



ADA LOVELACE

MATHEMATICIAN, WRITER

Ada Lovelace is widely regarded as world's first computer programmer. In 1842, she was asked to translate a lecture given by the developer of the *Analytical Engine*, the world's first mechanical general-purpose computer which was programmable by using punch cards. Lovelace added her own notes, and the document she produced ended up three times as long as the original transcript. In those notes, Lovelace suggested the Engine "might compose elaborate and scientific pieces of music of any degree of complexity or extent." She is thus the *first* person to see value in computers outside of calculation. Lovelace's notes were critical documents that inspired Alan Turing's work on the first modern computers in the 1940s.





AJAY BHATT

COMPUTER ARCHITECT

Ajay Bhatt is best known for his invention of USB (Universal Serial Bus) technology. USB cables - deemed so essential today that they are sold at gas stations and drugstores – allow us to connect all sorts of devices to one another, including computers, phones, monitors, printers and more. Bhatt developed the USB after his wife was frustrated that she couldn't print their daughter's school project; the printer and computer she was using each required a different sort of cable and could not be linked. As a result of this contribution (and others), Bhatt was featured in the July 2010 issue of GQ India as one of "The 50 Most Influential Global Indians."





AL-KHWARIZMI

MATHEMATICIAN

In about 820, Muhammad ibn Musa Al-Khwarizmi, a Muslim mathematician living in Bagdad, wrote a book presenting the first systematic solution of linear and quadratic equations. In the twelfth century (several hundred years later!) *The Compendious Book on Calculation by Completion and Balancing* was translated into Latin; the Latinized title of his book (*Al-Jabr*) is the source of the word "algebra." A second book by Al-Khwarizmi (which has only been preserved in its Latin translation) introduced the numerals we use today (0-9) and decimal positional number system to the Western world. Al-Khwarizmi's name for this publication was rendered in Latin as *Algoritmi* - and is the source for the term "algorithm."



