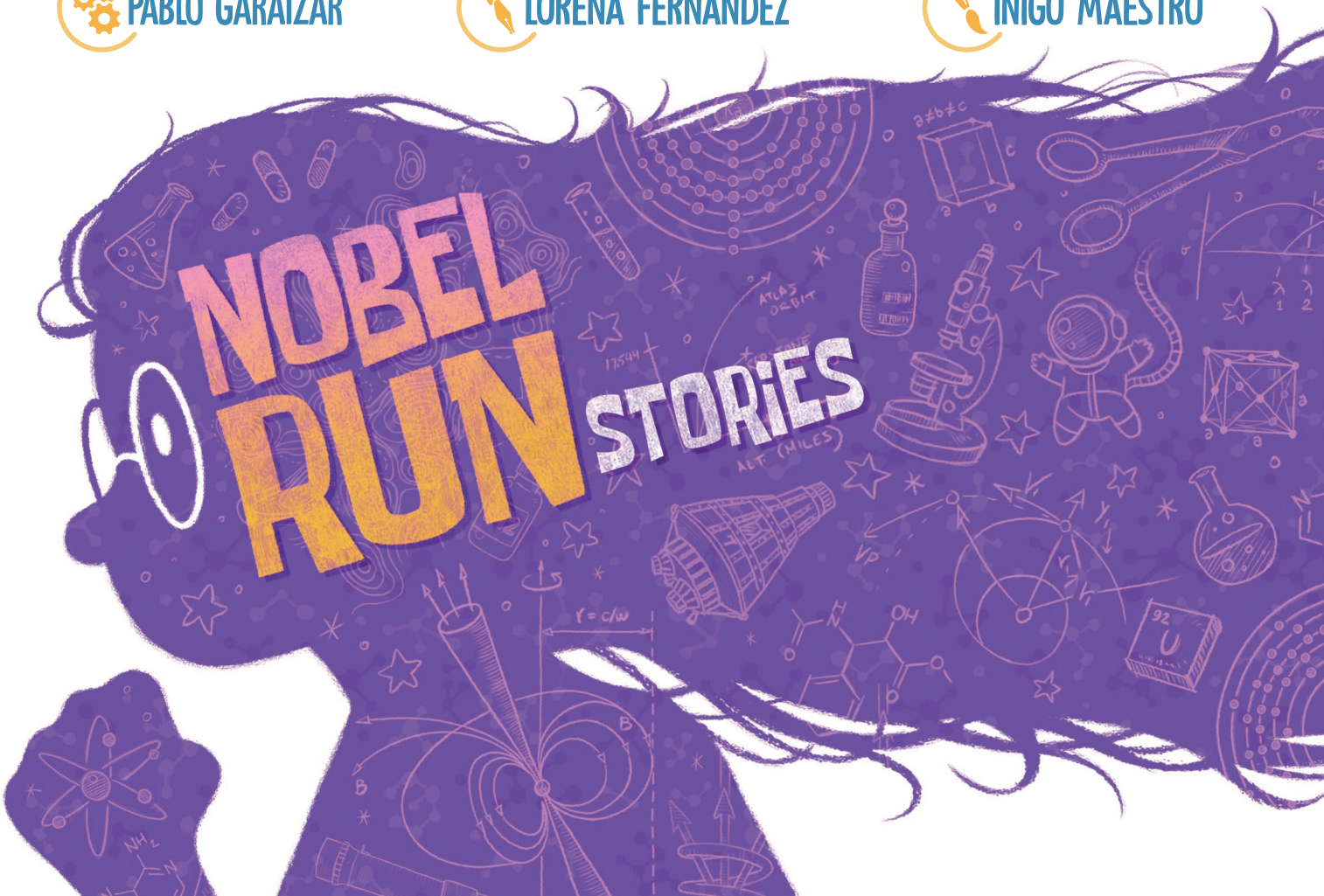
