic sales, group general manager of Sharp's household appliance group, and group general manager of overseas business. He became a corporate director in June 1987, corporate executive director in April 1990, and corporate senior executive director in October 1992.

When Machida rose to Sharp's leadership as president and CEO in June 1998, the company's prospects, largely dependent on the flailing computer LCD and semiconductor businesses were bleak, with profits down and the brand weak. As it became apparent that HDTV was the future of television, Machida made a bold, public pronouncement: Sharp would switch its line of domestically marketed televisions from cathode ray tube (CRT) to LCD by 2005.

“We had to break away from old technology,” Machida reflected. “As I saw it, the only logical conclusion was to develop a quintessential next-generation television.”

Sharp had been known as a center for LCD development. For instance, in 1973, the company produced the first portable calculator with an LCD screen. In 1992, Sharp pioneered the use of LCD screens instead of viewfinders on camcorders with the ViewCam. And in 1994, Sharp developed the industry's first reflective color TFT LCD that could be viewed outdoors. Several other LCD firsts followed over the subsequent decades.

As a result, Machida had confidence in Sharp's in-house LCD development, led by the company's TFT division general manager, Mikio Katayama. While outwardly confident of his LCD strategy, Machida later admitted he was only 60 percent confident on the inside, leading to many sleepless nights.

Not only was Machida worried about Sharp's ability to realize his LCD strategy; there was also an industry and media chorus of LCD naysayers. LCD was still unproven in sizes larger than laptop PC screens, and cheaper plasma technology had already begun to dominate the new flat-screen TV market.

Part of Machida's ability to focus on the seemingly impossible came from his passion for Nordic skiing. “Once you are on a mountain side, nobody is watching you,” Machida said. “If you get lost with no one else there, you will only be defeated by yourself. It is very important to work hard even if no one else is watching. You have to have self-discipline. I also learned about strong spiritual power and personal toughness.”

Machida launched a company-wide effort to bring the rest of Sharp's employees on board. He made almost daily trips to Sharp offices and factories and held town hall-style meetings, repeating the same mantra to sullen and unconvinced employees – “If we don't do this, Sharp has no future.”

In March 1999, the company started selling what was then the industry's largest LCD TV, a 20-inch model, jump-starting the LCD TV business. In 2001, the company unveiled its AQUOS TV brand, and, by 2004, Sharp had captured 50 percent of the Japanese LCD TV market and was acknowledged as the market leader in both high-quality and large screen LCD TVs.

In August 2006, Sharp opened the first factory to produce larger-screen eighth-generation glass substrates, and created a global five-base production system to produce products in the region in which they are used. At the 2007 International CES, Sharp displayed the world's largest LCD HDTV, a 108-inch model. LCD now accounts for more than 90 percent of all TVs sold.

LCD wasn't Sharp's only marquee product breakthrough under Machida. He bolstered the company's semiconductor and computer monitor business and established Sharp's presence in the solar panel market. In November 2000, the company made worldwide headlines when it introduced the world's first camera phone, the Sharp J-SH04, produced in the company's Hiroshima factory.

By 2003, Machida's LCD strategies had paid off. The company enjoyed the best fiscal year in its history, with new records set in each of the next four years under Machida's stewardship. Based on this unprecedented management success, Machida was elevated to company chairman in April 2007. He then became Sharp's corporate advisor in April 2012 and a special advisor on June 25, 2013.
There's an oft-repeated story that the inspiration for the founding of eBay was Pierre Omidyar's fiancée's passion for collecting Pez candy dispensers and her inability to find local trading partners. It wasn't. The story was a PR invention, which obscures the real passion of Omidyar himself, the creator of the most original and influential shopping experience ever conceived.

Omidyar was born Pyer Morad Omidyar on June 21, 1967, to Iranian immigrants sent to France by their parents to attend college. His father became a surgeon and his mother a well-known academic; but the couple separated when Omidyar was two. Omidyar attended a bilingual school, so he knew English when both his parents moved to Maryland when he was six.

Omidyar was always fascinated by gadgets, especially expensive calculators. When he was in the third grade at Maryland's Potomac School, he owned a Radio Shack TRS-80 and learned how to program BASIC on it. Like any budding nerd, he would cut gym and sneak into the computer room to tinker. He also had a tendency to take gadgets apart and then try to fix them.

He attended eighth and ninth grades in Hawaii, then returned to Maryland for his final three years of high school. After graduating in 1984, he attended Tufts University in Boston, where he taught himself how to program for the Apple Macintosh, and earned a degree in computer science in 1988. He then moved to Silicon Valley to work for Claris, an Apple subsidiary, where he helped create MacDraw.