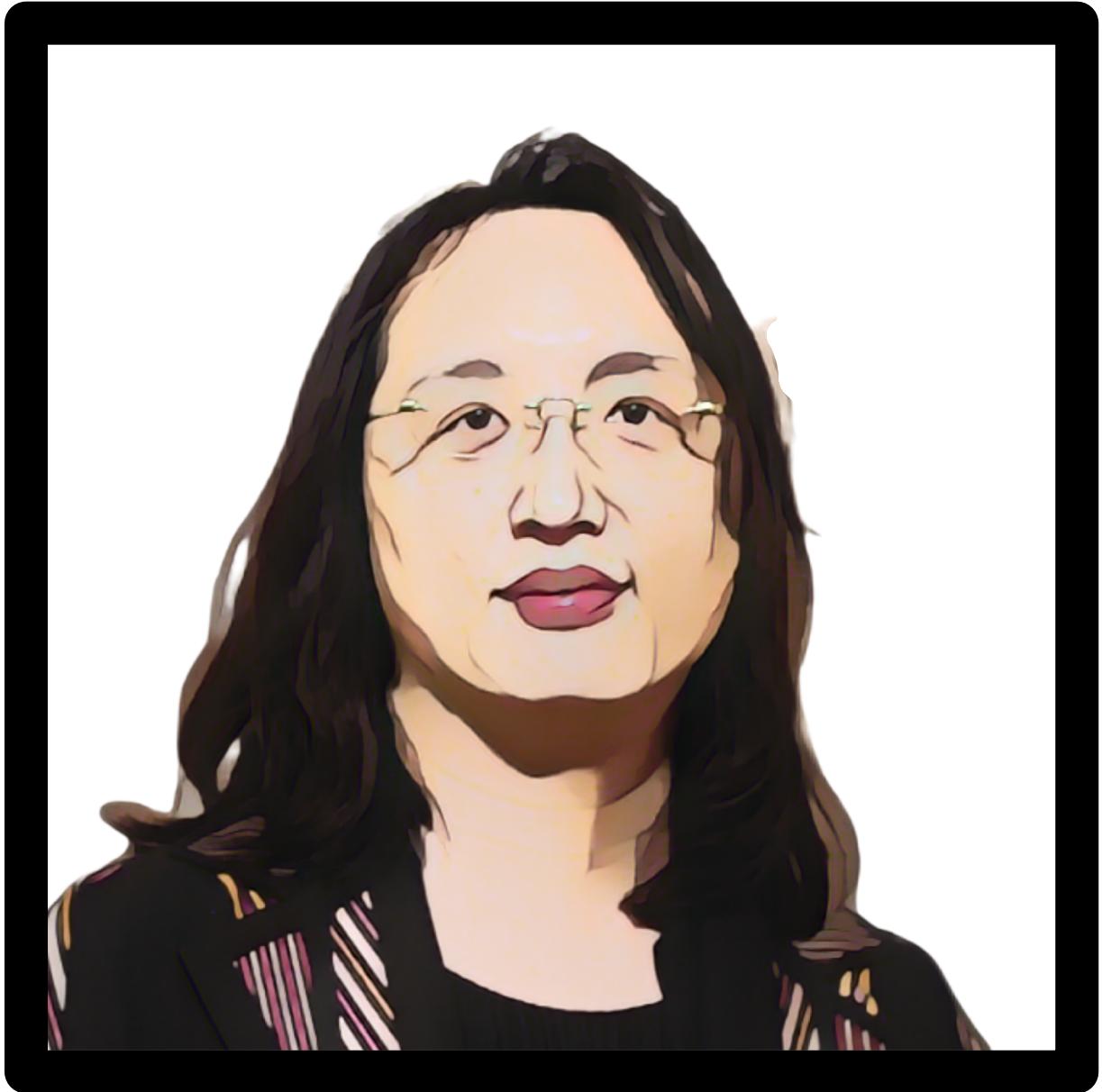


ALAN TURING

FATHER OF THEORETICAL COMPUTER SCIENCE & ARTIFICIAL INTELLIGENCE

During World War II, Turing oversaw British efforts to intercept and decrypt encoded messages sent by the Nazis. As a result of his work, the Allied forces were able to uncover information about the Germans' deployments and could safely reroute their convoys. Despite his contributions (many say he helped win the war), Turing was criminalized for his homosexuality in 1952. Fifty-five years after his death, he was pardoned by the British government, thanks largely to a campaign led by activists on his behalf. Turing has since become the first gay man on a British bank note. The A.M. Turing Award, named in honor of Turing, is often referred to as the "Nobel Prize of Computing."





AUDREY TANG

FREE SOFTWARE PROGRAMMER, DIGITAL MINISTER OF TAIWAN

Audrey Tang was born in Taiwan in 1981. In her youth, she was a shy child who battled health issues (including a congenital heart defect). She started learning how to program when she was 8 years old, and by age 12 she was coding in Perl (an all-purpose programming language). At 15, she started her own company, serving as chief technical officer for a team of 10 Perl hackers. Today, she is Taiwan's Digital Minister - as well as the first non-binary and transgender individual to be appointed to such a position. Tang believes that technology should be used to improve the abilities of government and to create an involved society. She is also a core member of g0v (also known as "gov-zero"), an open-source, open-government movement.



CHIEKO ASIKAWA

COMPUTER SCIENTIST

Asakawa invents technology to help the visually impaired be more independent. Although she was born with normal sight, she began losing her sight at age 11 when she hit her left eye on the side of a swimming pool. She was fully blind by age 14. In 1997, she developed the Home Page Reader (HPR), a voice browser that allows blind and visually impaired users to surf the Internet and navigate Web pages through a computer's numeric keypad. She has also developed a digital system to input and edit Braille; a network allowing Braille libraries to upload documents and books; and aDesigner, a disability simulator enabling sighted Web developers to mimic the experience of blind users.





