2024 Inductees

James Allison

Immune Checkpoint Blockade Therapy
U.S. Patent No. 5,811,097
Blockade of T lymphocyte down-regulation associated with CTLA-4 signaling

Inducted in 2024

Photo courtesy of MD Anderson Cancer Center

Inductee Bio:

James Allison invented immune checkpoint blockade therapy. His pioneering work brought immunotherapy into mainstream medicine as an effective treatment for cancer.

Allison was born in Alice, Texas, in 1948. At The University of Texas at Austin, he earned a bachelor's degree in microbiology in 1969 and a doctorate in biological sciences in 1973. He completed his postdoctoral research in the department of immunology at Scripps Clinic and Research Foundation.

Having lost his mother and two uncles to cancer, the possibility of developing better cancer treatments had been in the back of Allison's mind since his youth. In the field of cancer immunotherapy, researchers had primarily focused on how to activate T cells, which attack invading cells like bacteria and viruses. Allison was interested in understanding T cell biology, and in the late 1970s and early 1980s, while at The University of Texas MD Anderson Cancer Center, he contributed to advances in identifying the T cell receptor (TCR) and cloning TCR genes.

In 1985, Allison joined the University of California, Berkeley, where he became director of the Department of Cancer Research Laboratory. He moved to the Memorial Sloan-Kettering Cancer Center in New York City in 2004, where he helped found and served as director of the Ludwig Center for Cancer Immunotherapy until 2012. His work showed that CTLA-4, a protein on the surface of T cells, works as a "brake," or an immune system checkpoint that helps prevent overreaction in immune responses. To help T cells effectively attack cancer cells, he developed an antibody to block the braking capability of CTLA-4 and applied his findings to develop ipilimumab — the first in a class of drugs known as checkpoint inhibitors. In 2011, ipilimumab was approved by the Food and Drug Administration to treat late-stage melanoma. Released commercially as Yervoy®, it has produced unprecedented results.

In 2018, Allison was awarded the Nobel Prize in Physiology or Medicine. He holds 12 U.S. patents and serves as director of the James P. Allison Institute at MD Anderson in Houston.

Short Description:

James Allison invented immune checkpoint blockade therapy. His pioneering work in the field of immunology brought immunotherapy into mainstream medicine as an effective treatment for cancer.

Shankar Balasubramanian

Sequencing-by-Synthesis (SBS)
U.S. Patent No. 6,787,308
Arrayed biomolecules and their use in sequencing

Inducted in 2024

Photo courtesy of Nathan Pitts, © University of Cambridge

Inductee Bio:

Shankar Balasubramanian and David Klenerman co-invented Sequencing-by-Synthesis (SBS), a Next Generation DNA Sequencing (NGS) method that made possible efficient, low-cost and large-scale genome sequencing. Their work has enhanced our understanding of life, and enabled applications in genomics, medicine and biology.

Balasubramanian was born in Madras, India, in 1966, and his family moved to the U.K. in 1967. He studied at the University of Cambridge, where he earned his bachelor's degree in natural sciences in 1988 and doctorate in enzyme chemistry in 1991. He came to the U.S. to complete his postdoctoral research at Penn State University before returning to Cambridge to begin his research career in 1994.

While at Cambridge, Balasubramanian began collaborating with fellow National Inventors Hall of Fame® Inductee Klenerman to build an instrument that could be used to watch DNA being synthesized by an enzyme, using fluorescence detection. In 1995, they gained funding and recruited postdoctoral researchers to join them. As they explored, they began to see a way to sequence DNA with a transformative new method. By fragmenting DNA, decoding each fragment, color coding them with fluorescent nucleotides added by an enzyme, and then repeating this cycle many times, scientists could determine the DNA sequence of every fragment.

In 1998, Balasubramanian and Klenerman founded Solexa to develop and commercialize their technology. Solexa was acquired by Illumina in 2007, and SBS is now deployed in labs across the world. It has been applied to identify disease genes, advance our understanding of cancers, perform noninvasive prenatal testing and further COVID-19 research. While in 2000 sequencing a single genome cost over $1 billion and took more than 10 years, now it costs $200 and takes just one day. Thanks to SBS, more than 1 million human genomes are sequenced each year.

Balasubramanian, who holds 23 U.S. patents, serves as professor of medicinal chemistry at the University of Cambridge and research leader at the Cancer Research UK Cambridge Institute. He was knighted for his contributions to science and medicine in 2017, and his many awards include the 2022 Breakthrough Prize in Life Sciences.

Short Description:

Shankar Balasubramanian and David Klenerman co-invented Sequencing-by-Synthesis (SBS), a Next Generation DNA Sequencing (NGS) method that made possible efficient, low-cost and large-scale genome sequencing. Enhancing our understanding of life, SBS has enabled applications in genomics, medicine and biology.