In 1991, while working for General Magic, an Internet phone venture backed by Apple, Omidyar co-founded Ink Development, later reconceived as a shopping site called eShop after it was bought by Microsoft in 1996.

This short dabble in e-commerce led Omidyar to program a direct person-to-person auction site. He launched AuctionWeb on Sept. 4, 1995 – Labor Day.

The first item posted for auction was a broken laser pointer that Omidyar was about to throw away, which he only meant to list as a test. He was shocked when it was purchased for $14.83 by a guy who collected broken laser pointers.

At first, Omidyar treated AuctionWeb as a hobby, but the auction idea proved contagious. Within six months he was earning enough to cover his costs; within nine months he was making more through AuctionWeb than he was at his General Magic day job.

The fees Omidyar collected from each auction financed the site's expansion, but made him realize he'd need help with this hobby. After an introduction by mutual Silicon Valley friends, Omidyar recruited Jeffrey Skoll, a Stanford MBA and a newspaper executive trying to pull his reluctant employers onto the Internet. Skoll, who became president, wrote the first business plan to help the company make the transition out of startup mode.

Just one year and 250,000 auctions later, AuctionWeb started selling airline tickets. By early 1997, the site had hosted two million auctions and, by the middle of the year, was hosting nearly 800,000 auctions a day. For the first two years, the company grew 20-30 percent a month, far beyond Omidyar's wildest expectations.

One of the transitions from hobby startup to full-time business was redesigning the company logo and renaming the company. The first AuctionWeb logo was a black-and-white box, dubbed "the death bar" by the site's staff. Fortunately, the logo changed with the site's name. "eBay" was a shortened version of Omidyar's consulting business, "Echo Bay" and the now-familiar – and decidedly friendlier – colorful, overlapping letters logo was created.

In March 1998, Omidyar brought in business executive Meg Whitman as president and CEO; six months later, eBay went public, transforming Omidyar and Skoll into millionaires. Through the years, eBay has provided the market for items even stranger than a broken laser pointer – old gum, water left in a cup drunk by Elvis Presley, a Gulfstream II jet sold for an eBay record of $4.1 million, spouses, and the entire town of Bridgeville, Calif., population 25 – listed four times.

But mostly, eBay created a new market for goods usually found only at flea markets and garage sales. eBay now has a presence in 22 countries, 15,000 employees, and a user base of more than 90 million people worldwide who sell more than $1,900 worth of goods every second.

Omidyar married his fiancée, Pam, now a management consultant with a degree in molecular biology and more than 400 Pez dispensers, in 1999. In 2004, Omidyar and his wife founded The Omidyar Group to represent their philanthropic, personal and professional interests. From poverty alleviation to human rights and disaster relief, the Omidyars carry out their efforts through four primary organizations: HopeLab, Humanity United, Omidyar Network and Ulupono Initiative. Omidyar lives in Honolulu with his wife and three children.
Michael Ramsay viewed America as a “Disneyland for technologists” from his far away perch working for HP in Scotland. When he was recruited by HP to transfer to the U.S., he, like millions of immigrants before him, became an American looking for opportunity. He transformed that opportunity into TiVo, the first commercial DVR, whose success turned the name of the company into a verb and “time-shifting” into a life-shifting pastime.

Ramsay was born in Scotland in 1950. He graduated from Edinburgh University at the top of his class with a B.S. degree in engineering, financing his way through school by writing software to help Dolby Laboratories run its manufacturing and by working with a local electronics firm. This experience provided Ramsay important lessons about innovation and product designs.

After graduation, Ramsay joined HP as an electrical engineer, designing hardware and ICs. He was recruited by HP to transfer to the U.S. and immigrated with his wife, Carol. During the next six years he worked on the design of HP’s data terminal products.

In 1980, Ramsay joined his first startup Convergent Technologies, as director of engineering. As employee number nine, he experienced firsthand the excitement of creating a company from the ground up and building a successful business. Convergent grew fast, went public and Ramsay was promoted to general manager in charge of Convergent’s workstation products.

After five years, Ramsay got restless. After a brief stint back at HP, he joined Silicon Graphics (SGI) in 1986. Still a small company, at SGI Ramsay took responsibility for a new generation of products – the Personal Iris, Indigo, O2 and all related hardware and software products. In addition to managing SGI’s workstation business, Ramsay also ran a subsidiary of SGI – Silicon Studio, which was responsible for business development and strategic relationships with the media industry leading to SGI becoming the dominant hardware supplier to studios developing 3D special effects for movies and video games. Ramsay rose to senior vice president at SGI, and developed a keen interest in the use of computer technology for entertainment.