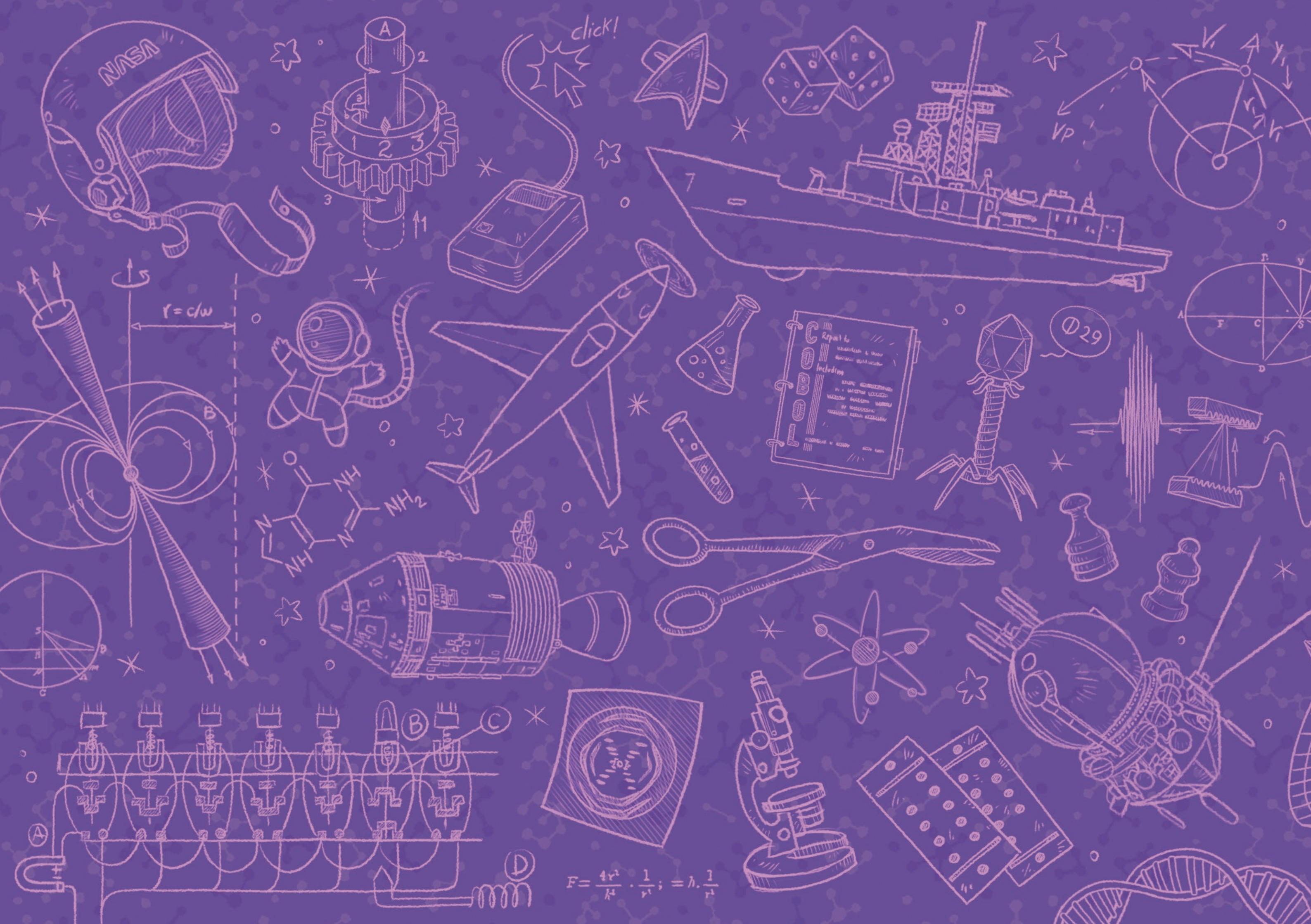
PABLO GARAIZAR

