

EYE ON SCIENCE

The logo for 'Sci planet' features the word 'Sci' in a stylized, rounded font with a white dot above the 'i'. Below it, the word 'planet' is written in a lowercase, sans-serif font. The entire logo is set against a dark red background.

planet

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A central image of a glowing lightbulb is set against a vibrant, abstract background of splattered colors including blue, red, yellow, and green. The lightbulb is rendered with a metallic base and a glass globe that is filled with a bright, multi-colored glow. The background consists of various paint splatters and brushstrokes, creating a sense of dynamic energy and creativity.

THE INVISIBLE
PEOPLE
OF SCIENCE

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The Invisible



PEOPLE OF SCIENCE

By: Maissa Azab

This year, we have tackled the human side of science; the people who dedicate their lives to observing, contemplating, and laboring, to disentangle the complex mysteries of our universe, our planet, and ourselves. We have chosen to spotlight groups of scientists and inventors who have transformed our life and the world, but who are often unnoticed, overlooked, or marginalized, if not altogether forgotten.

In previous issues, we have highlighted the science of the Arabs, whose contributions, although often obscured in history, have laid the foundations for countless crucial sciences, such as chemistry and optics, and whose significant contributions continue, albeit often in the shadows. We have also dedicated an issue to the formidable women who have and continue to remarkably reshape science, despite an ever ongoing discrimination that still stacks obstacles in their path, only to be demolished by courageous and relentless heroines.

In our last issue, we went on to elaborate on the role of the young and the extent of their distinctive involvement in the evolution of science, innovation, and entrepreneurship, which often goes undetected or underappreciated. Indeed, more often than not, certain sectors of the population are faced with certain misconceptions, which undermine their outstanding efforts that are often transformative.

With that in mind, we conclude our series about the people of science with an issue dedicated to a handful out of countless scientists and inventors who, for one reason or the other, have been unseen or unheard of by the public. In this issue, we humbly attempt to give due credit to those who have unpretentiously changed our lives and made it somehow better to live, yet their names have been concealed or simply forgotten. Hopefully, we intrigue you to attempt discovering for yourself more of and about the invisible people of science.



By: Hend Fathy

Did You Know?

While working on this issue, we wanted to introduce you to as many scientists and inventors whose contributions have had significant effect on our everyday life, but who have gone unnoted, or have not received the deserved recognition and/or fame possible. Sadly, we are confined to a limited number of pages; so, here are some names to dig up for further reading. Moreover, you can read more on [SCPlanet Online Magazine](#).

The idea of the stapler was first developed for King Louis XV in the 18th century. Although George McGill patented a form of paper fastener in 1866, it was Henry R. Heyl who patented the first stapler that both inserts and clinches a staple in one step in 1877.

Austrian physicist Robert Adler holds numerous patents for electronic devices. However, he is best known as a pioneer in the development of the remote control device, which he patented in 1957.

Croatian inventor Josip Belušić designed the first electric speedometer and patented his invention in 1889; it revolutionized the dimensions of measuring speed. His model was in analogous form; it was later developed into the digital form and became a necessary component of every vehicle.

American engineer Martin Cooper invented the first cellphone and made the first mobile call in 1973. The device “Motorola Dyna-Tac” was 23 cm tall and weighed 1.1 kg and had a talktime of 35 minutes.

Levi Strauss and Jacob Davis invented the world’s first jeans—first known as waist overall—in 1873. The fabric was specifically designed for miners and cowboys due to its strength; the word jeans became popular in the 1950s.

Dr. Francis Rynd, Ireland, was the first to develop a drip needle for introducing drugs into a vein in 1844. Before that, it had been impossible to administer drugs through the skin, only orally. Rynd reported his hypodermic syringe invention in the *Dublin Medical Press* in 1845. This was eight years before Alexander Wood and Charles Pravaz invented a new version of it, and were mistakenly credited with the invention.

SCIENCE COMMUNICATION

By: Maissa Azab

WHAT IS IT?



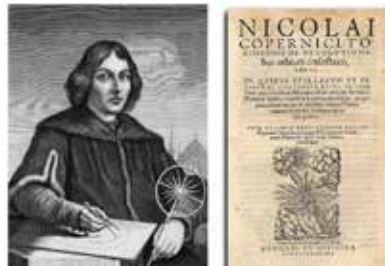
"Science Communication deals with an issue that is important, not only, or even mainly, for the scientific community, but also for the nation as a whole and for each individual within it. More than ever, people need some understanding of science, whether they are involved in decision-making at a national or local level, in managing industrial companies, in managing industrial companies, in skilled or semi-skilled employment, in voting as private citizens, or in making a wide range of personal decisions."

Public Understanding of Science, The Royal Society, London, 1985

Science communication generally refers to public communication presenting science-related topics to non-experts; this includes, among other forms, science exhibitions, journalism, policy or media production. It can aim to generate support for scientific research or study, or to inform decision-making, including political and ethical thinking. There is increasing emphasis on explaining methods, rather than simply findings of science; this may be especially critical in addressing scientific misinformation, which spreads easily because it is not subject to the constraints of scientific method.

Effective science communication has actually changed the world; a case in point would be the Copernican Revolution.

Copernicus published a book in 1543 on the movement of the Earth around the Sun, not the Sun around the Earth, which was the established belief at the time; it was a revolution in the way people thought. These revolutions, in the way we think, are fostered by great communicators.



Charles Darwin's books were bestsellers, the *Theory of Natural Selection* that he promoted was an amazing transformation in the history of human thought. Almost nobody has heard of Alfred Wallace, while almost everybody has heard of Charles Darwin. The truth is both Wallace and Darwin published papers back-to-back in *Nature* on the theory of natural selection; they each came up with this independently. Yet, we are far more familiar with Darwin, because he communicated the idea effectively. He was a very popular author who wrote eloquently; it was his communication skills that differentiated him from Wallace.

At the height of the Enlightenment in the late 18th century, science was characterized

by significant public participation, the "Republic of Science", even if the extent of participation was limited by the lack of education amongst the wider, unskilled population. By the end of the 19th century, however, science became increasingly professionalized and aligned with the interests of government, a trend which has continued ever since.



The relationship between science and the public became characterized by scientists communicating to a "scientifically illiterate" population, often referred to as the "deficit model". Critics of this model suggest that the public will not be interested in information that is not in context, or does not relate to their lives in some way.

Writing in 1987, Geoffrey Thomas and John Durant advocated various reasons to increase public understanding of science, or scientific literacy. If the public enjoyed science more, they suggested there would presumably be more funding, progressive regulation, and trained scientists. More

trained engineers and scientists could allow a nation to be more competitive economically. Governments and societies might also benefit from more scientific literacy, since an informed electorate promotes a more democratic society.

In the UK, the modern approach to science communication began with the Public Understanding of Science model, the model then changed to Public Engagement in Science and Technology (PEST). Although the aim was to improve interactions between scientists and the public, engagement was still on the scientists' terms and reflected only a minor change from the deficit model. The public still has to accept the message on the scientists' terms, with no true engagement or dialogue.

An open dialogue between scientists and the public fundamentally, thus, changes the practice of science communication, developing from a one-way to a two-way system. The idea is to have an open debate in which all stakeholders could participate, deliberate, and critique the issue. This new age of science communication certainly has potential and "good intentions", but many critics question if scientists would actually take on board the public's opinions or if this was just a public relations campaign.

At this time, it is probably too early to see what long-term trends will arise from the Internet and social media, or how the move to Open Access will make an impact. Will we see a revival of the Enlightenment's Republic of Science, or Citizen Science as it is often now referred to? Beyond amateur astronomers and naturalists, can the public lead or participate in science discourse? Examples of online public participation already exist, *Galaxy Zoo* and *Foldit*; yet, these are still top-down approaches.

Recent Periodic Table Videos have been made in direct response to the comments and requests of the audience, and social media has exposed some of the trade secrets of researchers. There are also signs that social media is challenging the internal hierarchy of science; even if such conversations are between scientists themselves and not scientists and the public. Clearly, the Internet does allow "outsiders" to debate the methods, motives, and conclusions of science in public. It may also allow scientists expand their networks, while overturning preconceptions about their fields. Whatever the results will be, the Internet and social media will surely become integral in how future relationships between scientists and the public develop.

Carl Sagan: The Scientist and Science Communicator

Carl Sagan was the Director of the Laboratory for Planetary Studies at Cornell University; he played a leading role in the American space program since its inception, was a consultant and adviser to NASA since the 1950s, briefed the Apollo astronauts before their flights to the Moon, and was an experimenter on the Mariner, Viking, Voyager, and Galileo expeditions to the planets.

As a scientist trained in both astronomy and biology, Dr. Sagan has made seminal contributions to the study of planetary atmospheres, planetary surfaces, the history of the Earth, and exobiology. He helped solve the mysteries of the high temperatures of Venus, the seasonal changes on Mars, and the reddish haze of Titan.

A Pulitzer Prize winner for the book *The Dragons of Eden: Speculations of the Evolution of Human Intelligence*, Dr. Sagan was the author of many bestsellers, including *Cosmos*, which became the bestselling science book ever published in English. The accompanying Emmy and Peabody award-winning television series has been seen by a billion people in sixty countries. His novel, *Contact*, is a major motion picture.

The Carl Sagan Foundation is a non-profit entity established to continue the planet-wide campaign of public science education that was so brilliantly conducted by its namesake throughout his career. It seeks to further public understanding of the goals, methods, and findings of science; to identify and challenge the misuse of science and high technology; to inspire the young to think critically and to consider career pathways in science. It views its mission



most urgently in those communities where exposure to science is likely to be minimal.