During his stint at HP, Ramsay made the acquaintance of Jim Barton, who was working on a project Ramsay was overseeing. They reunited at SGI in 1986, then again after Ramsay left SGI in 1997. Over a series of lunches, the pair combined to form Teleworld, later changed to TiVo – a nonsense name indicating nothing but more reflective of the company’s intention to change TV – with Ramsay as CEO and Barton as CTO, in August 1997.

The original plan for TiVo was to create a network server for the home. When the pair realized it would be tough to explain to consumers what they’d need a home network server for, they pared their idea down to a hard drive-based TV recorder dubbed a personal video recorder (PVR).

Unfortunately, Ramsay and Barton weren’t the only entrepreneurs dreaming of a digital replacement for the analog and tape-based VCR. TiVo and a company called ReplayTV both announced their products at the 1999 International CES, each promising products in a year.

In early March 1999, however, TiVo was behind its promised end-of-the-month delivery date. Ramsay cajoled his staff to meet their self-imposed deadline and beat ReplayTV to the market. Dubbing the effort Project Blue Moon since there was a second full blue moon that month, the team worked 24-hour days. One of the hall closets was designated just for blankets and pillows.

TiVo hit its mark, and shipped its first product on March 31, 1999, beating ReplayTV into the market by a couple of weeks. Thereafter, the last Friday in March was proclaimed an official “Blue Moon” holiday for all TiVo employees.

The idea of pausing live TV and easy one-button recording caught on. TiVo went public in September 1999 and grew rapidly through its own retail efforts and through strategic relationships with DirecTV, Sony, Philips, Comcast and many other CE and TV provider companies.

Over time the PVR became know as the digital video recorder (DVR). By 2013, a DVR was present in 46 percent of U.S. homes. The time-shifting TiVo enabled has become so prevalent it has changed television advertising models and pushed Nielsen to change its TV ratings methodology to compensate for viewers no longer watching programs when they originally air.

After 10 years at the helm of TiVo, Ramsay decided to use his experience to help emerging startup companies, and joined the New Enterprise Associates (NEA) as a venture partner, joining several boards of companies in which NEA was invested.

In 2012, the entrepreneurial bug again bit Ramsay and Barton. The pair founded a new company, InVisioneer, which received initial investments from KP, Redpoint and Andreessen-Horowitz. The pair promised “the re-invention of video entertainment, all over again.”
It’s an old scientific story. A researcher is searching for one thing, but ends up discovering something of far greater importance. This is the story behind Dr. Ching Tang’s role as the father of OLED and the founding of a still-growing multi-billion dollar industry.

Tang was born on a rice and chicken farm in Yuen Long, a poor village on Hong Kong’s outskirts, in 1947. After attending King’s College, a high school in Hong Kong, Tang graduated with a B.S. in chemistry from the University of British Columbia, Canada in 1970. He went on to pursue his graduate study in Cornell, where he earned a Ph.D. in physical chemistry in 1975, and then immediately joined Eastman Kodak as a research scientist.

Tang spent his first years at Kodak’s research laboratories trying to cook up new materials and device structures that would efficiently enable the conversion of sunlight into electricity. After a bit of struggle, Tang invented the organic heterojunction device structure and adapted it in organic solar cells to achieve as much as one percent efficiency, a major breakthrough in the field of organic photovoltaics (OPV). The organic heterojunction structure – an equivalent of the conventional "pn" junction – laid the basis for a new field now known as organic electronics.

While testing these OPV devices in a dark room one day in 1980, Tang observed a faint green light from one of the devices when he passed current through the device by applying voltage in the forward-bias direction. A light literally and figuratively went on for Tang when he discovered that he could create electroluminescence from organic thin films with a low voltage. In quick order, Tang was able to demonstrate blue light, a color not readily seen in conventional inorganic light emitting diodes, and thus triggered the prospect of practical use of what he later coined OLED – organic light emitting diode.

Tang and Steve Van Slyke searched for and discovered many organic materials with highly fluorescent and proper charge transport properties for use in their electroluminescent devices. By adapting the heterojunction structure that Tang discovered in OPV devices, they succeeded in achieving highly efficient electroluminescent devices with all three primary colors. Their OLED work was first published in *Applied Physics Letters* in 1987.


In addition to his basic scientific work on organic photovoltaics and OLED, Tang is responsible for numerous passive and active OLED commercialization innovations, including patterning and backplane technologies for OLED displays.

Tang was promoted to senior research scientist at Kodak in 1981, research associate in 1990, and senior research associate in 1998. In 2003, he was named Distinguished Fellow of the Kodak Research Laboratories. In 2006, he left Kodak and joined the University of Rochester as the Doris Johns Cherry Professor of Chemical Engineering. He is also a visiting member at the Institute for Advanced Study (IAS) of the Hong Kong University of Science and Technology (HKUST).