LORENA FERNÁNDEZ

IÑIGO MAESTRO

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NOBEL RUN STORIES

NOBEL RUN TIMELINE


Katherine Johnson
(1918)
Valentina Tereshkova
(1937)
Margarita Salas
(1938)
Alexandra Elbakyan
(1988)
Rosalind Elsie Franklin
(1920)
Margaret Hamilton
(1936)
Jocelyn Bell Burnell
(1943)
Donna Strickland
(1959)
Gladys Mae West
(1930)
Raye Jean Montague
(1935)
Sally Kristen Ride
(1951)
Roberta Williams
(1953)

On the shoulders of giantesses

If throughout the history of science we have seen farther, it is because we have stood on the shoulders of giants, men and women. However, women have often had an additional weight on their shoulders: the "superpower" of invisibility, the lack of female role models, the constant feeling of not being up to the task ("imposter syndrome") or the exclusive responsibility of caring for family members, among many other things. Multiple pinholes in a pipe that leaks from childhood to retirement and through which we have lost and continue to lose so much female talent.

The history of the Nobel Prizes is a faithful reflection of all this.

In its first 120 years of existence, only in 40 of them, awards were given to at least one woman. If we focus on science, this number is reduced to 19, where 12 women scientists won the Nobel Prize in Medicine, 7 in Chemistry, and 4 in Physics. Sadly, this is not a thing of the past, considering that no woman was awarded with a Nobel prize during 2016 and 2017.

Behind these cold numbers are stories of great unacknowledged women scientists. For example, Lise Meitner discovered nuclear fission together with Otto Hahn. She explained in Nature their findings on radioactivity but the Nobel Prize in Chemistry was awarded only to Hahn, who did not even acknowledge her when accepting the Prize.

In addition, women who did win the Nobel Prize had a tough time. The British press tried to belittle Dorothy Crowfoot Hodgkin's Nobel Prize in Chemistry with headlines such as "Oxford housewife wins Nobel". Donna Strickland's entry had been removed from Wikipedia for being considered unimportant, just months before she won the 2018 Nobel Prize in Physics. Even Marie Skłodowska-Curie, the first woman to win a Nobel and the first person to receive two in different categories (Physics and Chemistry), almost missed out on the first Nobel prize, which was initially awarded only to her husband. If Pierre Curie had not confronted the Academy and said that either they would give it to both of them or neither, we would now be talking about a different story.

This stubborn reality poses two important challenges. On the one hand, we need more visibility of women scientists and inventors who have made great contributions throughout history. On the other hand, it is instructive to show some of the difficulties that appear in scientific careers. That is why Nobel Run, the board game developed by Pablo Garaizar and Lorena Fernández within the framework of the European project "Gearing Roles", aims to question and transform gender stereotypes and inequality in science through a playful and innovative approach. Luckily enough, Iñigo Maestro turned each card into a small piece of art, in which you can find numerous details that provide more context to each scientist or inventor.

The race for the Nobel Prize begins here. RUN and PLAY!

Mary Somerville

(1780 ~ 1872)

Self-taught Scottish mathematician, astronomer, and scientist. She coined the word scientist instead of "man of science". It is said that her father took away her candles at night because he believed that studying could cause sterility in girls. She was, along with Caroline Herschel, the first woman to be appointed as an Honorary Member of the Royal Astronomical Society. In Nobel Run, her card gives Effort because she is known as "The Queen of Science of the 19th century", and it gives extra Effort when published because she was Ada Lovelace's mentor. The illustration shows her working on the book "Mechanism of the Heavens", a translation of the first two volumes of Pierre Laplace's "Traité de Mécanique Céleste", to which she added many explanations of the mathematics used. It became Cambridge University's recommended textbook on celestial mechanics, and she was described as "one of only six people in England who understood Laplace".

Ada Lovelace

(1815 ~ 1852)

Considered the first computer programmer as she created the first algorithm to be processed in a machine. However, many years had to pass after her death before she was given the recognition she enjoys now: there is a programming language named after her, and every year, on the second Tuesday of October, Ada Lovelace Day is celebrated to highlight the profile of women in science, technology, engineering, and mathematics. In Nobel Run, her card gives Money because she was born into a wealthy family, and gives extra Data when published because she was the forerunner of computer science. In the illustration, she is shown punching a parchment with her pen, alluding to the punched cards that were used in the Jacquard loom to repeatedly stamp the same design, similar to those that would contain the instructions for the Charles Babbage's analytical machine. She signed her Notes with her initials, due to the fear of being censored for being a woman.

