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GUILLERMO GONZÁLEZ CAMARENA

ELECTRICAL ENGINEER, INVENTOR

In 1939, Guillermo González Camarena independently developed a trichromatic field-sequential color television system, which he patented at age 23. During his childhood in Mexico, Guillermo loved to tinker and invent toys powered by electricity - including a radio transmitter at age 8 and a hobby radio at age 12. Guillermo also loved music and folklore, and composed his own songs. His best-known song is called "Río Colorado," and the royalties he collected from it allowed him to develop his color TV system.



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VICKI HANSON

HUMAN-COMPUTER INTERACTION, ACCESSIBILITY

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.



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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.



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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. 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, 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."



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AJAY BHATT

COMPUTER ARCHITECT

Indian-born American computer architect Ajay Bhatt is best known for his invention of USB (Universal Serial Bus) technology, which allows 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. When Bhatt first pitched the idea to tech companies in the early 90s, response was lukewarm. Bhatt persevered and the USB is now so essential that you can even buy one at a gas station! Bhatt, who holds over 130 US and International patents, was featured in the July 2010 issue of GQ India as one of "The 50 Most Influential Global Indians." Bhatt's advice for young people, "If you have imagination, then it is possible to make your vision a reality. Don't follow the conventional path, think differently, and make the impossible possible."



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MARY GOLDA ROSS

AEROSPACE DESIGN, SATELLITES

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.



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JERRY LAWSON

VIDEO GAMES, ELECTRONIC ENGINEER

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 video game 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, a group of early computer hobbyists and entrepreneurs that played an influential role in the development of the microcomputer revolution and the rise of that aspect of Silicon Valley.



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CHIEKO ASAOKAWA

COMPUTER SCIENTIST, ADAPTIVE TECHNOLOGY

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.



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JON "MADDOG" HALL

CHAMPION OF OPEN-SOURCE HARDWARE & SOFTWARE

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 with the United Nations. He 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.



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LISA GELOBTER

INTERNET TECHNOLOGIES, tEQUITABLE CEO

Gelobter worked on several pioneering internet technologies, including Shockwave (a multimedia platform used for video games) and the online video streaming service Hulu. 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). She went on to serve 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.



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LUIS VON AHN

FOUNDER OF RECAPTCHA, CEO OF DUOLINGO

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."



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FARIDA BEDWEI

SOFTWARE DEVELOPER, AUTHOR, DISABILITY RIGHTS ADVOCATE

Bedwei developed a cloud software platform that allows micro-finance companies to administer small loans to borrowers in rural or undeveloped areas by sending unique codes to their customers' mobile phones, which customers can immediately exchange for money at local branches. 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. In honor of World Cerebral Palsy day, Bedwei created a superheroine named Karmzah for the Afrocomic app. In the comic series, Karmzah gains superpowers with her walking crutches and partners with Africa's greatest superheroes to defend her local community and African society at large.



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CLARENCE "SKIP" ELLIS

COMPUTER SCIENTIST, GROUPWARE

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 develop the idea of clickable icons. As a teen in Chicago, Ellis guarded a mainframe computer at night and became a self-taught expert by reading the manuals. He earned a scholarship to study Math & Physics at Beloit College, where he helped set up the college’s first Computer Lab. Ellis worked at some of the most prestigious companies & universities, including Xerox, IBM, Los Alamos Scientific, Stanford, MIT & UC Boulder. He preferred to teach undergraduates with little experience in Computer Science because he wanted to encourage students of all backgrounds to stretch their academic abilities and consider a career in computer science. Ellis was passionate about civil rights, mentoring students from HBCUs & teaching in Africa.



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LYNN CONWAY

SUPERCOMPUTER TECHNOLOGY, MICROCHIPS

Conway's career began at IBM Research in 1964, where she helped develop supercomputer technology. 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."



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GRACE HOPPER

COMPUTER PROGRAMMER, INVENTOR, PROFESSOR, 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. During WWII she joined 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. 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! Hopper devised the theory of machine-independent programming languages and managed the development of one the first COBOL compilers, converting English terms into machine code understood by computers. The COBOL programming language is still in use today!