Tang has published more than 80 papers, including three influential papers on his OPV and OLED work, and has been awarded more than 70 U.S. patents.

Among the many honors bestowed on the man considered to be the father of OLED: Tang was elected Fellow of the American Physical Society in 1998, and Fellow of the U.S. National Academy of Engineering in 2006 for “the invention of the organic light-emitting device and organic bilayer solar cell, the bases of modern organic electronics.” In 2007, Tang shared the Daniel E. Noble Award from the IEEE, and in 2011, he shared the Wolf Prize in chemistry, an honor that many consider to be a stepping stone to a Nobel Prize.
It’s always a challenge for a son taking over a business from a successful entrepreneurial father – if you fail, you have not lived up to expectations; if you succeed, your predecessor gets the lion’s share of the credit. But when Jim Tweten took over Magnolia Hi-Fi from his father Len he took a 13-store local chain built over 50 years and, in five years, transformed it into a national high-end audio and video retailing giant with more than 350 locations, while pioneering the now common store-within-a-store retailing concept.

Tweten was born in 1951, in Seattle. When he was three, his father, Leonard, opened up Magnolia Stationery. Over the next dozen years, Len added cameras and, in 1967, hi-fi gear, creating Magnolia Hi-Fi.

While this switch to stereo gear was underway, Tweten attended the University of Washington, in Seattle. After a year as a ski instructor in Aspen, Colo., Tweten found himself broke and returned to Seattle in 1972 to work in the Magnolia warehouse, delivering and installing stereo systems and selling hi-fi gear.

The elder Tweten opened a second Roosevelt store in Seattle’s University district in 1972, establishing Magnolia’s street cred with music-loving college students. Len put Jim, with his first-hand insight into the developing music and electronics youth culture, in charge of this no-expenses-spared showcase.

Tweten immediately found his passion in working with people and “the sheer enjoyment of introducing new entertainment products to customers. It’s all about the demo and seeing people’s eyes light up on how cool the experience is.”

A few months later, Tweten was re-acquainted with a high school girlfriend, Ilsa Relle, whom he married six months later. Under the Tweten’s co-stewardship, Magnolia Hi-Fi grew to a peak of 16 locations throughout the Pacific Northwest, and became the most award-winning electronics entertainment retailer in the nation. Magnolia earned Audio/Video magazine’s “Retailer of the Year” award for 21 consecutive years, as well as TV Guide’s “Hall of Fame” award.

In 1992, the elder Tweten handed off active day-to-day operations to Jim, who became president and CEO. In 1996, Tweten consolidated Magnolia’s administration, warehouse and service departments in a 100,000-square-foot building he constructed in Kent, Wash.

Under Tweten, Magnolia was generating $100 million in sales a year by the end of 2000, and had several suitors offering to buy the company. The Twetens decided to sell Magnolia and its 13 free-standing stores to Best Buy for $87 million. Tweten was named president of the newly-named Magnolia Audio Video of Best Buy, and began to transform Magnolia into a more services-oriented retailer of premium home entertainment and custom design.

Tweten also wanted to leverage Best Buy’s ability to generate foot traffic at the chain’s vast number of locations. At the 58,000-square-foot Woodland Hills Best Buy, Tweten carved out 10,000 square feet and put up a dividing wall with a separate entrance to create side-by-side locations. Magnolia’s reputation combined with Best Buy’s traffic proved to be a successful hybrid.

Tweten arranged an afternoon store visit from Best Buy CEO Brad Anderson. The pair stood in the Best Buy parking lot and watched Best Buy customers walking out of Best Buy and into Magnolia. Tweten asked Anderson, “Why not just put our store inside Best Buy?”

Once vendor approval was procured, Tweten collaborated with Best Buy leaders to open 1,500-square-foot Magnolias inside two of Best Buy’s California stores, in downtown San Francisco and the South Coast Plaza mall in Costa Mesa. These in-store Magnolias featured specialized sales and vendor training, a richer customer experience, more home theater, custom design and installation revenue and profit, and new innovative brand introductions – with no impact on Best Buy’s existing home theater departments.

With these dual-location successes, Tweten and Best Buy quickly expanded the in-store concept. By 2004, there were 20 in-store Magnolia Home Theater Best Buy stores; by 2007, there were 340 – plus the 13 existing Magnolia AV locations. As of 2013, there are 380 Magnolia in-store locations and four free-standing Magnolias.

Best Buy furthered the in-store concept with in-store Magnolia Design Centers, Pacific Kitchen & Home and Geek Squad, as well as Apple, Samsung and Microsoft Windows in-store experiences.