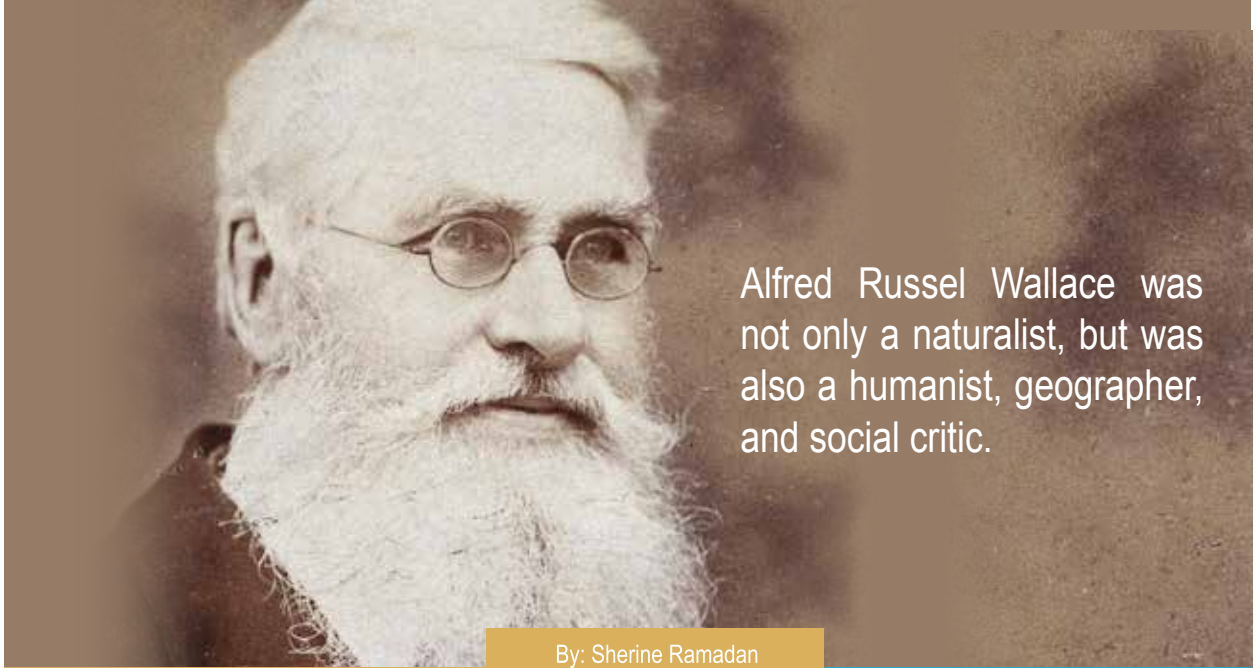
Our society is increasingly dependent on science and high technology; preserving and enhancing its democratic nature requires a citizenry of informed decision-makers. The Carl Sagan Foundation, through its sponsorship of innovative approaches, institutions and individuals, aspires to help meet this pressing need. The inaugural project of the Foundation is The Carl Sagan Discovery Center at The Children's Hospital in New York.

Carl's forty-year campaign for public science education was rooted in his dream of a wise and just society. Before anyone else, he recognized that a society wholly dependent on science and high technology could not hope to become a democracy if only a fortunate few possess the secrets of science's methods, laws, and language.

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By: Sherine Ramadan

Alfred Russel Wallace was not only a naturalist, but was also a humanist, geographer, and social critic.

ALFRED RUSSEL WALLACE:

THE UNSEEN EVOLUTIONARY

Today, Darwin is the man who gets the lion's share of credit for the theory of evolution, which provides the mechanism to explain how a species can be slowly transformed into another. Darwin explained that theory in his book *On the Origin of Species*, in 1859. However, there was another British biologist working at the same time as Darwin, who came up with the theory independently, this was Alfred Russel Wallace (1823–1913), who discovered the concept of evolution by natural selection. It is the process by which plants and animals, which can adapt to changes in their environment, are able to survive and reproduce; while those that cannot adapt do not survive. Though Wallace has been forgotten, he still deserves recognition for his achievement in biology and the evolution theory as well.

The Father of Biogeography

Though Wallace had no formal training as a biologist and did not attend university, when he worked as a land surveyor with his brother, his interest grew tremendously in the natural world, and he began collecting insects. He was also inspired much by reading about the work of naturalists, such as Carl Linnaeus, Charles Darwin, and Alexander von Humboldt.

Wallace was a hard worker, collecting biological specimens in Southeast Asia for sale to museums and private collectors. He conducted a significant amount of fieldwork in the Amazon River basin in South America, and the Malay Archipelago, collecting more than 100,000 insect, bird, and animal specimens, which he gave to British museums.

The Evolution Theory

Charles Darwin began formulating his theory of natural selection in the late 1830s, but he continued working quietly on it for twenty years; he wanted to collect a wealth of evidence before publicly presenting his idea. During those years, he corresponded briefly with Wallace, who was exploring the wildlife of South America and Asia. Darwin was surprised to read that Wallace had come upon essentially the same explanation for evolution. Being a fair man, Darwin insisted that Wallace also received credit for the natural selection theory during debates over its validity.

Wallace supplied Darwin with birds for his studies, and decided to seek Darwin's help in publishing his own ideas on evolution; in 1857, he sent his theory to Darwin, who joined Wallace in publishing a paper on the latter's theory with his writings in 1858. After one year, Darwin published his famous book *On the Origin of Species*, which became one of the world's most influential scientific books.

There were, of course, some differences in Wallace's and Darwin's theories. While Darwin thought evolution was driven by competition between individuals, Wallace believed that the environment was the driving force. Basically, Wallace believed that species changed over time so they could fit into new environments; moreover, Wallace did not think that sexual selection played a major role in evolution. In both instances, we now know that Darwin was probably correct.

The Controversy

The controversy of whether Darwin borrowed the idea from Wallace or not had begun in 1972, after a researcher found another letter from Wallace to a friend sent in March 1858. The letter had postmarks from Singapore and London that showed it arrived in London in June 1858; two weeks before Darwin said that he received the essay from Wallace.

Researchers assumed that Darwin kept the letter, which included theories about natural selection for two weeks, to enable him to revise elements of his own theory of evolution before announcing it to the world in July 1858. The mystery led to numerous conspiracy theories, including the accusations that Darwin stole ideas from the letter, which plagued Darwin's reputation.

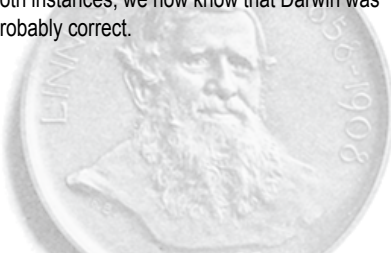
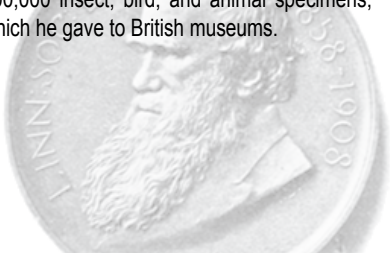
In 2013, scientists turned into detectives and have now vindicated Darwin from these accusations by tracing historical shipping records. They proved that Charles Darwin received the letter a month later than previously thought; finally, he was cleared from stealing ideas of the theory of evolution after 40 years of his first accusation by historians.

Alfred Russel Wallace was not only a naturalist, but was also a humanist, geographer, and social critic. He published 21 books, and the list of his articles, essays, and letters in periodicals contains more than 700 items. Yet, his career eludes simple description or honorifics.

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By: Sherine Ramadan



The Adventures of ALEXANDER VON HUMBOLDT

A BEAUTIFUL MIND

One of the most important scientists whose name was sadly lost in history, Alexander von Humboldt (1769–1859) was a geographer, a naturalist, and a courageous explorer. Charles Darwin described him as “the greatest scientific traveler who ever lived”; he is widely respected as one of the founders of modern geography.

From his early childhood, Humboldt had a great passion for nature and often spent time observing and gathering samples of plants, insects, and shells; he even categorized them. While attending university, Humboldt developed an interest for geology and mineralogy. His restless life was packed with adventures and discoveries, whether climbing the highest volcanoes in the world, or traveling over 39,000 kilometers, in order to understand the relationship between nature and habitat. He is recognized for his works on botanical geography, which is what laid the foundation for biogeography.

Latin America Expedition

Together with botanist Aimé Bonpland, Humboldt began planning and preparing for an expedition to Latin America, a region poorly known to European science at that time. In 1799, they started sailing towards Latin America where they spent five years in South America, exploring the territories of what are now Colombia, Cuba, Ecuador, Mexico, Peru and Venezuela.

Humboldt scaled the heights of the Andes and penetrated the unknown depths of the rain forests, studying and recording information on geology, geography, botany, archeology, zoology, oceanography, and other fields of natural science of the Continent.

The journey was full of dangers and diseases, but also fantastic discoveries. Humboldt was the first to witness the preparation of “Curare Plants” for poisoning arrows; he recognized the importance of the Cinchona tree, the bark of which contains Quinine, which is a cure for malaria. Even more importantly, he discovered and recorded many new species and animals, including the “Electric Eel”.

Founding Biogeography

On his adventures, Humboldt measured the shape of the land, its temperature, the air pressure, and the strength of magnetic fields. By connecting identical temperatures, he created contour maps of lines with similar temperatures, which he called Isotherms.

Humboldt believed that no organism or phenomenon could be fully understood in isolation. Living organisms, the objects of biological study, had to be considered in conjunction with data from other fields of research, such as meteorology and geology. These discoveries and measurements were critical to what made him such an important scientist.

Before Humboldt, the crucial connection between living organisms and the places in which they lived was not clearly seen; the role of the environment on the diversity of life was not appreciated. Humboldt discovered and understood those connections; because of this, he is considered to be a founder of Biogeography.

The Cosmos

After spending almost one year in Berlin, giving public lectures, which became so popular, Humboldt began writing his

five-volume book entitled *Cosmos*; a massive work in which he attempted to organize everything known at that time about the entire universe. Humboldt intended the book to be a popular scientific book that would provide the general public with an overview of the entire natural world.

Humboldt turned scientific observation into poetic narrative, and his writings inspired naturalists and poets, such as Darwin and Goethe. He hoped it would inspire a wider appreciation of science and scientific study; such a huge success was eventually translated into most European languages. Sadly, he passed away at the age of 89 before finishing the last volume.