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ALAN TURING

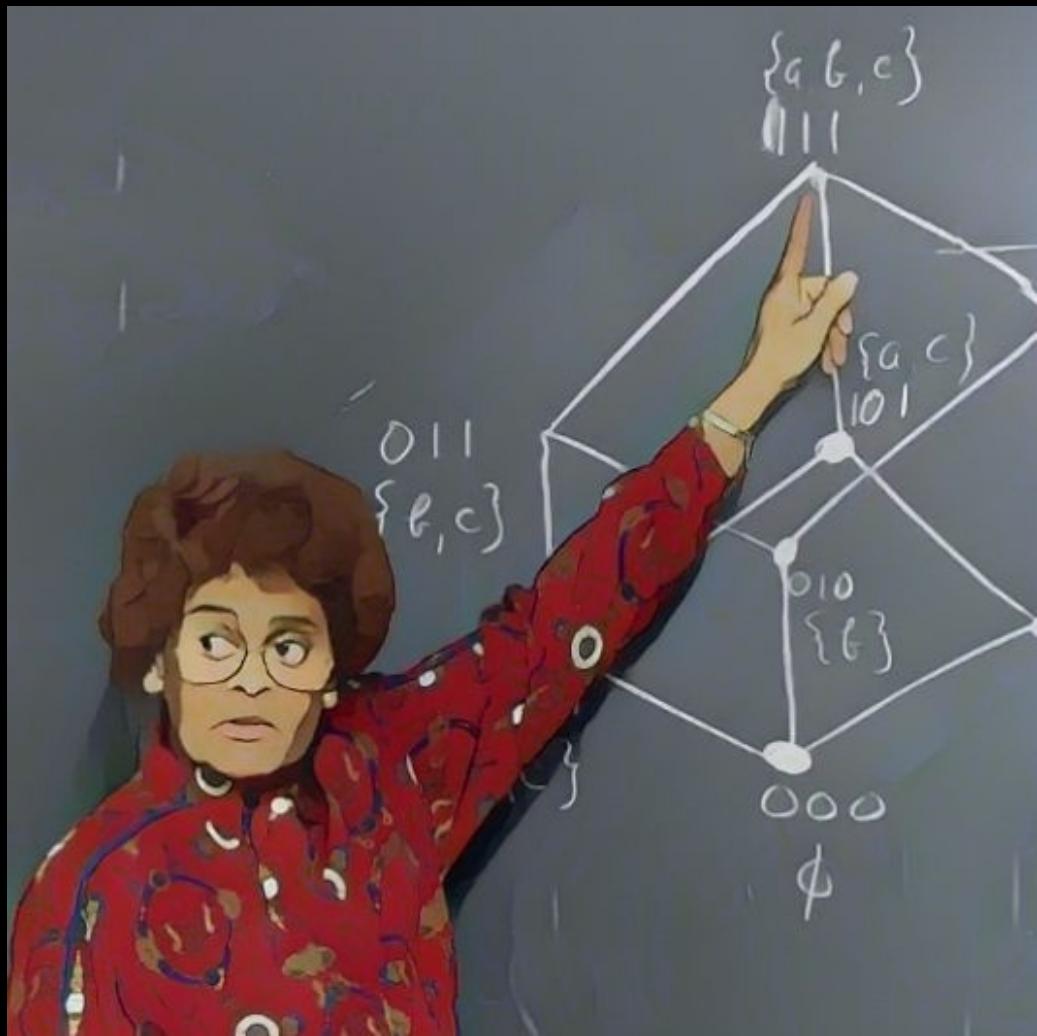
CRYPTOGRAPHY, THEORETICAL COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE

Alan Turing was highly influential in the development of theoretical computer science, defining the limits of computability. He was also responsible for early work in artificial intelligence. In addition, during World War II, Turing played a crucial role in cracking intercepted coded messages sent by the Nazis. Despite this, in 1952, Turing was criminalized for his homosexuality. 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 Turing Award, named in his honor, is the highest award in computing and is often referred to as the “Nobel Prize of Computing.”