Tweten retired in 2007, and splits his time between Seattle and California with his wife, Ilsa, his two children, Andrea and Jamie, and his granddaughter, Madison.
When Len Tweten added a few stereo components to his usual inventory of stationery supplies and cameras in his small neighborhood shop in Seattle, he noticed the uptick in interest from his customers, especially the younger ones. Feeding this interest in music technology, Tweten's tiny store soon morphed into Magnolia Hi-Fi, the prototype of all high-end AV stores to follow. Under the stewardship of his eldest son, Jim, Magnolia Hi-Fi became the most successful specialty audio/video stores in the country.

Tweten was born May 9, 1927, in Hamburg, N.D., to Len, a carpenter and the son of Norwegian immigrants, and Lillian. The family moved to Seattle when Len was a child, joining a vibrant Scandinavian community. After high school, Tweten served in the Navy during WWII in the Pacific theater, including a tour of duty at Okinawa. After the war, Len – already a married man with children – attended school on the GI Bill, graduating from the University of Washington with a degree in business administration.

Tweten went to work as an accountant for a construction company owned by Gene Conger, who saw promise in the young veteran. One day, Conger approached Tweten to tell him of a small, 500-square foot store available in Seattle's Magnolia district and suggested he open his own business. Under the stewardship of his eldest son, Jim, Magnolia Hi-Fi became the most successful specialty audio/video stores in the country.

In 1954, Tweten opened Magnolia Stationery. Tweten soon started adding cameras to the mix, changing the store's name to Magnolia Stationers and Camera Shop. In 1967, he decided to add new-fangled audio gear as an adjunct to the cameras.

Upon seeing the reaction of his young customers to the stereo equipment, Tweten made the decision to switch his store's sole focus to stereo equipment. Besides, he thought, music was more fun to deal with than film. He called his sister Anne Marie, and the two of them sold every greeting card in the store for a penny each, liquidating the camera stock as well. From then on, the store became Magnolia Hi-Fi.

What made Magnolia a destination was Tweten's interaction with the customers, young and old. “Can I show you something new?” became his well-known greeting as he listened to his customers’ stories and shared his own.

Tweten also became famous for his loyalty to his employees and his fanatical dedication to customer service. For instance, in the early 1970s, he invited Dr. Amar Bose for a supper meeting. When one of Magnolia's customers called with a problem with a low-end receiver, Tweten left Bose in the sound room to visit the customer's house and solve the problem. This individualized attention to service became a personal credo that would become the driving passion of Magnolia for the next five decades.

Tweten's switch to stereo proved to be great timing, coming at the dawn of the 1970's home stereo revolution. Early on, he had introduced not only Bose but also Bang & Olufsen and Nakamichi, when these brands were still largely unknown. Bob Carver came first to Tweten with the prototype of what would become the world's first super high-powered amplifier, the Phase Linear 700. Magnolia also was one of the first retailers to see Advent's Videobeam big screen front projection system.

Tweten also pioneered the “stereo system” concept – a receiver/turntable/speaker package that offered first rate sound at an affordable price.

Tweten opened a second Roosevelt store in Seattle's University district in 1972, appealing to the city's music-loving college students. Tweten put his 20-year-old son, Jim, with his first-hand insight into the developing music and electronics youth culture, in charge of this no-expenses-spared showcase.

When this second store proved even more successful than the first, the father-son duo expanded their retail footprint to a peak of 16 locations throughout the Pacific Northwest. To boost the store's image, the Twens were early advertisers in regional editions of Time, Newsweek and Sports Illustrated, and also the largest advertiser on the local classical FM station as well as on the core rock stations.

Magnolia Hi-Fi would go on to become the most award-winning electronic entertainment retailer in the nation, winning Audio/Video Magazine's “Retailer of the Year” award 21 consecutive years, as well as TV Guide's “Hall of Fame” award.

In 1992, the elder Tweten handed off active day-to-day operation to his son, Jim, who became president and CEO, and assumed an advisory role. Len Tweten now divides his time between his homes in Monterey, Calif., and Palm Desert, Calif., with his wife, Rebecca, and can often be seen driving his new Audi R8 and his Bentley Speed, or playing golf at Big Horn or the Madison Club in the California desert, and Tehama in Carmel, Calif.
Just as we grab a flashlight to scour through drawers or closets searching for an item we know is there somewhere, Steve Van Slyke grabbed a fluorescent light to scour through Kodak’s massive collection of organic chemicals searching for a material that would retain brightness for a lengthy period of time.

Van Slyke’s ultimately successful search, conducted with Kodak research partner Dr. Ching Tang, resulted in the invention of organic thin film electroluminescence/small-molecule organic light emitting diodes, technically called organic thin film electroluminescence, but better known today as OLED (Organic Light Emitting Diode): thin, bright and low-power displays now used in smartphones, digital cameras and next-generation HD and Ultra HDTVs.