David Klenerman

Sequencing-by-Synthesis (SBS)
U.S. Patent No. 7,297,486
Production of molecular arrays

Inducted in 2024

Photo courtesy of Nathan Pitts, © University of Cambridge

Inductee Bio:

David Klenerman and Shankar Balasubramanian co-invented Sequencing-by-Synthesis (SBS). This Next Generation DNA Sequencing (NGS) method made possible efficient, low-cost and large-scale genome sequencing, and enabled significant advances in genomics, medicine and biology.

Klenerman was born in 1959 and grew up in London. A lifelong affinity for science led him to study chemistry at the University of Cambridge, where he earned his bachelor's degree in 1982 and his doctorate in 1986. He then completed his postdoctoral research at Stanford University in 1987. That same year, Klenerman then returned to the U.K. and took a position with BP Research, where he focused on applying state-of-the-art laser spectroscopy to oil industry problems.

In 1995, he joined the University of Cambridge, where he continues today as a professor of biophysical chemistry. Here, he met fellow National Inventors Hall of Fame® Inductee Balasubramanian. The two chemists wrote a grant with plans to study single molecules and DNA polymerase, the enzyme that inserts nucleotides into DNA. Together with a team of postdoctoral researchers, they developed a transformative method. It involved fragmenting DNA into many small pieces that are immobilized on the surface of a chip, decoding each fragment and color coding them with fluorescent nucleotides. As scientists detected the color-coded nucleotides and repeated this cycle hundreds of times, they could determine the DNA sequence of every fragment.

To advance SBS, in 1998, Klenerman and Balasubramanian founded Solexa, which was acquired by Illumina in 2007. SBS is now used in labs worldwide and has been applied across applications from identifying disease genes and performing noninvasive prenatal testing to furthering COVID-19 research and advancing our understanding of cancers. While in 2000 sequencing a single genome cost over $1 billion and took more than 10 years, now it costs $200 and takes just one day.

Klenerman was knighted in 2019 for his service to science and for the development of high-speed DNA sequencing. He holds nine U.S. patents and his many awards include the 2022 Breakthrough Prize in Life Sciences.

Short Description:

David Klenerman and Shankar Balasubramanian co-invented Sequencing-by-Synthesis (SBS). This Next Generation DNA Sequencing (NGS) method made possible efficient, low-cost and large-scale genome sequencing, and enabled significant advances in genomics, medicine and biology.

Eric Betzig

Photoactivated Localization Microscopy (PALM)
U.S. Patent No. 7,535,012
Optical microscopy with phototransformable optical labels

Inducted in 2024

Photo courtesy of National Inventors Hall of Fame

Inductee Bio:

Eric Betzig and Harald Hess co-invented a super-resolution imaging technology called photoactivated localization microscopy (PALM), which allows biologists to look inside cells with unprecedented resolution. Through imaging at the nanoscale, biological structures, processes and diseases can be studied with greater clarity.

Betzig was born in Ann Arbor, Michigan, in 1960. He earned his bachelor's degree in physics at the California Institute of Technology in 1983, and his master's degree and doctorate in applied physics from Cornell University in 1985 and 1988, respectively. He then began working for Bell Labs in 1988.

It was at Bell Labs that Betzig began collaborating with his friend and fellow National Inventors Hall of Fame® Inductee Hess. A pivotal experiment using Betzig's near-field super-resolution probe in Hess' cryogenic scanned-probe microscope suggested a pathway to even higher resolution by distinguishing multiple light emitters in one illuminated spot by their different colors. As he met challenges in pursuing his goals, Betzig left Bell Labs in 1994 and joined Ann Arbor Machine Co., where he served as vice president of research and development until 2002.

In 2005, Betzig and Hess revived their collaboration. Investing $25,000 each and relying on newly developed fluorescent molecules that could be turned on at will, they built a prototype microscope in Hess' living room using the same principle as their earlier experiment, except using the different times at which the molecules are turned on rather than their colors to discriminate them. Their microscope made it possible for scientists to image protein molecules inside even living cells at tenfold higher resolution than previously possible, representing a monumental achievement in super resolution microscopy for life sciences.

In 2014, in recognition of his foundational work in making single molecule localization microscopy conceivable, Betzig shared the 2014 Nobel Prize in Chemistry with William E. Moerner and Stefan Hell for "super-resolved fluorescence microscopy."

Betzig, who holds 42 U.S. patents, currently serves as a professor of molecular and cell biology and experimental physics and Howard Hughes Medical Institute investigator at the University of California, Berkeley. He is also a co-founder and scientific adviser of Eikon Therapeutics.