Perceiving nature as an interconnected global force, Humboldt discovered similarities between climate zones across the world and predicted human-induced climate change. Though Alexander von Humboldt is almost forgotten today, he made important contributions to nearly every branch of the natural sciences. His story might be forgotten but his name still lingers everywhere, because many geographical features and places were named after him, including bays, rivers, falls, haciendas, in addition to Peru’s national forest, the famous Humboldt Current, and the Humboldt penguin.

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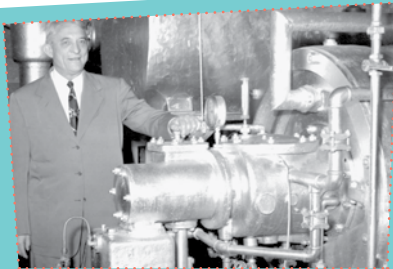
By: Sara Khattab

Inventions & their UNKNOWN Inventors



Who has not celebrated air conditioners on scorching hot summer days? Do you know who invented the air conditioner? Or, who invented the ATM machines, which save us when we have no cash money after working hours or on weekends, not to mention the hassle and time of queueing at the bank, if one is available nearby to begin with?

The truth is we nearly do not know any of the inventors of most of the devices and products that are indispensable to us nowadays. So, let us introduce some of the inventions that have changed the world and their unknown inventors.



Air Conditioners

Throughout history, there were various attempts to create cooling systems. The very first attempts were by Ancient Egyptians who created the first known cooling systems to cool their homes, hanging wet mats over their doorways, so that the evaporated water would reduce indoor air temperatures and add refreshing moisture to the dry air. After that, the Romans developed a primitive air conditioning system, using their famous aqueducts to circulate fresh water through pipes; this method reduced temperature inside homes.

Much later on, Benjamin Franklin, along with John Hadley, experimented the refrigerating effects of certain liquids; such as the mercury inside a thermometer, which proved that there is a possibility of freezing even on a warm summer day. In 1820, Michael Faraday also experimented the

refrigerating properties of gases, which led him to discover that he could cool air by compressing and liquidizing ammonia then allowing it to evaporate.

Based on the previous findings, Willis Carrier, known as the "Father of Modern Air Conditioning", managed to create the first model of air conditioning systems eventually. Carrier was an engineer who, in 1902, was given a job to decrease the humidity in a printing shop where the high temperature and humidity were affecting the quality of inks and sizes of paper. He found a solution by inventing a machine that blows air over cold coils to control room temperature and can adjust the humidity level to a desired setting; thus creating a framework for the modern air conditioner.

His "Rational Psychometric Formulae" introduced in 1911 initiated the scientific air-conditioning design, which is still used today by the air conditioning industry. By 1915, he was running his own company "Carrier Engineering Corporation" which supplied cooling systems to hotels, stores, theaters, and eventually, private homes. Carrier passed away in 1950, but his Company still exists and remains a major manufacturer of cooling and refrigeration systems.



Matches

Fire gave our ancestors the power to survive in harsh environments and prepare food. As years passed by, humans started to develop advanced tools to create a self-igniting source of fire. The basis of the modern match and lighter technology was founded by alchemist Hennig Brandt in the second half of the 17th century, when he managed to extract pure phosphorous and test its flammable properties.

Later, Jean Chancel tried to find a safe way to produce wooden matches. His method caused a violent chemical reaction that produced fire after dipping a wooden stick coated with a mixture of potassium chlorate, sulfur, sugar, and rubber, into a bottle filled with sulfuric acid. This process produced dangerous and toxic reactions, which did not find much commercial use.

In 1826, English chemist John Walker experimented in his laboratory using chemicals in an attempt to find a means to obtain fire easily. Accidentally, he discovered a mixture of antimony sulfide, potassium chlorate, gum, and other materials, that could combust in flames when scrapped. He dipped cardboard strips in this paste and left them to dry, then used them to ignite fire. His chemical formula did not suit widespread use; the sulfur coated tip of the stick burnt so strongly, leading to its detaching from the stick and destroying carpets and clothes.

Gustaf Erik Pasch, along with Johan Edvard Lundstrom, were the inventors of the most popular match design, succeeding to design a safe, cheap, and non-toxic match by putting the phosphorus coating on a separate location, which is the design of the known red-headed matches. Today, 500 billion matches are used yearly, which would not have been possible without the efforts of all these inventors.



Gas Mask, Hair Straighteners, and Traffic Signals

African-American inventor and businessman Garrett Morgan was behind the invention of various devices; such as the gas mask, hair straightener, and an improved version of traffic signals. Although Morgan did not receive any formal education beyond elementary school, he taught himself the inner workings of machines and how to fix them. His interest in mechanical things led him to develop inventions of surprising technological complexity that were always concerned with the safety and the welfare of his fellow citizens.

During his work to improve sewing machines, he experimented with a chemical solution to reduce friction caused by the needle, giving the needle a high polish that protected the fabrics. Subsequently, he noticed that the hairs of the cloth were straighter. In order to confirm his theory, he decided to apply some of this solution on a dog; the solution straightened the dog's hair. He then tried the solution on his hair and

succeeded; this experiment, thus, introduced the first human hair straightener. He then made the liquid into a cream and launched the "G.A. Morgan Hair Refining Company" to market it.

Morgan noticed that people who fought fires and who had to go into tunnels filled with smoke and fumes had no means to protect themselves from breathing the suffocating gases. In 1912, he invented a breathing device that was eventually developed into the gas mask. In 1916, he was able to rescue some of the workers trapped during an explosion in an underground tunnel using his breathing device. The Morgan gas mask was later refined for use by the US Army during World War I.

After witnessing a terrible car accident, Morgan decided to work on an improved version of traffic signals. At the beginning of the 20th century, a number of versions of traffic signal devices began to be developed. Although Morgan's traffic signal was not the first, it was an important innovation as it was the first to have a third position. "Stop everybody" besides "Stop" and "Go" which regulated traffic more safely at intersections.



Kevlar

While experimenting in the laboratories of the chemical company "DuPont", American chemist Stephanie Kwolek was asked to develop a new generation of fibers capable of performing in extreme conditions. During her analysis of long molecule chains at low temperatures, Kwolek observed how polyamide molecules line up to form liquid crystalline polymer solutions of exceptional strength and stiffness; this discovery led to the creation of strong synthetic fibers such as Kevlar.

Kevlar is a heat-resistant material that is five times stronger than steel, but lighter in weight, and flexible. It was initially intended to be used in automobile tires; yet, this breakthrough opened up possibilities for new products resistant to bullets, extreme temperatures, and other tough conditions.

Today, Kevlar is used in hundreds of products, including bulletproof vests, spacecrafts, helmets, underwater cables, skis, boat parachutes, and fiber-optic cables.



ATM Machines and PIN Numbers

In the early 1960s, banks were under pressure to find a method to provide an acceptable level of service for customers who work during working hours. Although not applied then, a cash machine was previously introduced by American inventor Luther George Simjian, and the idea was developed by British inventor John Shepherd Barron. A Scottish development engineer James Goodfellow was assigned by "Smiths Industries" to develop these machines to find a way for people to perform financial transactions, especially cash withdrawal, from banks after the bank's working hours and on weekends without the need for a human cashier.

Goodfellow created a system that accepted a machine readable encrypted card and he created a numerical keypad that was added to the machine. A Personal Identification Number (PIN), known only by the customer to whom the card was issued, has to be entered manually. This PIN turned cash machines into Automated Teller Machines (ATM), which turned to be more practical; they were simple to be used by customers and secure for banks. Today, Goodfellow's system is used in all ATMs around the world.

The names of most of these inventors are not well-known; however, their innovative ideas have changed our life, which is still changing constantly with new gadgets and inventions emerging every day.

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THE TWO SIDES of the COIN

By: Hend Fathy

Who said inventors are notorious science geeks who lock themselves up inside laboratories and research centers all the time? Most scientists, discoverers, and inventors live normal lives; some even have other interests that might have caught more attention than their contributions to science. In fact, many musicians, actors, writers, painters, and other art professionals have left their eminent fingerprints in different scientific fields and applications.

George Antheil and Hedy Lamarr



If you are a loyal fan of 20th century music or cinema, you might be familiar with either the American composer George Antheil (1900–1959) or the movie star Hedy Lamarr (1914–2000), nicknamed “The Most Beautiful Woman in Films”.

George Antheil wrote over 300 musical works, including symphonies, chamber works, film music, and operas. He was technically far ahead of his time, employing many unusual sound sources and combinations of instruments. Famous for *Algiers* (1938) and *Samson and Delilah* (1949), Hedy Lamarr charmed both critics and fans of the silver screen at that time. Surprisingly, both artists formed the technical backbone for cellular phones, fax machines, and other wireless operations, known nowadays as spread-spectrum technology.

A causal conversation between both artists at a dinner party gave birth to a brilliant idea for a secret communications system aimed to help combat the Nazis in World War II. Together, they developed a scheme to control torpedoes over long distances without the enemy detecting them. By manipulating radio frequencies at irregular intervals between transmission and reception, the invention formed an unbreakable code to prevent messages from being intercepted.

Although they patented their invention in 1941, neither ever received any money for it; it also took decades until its significance was recognized. Using today's ultrafast microprocessors, it has become an inexpensive means to communicate privately and efficiently over long distances.

Paul Winchell



American ventriloquist and voice actor Paul Winchell (1922–2005) is best known for hosting the *Winchell-Mahoney Time* children's show in the 1960s; he was also the voice performer of very popular cartoon characters such as Gargamel of the *Smurfs*, Winnie the Pooh, and Tigger. However, there was a different side of the professional entertainer that millions of his followers did not know about.

Winchell was an amateur inventor holding over thirty patents, including a flameless lighter, a fountain pen with a retractable tip, and battery-heated gloves. He also established many medical patents for the American Red Cross, including a disposable razor, a blood plasma defroster, a hypothermia garment, and a device for filling blood containers.

Winchell's most eminent contribution as an inventor is the first artificial heart, patented in 1963, implantable in the chest cavity; he developed it with the assistance of Dr. Henry Heimlich, inventor of the Heimlich Maneuver, at the University of Utah. Winchell's artificial heart was a battery-operated motor worn outside the body and connected to a non-toxic bag inside the body, which mimics the pumping action of a real heart.