Van Slyke was born in 1956, in Denver, Colo., to Anna and Dr. Barton Van Slyke, a radiologist. During his childhood, Van Slyke displayed a flair for science. He bounced between physics and chemistry in college, but was inspired to major in chemistry by one of his professors at Ithaca College, where Van Slyke spent summers researching solar energy storage. But Van Slyke retained an interest in electrical engineering, which would figure prominently in his later OLED work.

After receiving his B.S. in chemistry from Ithaca College, Van Slyke joined Eastman Kodak in 1979. He was hired by Dr. Ching Tang, who was working on photovoltaics – solar panels – and thin film electroluminescence. Tang had discovered that light was emitted by organic thin film photovoltaics when a light voltage was applied. Van Slyke’s job was to locate the right organic compounds that would sustain this voltage-enabled emitted light.

Van Slyke and Tang struggled for several years to maintain this light for more than half an hour, studying many classes of fluorescent materials when Van Slyke started his organic materials search. Once he had a list of candidate materials, Van Slyke examined the chemical structures of each – first on index cards and later on a rudimentary computer system – to determine which materials were of the appropriate molecular weight so they could be heated and evaporated in a vacuum coater to coat a substrate with a thin film. While working for Tang, Van Slyke earned his master’s degree in materials science from Rochester Institute of Technology (RIT).

One of these compounds was an organometallic compound called “metal chelate.” After purification, the chelate was incorporated into an OLED device that operated overnight. When Tang and Van Slyke arrived the next morning, they stared at the still glowing device with wonder – it retained nearly the same brightness in the morning as it had the previous evening.

This search and discovery of the metal chelate compound created a substantial jump in OLED operational lifetime, from minutes to years. A derivative of this compound – AlQ – is still used widely in OLED device research, and OLED operational time is estimated at nearly a million hours.

Over the following decade, Van Slyke and Tang refined the “metal chelate” and developed processes that finally resulted in the fabrication of demonstration devices emitting red, green and blue colors, as well as a stable fabrication process.

Van Slyke and Tang’s breakthroughs resulted in their development of self-illuminating OLEDs that convert electrical energy into light via a stack of thin organic layers sandwiched between a transparent anode and a metallic diode.

In the late 1990s, Kodak and Sanyo formed a joint venture to manufacture full-color active matrix OLED displays. Van Slyke led the technology transfer, which resulted in the first full-color OLED display to be incorporated into a commercial product. In March 2003, Kodak announced its 3.1 MP Kodak EasyShare LS633 digital camera, equipped with a “NuVue” 2.2-inch active matrix OLED screen, or AMOLED, a subset of OLED. This first OLED-equipped gadget paved the way for others, especially from Samsung, which now sells more than 300 million AMOLED displays for smartphones each year.

Van Slyke has published and presented more than 40 papers on OLED and holds 36 patents in the areas of OLED materials and device architecture.

In 2000, Van Slyke and Tang received the Eastman Innovation Award; the following year, Van Slyke and Tang received an Industrial Innovation Award from the American Chemical Society (ACS) for their work with OLEDs, as well as the Jan Rajchman Prize of the Society for Information Display (SID). In 2004, he was a co-recipient with Ching Tang of the ACS Award for Team Innovation, and was named an Eastman Kodak Research Fellow and Fellow of the SID.

After 31 years at Kodak, Van Slyke was named CTO and director of process development for Kateeva, a Silicon Valley startup providing ink-jet printing equipment to the OLED industry. Van Slyke, an avid bicycle rider resides in San Mateo, Calif., with his wife Sharon.
No matter what Meg Whitman accomplishes in business or in politics, her reputation was most firmly established during the decade in which she grew eBay from 30 employees with 500,000 subscribers and annual revenues of $4 million to more than 15,000 employees with hundreds of millions of subscribers and $8 billion in annual revenue. In just a few years, she transformed a living room hobby into one of the most iconic businesses in the world.

Meg Whitman was born Aug. 4, 1956, on Long Island, N.Y. After graduating from Princeton University and then Harvard Business School, she began her business career as a brand manager at Proctor & Gamble in Cincinnati in 1979, then moved to San Francisco to work as a consultant for Bain & Company, eventually rising to senior vice president. In 1989, Whitman was named vice president of strategic planning at the Walt Disney Company, moved to Stride Rite two years later, and then was hired as president and CEO of FTD in 1995. Two years later, she was named the general manager of Hasbro’s Playskool division, responsible for global management and marketing.