CRISTINA AMON

MECHANICAL ENGINEER, PROFESSOR

Cristina Amon is a pioneer in the development of computational fluid dynamics, which uses numerical analysis and data structures to analyze and solve problems that involve fluid flows, like electronics cooling, wearable computers and electric vehicles. Her interest in science and engineering was inspired by one of her own female teachers when she was a young girl in Uruguay. "This special mentoring relationship helped me recognize the positive influence that strong role models can have on young women." Amon is committed to giving back to her profession and inspiring a younger generation of women to become engineers.





CLARENCE ELLIS

COMPUTER SCIENTIST

Ellis was the first African American PhD in computer science. A pioneer of “groupware,” which allows several users to collaborate on a document, he also helped to develop the idea of clickable icons. Ellis became a self-taught expert as a teen in Chicago by reading manuals for a mainframe computer he was hired to guard at night. Ellis earned a scholarship to study Math & Physics at Beloit College and went on to work at some of the world’s most prestigious companies and universities, including Xerox, IBM, Los Alamos Scientific, Stanford and MIT. Ellis preferred to teach undergraduates with little experience in CS because he wanted to encourage students of all backgrounds to stretch their academic abilities. He was passionate about civil rights, mentoring students from HBCUs & teaching in Africa.





ELLEN OCHOA

ASTRONAUT

During Ochoa's childhood, the space program was in its infancy, so Ochoa did not aspire to go to space; that changed in 1983 when Sally Ride (the first woman in space) was chosen as a crew member for the Space Shuttle Challenger. When Ochoa went to college, discovered a love of physics, math, and engineering. In 1985, Ochoa applied for NASA's highly competitive astronaut Training Program but was rejected. She applied again in 1987, and finally won acceptance in 1990, leading her to become the first Latina woman to travel into space. She is currently the director of NASA's Johnson Space Center.





EVELYN GRANVILLE

MATHEMATICIAN, COMPUTER SCIENTIST, EDUCATOR

Granville worked for NASA, writing computer programs that tracked the paths of vehicles in space. As only the second African-American woman to receive an advanced degree in math from an American University (PhD from Yale in 1949), Granville started her career teaching at Fisk University (a college for Black students) because more prestigious positions were not available to Black women at the time. In reflecting on her childhood, Granville recounts, "we heard about and read about individuals whose achievements were contributing to the good of all people. These individuals, men and women, served as our role models; we looked up to them and we set out goals to be like them. We accepted education as the means to rise above the limitations that a prejudiced society endeavored to place upon us."





FARIDA BEDWEI

SOFTWARE DEVELOPER, CEO, MICROFINANCE

Bedwei developed a cloud software platform that allows microfinance companies to administer loans by sending unique codes to their customers' mobile phones, which customers can immediately exchange for money at local branches. Microbanking is a means of extending credit (usually small loans with no collateral) to borrowers in rural or undeveloped areas. Bedwei is proud of her platform because it results in more loans to people in need. Born in Ghana in 1979, she was diagnosed with cerebral palsy at the age of one. Throughout her life, and thanks to the tireless support of her mother, Bedwei has refused to let her disability affect her career; today, she is considered one of the most powerful women in financial technology.





FREDERICK JONES

INVENTOR, ENTREPRENEUR

Jones was a prolific early 20th century Black inventor who helped to revolutionize both the cinema and refrigeration industries. Born in Ohio, he was raised by a priest after his mom died when he was 9. Jones started working as a mechanic's helper at 16 and by 19 had built and driven several cars in racing exhibitions. After serving in France during WWI, he moved to Minnesota and began his study of electronics, eventually building a transmitter for a local radio station. He went on to earn over 60 patents, including an automatic movie ticket distribution machine, the first process that enabled movie projectors to play back recorded sound, a unit for storing blood serum for transfusions, and a refrigeration system for trucks that prevented food from spoiling during long cross-country drives. During the 1950s, he was a consultant to the U.S. Department of Defense and the U.S. Bureau of Standards.