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EVELYN GRANVILLE

MATHEMATICIAN, COMPUTER SCIENTIST, EDUCATOR

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 highly rated Historically Black University in Nashville). She went on to work for NASA, writing computer programs that tracked the paths of vehicles in space. 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 our 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."



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THOMAS DAVID PETITE

INVENTOR, WIRELESS MESH NETWORKS

Petite is one of the early inventors of wireless mesh networks, which allow our cell phones and other wireless devices to communicate. He holds over 40 U.S. issued patents and is a highly recognized inventor in the worldwide energy and communications community. A registered member of the Fond Du Lac Tribe and son of a Chippewa Chief from Wisconsin, Petite founded the Native American Inventors Association to support Native inventors with patenting. His love of technology started with taking apart radios and putting them back together with his Dad, a sonar engineer. He has written about how dyslexia and his short attention span were "mental challenges that have helped me to become who I am today, a downright stubborn American Indian Inventor that happens to be a business junkie, Innovator with over 100 patents worldwide."



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ELLEN OCHOA

ASTRONAUT, ELECTRICAL ENGINEER, INVENTOR

Ellen Ochoa is a veteran of four NASA Space Shuttle flight missions and was the first Hispanic woman to travel into space. After studying Physics in college, Ochoa considered a career as a classical flutist or in business, but, ultimately, enrolled in graduate school for engineering. In 1983, while Ochoa was working on her PhD in Electrical Engineering, Sally Ride became the first American woman in space, inspiring Ochoa to become an astronaut herself. Ochoa applied to NASA's astronaut training program several times before she was finally accepted in 1990. In the meantime, she co-invented three optical devices that help scientists to refine images from space and her expertise in optics and computer hardware caught NASA's attention for their potential to improve the gathering of data and assessing the safety of equipment. Ochoa also participated in an international study of damage to the Earth's ozone layer and served as the 11th director of the Johnson Space Center.



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TAHER ELGAMAL

SECURITY LEADER, CRYPTOGRAPHER, CISO, CTO

Elgamal is a world-renowned Egyptian-American cryptographer - someone who studies secure communication techniques. He is considered a pioneer 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." After earning his B.S. from Cairo University Elgamal went on to earn his PhD in Electrical Engineering from Stanford University, graduating at the beginning of the dot com era. He has authored important papers since the 1980s, been an entrepreneur, and has held several executive roles at technology and security companies. Elgamal's first love was mathematics. He's said, "cryptography was the most beautiful use of math I'd ever seen."



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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 also served as an investor and advisor to a number of Silicon Valley companies.