William Moulton Marston



William Marston's (1893–1947) biography reads like one of a renaissance man. He was a Harvard-educated psychologist, a lawyer, a writer, a feminist, and a popular comic book superhero creator. Marston was a loyal advocate for women's rights and believed that women needed a symbol of power. As a consultant to the company that later became DC Comics, he was inspired to create a female superhero character. Wonder Woman first appeared in 1941, and since then became the most popular comic-book female superhero of all time.

Wonder Woman is famous for her magical weapon, the Lasso of Truth, which forced anyone ensnared by it to tell the truth. Not only was the superheroine idea inspired by Marston's beliefs, but her weapon was also inspired by the Lasso of Truth of his own: the lie detector device.

As a student of psychology, Marston was interested in the connection found between telling a lie and a rise in blood pressure. He worked on a device, which would measure changes in a person's blood pressure as they were being asked certain questions. Marston constructed the first polygraph machine in 1915, and published his findings in 1917; his device later evolved into the modern day polygraph.

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These great figures only symbolize hundreds, if not thousands, of geniuses who mastered both the arts and the scientists; their eminent contributions have nourished both the mind and soul of humanity.

The Elusive Genius: Mr. Satoshi Nakamoto



For years, the genius mathematician responsible for the creation of Bitcoin—the first ever digital cryptocurrency—remained unknown. Choosing to stay in the shadows, Bitcoin's creator went by the pseudonym Satoshi Nakamoto, never once revealing to the public his true identity.

Since he first released Bitcoin's code on 9 January 2009, Nakamoto's ingenious digital currency has grown from a nerd novelty to a kind of economic miracle. As the first independent decentralized virtual currency that is also practically impervious to fraud or theft and with no transaction fees, it holds the promise to liberate money in the same way the World Wide Web made information free.

The technology that underlies the Bitcoin currency—known as the blockchain—is widely accepted as brilliant. A publicly accessible and decentralized ledger, the blockchain records and verifies transactions by network nodes, which uses Bitcoins as its unit of account. This ledger contains every transaction ever processed, allowing any user's computer to verify the validity of each transaction.

The authenticity of each transaction is protected by digital signatures corresponding to the sending addresses, allowing all users to have full control over sending Bitcoins from their own Bitcoin addresses. Moreover, anyone can process transactions using the computing power of specialized hardware and earn a reward in Bitcoins for this service. This is known as "mining", and it is the activity of "miners" that keeps the blockchain running.

From a regular user's perspective, Bitcoin is much simpler. It is simply nothing more than a mobile application or a computer program that provides a personal Bitcoin wallet and allows a user to send and receive Bitcoins through it. This is how Bitcoin works for most users who are not miners.

Besides being obtained by mining, Bitcoins can be exchanged for other currencies, products, and services. The key difference

between Bitcoin and any other currency is that there are no control over the value of the currency. It is a new form of money that uses cryptography* to control its creation and transactions, rather than a central authority.

People see value in a currency free from government control and the fees banks charge, as well as transparency and protection from fraud because anyone can use the blockchain to verify transactions, and no sensitive information is shared, which means fewer risks for merchants.

Since Bitcoin's release eight years ago, it has been adopted for everything from international money transfers to online shopping and services. The list of businesses accepting Bitcoin as a method of payment keeps growing each year and with it grows the network of individuals using it.

Global computing giant Microsoft added Bitcoin as a payment option for a variety of digital content across its online platforms in December 2014. Dell, the multinational computer technology specialist, followed lawsuits in July 2015. Other major online retailers such as Overstock, Newegg, Showroomprive, and TigerDirect have also joined the list of Bitcoin dealing merchants, as well as some popular online services such as Namecheap, WordPress, and Reddit.

While Bitcoin remains a relatively new phenomenon, it is growing fast; the total value of all Bitcoins has grown to nearly USD 7 billion. That Mr. Nakamoto has not basked in the glory of his creation suggests an overwhelming desire for privacy; nor does he seem to be motivated by fortune. The public Bitcoin transaction log shows that Nakamoto's known addresses contain roughly one million Bitcoins; as of 19 June 2016, this is equivalent to USD 758 million.

After Mr. Nakamoto released his invention, he continued to collaborate with other developers on the Bitcoin software until mid-2010. Around this time, he handed over control of the source code repository

and network alert key to his collaborator Gavin Andresen, transferred several related domains to various prominent members of the Bitcoin community, and stopped his involvement in the project, stating he is "moving on to other things".

Mr. Nakamoto's reclusiveness has given rise to a cult of Satoshi-Hunters; much effort has been made to try and unmask his identity, but to no avail. Nobody, not even his closest collaborators, ever met Mr. Nakamoto in person. They communicated with him only electronically, and ever since he handed over his creation, they have not heard from him again.

Many candidates were assumed to be him, some even claimed that they were, but all turned out to be hackers or imposters seeking false fame. However, the true Mr. Satoshi Nakamoto seeks no fame or glory; as his creation grows way beyond his persona, his identity will remain a cipher for now.

***Cryptography** is the practice and study of techniques for secure communication in the presence of third parties.

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Rediscovering The Forgotten Scientists

By: Sherine Ramadan

Most extraordinary scientists and inventors have received prestigious awards, medals, and/or other forms of recognition for their work. However, there are some scientists who were somehow forgotten, underrated throughout their lives, their efforts only recognized after death, or whose contributions were wrongly attributed to others, not to mention the many female scientists who were hindered by gender discrimination. The unpleasant truth is that many of these scientists were not given due credit for their pioneering work and achievements; as a result, their legacies have been obscured. Let us then rediscover some of those unknown soldiers of science.

Hidden in History

There are many forgotten, but no less talented scientists, who have undertaken important scientific work and made significant breakthrough discoveries throughout the history of mankind.



Nicolaus Steno

(1638–1686)

Despite lacking the fame, Danish physician and geologist Nicolaus Steno was actually the first to realize that the Earth's crust contains a chronological history of geologic events, and that history may be deciphered by careful study of the strata and fossils. Moreover, he had many contributions in anatomy, as he traced the human lymphatic system, and was the first to show that the heart consists of two relatively independent pumps.

Steno's early observations greatly advanced the development of geology.

His fundamental principles of geology are still routinely used to interpret sedimentary rock layers. He published his geological findings in 1671 in a book¹, in which he outlined the principles of modern physical geology.



Mary Anning

(1799–1847)

An early British fossil collector, Mary Anning was a self-educated English paleontologist who left a great mark in the field of collecting fossils by making several contributions to extracting marine Jurassic fossil beds in England. She discovered the first complete Ichthyosaurus and Plesiosaurus fossils², which became major evidence of the extinction theory, while it was widely believed that animals did not become extinct. Her findings, which are some of the most important geological

pieces of all time, are now on display at the Natural History Museum, London.



George Washington

(1864–1943)

George Washington Carver started his life as a slave. He worked hard to become a respected and world-renowned agricultural chemist. Although he was a talented student, he could not overcome racism; back then, local schools did not take in African-American children, so he had to walk ten miles every day to attain education.

Carver made important agricultural discoveries and inventions. His research on peanuts, sweet potatoes, soybeans, and other products helped poor southern farmers vary their crops and improve their diets. He succeeded in utilizing ordinary peanuts

to make hundreds of useful products, including milk, cheese, soap, and grease; he also made over a hundred products from sweet potatoes.

Underrated Minds

Unfortunately, many great scientists go unnoticed and many great discoveries are left anonymous. These discoveries became so common knowledge that we forget their innovation.



Nikola Tesla

(1856–1943)

Serbian-American engineer and physicist Nikola Tesla is perhaps one of the most underrated inventors in history, although he was one of the greatest and most enigmatic scientists who played a key role in the development of electromagnetism, wireless radio communications, and many other scientific discoveries.

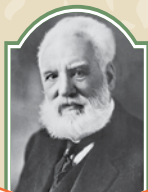
He registered over 700 patents

worldwide, in addition to countless unpatented ideas that he developed over the course of his career.

Among his discoveries are fluorescent light, laser beam, wireless communications, wireless transmission of electrical energy, remote control, robotics, Tesla's turbines and vertical take-off aircraft. Despite his numerous patents and discoveries, his achievements were often underestimated during his lifetime, because he was an excellent inventor but an incompetent businessman. Tesla passed away moneyless and without the recognition he deserved.

Unknown Soldiers

Many scientists labor in obscurity; one of the few ways in which they can gain lasting recognition is by having a scientific discovery named after them. However, the system does not always work smoothly; indeed, naming disputes are sometimes wrongly attributed.



Antonio Meucci

(1808–1889)

It is well known that Alexander Graham Bell invented and patented the telephone in 1876; however, Antonio Meucci had created a device similar to the telephone 58 years earlier. Unlike Graham Bell, Meucci could not have his invention patented or put into production due to his lack of resources.

Meucci built and installed his first voice transmission device that communicated through wires, to connect his laboratory with the bedroom of his house, to communicate with his wife who was ill with arthritis and could not move. Years later, Meucci worked on improving his device and developed more than thirty

different versions of it.

In 2002, the Congress of United States of America recognized the little-known Italian mechanical genius and immigrant Antonio Meucci as the inventor of the telephone rather than Alexander Graham Bell 113 years following his death.



William Dickson

(1860–1935)

Scottish inventor William Dickson developed the "Kinetoscope", which was the first machine for capturing and projecting motion images. He worked for, and in cooperation with Thomas Edison on developing both the phonograph and the motion picture.

While Edison seems to have conceived the idea and initiated the experiments, Dickson apparently performed the bulk of the experimentation; that is why there is an argument about how much Edison himself contributed to the invention of the motion picture camera. In fact, historians still argue over who was more important to the development of films; while Thomas Edison took all the credit then, most modern scholars assign Dickson with the major credit for turning the concept into a practical reality.

Gender Discrimination

While gender discrimination in science is not as severe an issue today as it used to be, over many centuries, numerous female scientists were not given the credit they deserved for their truly groundbreaking discoveries; making observations, proposing hypotheses, testing experiments, and putting in the hard work, only to have it stripped away because of their gender.