GRACE HOPPER

COMPUTER SCIENTIST, US NAVY REAR ADMIRAL

As a child, Hopper loved taking apart household goods and putting them back together again. Given her love of problem-solving, no one was surprised when she earned her Masters and PhD in mathematics from Yale, and then became a professor at Vassar. Eventually, Hopper resigned her position to join the Navy WAVES (Women Accepted for Voluntary Emergency Service), where she worked on the Mark 1 - an early prototype of the very first electronic computer. Hopper wrote the 500-page manual that outlined the fundamental operating principles of the Mark 1. Additionally, while working on the Mark I, Hopper coined the word "bug" (apparently after a moth found its way into her computer) to describe a computer malfunction!





GUILLERMO CAMARENA

ELECTRICAL ENGINEER, INVENTOR

In 1939, Guillermo Gonzalez Camarena independently developed the first Trichromatic Field Sequential System for color transmission for television, which was based on three colors - red, green and blue. He patented his color television system in 1940, at age 23. During his childhood in Mexico, Camarena loved to tinker and invent toys powered by electricity - including a radio transmitter at age 8 and a hobby radio at age 12. Camarena also loved music and folklore, and in fact composed his own songs. His best-known song is called "Rio Colorado," and the royalties he collected for it allowed him to develop his color TV system.





JERRY LAWSON

ELECTRONIC ENGINEER, FATHER OF MODERN GAMING

Long before PlayStation, X-Box, and Wii hit the scene, Lawson made it possible to play video games at home! His first grade teacher in Brooklyn suggested that he could be the next George Washington Carver and he remembers thinking, "I want to be a scientist. I want to be something." As a teenager, he earned money repairing televisions, gained an amateur ham radio license, and built his own station at home. In 1976, Lawson led the team of engineers that developed "The Fairchild Channel F," the first console with removable cartridges, allowing users to have a library of games. Lawson and Ron Jones were the sole Black members of the Homebrew Computer Club, an influential group of early computer hobbyists and entrepreneurs that included Apple Computer founders Steve Jobs and Steve Wozniak.





JON “MADDOG” HALL

BOARD CHAIR OF LINUX PROFESSIONAL INSTITUTE

Jon "Maddog" Hall is the executive director of Linux International, a non-profit group dedicated to spreading Free Open Source Software, which has been his focus since 1994. Based in New Hampshire, Maddog has consulted with the governments of China, Malaysia, and Brazil, as well as the United Nations, is the co-founder of Caninos Loucos (bringing inexpensive, locally designed and manufactured single board computers to Brazil) and President of Project Cauā (whose goals are to help university students better afford an education while improving the support of small businesses in using their computers). Maddog began his career in commercial computing in 1969, and decided to publicly come out as gay at the age of 61. His efforts on all fronts are making the tech community stronger, smarter, and more connected.



KATHERINE JOHNSON

MATHEMATICIAN

Johnson, who is featured in the 2017 film "Hidden Figures," made a number of significant contributions during her 33 years working in NASA's Flight Research Division. For instance, her work made it possible for John Glenn to orbit the Earth, and she calculated the precise trajectories that would let Apollo 11 land on the moon. Despite these achievements, almost no one knew Johnson's name until decades later. That changed when, in 2015, President Barack Obama awarded Johnson the Presidential Medal of Freedom, proclaiming, "Katherine G. Johnson refused to be limited by society's expectations of her gender and race while expanding the boundaries of humanity's reach."





KIMBERLY BRYANT

FOUNDER OF BLACK GIRLS CODE, ELECTRICAL ENGINEER

Bryant is a self-proclaimed "nerdy girl." Raised in Memphis, TN by her single mother during the Civil Rights Movement, she always loved and excelled at math and science. Although she initially planned to become a civil engineer, tech such as the microchip, the personal computer, and the cellphone enticed her to switch her focus to electrical engineering. After earning her degree, Bryant held jobs with companies like Pfizer and Merck until 2011. She decided to launch Black Girls CODE because her daughter expressed an interest in computer programming and all of the available courses were populated mostly by boys. Bryant hopes that her nonprofit will teach one million black girls to code by 2040.