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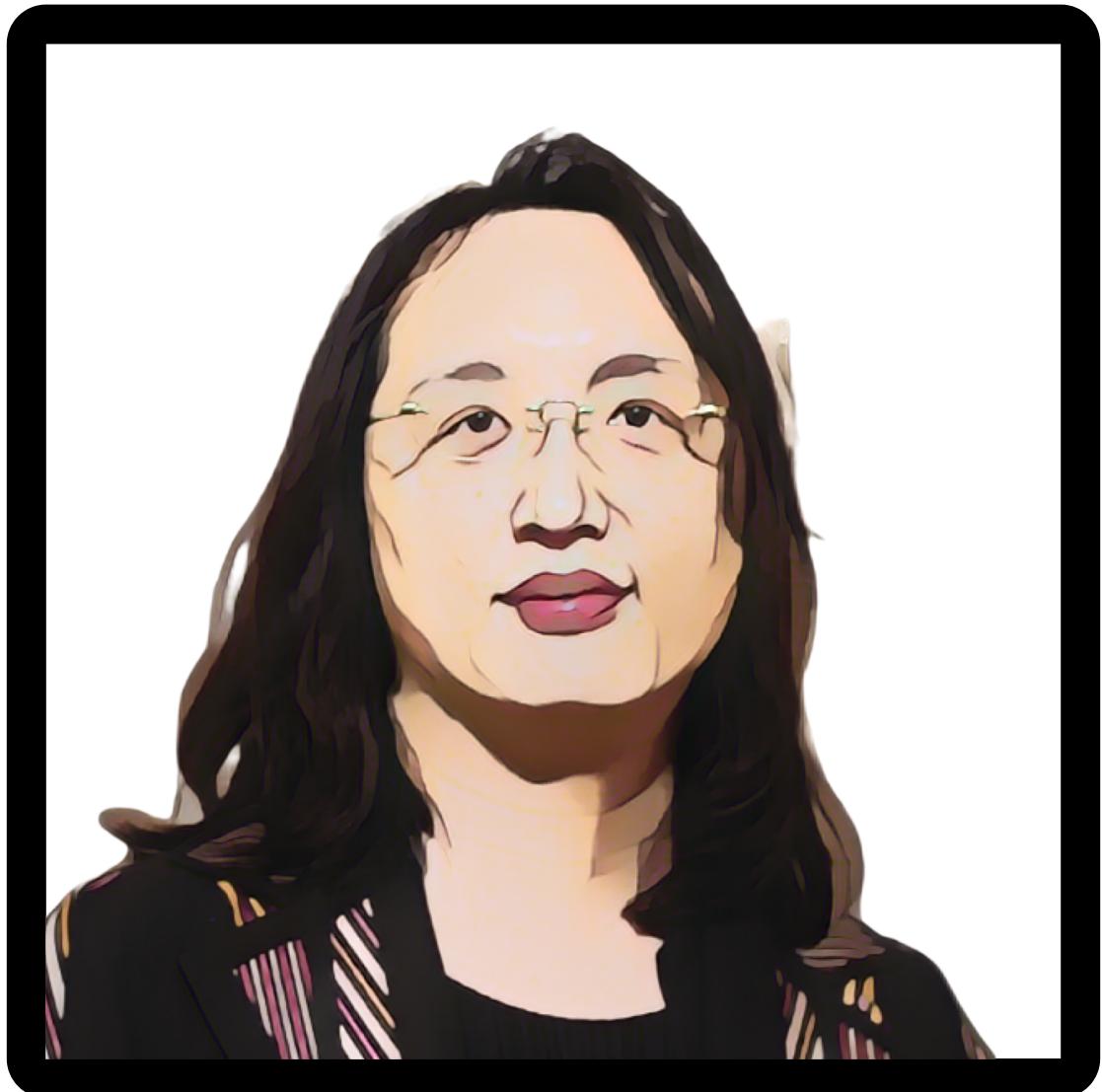


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AUDREY TANG

OPEN SOURCE SOFTWARE, DIGITAL MINISTER OF TAIWAN

Audrey Tang is a core member of g0v (also known as "gov-zero"), an open-source, open-government movement. Tang believes that technology should be used to improve the abilities of government and to create an involved society. In 2016, Tang took office as Taiwan's Digital Minister, becoming the first non-binary and transgender individual to be appointed to such a position. Born with a congenital heart defect in 1981, Tang was a shy kid and started learning how to program at 8 years old. By age 12 Tang was coding in Perl. At 15, Tang started their own company, serving as chief technical officer for a team of 10 Perl hackers.