Short Description:

Eric Betzig and Harald Hess co-invented a super-resolution imaging technology called photoactivated localization microscopy (PALM), enabling scientists to distinguish individual molecules, and study biological structures and processes with unprecedented resolution.

Harald Hess

Photoactivated Localization Microscopy (PALM)
U.S. Patent No. 7,535,012
Optical microscopy with phototransformable optical labels

Inducted in 2024

Photo courtesy of Harald Hess

Inductee Bio:

Harald Hess and Eric Betzig co-invented photoactivated localization microscopy (PALM), a super-resolution imaging technology that enables imaging at the nanoscale, and allows scientists to study biological structures, processes and diseases with greater clarity.

Hess grew up in Pana, Illinois, in the 1960s. He earned his bachelor's degree in physics from the University of Chicago, followed by a doctorate in physics from Princeton University in 1982. He completed his postdoctoral research at the Massachusetts Institute of Technology.

While working at Bell Labs in the late 1980s, Hess began collaborating with his friend and fellow National Inventors Hall of Fame® Inductee Betzig. The pair was interested in the potential of scanned probe microscopies with Hess focusing on low temperature imaging of magnetic field lines, vortex states and individual electrons, while Betzig focused on optical imaging of individual molecules. They combined their expertise to image individual luminescent centers of a semiconductor, an experiment that hinted at a new microscope concept.

In 1998, Hess immersed himself in the nanoscale challenges of the hard disk drive and semiconductor equipment industry. In 2005, he and Betzig decided to explore new research options together. On learning of new blinking fluorescent molecules, they quickly realized its implication for a much higher resolution microscope. They each invested $25,000 and got to work in Hess' living room in September 2005. In just two months, they hand-built a prototype. Approximately the size of a soda can, the prototype used fluorescent proteins to differentiate individual molecules, surpassing the contemporary limitations of resolution in optical microscopy.

In 2005, Hess and Betzig's microscope was used successfully for the first time, representing a foundational achievement in super resolution microscopy for life sciences. In 2007, the co-inventors signed a license agreement with Zeiss to commercialize PALM technology.

Hess holds 31 U.S. patents and his honors include the 2023 James Prize in Science and Technology Integration, awarded by the National Academy of Sciences. He currently serves as senior group leader at the Janelia Research Campus of the Howard Hughes Medical Institute.

Short Description:

Harald Hess and Eric Betzig co-invented photoactivated localization microscopy (PALM), a super-resolution imaging technology that enables imaging at the nanoscale, and allows scientists to study biological structures, processes and diseases with greater clarity.

Andrea Goldsmith

Adaptive Beamforming for Multi-Antenna Wi-Fi
U.S. Patent No. 8,064,835
Antenna assignment system and method

Inducted in 2024

Photo courtesy of David Kelly Crow for Princeton University

Inductee Bio:

Andrea Goldsmith created technical innovations including adaptive beamforming for multi-antenna Wi-Fi. Her work has shaped the performance of wireless networking and enabled fast, reliable wireless service around the world.

Born in 1964, Goldsmith grew up in Los Angeles. As a teenager, she traveled through Europe and enrolled in junior college courses before becoming a graduate of the University of California, Berkeley. She earned her bachelor's degree in engineering mathematics in 1986, and her master's degree and doctorate in electrical engineering in 1991 and 1994, respectively. During her undergraduate studies, she became interested in the creative application of math and science to solve problems and develop impactful technologies. Her motivation to attend graduate school was prompted by her work for a defense communications startup focusing on wireless communication, long before the cellular and Wi-Fi revolutions came about.

Goldsmith joined the electrical engineering faculty at Stanford University in 1999. Among the most prolific researchers in wireless communications, she discovered adaptive modulation techniques that allow network designers to align the speed at which data is sent with the speed a channel can support while network conditions and channel quality fluctuate. Her innovations have reduced network disruptions, provided the foundation for Internet of Things applications, and enabled the fast Wi-Fi people now rely on for working, shopping, communication and entertainment.

In 2005, Goldsmith co-founded Quantenna Communications Inc. to enable video distribution through the home over Wi-Fi. In 2010, she co-founded Plume Design. Through both her groundbreaking research and her entrepreneurial efforts, Goldsmith has influenced virtually all cellular and Wi-Fi networks worldwide.

Among her many honors, Goldsmith was awarded the 2020 Marconi Prize for her "pioneering contributions to the theory and practice of adaptive wireless communications." Goldsmith also founded and chaired the IEEE Board of Directors Committee on Diversity and Inclusion to radically improve diversity and inclusion in engineering, a cause she has furthered throughout her career. In addition, as chair of the selection committee for the IEEE Alexander Graham Bell Medal, she led efforts to increase nominations of women and candidates from geographically underrepresented areas for all IEEE Awards.