LAURA GOMEZ

CEO OF ATIPICA (TECH STARTUP)

At age 8, Gomez immigrated to the US from Mexico, settling in Silicon Valley. She was an undocumented immigrant until she was 17, when she attained a work permit and began a software engineering internship at Hewlett Packard. She remembers how during her internship, she stood out because she was a woman and a minority. She recalls, "I was determined to not let the industry make me into a victim. I decided that I'd work in tech, whether the industry embraced me or not." She eventually created her own startup, Atipica, which uses AI to help tech companies find and hire diverse candidates in an unbiased manner.





LISA GELOBTER

COMPUTER SCIENTIST, TECHNOLOGIST, CEO

Gelobter worked on several pioneering internet technologies, including Shockwave, a multimedia platform used for video games, and the online video streaming service Hulu. She is also credited with developing the animation used to create GIFs. At Obama's invitation, she joined the Digital Service Office, helping to redesign Healthcare.gov (the website used to enroll Americans in health care under the Affordable Care Act) and then she served as the Chief Digital Service Officer for the US Department of Education. As a Black woman in the US, Gelobter understood the dire need for more equitable workplaces. In 2016, she founded tEQuitable, "an independent, confidential platform to address issues of bias, discrimination and harassment in the workplace," aiming to empower employees, quantify systemic issues, and improve workplace culture.





LUIS VON AHN

ENTREPRENEUR, COMPUTER SCIENTIST

Von Ahn's first claim to fame was his role in developing CAPTCHAs, computer-generated tests that humans can pass but that computers cannot - for example, deciphering hard-to-read text or matching images. CAPTCHAs stop bots from perpetrating large-scale abuse on websites, such as buying huge amounts of tickets for resale by scalpers. Von Ahn, who was born and grew up in Guatemala City, is also the CEO of Duolingo, a language learning mobile app and website where users can learn over 30+ different languages. All of his work centers around his mission of building systems that "combine humans and computers to solve large-scale problems that neither can solve alone."





LYNN CONWAY

COMPUTER SCIENTIST, ELECTRICAL ENGINEER, INVENTOR

Conway's career began at IBM Research in 1964, where she helped develop supercomputer technology. (A supercomputer is any of a class of extremely powerful computers; the term is commonly applied to the most powerful systems available at any given time.) In 1968, when Conway told IBM about her planned gender transition, she was fired from the company. For the next thirty years, she continued revolutionizing microchip technology while working in what she calls "stealth mode", presenting herself as a cisgender woman. As she neared her retirement in 1998, she came out as transgender via her personal website and has since been an activist for transgender rights. In 2020, IBM publicly apologized to Conway; IBM's director stated that Conway "forever changed microelectronics, devices, and people's lives."





MARK DEAN

INVENTOR, COMPUTER ENGINEER

In the 1980s, Dean was chief engineer of the 12-person team that designed the original IBM PC. Dean's work at IBM led to the development of the color PC monitor as well as the first gigahertz chip - a revolutionary piece of technology that can do a billion calculations per second! Dean holds three of IBM's original nine patents, and in total has twenty to his name. From an early age, Dean loved building things - and even has memories of constructing a tractor from scratch with his father when he was a young boy in Tennessee. Dean states, "a lot of kids growing up today aren't told that you can be whatever you want to be." He acknowledges, "There may be obstacles, but there are no limits." In 1996, Dean was the first African American ever to be named an IBM fellow, and in 1997, he was honored with the Black Engineer of the Year President's Award.