Emmy Noether

(1882–1935)

German mathematician Emmy Noether was known for her landmark contributions to abstract algebra and theoretical physics. She persisted in the face of tremendous obstacles to become one of the greatest algebraists of this century.

Despite her intellectual achievements, she endured years of poor treatment by German universities, where for a time she could not even lecture under her own name. In fact, her colleagues expressed frustration at the fact that she was not elected to the Academy of Sciences and was never promoted to the position of a professor.

Posthumously Recognized

Many scientist were taken for granted during their lives; however, due to their genuine contribution, they became famous following their death for their profound impact on science that can still be felt today.



Alfred Wegener

(1880–1930)

Alfred Wegener suggested that many millions of years ago Earth had consisted of a single great continent, which he called Pangaea. Very slowly the land masses of this huge continent had moved apart to form the continents we know

today. Despite publishing a large body of compelling fossil and rock evidence for his theory between 1912 and 1929, it was rejected by most other scientists. It was only in the 1960s that continental drift finally became part of mainstream science.



Gregor Mendel

(1822–1884)

Gregor Mendel was a German monk who founded the science of genetics; he was the first person to correctly identify the rules of genetic inheritance, which determine how traits are passed through generations of living things. Many disregarded his theories and information due to the fact that they just did not understand it.

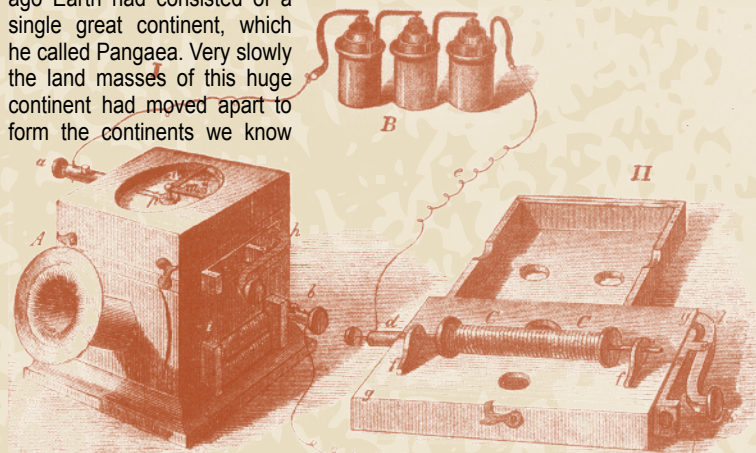
Mendel's work was not widely accepted until after his passing away. The importance of his work was only properly appreciated in 1900s, sixteen years following his death, and 34 years after he first published it. Today, Mendel has two laws named after him, both dealing with genetics.

Glossary

- (1) The book is *The Prodromus to a Dissertation Concerning Solids Naturally Contained Within Solids*.
- (2) Ichthyosaurs and Plesiosaurus are extinct marine reptiles that lived during the time of the dinosaurs.

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The MATILDA Effect

By: Lamia Ghoneim

When speaking of unknown scientists, the conversation inadvertently shifts to women scientists, whom over the centuries have been repeatedly underrepresented in the world of science, not for their lack of contribution, as much as it is for the systemic bias against recognizing their efforts. Many had been denied fame and credit for their discoveries, which instead has been attributed to their male colleagues, while their names remained unknown, written off by history.

This phenomenon has been so widespread throughout history that it was granted its own name The Matilda Effect, after the American women's rights activist Matilda Joslyn Gage, who first observed the phenomenon in the 19th century and described it in her essay *Woman As Inventor*. The name of the effect was dubbed later by science historian Margaret Rossiter, who both experienced and articulated the phenomenon, citing many examples of *The Matilda Effect* in a scientific study she published in 1993.

Contemporary studies have corroborated Rossiter's findings. One study published by the Ohio State University examined over 1,000 research publications between the years 1991–2005, and found that male scientists often cited the publications of male authors and ignored those of female authors. In 2012, two female researchers from Radboud University proved that in the Netherlands the gender of professorship candidates influences the evaluation made of them. Similar cases were described in American, Italian, and Spanish studies published between the years 2002–2012.

Rosalind Franklin (England, 1920–1958)



Rosalind Franklin was a brilliant female scientist who used X-rays to take a picture of DNA that would change biology forever. Hers is perhaps one of the most well-known—and shameful—instances of a researcher being robbed of credit due to gender, and of being wrong by her male colleagues.

You have probably heard of the names Watson and Crick, who are credited for the discovery of the DNA structure. What you might not know is the controversy surrounding their discovery, and how it was a classic case of “The Matilda Effect”.

After Rosalind Franklin graduated with a Doctorate in Physical Chemistry from

Cambridge University in 1945, she spent three years at an Institute in Paris, where she learned X-ray diffraction techniques, and the ability to determine the molecular structures of crystals. She returned to England in 1951, as a research associate in John Randall's laboratory at King's College in London, and soon encountered Maurice Wilkins, who was leading his own research group studying the structure of DNA.

Franklin and Wilkins worked on separate DNA projects, but by some accounts, Wilkins mistook Franklin's role in Randall's lab as that of an assistant rather than head of her own project.

Meanwhile, James Watson and Francis Crick, both at Cambridge University, were



also trying to determine the structure of the DNA. They communicated with Wilkins, who at some point showed them Franklin's image of the DNA—known as Photo 51—without her knowledge, as well as a report of her recent findings. She had by then reached the conclusion that DNA consisted of two chains and a phosphate backbone. The shape was also confirmed by her X-ray experiments of the DNA structure itself as well as her unit cell measurements.

Photo 51 enabled Watson, Crick, and Wilkins to deduce the correct structure for the DNA, which they published in a series of articles in the journal *Nature* in April 1953. Franklin also published in the same issue, providing further details on DNA structure, but her research was seen as a confirmation of her male colleagues work rather than a discovery.

Franklin's image of the DNA molecule was the key to deciphering its structure; however, only Watson, Crick, and Wilkins received the 1962 Nobel Prize in Physiology or Medicine for their work, while Rosalind Franklin virtually had no recognition.

Jocelyn Bell Burnell (Northern Ireland, b. 1943)



Jocelyn Bell Burnell is a groundbreaking scientist who discovered pulsars in 1967 while still a graduate student in radio astronomy at Cambridge University in England. After being inspired by her father's books, Burnell began her work with astronomy; she was able to graduate with a Bachelor's degree in Physics from



Much like the Matthew Effects, which observe how eminent scientists will often get more credit than a comparatively unknown researcher, even if their work is shared or similar, The Matilda Effect observes cases of women scientists who have been ignored on basis of their gender.

the University of Glasgow and went on to Cambridge to earn her PhD.

At the time of her discovery, Burnell was working under Antony Hewish studying quasars. While independently working with radio telescopes, Bell noticed being given off by something in space. The signals were unlike any known signals they had ever received; though she did not know the source of the signals at the time, the discovery was huge.

These signals would later be known as pulsars, which are signals that are given off by neutron stars. These observations were quickly acknowledged and published with Hewish's name appearing before Burnell's. Though Burnell had made both the observation and the discovery on her own, Hewish later went on to win the 1974 Nobel Prize in Physics for his discovery of pulsars. The snub generated a wave of sympathy for Bell Burnell, who was later universally accepted as the person who made the discovery, without receiving formal credit.

"The picture people had at the time of the way that science was done was that there was a senior man—and it was always a man—who had under him a whole load of minions, junior staff, who were not expected to think, who were only expected to do as he said," explained Bell Burnell, now a visiting astronomy professor at the University of Oxford.

Despite the sympathy, and her groundbreaking work, Bell Burnell said she was still subject to the prevailing attitudes toward women in academia.

History is replete with examples of discrimination against women in science in the past. Despite the enormous progress in women's rights in recent decades, till today women scientists still have to deal with the "The Matilda Effect", albeit in a less overt way.

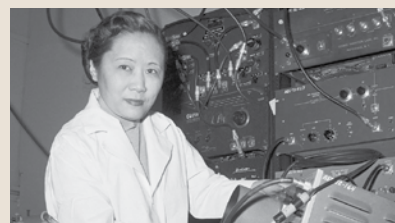
Esther Lederberg (USA, 1922–2006)



Esther Lederberg was a brilliant microbiologist who is known for identifying a stealthy virus that invades bacteria and hides within its DNA, called the Lambda Bacteriophage—in 1951, while at the University of Wisconsin. However, that was not her only discovery; her story of gender discrimination is not one of being wronged by her male colleagues, but rather of being overshadowed by her husband.

Esther, along with her first husband Joshua Lederberg, developed a way to easily transfer bacterial colonies from one Petri dish to another, called "Replica plating", which enabled the study of antibiotic resistance. While both husband and wife played equally important roles in the development of this method, Esther's contributions were largely unrecognized, as Joshua went on to win a Nobel Prize in 1958 for his work, while Esther remained unrecognized for her efforts. The Lederberg Method is still in use today.

Chien-Shiung Wu (China, 1912–1997)



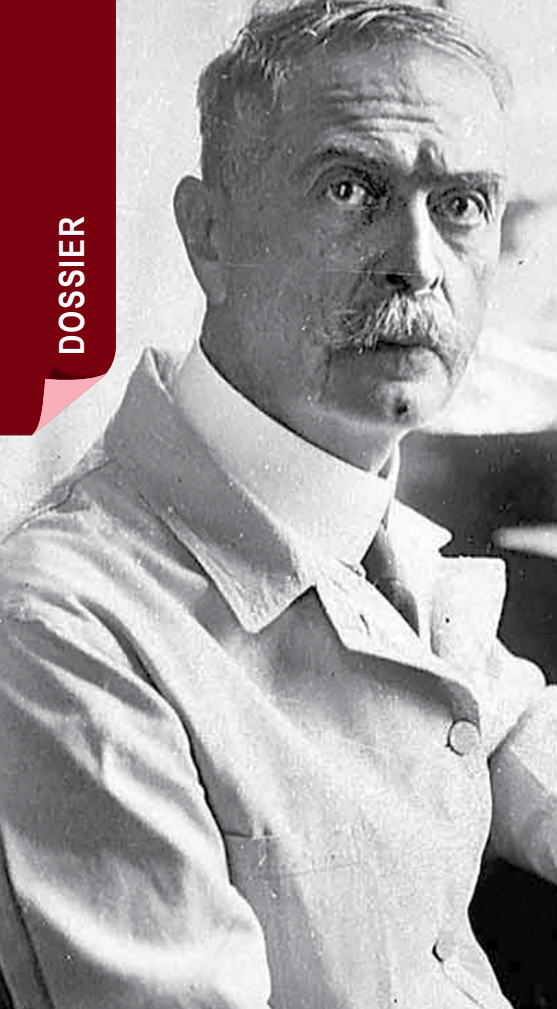
Chien-Shiung Wu overturned a law of physics and participated in the development of the atomic bomb. Wu was recruited to Columbia University in the 1940s as part of the Manhattan Project and the development of the atomic bomb. She conducted research on radiation detection and uranium enrichment.