Goldsmith holds 38 U.S. patents and has been the dean of engineering and applied science at Princeton University since 2020. She remains committed to applying technology to benefit humanity.

Short Description:

Andrea Goldsmith created technical innovations including adaptive beamforming for multi-antenna Wi-Fi, which have shaped the performance of wireless networking and enabled fast, reliable wireless service around the world.

Asad Madni

MEMS Gyroscope for Aerospace and Automotive Safety
U.S. Patent No. 7,360,422
Silicon inertial sensors formed using MEMS

Inducted in 2024

Photo courtesy of UCLA

Inductee Bio:

Asad Madni led the development and commercialization of the MEMS gyroscope for aerospace and automotive safety. Commercialized as the GyroChip and first applied in the aerospace and defense industries, the technology has saved lives around the world through its use in aircraft and passenger vehicles.

Born in 1947 in Mumbai, India, Madni studied electrical engineering at the University of California, Los Angeles (UCLA), where he earned his bachelor's degree in 1969 and his master's degree in 1972. He earned his doctorate from California Coast University in 1987 followed by the Senior Executive Program postgraduate credential from the Massachusetts Institute of Technology Sloan School of Management in 1990.

Madni joined Systron Donner Corp. as an engineer in 1975 and was chairman, president and CEO when BEI Technologies Inc. acquired the major assets of the company in 1990. From 1992 to 2006, he served as president, COO and chief technology officer of BEI, making high-precision, intelligent sensors and systems for aerospace, defense, industrial and transportation applications. One particularly significant application of Madni's work was an extremely slow-motion, dual-axis, servo control system for NASA's Hubble Space Telescope's star selector. It is still used today to ensure accuracy and stability for images that further our understanding of the universe.

Madni's MEMS (Micro-Electro-Mechanical Systems) GyroChip continued its development at BEI. This inexpensive technology, which can detect and measure the angular motion of an object, was introduced in the 1990s and is now used worldwide to enable guidance, navigation and control in many types of aircraft and passenger vehicles. Over 55 million GyroChip sensors have been used in cars, saving lives by enhancing electronic stability control and preventing rollover accidents.

After leading the sale of BEI to Schneider Electric in 2005, he established his consulting business in 2006. In 2011, Madni returned to UCLA to guide doctoral and postdoctoral research as a distinguished adjunct professor and distinguished scientist. Passionate about art since his childhood, Madni regards solving engineering challenges as a form of artistic expression, and as a mentor, he continues to share this creative approach with the next generation. Madni holds 28 U.S. patents and his many honors include the 2022 IEEE Medal of Honor, the 2022 Royal Academy of Engineering Prince Philip Medal and the 2023 John Fritz Medal.

Short Description:

Asad Madni led the development and commercialization of the MEMS gyroscope for aerospace and automotive safety. Commercialized as the GyroChip and first applied in the aerospace and defense industries, the technology has saved lives around the world through its use in aircraft and passenger vehicles.

Lanny Smoot

Theatrical Technologies and Special Effects
U.S. Patent No. 7,273,280
Interactive projection system and method

Inducted in 2024

Photo courtesy of Kathy Schuh Photography

Inductee Bio:

At The Walt Disney Company, Lanny Smoot has developed interactive attractions, special effects, new concepts for ride vehicles, and other technological advancements for Disney's theme parks, attractions, resort hotels and cruise ships, creating magical guest experiences and driving innovation.

Born in 1955, Smoot grew up in Brooklyn, New York. At Brooklyn Technical High School, he was selected as a Bell Labs Engineering Scholar, earning a full scholarship to Columbia University. Upon earning his bachelor's and master's degrees in electrical engineering, he began his career with Bell Labs in 1978. Here, Smoot invented some of the first fiber-optic transmission technologies to be widely used in the Bell Telephone system. Later, he moved to Bellcore and became the company's patent leader and a Bellcore Fellow. One of his many inventions at Bellcore was the "Electronic Panning Camera" prototype, which allowed unlimited users to control their individual views of a remotely televised site.

In 1998, Smoot was approached by Disney representatives who were interested in this camera, and he accepted their offer to manage the company's research arm. Smoot has since become Disney's most prolific inventor, developing technologies that allow the company, and the theatrical community at large, to create cutting-edge experiences, illusions and entertainment.