When Whitman joined eBay after being recruited by founder Pierre Omidyar, the site still had a simple black-and-white presentation with a plain typewriter font. On her first day, the site crashed for eight hours. Finding the navigation confusing, Whitman started rebuilding eBay’s organization inside and out. She hired managers to run each of the new 23 business categories, which encompassed 35,000 sub-categories. She built out a management team, hiring executives from Fortune 500 companies who averaged 20 years of experience.

She also rebuilt eBay’s brand by shifting the company’s image from quirky collectibles to new and more upscale goods from major labels with higher selling prices, boosting eBay’s bottom line.

Recognizing the importance of heeding the wisdom of eBay sellers, Whitman launched a series of customer-based initiatives. In 1999, for instance, Whitman started a “Voice of the Customer” program. Every few months, the company flew a dozen loyal customers to eBay’s company headquarters, where they met with Whitman and other eBay executives to discuss what was working and wasn’t, and to produce new ideas. After returning home, these buyers and sellers kept in touch via regularly scheduled conference calls. Whitman also launched eBay University, a traveling show designed to teach consumers how to use the site. In 2002, eBay hosted the first eBay Live! event, which is now an annual customer convention. At eBay Live! in June 2005, she announced ProStores, a Web hosting and e-commerce solution aimed at eBay Store owners, who received a 30 percent discount.

The changes accelerated eBay’s already startling growth. Six months after joining the company, she oversaw eBay’s public offering. After surviving a 22-hour outage in June 1999 that generated international headlines and prompted apology phone calls from Whitman to top sellers, eBay’s profits tripled between 2001 and 2002. By 2002, Whitman had grown eBay’s subscriber base 10 fold and its annual revenues nearly 20-fold.

In 2002, it was clear eBay users wanted to make online payments via PayPal, so Whitman engineered the purchase of the online payment site. She also expanded eBay by buying innovative e-commerce entities such as Shopping.com, StubHub and Bill Me Later. In September of 2005, eBay bought video chat company Skype for $4.1 billion. After Whitman left eBay, Skype was sold to Microsoft for $8.5 billion.

During her tenure, the company moved its headquarters to a complex in San Jose; the buildings are named for eBay categories – Collectibles, Jewelry, Motors, Music, Sports, Technology and Toys. Today, roughly 1.5 million people make a full-time living from eBay.

Whitman resigned from eBay in November 2007, but stayed on the board and served as an advisor to the new CEO, John Donahue, until late 2008. Explaining her decision to step down, Whitman explained in an interview that “10 years is roughly the right time to stay at the helm at a company like ours. It’s time for new leadership, a new perspective and a new vision.”

That same year, Whitman was elected to the U.S. Business Hall of Fame. She also has been named one of the top five most powerful women by Fortune magazine; Time magazine included her in their annual list of Most Influential People in 2004 and 2005; the Harvard Business Review named her the eighth best-performing CEO of the decade in 2010; and the Financial Times listed her as one of the “50 faces who shaped the decade.”

Whitman ran unsuccessfully for governor of California in 2010, and was named CEO of Hewlett-Packard in November 2011.
The CE Hall of Fame program recognizes the leaders in the consumer electronics industry who imagine, create and market the products and technologies that continue to shape the world. To see the latest innovations, come to the 2014 International CES, January 7-10, the world’s gathering place for all who thrive on the business of consumer technologies.

CES has served as the proving ground for innovators and breakthrough advances for more than 40 years—the global stage where next-generation innovations are introduced to the marketplace. As the largest hands-on event of its kind, CES features all aspects of the industry. Check out the time-line below to see some of these significant milestones in the last few years.

2013
- First 4K Ultra High-Definition TVs go on sale.
- Microsoft Xbox One released.
- Sony PlayStation 4 released.
- Wi-Fi Certified Passpoint (Hotspot 2.0) hotspots rollout.
- First smartphones with quad core processors and 13 MP cameras go on sale.
- HP sells webOS to LG.
- BlackBerry eliminates “RIM” (Research in Motion) corporate name; Z10 smartphone running new BB10 operating system goes on sale.
- OLED HDTVs go on sale.
- Largest CES – 153,000 attendees and 3,100 exhibits.
- FCC agrees to expand unlicensed 5 GHz band for Wi-Fi deployment.
- T-Mobile and MetroPC merge.
- First devices compatible with HEVC (High Efficiency Video Coding), aka H.265 video compression format, released.
- First Class 1 Bluetooth headset goes on sale.
- Pre-paid cellular companies begin to sell 4G LTE smartphones.
- Next-generation Secure Memory (NSM) SD card format announced.
- Sony announces first 4K content streaming service.