In the mid-1950s, two theoretical physicists, Tsung-Dao Lee and Chen Ning Yang, approached Wu to help disprove the Law of Parity. The Law holds that, in quantum mechanics, two physical systems—like atoms—that were mirror images would behave in identical ways. Wu's experiments using Cobalt-60, a radioactive form of the cobalt metal, upended this law, which had been accepted for 30 years.

Her experiments were incredibly significant in that she was able to show that one particle was more likely to eject an electron than the other and they were therefore not symmetrical. This milestone in physics led to a 1957 Nobel Prize for Yang and Lee, but not for Wu, though it was her experiment that truly disproved the law.

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Landsteiner:

The Reclusive to the Rescue

Austrian-born American immunologist, physician, and pathologist, Karl Landsteiner was awarded the Nobel Prize in 1930 for Physiology or Medicine, for detecting the major blood groups and creating the ABO system of blood typing that revolutionized the process of blood transfusion and medical practices related to it.

Born in 1868 in Vienna, Austria, Landsteiner was essentially raised by a single mother, as his father died when he was only six. Karl Landsteiner was a bright student who was allowed to study medicine when he was merely seventeen years old; he finished medical school at the age of twenty-three. Landsteiner saw that the future of medicine was in research; he, thus, preferred to become a research scientist rather than an ordinary medical practitioner.

However, Landsteiner often could not find research jobs and would, thus, make his living by doing autopsies at “deadhouses”, which we now call morgues. Yet, he always persevered; no matter what his circumstances were, he would carve out a space to do research. Somewhat reclusive and pessimistic by nature, he felt at home in the laboratory and made it the focus of his life.

One of the topics he researched and found interesting was human blood. Doctors had tried giving people transfusions—a dose of another person’s blood—but it was actually just pure luck if it worked; sometimes the patient became much better, and other times the patient had a fatal reaction. Before Landsteiner discovered that people had different blood group types, people routinely bled to death from ulcers, accidents, and childbirth problems.

No one knew that there were four different types of blood—A, B, AB, and O—and that if you gave a person the wrong

type of blood, they could die from a reaction between their blood and the donor’s blood. This can start a chain reaction of other problems, in which the red blood cells will begin to react with the new blood cells, and then the cells will actually fall apart in the blood vessels, releasing hemoglobin that can damage the kidneys, which can lead to death.

In 1901, Landsteiner discovered that different people’s blood had different characteristics that made it “incompatible” with other people’s blood that did not carry those same traits. He followed a simple, yet quite systematic, approach to reach his great discovery. He cross-tested serum—blood plasma; a component of blood that is neither a blood cell nor a clotting factor—and red cells—the most common type of blood cell and the vertebrate organism’s principal means of delivering oxygen to the body tissues.

After cross-testing, his findings revealed that blood from certain scientists caused the blood of others to clump, suggesting the existence of at least two antibody classes, with the possibility of several antibody classes as well. Landsteiner promptly dubbed them “anti-A” and “anti-B”; after further investigation, he could clearly identify the existence of three different groups, which he called A, B, and C. Later on, group C was renamed as “O” due to its unique characteristics.

One year later in 1902, Landsteiner’s three fellow scientists discovered a fourth

blood type named AB. The discovery of the differences and identification of the groups that were alike made it possible for blood transfusions to become a safe routine procedure. This paved the way for many other medical procedures that we take for granted today, such as surgery, blood banks, and transplants.

Landsteiner is known as the “melancholy genius” because he was so sad and intense; yet, he was so systematic, thorough, and dedicated. He wrote 346 papers during his long career, contributing to many areas of scientific knowledge. He is considered the father of hematology (the study of blood), immunology (the study of the immune system), polio research, and allergy research. The role of Landsteiner’s contributions in medicine is crucial; thanks to his discoveries, thousands of lives were saved in hospitals during World War I, and are still being saved to this day.

Landsteiner died of a heart attack in 1943 while still performing his duties at his laboratory at the age of 75. Besides being awarded the Nobel Prize, he was honored with a Lasker Award—the highest medical award in the US—in 1946, three years after his death.

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A few droplets of boiling water splashed onto my fingertips while I was preparing a cup of coffee; it hurt very much. Burns must cause the most severe pain; my injury was not serious, but it reminded me of the pains that the unnoted Italian thinker and philosopher Giordano Bruno must have experienced. I remembered and imagined him in prison, awaiting his execution by burning; no doubt he thought deeply before the execution. He could have disclaimed his ideas as Galileo did, but he did not; he favored burning to disclaiming his beliefs... Excuse me dear reader; you must be wondering who Giordano Bruno was and why he was sentenced to burn to death. Let me then introduce him to you, and let us imagine and analyze together.

Bruno was born in 1548 in the Kingdom of Napoli; his father was a military warrior and the family moved to Napoli when he was eleven years old. Bruno studied at the Dominican Monks School, where he gained the title "Giordano". Bruno was a bookworm during his years of study and the library of the Couvent des Dominicains did not only contain theology books, but was rich with old Greek and Latin books about Plato, Aristotle, and different pure sciences, philosophy, and mythology, all serving to establish his empirical beliefs against theologian thought.

As a student, Bruno always argued and disagreed with his teachers over intellectual issues. He believed in Democritus' ideas about the universe, and read for Copernicus and Muslim thinkers, such as Avicenna and Averroes; he also delved into the study of Jewish philosophies by Ibn Gabirol. Bruno was excited about the idea of an endless world that has no center nor circumference, deriving life from a single soul.

The young monk's supervisors were upset with his thought trends, his strange theories, recurrent questions, and increasing doubts; nevertheless, Bruno was appointed a monk in 1572. His arguments about the Divine Entity and the decentralized nature of the universe kept increasing though; his supervisors officially rebuked him twice. Having spent eleven years as a monk, Bruno escaped the monastery and disappeared, leaving Napoli to work as a teacher in a boys' school near Genoa. He then moved to Savona, Turin, Venice, then to Badu; he later returned to his monk's robes, moving from one place to another, as far as Lyon and Geneva. He eventually discarded his robes again and embarked on editing manuscripts for printing.

Historians state that Bruno wrote a critique about a lecture by a clerk at Geneva University, highlighting twenty errors in it.



By: Dr. Omar Fikry
Head, Planetarium Section, BA Planetarium Science Center

GIORDANO BRUNO:

THE FORGOTTEN PHILOSOPHER

The owner of the print shop that printed the critique was arrested and fined. Bruno, on the other hand, was subjected to trial at the church's court, but was forgiven after he apologized. I see you wondering, dear reader, if this deserves the death penalty; I beg your patience. At the time, Bruno had gained fame in different fields, such as philosophy, mnemonics, astronomy, and literature. His fame turned dangerous in 1582, when he published his satirical novel *The Torchbearer*, which cruelly criticizes church monks and professors; he signed it "Bruno of Nola, a Graduate of the Academy of Annoyance".

In 1583, Bruno lectured at Oxford University about the eternity of the soul, the celestial sphere, and about Copernicus' belief in the movement of planets, which did not go without attacking the church again in

this respect. He called himself in this lecture a "Dr. in Modern Theology and a Professor of Harmless Pure Wisdom". In late 1585, Bruno returned to Paris, where he lectured at the Sorbonne and antagonized Aristotle's proponents. Bruno insisted on his ideas that went against the church's regarding the concept of willingness and the geocentric model; he preached his philosophical ideas about God, and his belief in Copernicus' theories in different places and universities, until he was forbidden from teaching by the church.

The inquisition accused Bruno of heresy; he was arrested for his beliefs about the universe and the Divine Entity. You might be wondering again, dear reader, if one could be sentenced to death for his ideas? "Yes", history answers. Bruno was offered opportunities to disclaim his ideas and avoid burning to death, but he would not do it; his fate might have instigated Galileo Galilei to save himself from a similar tragic fate later. Still, whereas history remembers Nicolaus Copernicus and Galileo well, it forgets our young martyr scientist.

I drank my cup of coffee, looking at the light burn traces on my fingers. I thanked God that they did not burn as Giordano Bruno did because he disagreed with the geocentric model.



By: Jailane Salem

UNSOLVED MYSTERIES OF SCIENCE

While knowledge accumulated by humanity keeps increasing day by day, and while we now know more than we have ever known before in our history, there still remain mysteries that we have yet to unravel and occurrences that we have yet to fully understand. Humans by their nature are inquisitive beings; even when we encounter things we cannot fully comprehend we come up with hypotheses and theories until we arrive at a definitive answer.

Science has been humanity's tool in deciphering events; with this tool we have made great advances and gained a lot of understanding about our universe, our planet Earth, as well as our own kind. This sort of understanding helps in our development, not only as individuals, but as societies as well. Nevertheless, while books on every possible subject under the Sun can be found in libraries around the world, there are still many mysteries that science has yet to find a logical explanation for; as anything else, research will probably eventually come up with an answer to those mysteries, or so one can hope.

Dark Energy

For something that makes up part of the universe, dark energy eludes definite explanations. What exactly is it? How does it operate? These are questions that are still being posed; how then do we know of its existence?

It was first believed that the universe's expansion was slowing down; however, scientists later on discovered that, to the contrary, our universe was expanding at a greater speed. One given explanation for the cause of the expansion was that dark energy acts as a fluid force in space, causing this expansion. Scientists believe that it was after the Big Bang that the universe started expanding and that, at one point in time, the universe will run out of energy, causing the expansion to eventually slow down.