Among Smoot's many Disney innovations is the "Where's the Fire?" attraction, which was at EPCOT from 2004 through 2014. By aiming "X-ray flashlights" at the walls of life-sized model rooms, guests saw surfaces "melt" away to reveal safety hazards, learning how to make their own homes safer. Smoot also helped develop technologies for interactive scavenger hunts at Disney Parks, and for Disney Cruise Line, he helped create interactive floor surfaces that respond to children's movements. Smoot and his team also patented a realistic, extendable and retractable lightsaber and created an interactive lightsaber experience that enabled guests to battle a training droid and deflect laser blasts like those seen in "Star Wars" movies.

The recipient of three Thea Awards from the Themed Entertainment Association (TEA), Smoot was named a TEA Master in 2020. He is a Disney Research Fellow, the highest technical honor at the company, and in 2021, he earned his 100th career patent — a first for anyone at Disney.

Short Description:

Disney Imagineer Lanny Smoot is the patent leader, with over 100 patents, at The Walt Disney Company. He has developed many special effects, interactive experiences, new ride vehicle and robotic concepts, and other technological advancements for Disney's theme parks, attractions, resorts hotels and cruise ships, creating magical guest experiences and driving innovation for future attractions.

Xiaowei Zhuang

Stochastic Optical Reconstruction Microscopy (STORM)
U.S. Patent No. 7,776,613
Sub-diffraction image resolution and other imaging techniques

Inducted in 2024

Photo courtesy of Harvard University

Inductee Bio:

Xiaowei Zhuang introduced one of the most widely used methods of super-resolution imaging — stochastic optical reconstruction microscopy, or STORM. This technique, which overcomes the diffraction limit of light microscopy to produce images with higher resolution, is used to investigate biological systems and processes.

Zhuang was born in Rugao, Jiangsu, China, in 1972. She earned her bachelor's degree in physics from the University of Science and Technology of China in 1991, followed by her doctorate from the University of California, Berkeley, in 1996. She completed a Chodorow Postdoctoral Fellowship at Stanford University in 2001.

Zhuang has been with Harvard University since 2001, and is currently the David B. Arnold Professor of Science, as well as an investigator of the Howard Hughes Medical Institute since 2005. In 2006, Zhuang's team became one of the first to successfully overcome the diffraction limit of light microscopy, which had prevented researchers from using light to differentiate between objects separated by 200 nanometers or less. STORM allows researchers to look inside cells and see how molecules interact and function, producing ultra-high-resolution images of structures 10,000 times smaller than the width of a human hair.

With STORM, Zhuang's team discovered novel cellular structures, such as a periodic membrane skeleton in neurons that consists of rings of a protein called actin, evenly spaced and connected by another protein called spectrin. In 2009, STORM was licensed to Nikon Corp., which introduced its N-STORM microscope in 2010.

In 2015, Zhuang published a new genome-scale imaging method. Multiplexed error-robust fluorescence in situ hybridization, or MERFISH, allows scientists to measure and map RNAs of thousands of genes in individual cells, identify unknown types of cells, and determine spatial organizations of different types of cells in complex biological tissues, such as the brain. MERFISH is a key technology for the Human Cell Atlas initiative, a global effort to identify all cell types in the human body and map their spatial organization to better understand biology and disease. Zhuang co-founded Vizgen Inc. in 2019 to commercialize this technology, making it broadly accessible to advance life sciences and medicine. Zhuang holds 14 U.S. patents, and her many honors include the 2019 Breakthrough Prize in Life Sciences, the 2020 Vilcek Prize in Biomedical Science and the 2023 Dreyfus Prize in Chemical Sciences.

Short Description:

Xiaowei Zhuang introduced one of the most widely used methods of super-resolution imaging — stochastic optical reconstruction microscopy, or STORM. This technique, which overcomes the diffraction limit of light microscopy to produce images with higher resolution, is used to investigate biological systems and processes.

Joseph-Armand Bombardier

Snowmobile
U.S. Patent No. 3,023,824
Endless track vehicle

Inducted in 2024

Photo courtesy of Museum of Ingenuity J. Armand Bombardier Collections

Inductee Bio:

Joseph-Armand Bombardier invented the Ski-Doo® snowmobile, the first mass-produced snow machine, and launched snowmobiling as a sport and recreational activity. Born in 1907 in Valcourt, Quebec, Canada, Bombardier understood the challenges of living in rural villages where snow made unplowed roads impassable. In 1926, he opened his own machine shop in Valcourt, and over the next decade he spent his spare time developing various motorized vehicles to travel on snow.

A vehicle needed to be light enough to travel over snow and its changing consistency. At the time, only heavy motors existed on the market. Bombardier put the motor in the back of the vehicle and redistributed the weight over a track-and-wheel system. A pair of front-mounted skis directed the vehicle. For propulsion he added a rubber-covered sprocket to pull the track. This allowed his big vehicles to “float” over snow.