2012
- Global spending on technology devices worldwide surpasses $1 trillion.
- Digital music downloads surpass CD sales for first time.
- First short-throw laser and pico projectors announced.
- Smartphone ownership surpasses 50 percent of all mobile subscribers.
- First digital camera to run on Android operating system, the Samsung Galaxy Camera, goes on sale.
- U.S. factory sales of consumer electronics exceed $200 million annually; worldwide sales top $1 billion.
- First five-plus inch smartphones with HD resolution go on sale.
- Windows 8 PC and tablets, Windows Phone 8 smartphones and tablets go on sale.
- Kodak files for Chapter 11 bankruptcy, ends camera and printer sales.
- First Wi-Fi-equipped camcorders available.
- IPv6 Internet protocol launches, expands available IP addresses to nearly infinity.
- Google unveils “Project Glasses,” Internet-connected eyewear.
- Barnes & Noble announces first front-lit E-ink ebook reader.
- AT&T inaugurates 4G LTE network.
- Nintendo Wii U tablet-controlled videogame console goes on sale.
- First smartphone with built-in Qi wireless charging, Nokia 920, goes on sale.
- First HDTV with a built-in Web cam goes on sale.
- First “premium compact” point-and-shoot digital cameras go on sale.
- CEA study finds more than half of online U.S. adults watch some streaming or downloaded video at home.
- Sprint launches 4G LTE networks.
- AT&T and T-Mobile end merger deal.
- Wi-Fi 802.11ac standard, offering wireless speeds of 1.3 Gbps, announced.
- Sony PlayStation Vita portable game player goes on sale.
- Nintendo tablet-controlled Wii U video game console goes on sale.
- Sony purchases Sony Ericsson and re-enters cell phone market.
- FCC approves “super Wi-Fi.”
- Apple launches, iPhone 5, iPad mini tablet with Lightning connecting jack.
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- Wi-Fi 802.11ac standard, offering wireless speeds of 1.3 Gbps, announced.
- Sony PlayStation Vita portable game player goes on sale.
• First contextual ecommerce capability, allowing consumers to buy from TV EPG, announced.
• First Mobile DTV laptop dongle antennas go on sale.
• Motorola splits into two companies; cell phone business sold to Google.
• Glasses-free 3D HDTVs demonstrated.
• First universal active shutter 3D glasses available.
• Cisco announces that it will end sales of Flip pocket camcorder.
• First dual-core processor smartphone, Motorola’s Atrix, goes on sale.
• Retailer Ultimate Electronics goes out of business.
• First dual-screen smartphone announced.
• Verizon and Panasonic demonstrate 3D HD streaming.
• Nintendo 3DS, the first glasses-free 3D portable gaming device, goes on sale.
• First LTE 4G cell phones available.
• Guinness World Records names Microsoft Kinect the fastest-selling consumer electronics device ever.

2010
• Smartphones pass PCs in sales.
• CES opens doors to consumers
• Sharp develops 3D camera for mobile phones.
• Skype HDTV-based video telephony introduced.
• 4G LTE wireless broadband networks rolled out in more than two dozen markets.
• Apple iPad goes on sale.
• HDMI specification v1.4 adopted and first v1.4-enabled devices go on sale.
• 2K and 4K “ultra” HDTVs demonstrated.
• First USB 3.0 products go on sale.
• Google connected TV STB announced.
• Gesture-based gaming systems from Microsoft and Sony, Kinect and Move, go on sale.
• Wireless power transmission successfully demonstrated.
• First color dedicated e-readers go on sale.
• 3D upgrade for legacy HDMI v1.3 devices is announced.
• First 3D HDTVs, 3D Blu-ray players and 3D Blu-ray movies go on sale; first stereoscopic 3D programs broadcast.
• TerreStar initiates consumer satellite cellular smartphone service.
• HP buys Palm.
• Microsoft releases “Kinect” motion-control accessory.
• First “passive” 3D HDTVs go on sale
• High-speed CompactFlash card standard specification announced.
• Cisco debuts UMI home video conferencing.
• Sony unveils first interchangeable lens camcorder.
• West Coast CE retailer Ken Crane’s closes.
• First HSPA+ 4G cell phone announced.
• First 3D digital cameras available.
• First cell phones with built-in mobile Wi-Fi hot spot capability available.
• Flash memory becomes predominant camcorder storage medium.
• Sonic purchases DivX.
• First smartphones running Microsoft’s Windows Phone 7 OS go on sale.
• Mobile DTV broadcasting begins.
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  - Las Vegas, NV

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  - March 18-21, 2014
  - Four Seasons Resort
  - Vail, CO

- **CES on the Hill**
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  - Washington, DC

- **Digital Patriots Dinner**
  - Spring 2014
  - Washington, DC

- **Technology & Standards Spring Forum**
  - May 19-26, 2014
  - Seattle, WA

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  - June 25-26, 2014

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