Florence Nightingale

(1820 ~ 1910)

British nurse, writer, and statistician. Considered to be a predecessor of modern professional nursing. She opened the world's first professional nursing school, now part of King's College London. In Nobel Run, her card gives Data because she was the first to publicly and massively employ an infographic in the mid-19th century to convince the political class and public opinion of the importance of hygiene. This diagram was called the "Nightingale's Rose", currently known as a polar area diagram. Her card also gives Prestige by publishing it because International Nursing Day is celebrated in her honor, coinciding with her birthday. The illustration shows her holding the Turkish lamp or "fanoos" that she carried on her nightly rounds in Scutari during the Crimean War, for which she became known as "The Lady with the Lamp".

Margaret Eloise Knight

(1838 ~ 1914)

American inventor. At the age of 12, after witnessing a workplace accident, she created a safety device that automatically stopped a loom if something got caught in it. The illustration of the card in Nobel Run shows her with her best-known invention, the flat-bottomed paper bag, which is still in use today. She created a machine that produces more than a thousand bags by simply turning a crank. When she tried to patent it, she found that her model had been stolen. That's why her Nobel Run card subtracts Money from your rival. She won the case because the thief's argument was that it was impossible for a woman to make technical designs. If you publish her Nobel Run card, it takes away even more Money because it was the companies she worked for, not Knight herself, who took the benefits of her inventions. At the bottom of the card there are sketches of her other inventions, such as the internal combustion engine and the automatic tool for drilling or brushing surfaces.

Elizabeth Magie

(1866 ~ 1948)

Inventor, game designer, writer, journalist, entrepreneur, and actress. In 1893, she obtained her first patent for a device that facilitated paper feed into typewriters, and allowed the insertion of documents of different sizes. In 1903, she patented "The Landlord's Game", a forerunner of Monopoly. In Nobel Run, her card subtracts Money from your rival because Charles Darrow, creator of Monopoly, stole the idea from Magie. For this reason, in the illustration she appears to be using voodoo on Monopoly's main character. Her Nobel Run card subtracts even more Money when published because she earned just 500 dollars with her game, which was intended to be a criticism to capitalism, while Darrow became a millionaire. She devoted much of her time to advocating for women's rights. To draw attention to the labor discrimination that conditioned women to marry in order to prosper, she placed an advertisement in the press where she offered herself for sale as a "young American slave".

Marie Skłodowska-Curie

(1867 ~ 1934)

Pioneer in the field of radioactivity, the first woman to win a Nobel Prize, and the first person to win two in different categories (Physics and Chemistry). For this reason, her Nobel Run card gives Effort and Prestige once published. In the background of the illustration, there are representations of polonium and radium, elements she co-discovered together with her husband, Pierre Curie. There is also an X-ray, because she invented mobile radiology units that saved thousands of lives in the First World War. She also suffered the "Matilda effect", since initially the first Nobel Prize was awarded only to Pierre, who confronted the Academy and declared that either they would give it to both of them or to neither. In 1906, after the death of her husband, she finally received tenure at the University of Paris, taking over Pierre's position, becoming the first woman to be a lecturer and professor there. However, in 1911 her nomination to the French Academy of Sciences failed in a vote, despite being a Nobel Laureate.