In 1937, he obtained his first patent, in Canada, for this sprocket wheel/track system and concentrated all his time on building snow vehicles. That year, he introduced the B7 model, which carried seven passengers in an enclosed compartment. He later made the 12-passenger B12 snowmobile, and the C18 with a capacity of 18 adults or 25 children. These vehicles had many uses, such as delivering mail and goods and operating as school buses. Bombardier incorporated his business in 1942 as L'Auto-Neige Bombardier Limitée. The company sold several hundred vehicles a year until the late 1940s, when the Quebec government began plowing rural roads and the demand for large snow vehicles declined significantly. The company adapted by producing tracked vehicles for farming, mining, logging and forestry, and petroleum exploration operations.

In 1957, Bombardier intensified his research for a small, economical and multi-purpose snow vehicle. Bombardier and his staff used a lightweight engine and their own designs for other mechanical components as they introduced the first rider-over-tunnel design, where the rider straddled an elongated seat and steered a pair of front-mounted skis. When Bombardier brought a working prototype to an Ontario missionary outpost in 1959, the first lightweight, maneuverable vehicle was so popular, he was inspired to pursue the idea of using snowmobiles for recreation as well as for work. Bombardier’s small, affordable vehicle, originally called the Ski-Dog, went into production as the Ski-Doo snowmobile in 1959, and its rider-over-tunnel design became the industry standard.

Bombardier Inc., the successor to L'Auto-Neige Bombardier Limitée, diversified after Bombardier’s death and is a global leader in aviation, focused on designing, manufacturing and servicing business jets. Bombardier’s legacy is celebrated in his hometown of Valcourt at the Musée de l’ingéniosité J. Armand Bombardier, through the Fondation J. Armand Bombardier philanthropic activities and the headquarters of BRP (Bombardier Recreational Products), which became an independent company in 2003 and is a worldwide leader in recreational vehicles. Joseph-Armand Bombardier held 16 U.S. patents.

Short Description:

Joseph-Armand Bombardier invented the Ski-Doo® snowmobile. The first mass-produced snow machine, it set industry standards and launched snowmobiling as a sport and recreational activity.

George Washington Murray

Agricultural Machinery
U.S. Patent No. 517,960
Combined furrow-opener and stalk-knocker

Inducted in 2024

Photo courtesy of C.M. Bell Studio Collection (Library of Congress)

Inductee Bio:

George Washington Murray invented and patented agricultural machinery, served in the U.S. Congress and advocated for greater recognition of his fellow Black inventors.

Murray was born enslaved in Sumter County, South Carolina, in 1853. Though he hadn't previously received a formal education, he began attending the University of South Carolina in 1874. In addition to working as a teacher, Murray became a landowner and a successful farmer. By 1880, he owned 49 acres of tilled farmland, as well as 15 wooded acres.

In the early 1880s, Murray found inspiration for his inventions when he watched his wife work with sewing machine attachments in their home. He thought he might try equipping one of his farm machines with interchangeable attachments, making it possible for one machine to serve multiple functions at an affordable cost.

Murray earned eight patents for his agricultural machinery inventions in 1894. The patents described a machine with furrow-opening, stalk-knocking, planting, fertilizing, reaping and distributing attachments. It could harvest small grains, gather them into sheaves or bundles, and distribute the sheaves in even intervals along the ground, where they could be collected easily.

In 1893, Murray was elected to the U.S. House of Representatives and served as the only Black representative in the 53rd and 54th Congresses until 1897. He supported funding the Cotton States and International Exposition in Atlanta, which would include an exhibit celebrating the achievements of Black Americans. In a floor speech in August 1894, Murray, who saw patents as emblematic of equality and progress, championed recognition of Black inventors and submitted into the Congressional Record a document from patent examiner Henry E. Baker. Known as "Baker's List," this document named 92 U.S. patents granted to Black inventors. Congress subsequently voted in favor of funding the exhibition.

After leaving Congress in 1897, Murray returned to his farm and invested in land. He later moved to Chicago, where he sold life insurance and real estate, wrote books and worked as a professional lecturer. While serving as treasurer of a Chicago department store, Murray received his ninth and final patent for a portable hoisting device designed for use in stores and warehouses.

Short Description:

George Washington Murray invented agricultural machinery designed to accelerate planting and harvesting processes. He also served in the U.S. Congress and advocated for greater recognition of his fellow Black inventors.

Mary Florence Potts

Cold-Handle Sad Iron
U.S. Patent Nos. 103,501 & 113,448
Improved sad-iron; Improvement in sad-irons

Inducted in 2024

Photo courtesy of Alice Marshall Women's History Collection, Penn State Harrisburg Library

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Inductee Bio:

Mary Florence Potts invented an improved sad iron with a lighter weight and a cooler, more ergonomic handle, offering an easier, safer solution for ironing clothing and linens.