This theory was disproved when the study of distant supernovae demonstrated that the universe was actually expanding at an accelerated rate. Where did this strong force

come from that challenged gravity? Scientists believe that that would be dark energy. However, what are the properties of dark energy? Is dark energy constant? If not, does it fluctuate in various spots throughout space? What is its source? All these questions still remain unanswered and research is still being conducted on it.

The Space Roar

Another mysterious event that took place in space is the space roar; a sound heard that was not fully comprehended. You might have heard the famous line: "In space, no one can hear you scream," which is a tagline on the movie poster of *Alien*. Indeed, sound as we know it does not exist in space; since space is a vacuum, there is no physical medium for sound to move through and create a noise audible to us.

For us to hear sound, it has to move through air or water for example; however, radio waves do not face this restriction. Electromagnetic waves caused by radiation





can be found in space; we can “hear” these waves when they are picked up by specialized devices that turn them into signals that can then be translated into vibrations, which the human ear can hear. This is how scientists were able to hear the “space roar”.

In 2006, NASA’s Goddard Space Flight Center sent the Absolute Radiometer for Cosmology, Astrophysics, and Diffuse Emission (ARCADE) into space; this device was attached to a giant balloon and sent off into space in order to help researchers learn about radiation from the universe’s earliest stars. The device was equipped with seven sensors that could pick up electromagnetic radiation such as radio waves; it had to be far enough from the Earth’s atmosphere to avoid interference with its equipment.

While ARCADE was supposed to pick up faint radio signals from ancient stars, it instead picked up on a much louder noise; a loud boom that was six times louder than researchers expected. This noise was dubbed the “space roar”. There are several theories floating around trying to explain the phenomenon but its origin is as of yet unknown.

Plate Tectonics

If we look at the map of the world, we can easily see how the different continents could have at one point fit together to form one large continent. When we look at Africa and South America especially, this is very noticeable; it seems like they would fit perfectly together like two corresponding jigsaw puzzle pieces. There have also been discoveries of animal fossils and plant fossils from the same families on the shores of the different continents, giving weight to the hypothesis that the continents were joined at their commencement.

How then did the different continents end up drifting so far apart? The continental plates form the top layer of the Earth and are called

the lithosphere; under this layer is flowing molten rock that is constantly heated due to the flow of heat from the center of the Earth to the upper levels of the Earth. Scientists have theorized that it is this heat that causes the continental drift; however, the nature of the continental drift is not fully understood and there is no all-encompassing answer.

Why Do We Sleep?

Most of us cannot wait to get to bed after a long and tiring day; the sweet relief a warm bed offers is unparalleled. If one goes without sleep for one day or two, you might start feeling extremely tired and you may also notice that your body is underperforming.

Different researchers have found benefits for sleeping; one of which is that, when we sleep, we tend to consolidate important memories and information, flushing away those deemed unimportant. In 2013, a study published by researchers found that cerebral spinal fluid is pushed around the brain to clear waste chemicals that are produced as part of a cell’s natural activity. This method of waste removal, known as the glymphatic system, mainly occurs when we sleep, pointing to the importance of sleep.

The connection between sleeping and feeling rested and refreshed is well documented; however, William Dement—a retired Dean of sleep studies at Stanford University—has studied sleep for almost

half a century said that the most definitive reason for why we sleep is “because we get sleepy”. As more and more research is conducted on why we sleep, we will eventually have a well-rounded answer to this important question.

Why Do We Laugh?

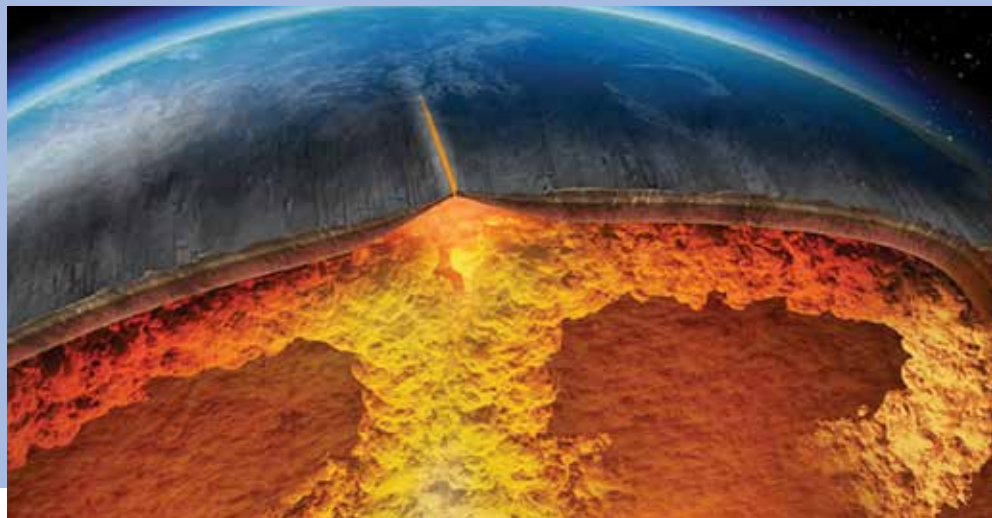
Human behavior is not easily explainable; indeed, there are many actions that we perform on a daily basis that elude any explanation. We all heard of the phrase “laughter is the best medicine,” which is interesting, because it is something that happens unconsciously. We are aware that laughter activates parts of the body and can trigger certain sensations and thoughts. It affects the muscles in our bodies, from our facial muscles to our abdomen, as well as our breathing patterns.

It is something we learn before we even start speaking, and is therefore one of our most natural reactions. Many view laughter as a social signal; one that helps bond people together and helps them form relationships. While the social implications of laughter are understood, not much is known about the brain mechanisms that bring about laughter, which makes it a mysterious behavior.

These unsolved enigmas just go to show how there is still much that we need to explore and research, and proves as a reminder that, even though we live in an advanced age, we have yet to gain complete knowledge of all phenomena that surround us. Then again, a little mystery never hurt anybody!

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Inventions Lost in the Mists of TIME

By: Esraa Ali

Thousands of years ago, ancient Egyptian technology was at its peak; numerous inventions in Ancient Egypt would leave us fascinated by the advancement of technology of these people. Many of these inventions, however, were lost to the pages of history, to be attributed to other nations, or to become reinvented just a few centuries ago.

Ancient Egyptians were innovators in several fields, such as astronomy, mathematics, and medicine, among many others, and their inventions exist in our everyday life today. We would be puzzled by them; not only because they were ahead of their time, but despite our advancement, we cannot comprehend the underlying principles of some of their inventions until now.

As ancient Egyptian inventions can be quite a lengthy document, let us feature a few examples that demonstrate the ingenuity of our ancient ancestors in time-telling and personal hygiene.

Calendar

Living in an agrarian lifestyle, for ancient Egyptians a calendar meant the difference between a feast and a famine; ancient Egyptians, thus, invented the calendar more than 5000 years ago. Their calendar was originally based on the twelve-month lunar cycle; the beginning of the year was based on the appearance of the star Sirius, which occurred around 21 June.

They divided the calendar into three seasons, each comprising four months that seemed to coincide with the rise and fall of the waters of the Nile River, and each month was divided into 30 days, for a total of 360 days per year. Later, the Egyptians noticed that their calendar was not accurate enough; every year, the River flood did not occur by end-June as expected. Accordingly, they decided to add five extra days to the year, to make up the difference,

and the total number of days was brought up to 365 days.

Depending on a lunar year, the ancient Egyptian year was almost one-quarter of a day shorter than the solar year; in time, this discrepancy added up. Being a stellar event, the rising of the star Sirius, which occurs every 365 and-a-quarter days, did not precisely match their calendar, which caused a dilemma. To correct that discrepancy, every three years, they added an extra month to a year of 384 days, creating a "Great Year".

In 238 BCE, the Ptolemaic rulers decreed reforming the Egyptian calendar by adding six extra days, instead of five, once every four years to be 366 days long rather than 365; in other words, a leap year. The Egyptians were very resistant to accept that reform as most of them were farmers, and it was the agricultural seasons that made

up their year. However, in 25 BCE, the Alexandrian calendar was introduced to the Egyptians and was effectively implemented.

The ancient Egyptian calendar has been used throughout the ages. Like our ancient predecessors, the ancient Egyptian calendar is still used to date by the Egyptian Church and contemporary Egyptian farmers, to calculate the agricultural seasons. Moreover, the Egyptian calendar is also associated with local festivals, such as the annual flooding of the Nile, and the ancient Spring Festival Sham el-Nessim.

Clocks

Ancient Egypt was one of the first Ancient civilizations that divided the day into sections to tell time; the day was determined by the position of the Sun, and the night was determined by the rise and fall of the stars. Some of the earliest forms of clocks used by ancient Egyptians were shadow clocks, sundials, water clock, and merkhet.

Ancient Egyptians first measured time using the shadow clock that depends on the Sun. This clock uses a vertical stick; through the length and direction of its shadow, they could determine the time of day. The shadow clock was later improved upon by the invention of the sundial, which was attributed mistakenly by Herodotus to the Babylonians.



Many kinds of sundials were used in Antiquity; however, the earliest known sundials were of Egyptian origin. The sundial divided daytime into twelve parts conveyed on a flat base, projecting from a hole that held an upright wooden or metal bolt. They were able to determine the time as the shadow of the bolt moved across these parts. However, this method of measuring time would only function when there was sunlight.

To know the time at night, ancient Egyptians used the water clock. Although there is no evidence where the first water clock was invented, the oldest known one dates to 1500 BCE, and was found in Egypt in the tomb of Amenhotep I. Water clocks were shaped like a bowl, with a small hole in its bottom to allow the water to drip. As water dripped from the hole with a constant rate, the bowl was marked with equal twelve columns, which allowed them to tell the time by the level of water.



Furthermore, ancient Egyptians were able to track time at night, provided the stars were visible, using a device known as merkhet. It was an Egyptian development used at least since 600 BCE. This instrument was used to track time by tracking the alignment of certain stars, in order to approximate the time at night.