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SHAFFI GOLDWASSER

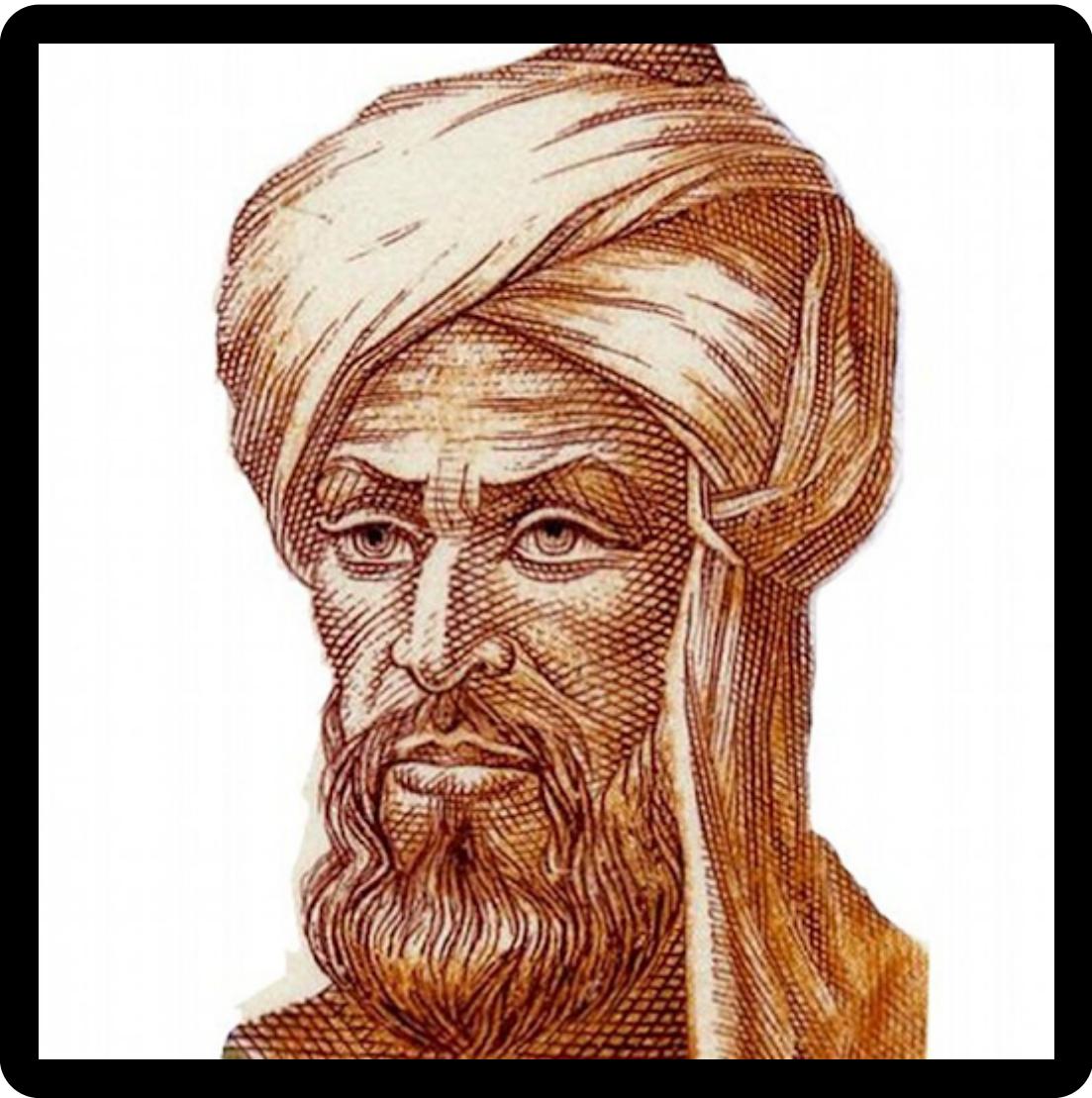
COMPUTER SCIENTIST, CRYPTOGRAPHY EXPERT

Goldwasser is the inventor of several revolutionary cryptographic technologies. 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. In 2018, Goldwasser became the Director of the Simons Institute for the Theory of Computing. She is also a professor of Electrical Engineering & Computer Science at UC Berkeley and MIT, professor of Computer Sciences & Applied Mathematics at the Weizmann Institute of Science in Israel, and the co-founder and chief scientist of Duality Technologies, which allows organizations to safely share and analyze encrypted data.



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AL-KHWARIZMI

MATHEMATICIAN

In about 820, Muhammad ibn Musa Al-Khwarizmi, a Muslim mathematician living in Baghdad, 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. The term "algorithm" is derived from the latinized version of his name.



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ADA LOVELACE

MATHEMATICIAN, WRITER, PROGRAMMER

Ada Lovelace is widely regarded as one of the world's first computer programmers. 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 one of the first people to see value in computers outside of calculation.



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