Potts was born Mary Florence Webber in 1850. At the time, sad irons were cast entirely in solid metal. The invention of the cast-iron cook stove in the 1820s, which made it easier to heat irons, had helped popularize their use. As one iron cooled, another could be taken off the stove.

Standard sad irons were exceptionally heavy, and because the handle was attached to the base, it would also become hot. Users needed a heavy glove or potholder to handle the iron, and they often suffered burns and blisters.

To develop needed improvements to the sad iron, Potts started with a hollow design that could be filled with a material that did not conduct heat, like plaster of Paris. Combined with a wooden handle, this resulted in a cooler, lighter iron. Pointed on both ends, her design was also easier to push back and forth. The bottom and ends of the iron were thicker, allowing the heat to radiate where it was needed most. Potts' design held heat longer, allowing users to iron more items without needing to reheat.

In 1870, Potts patented her sad iron. She then developed a new wooden handle that could detach from the iron as it sat on the stove, so it could be switched to another hot iron base. Potts lacked the financial resources to manufacture and sell her invention on her own, so she began working with third-party manufacturers. Marketing the invention as Mrs. Potts' Cold Handle Sad Iron, the manufacturers promoted the fact that a woman had designed it. The new sad irons were sold as a set including three irons of varying weights, one handle and a stand.

When patent rights expired in the 1890s, many ironworks began to copy Potts' original design, often advertising it as the Mrs. Potts Iron. They were commonly used into the 1930s, when they were surpassed in popularity by electric irons. Today, Mrs. Potts Irons are sought after by antique collectors.

Short Description:

Mary Florence Potts invented an improved sad iron, which was lighter and offered a cooler, more ergonomic handle. It was widely commercialized as an easier, safer solution for ironing clothing and linens.

Alice Stoll

Fire-Resistant Fibers and Fabrics
U.S. Patent No. 3,148,531
Method and apparatus for thermal analyses

Inducted in 2024

Photo courtesy of SWE Archives

Inductee Bio:

Alice Stoll, a research physiologist and pioneer in aerospace medicine, led the development of fire-resistant fabrics. Her work made it possible to rate materials by their ability to protect from thermal burns and demonstrated that fabric could be constructed with fire-resistant fibers.

Born on Long Island, New York, in 1917, Stoll earned her bachelor's degree in chemistry and physics from Hunter College in 1938. Enlisting in the U.S. Naval Reserve during World War II, she was on active duty from 1943 through 1946 before serving in the Reserve for the next 20 years. In 1948, Stoll earned her master's degree in physiology and biophysics from Cornell University Medical College.

Beginning in the late 1950s, Stoll worked with chemist Maria Chianta at the Naval Air Development Center in Warminster, Pennsylvania, to determine the level of heat energy required to cause burns, developing a Stoll Curve to chart the heat levels and durations producing second-degree burns under various exposure conditions. They found that the degree of skin damage did not depend on the source of heat, but on the elevation in skin temperature and the total exposure time.

At the time, treating fabrics with fire retardant was considered the best method of protection, but Stoll's work showed it was both possible and preferable to construct fabrics with fire-resistant fibers. In the early 1960s, Stoll patented a device to measure fabrics' properties. After testing over 200 materials, she identified a synthetic polymer called HT-1, later marketed by DuPont as Nomex®, as the best fiber for fire-resistant clothing. When exposed to extreme heat, Nomex fibers do not melt or support combustion. They thicken and carbonize, absorbing heat rather than transmitting it to the wearer. Nomex was used to create the first inherently fire-resistant protective clothing for U.S. Navy personnel. The other U.S. military branches also began issuing protective clothing made from Nomex, as did fire departments, and the fiber found use in a variety of civilian applications.

In 1966, Stoll retired from the U.S. Naval Reserve with the rank of commander in the Medical Service Corps. She served as the head of biophysics and bioastronautics division at the Naval Air Development Center's Aerospace Medical Research Department until 1980. She held two U.S. patents.

Short Description:

Alice Stoll, a research physiologist and pioneer in aerospace medicine, led the development of fire-resistant fabrics. Her work made it possible to rate materials by their ability to protect from thermal burns and demonstrated that fabric could be constructed with fire-resistant fibers.

Jokichi Takamine

Adrenaline (Adrenalin®)
U.S. Patent No. 730,176
Glandular extractive product

Inducted in 2024

Photo courtesy of Science History Institute

Inductee Bio:

Chemist and entrepreneur Jokichi Takamine was a biotechnology pioneer whose research led to the use of adrenaline in medicine. Also known as epinephrine, adrenaline is widely used for many applications, including the treatment of anaphylaxis and cardiac arrest.