Ancient civilizations had several challenges to deal with; however, they were able to overcome them, until we reached our modern-day battery-operated gadgets. We now take our ability for tracking time for granted, simply by taking a glance at our watches, clocks, or even mobile phones. Today, if we compared how easily we can keep track of time, we will notice that we have come quite a long way.

Breath Mints and Toothpastes

Ancient Egyptians had specialists to help in solving their dental problems; however, they experienced problems with their dental hygiene. They used stones in grinding their food, which affected their teeth, and like everybody, they did not like having bad breath. In order to fight that problem, they invented the first ever breath mint by boiling frankincense, myrrh, and cinnamon, then mixing them with honey, and shaping them into pellets that they could chew.

Another invention attributed to ancient Egyptians to care for their teeth and keep them clean is the toothpaste and toothbrush. Early toothpaste was formed of different ingredients, which included eggshells and ashes. Ancient Egyptian mixtures of breath mints and toothpastes did not have a good taste like the ones we know today, but no doubt they helped in freshening up their breath.



Wigs and Eye Makeup

We are all familiar with the common figure of ancient Egyptians with bald heads or wearing wigs, without knowing the idea behind that. Ancient Egyptians were eager to shave their heads bald during the hot summers to keep their heads free from pests. Since baldness was not regarded as appealingly good, they invented wigs, which protected their heads from the Sun as well. Both genders wore wigs in Ancient Egypt, except priests and laborers. Wigs in Ancient Egypt were made of human hair, and they could add plant fiber or sheep wool to increase their volume.

Egyptian eye makeup, or kohl, was another marking feature of Ancient Egyptians; both genders from different social classes wore kohl. It was made by grinding down different minerals, such as galena, which produces the black color. The powder was then mixed with water and animal fat to make a paste that would stick to the eyelids; it was stored in containers called kohl pots.

Besides having cosmetic and spiritual purposes, eye makeup was believed to have many medicinal purposes as well, which were outlined in papyrus scrolls. Kohl was prescribed by Ancient Egyptian physicians against eye diseases, as galena had disinfectant qualities. Moreover, kohl shielded their eye against the harsh sunlight and acted as a deterrent to flies.

Even after death, Ancient Egyptians cared for their appearance. They believed that during their judgment, while introducing themselves to their gods, they had to have the best look in order to make the right impression. The *Book of the Dead* included the following statement: "A man says this speech when he is pure, clean, dressed in fresh clothes, shod in white sandals, painted with eye-paint, anointed with the finest oil of myrrh".

Cleanliness and personal appearance were important for Ancient Egyptians. Nowadays, contemporary Egyptians have inherited some of their traditions, and some families, especially in Upper Egypt, believe in the spiritual and medicinal powers of eye makeup and apply kohl to their newborns.

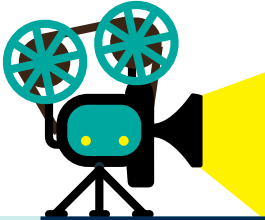
We are often surprised and impressed by new inventions and tend to look back at Ancient inventions with an air of superiority. However, if we look back in our Ancient Egyptian heritage, we can find mechanical marvels and incredible feats that reach beyond modern understanding. These inventions were forgotten, lost in the mists of time, though they had a great impact on many civilizations that followed, and managed to survive centuries so that they are still seen and utilized today.

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a BIG SCREEN

By: Shahenda Ayman



Reveal of

BIG HEROES

Many scientists exerted extensive efforts to benefit people by their research and inventions; yet, not many know their stories or what they have achieved. Here comes the role of the media to shed light on their lives and show people what they endured for the sake of their comfort.

Strathairn, the 2010 movie talks about the autistic icon Temple Grandin, a woman who has become one of the top scientists in the humane livestock handling industry despite her disability. The movie received seven Emmy Awards, a Golden Globe, and a Peabody Award.

Grandin is widely celebrated as one of the first individuals on the autism spectrum to publicly share insights from her personal experience of autism. She is also the inventor of the “hug box”, a device to calm those on the autism spectrum. In the 2010 *Time 100*, an annual list of the one-hundred most influential people in the world, she was named in the “Heroes” category.

At the age of two, Grandin was diagnosed with autism, her treatments included extensive speech therapy, which helped draw out and reinforce Grandin’s communicative abilities; she began to speak at the age of four. Although her parents sought the best possible teachers, social interactions remained difficult in middle and high school, where other students teased Grandin regularly for her verbal tics.

Despite these difficulties, Grandin achieved considerable academic success; she earned a degree in psychology from Franklin Pierce University in 1970, followed by a Master’s degree in Animal Science from Arizona State University, and a Doctoral degree in Animal Science from the University of Illinois. She then worked as a consultant to companies with large animal slaughterhouse operations, developing animal welfare guidelines for the meat industry, and consulting with McDonalds,



The Imitation Game (2014)

Featuring Benedict Cumberbatch, Keira Knightley, and Matthew Goode, *The Imitation Game* is not a tragedy; it is a celebration of Alan Turing’s extraordinary achievements through decrypting German intelligence codes for the British Government during World War II.

Born on 23 June 1912 in London, Turing showed signs of high intelligence at a young age; at the age of thirteen, he became particularly interested in mathematics and science. In 1936, Turing delivered a paper on computable numbers, with an application to the Entscheidungsproblem (German for decision problem), in which he presented the notion of a universal machine later called the “Universal Turing Machine”. This machine is capable of computing anything that is computable; the central concept of the modern computer was based on Turing’s paper.

Over the next two years, Turing studied mathematics and cryptology at the Institute for Advanced Study in Princeton, New Jersey. He then returned to Cambridge after receiving

his PhD from Princeton University in 1938, to take a part-time position with the Government Code and Cypher School—a British code-breaking organization.

During World War II, Turing was a leading participant in wartime code-breaking, particularly that of German ciphers. He worked at Bletchley Park where he made five major advances in the field of cryptanalysis, including specifying the bombe, an electromechanical device used to help decipher German Enigma encrypted signals. Shortly after World War II, Alan Turing was awarded an Order of the British Empire for his work.

Time magazine named Turing one of its “100 Most Important People of the 20th century”, stating “The fact remains that everyone who taps at a keyboard, opening a spreadsheet or a word-processing program, is working on an incarnation of a Turing machine”. Turing was also ranked 21st on the BBC nationwide poll of the “100 Greatest Britons” in 2002. Turing has been recognized for his impact on computer science, with many crediting him as the “founder” of the field.

Temple Grandin (2010)

Directed by Mick Jackson and featuring Claire Danes, Julia Ormond, and David





Wendy's International, Burger King, and other companies on animal welfare.

Grandin has performed extensive work on the design of handling facilities; half the cattle in the USA and Canada are handled in equipment she has designed for meat plants. She published several hundred industry publications, book chapters, and technical papers on animal handling, in addition 63 refereed journal articles, and ten books. She is currently a Professor of Animal Sciences at Colorado State University, where she continues her research while teaching courses on livestock handling and facility design.

In her essay *Animals Are Not Things*, Grandin argues that while animals are technically property in our society, the law ultimately grants them certain key protections. Her book *Animals in Translation* was a *New York Times* bestseller, and her book *Livestock Handling and Transport* now has a third edition. Other popular books authored by Dr. Grandin are *Thinking in Pictures*, *Emergence Labeled Autistic*, *Animals Make Us Human*, *Improving Animal Welfare: A Practical Approach*, *The Way I See It*, and *The Autistic Brain*.

In the Autistic community, Grandin has taken strong positions; she advocates early intervention, including the training of teachers to direct each child's specific fixations. She is a champion of "neurodiversity" and has opposed the notion of a comprehensive cure for autism. She argues that her contributions to the field of animal welfare would not have been possible without the insights and sensitivities that are a consequence of her autism.

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VISITORS INFO

Planetarium

Available Shows

Enlightened Mind
 19 min. Full-dome Show

The Mission
 24 min. Full-dome Show

Stars Show
 45 min. Live Show by the
 PSC Resident Astronomer

Oasis in Space
 25 min. Full-dome Show

Stars of the Pharaohs
 35 min. Full-dome Show

Seven Wonders
 30 min. Full-dome Show

The Life of Trees
 33 min. Full-dome Show

Kaluoka'hina
 35 min. Full-dome Show

To Space and Back
 25 min. IMAX Show

Cosmic Voyage
 35 min. IMAX Show

**Alexandria, The Cradle of
 Astronomy**
 22 min. Full-dome Show

Visitors INFO

- For the Planetarium daily schedule and fees, please consult the Center's official website: www.bibalex.org/psc
- Kindly note that, for technical reasons, the Planetarium maintains the right to cancel or change shows at any time without prior notification.

History of Science Museum

Visitors INFO

Opening Hours

Sunday–Thursday: 9:30-16:00
 Saturday: 12:00-16:00

Guided Tours Schedule

Sunday–Thursday:
 10:30, 11:30, 12:30, 13:30, 14:30,
 15:30

- Museum entry fees are included in all Planetarium shows tickets.
- For non-audience of the Planetarium, Museum entry fees are EGP 2.-



- Museum Tours are free for ticket holders.

ALEXploratorium

Visitors INFO

Discovery Zone

Opening Hours

Sunday–Thursday: 9:30-16:00
 Tuesday: 9:30- 12:30
 Saturday: 12:00-16:00

Guided Tours Schedule

Sunday, Monday, Wednesday, Thursday:
 10:00, 11:00, 12:00, 13:00, 14:00, 15:00
 Saturday: 12:00, 13:00, 14:00
 Tuesday: 10:00, 11:00

Entry Fees

Students: EGP 5.-
 Non-students: EGP 10.-

Listen and Discover

- For the list of shows available at the "Listen and Discover" and the schedule, please consult the Center's official website: www.bibalex.org/psc.
- For reservation, please contact the PSC Administrator, at least one week before the desired date.

Show fees

DVD shows:

Students: EGP 2.-
 Non-students: EGP 4.-

3D shows:

Students: EGP 5.-
 Non-students: EGP 10.-

4D shows:

Students: EGP 10.-
 Non-students: EGP 15.-

SERENDIPITY: THE MOTHER OF INVENTION!