MARY GOLDA ROSS

ENGINEER

Ross is best known for her work on aerospace design and design concepts for interplanetary space travel, crewed and un-crewed Earth-orbiting flights, and the earliest studies of orbiting satellites for both defense and civilian purposes. Born in 1908, Ross was brought up "in the Cherokee tradition of equal education for boys and girls." After earning her bachelor's degree in mathematics, she taught science and math in rural Oklahoma for 9 years, taking graduate courses during the summer. When the U.S. joined WWII, she moved to California and was hired by Lockheed to work on the first jet that could travel at over 400mph. After the war, she was on the top-secret space race think tank "The Skunk Works" - the only woman and the only American Indian on the 40 person team. The 2019 Native American \$1 coin honored American Indians in the Space Program and featured an image of Ross.





RUCHI SANGHVI

COMPUTER ENGINEER, BUSINESS WOMAN

Sanghvi was raised in the industrial town of Pune, India, where her father owns a company that lends equipment to industrial projects. Sanghvi recounts, "I've been obsessed with taking it over since I could talk. I'd follow him and repeat conversations about how many tons of cranes were arriving. He said it was a man's world, so I studied electrical engineering because it was related." After excelling in her studies at Carnegie Mellon, Sanghvi was hired as one of Facebook's founding engineers - as well as the company's first female engineer. Her first big project was as a lead developer of Facebook's Newsfeed. As a result of Sanghvi's work (and the increased site traffic that resulted), newsfeeds have since become a common feature of social networking sites. Since her days at Facebook, Sanghvi has served as an investor and advisor to a number of Silicon Valley companies.





SHAFFI GOLDWASSER

COMPUTER SCIENTIST, CRYPTOGRAPHY EXPERT

Goldwasser is an Israeli-American professor of electrical engineering and computing. Much of her work focuses on what "secure" really means via rigorous mathematical study. One of her greatest achievements is the "zero knowledge proof," which uses cryptography to prove that something is true without revealing any further information. Zero knowledge proofs are used today in sophisticated e-voting systems to prove proper tallying of votes without revealing who voted for what. Goldwasser won the prestigious Turing Award in 2012 for her research on cryptography. Goldwasser is currently a professor of Electrical Engineering and Computer Science at MIT as well as the co-founder and chief scientist of Duality Technologies, which allows organizations to safely share and analyze encrypted data.





TAHER ELGAMEL

CRYPTOGRAPHER, ENTREPRENEUR

Elgamal is a world-renowned Egyptian-American *cryptographer* - someone who studies secure communication techniques. He is considered the father of the Secure Sockets Layer (SSL), which allows sensitive information such as credit card numbers, social security numbers, and login credentials to be safely transmitted online. SSL secures millions of peoples' data on the Internet each day! You can tell that a website is SSL-secured - and you can simultaneously see the impact of Elgamal's work - when a web address begins with "https" rather than "http." SSL-secured sites are also accompanied by a small padlock icon.



TIM COOK

CEO OF APPLE INC.

Tim Cook has been the CEO of apple since 2011 and is responsible for Apple investing in flash memory, which eventually led to the development of the iPad and the iPhone. Before joining Apple, Cook studied industrial engineering and business administration and worked for IBM and then Intelligent Electronics for 12 years. He is the first and only openly gay CEO on the Fortune 500 list. In 2015, Cook explained his decision to come out publicly, saying, "Where I valued my privacy significantly, I felt that I was valuing it too far above what I could do for other people, so I wanted to tell everyone my truth."





VICKI HANSON

COMPUTER SCIENTIST

Hanson's research focuses on human-computer interaction (HCI), meaning she spends time observing the ways humans interact with computers. She is also interested in accessibility and thinks about how to design technology that is usable by people with disabilities. Hanson is responsible for helping develop a browser extension that allows people with visual, motor, and cognitive disabilities to modify Web content on the fly to meet their needs. She also helped develop the world's first fully accessible 3D virtual world! In 2018, Hanson was named the first female CEO of the Association for Computing Machinery (ACM), the world's largest scientific and educational computing society.