Takamine was born in Takaoka, Japan, in 1854. He attended the University of Tokyo, where he earned a degree in applied chemistry in 1879, followed by doctorates in chemical engineering in 1899 and pharmacology in 1906. He completed postgraduate studies in Scotland, at the University of Glasgow and the University of Strathclyde.

In the late 1800s, Takamine began brewing whisky using koji mold instead of barley malt. Moving to the U.S., he worked for a distillery in Illinois, where his approach promoted faster fermentation and produced more affordable whisky. Finding that the koji mold enzyme could also aid the digestion of starch, he developed the digestive supplement Taka-Diastase. The first commercially produced microbial enzyme in the U.S., it was patented in 1894 and licensed to Parke-Davis & Co. The company successfully marketed it and retained Takamine as a consultant.

With his profits, Takamine started a lab in Manhattan and began researching adrenal gland secretions. In 1900, a chemist under his direction, Keizo Uenaka, successfully crystalized an adrenal gland secretion product and Takamine named it "adrenalin." In 1903, he obtained five patents covering the isolation and crystallization processes. Today, adrenaline is used to treat heart and respiratory problems including life-threatening allergic reactions. A widely used medical device containing adrenaline is the EpiPen® autoinjector. In surgery, adrenaline is combined with the local anesthetic lidocaine to reduce blood loss and to extend the duration of action.

Leveraging his success to make a social impact, Takamine found many opportunities to promote Japanese culture. In 1905 in New York City, he established the Nippon Club for Japanese Americans and Japanese nationals. In 1912, he helped beautify the area around the Potomac River in Washington, D.C., with several thousand cherry trees that remain well-known symbols of friendship between Japan and the U.S. In 1913, Takamine joined Sankyo Pharmaceutical Co., now Daiichi-Sankyo, and was named the company's first president. He held over 20 U.S. patents, and his honors include the 1912 Imperial Academy Prize.

Short Description:

Chemist and entrepreneur Jokichi Takamine was a biotechnology pioneer whose research led to the use of adrenaline in medicine. Also known as epinephrine, adrenaline is widely used for many applications, including the treatment of anaphylaxis and cardiac arrest.

Ralph Teetor

Cruise Control
U.S. Patent No. 2,519,859
Speed control device for resisting operation of the accelerator

Inducted in 2024

Photo courtesy of Jack Teetor

Inductee Bio:

Automotive engineer Ralph Teetor invented cruise control. Originally limited to luxury vehicles, this speed control technology has become a standard feature providing greater ease in driving, as well as safety benefits.

Teetor was born in 1890 in Hagerstown, Indiana. When he was 5, one of his eyes was injured in an accident, and within a year, he had completely lost his sight. Never letting his condition deter him from his interests and ambitions, he developed a heightened sense of touch that would ultimately benefit him throughout his career. At his family's business, Perfect Circle Corp., he trained as a machinist, and at just 12, he designed and built a 3 hp motor car capable of reaching a speed of 12 mph. He earned his bachelor's degree in mechanical engineering from the University of Pennsylvania in 1912.

As lead engineer at Perfect Circle, he helped improve the company's designs. He was assistant engineer from 1919 until 1937, when he became vice president of engineering, and was appointed president in 1946. Teetor became chairman of the company in 1957 and served until 1963.

The inspiration for his invention of cruise control came to Teetor in 1936 as a passenger in a car. The driver, his friend and patent attorney Harry Lindsey, tended to vary his speed during conversation, depending on whether he or Teetor was speaking. To address such inconsistencies, Teetor developed a device to control automotive speed. In 1948, he filed his first patent on the invention, which held the gas pedal steady to maintain a speed selected by the driver.

Manufactured by Perfect Circle and trademarked as the "Speedostat," it was first introduced in Chrysler cars including the 1958 Imperial, New Yorker and Windsor luxury models. Chrysler marketed the feature under the name "Auto-Pilot" and offered it as an option on all its models in 1959. That same year, Cadillac offered the speed control device and called it "Cruise Control," the popular name now recognized throughout the world, making it easy for drivers to maintain a steady speed while increasing fuel efficiency.

Serving as president of the Society of Automotive Engineers (SAE), Teetor, who was granted over 40 U.S. patents, became an influential supporter of automotive education. SAE International recognized his contributions by establishing the prestigious Ralph R. Teetor Educational Award in 1963.

Short Description:

Automotive engineer Ralph Teetor invented cruise control. Originally limited to luxury vehicles, this speed control technology has become a standard feature providing greater ease in driving, safety, as well as fuel efficiency benefits.