Lise Meitner

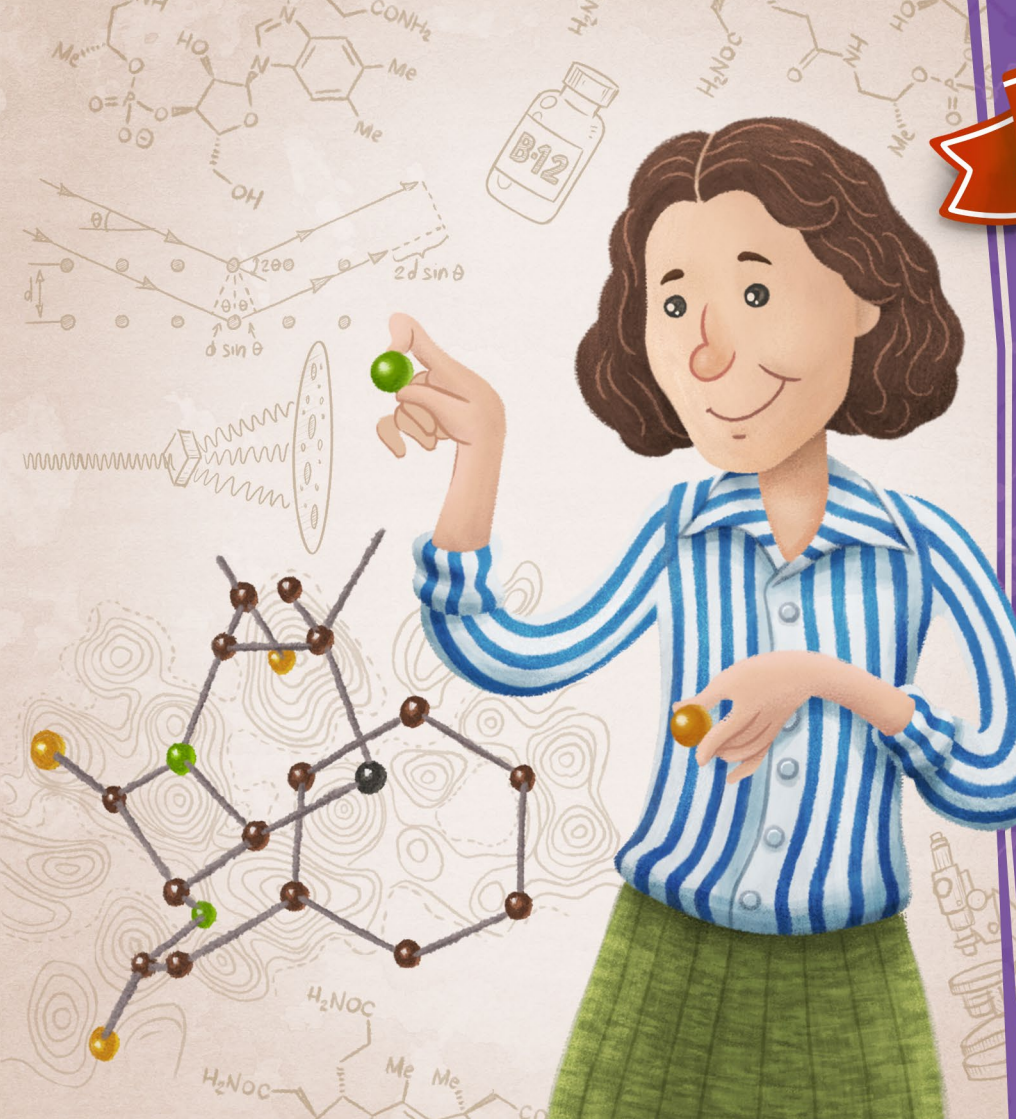
(1878 ~ 1968)

Physicist who discovered nuclear fission together with Otto Hahn. She explained in the journal "Nature" her findings on atomic theory and radioactivity, but only Hahn won the Nobel Prize in Chemistry. Despite their years of collaboration, in which Meitner was often the leader of their research, Hahn did not even acknowledge her when he accepted the Prize. In Nobel Run, her card gives Effort because she was a tireless scientist and it gives extra Effort when published because that is what she needed when she was not allowed to access the all-male chemistry department in Berlin: she was asked to use a separate entrance to access the lab to avoid "distracting" other scientists. In the illustration, she is shown throwing a neutron towards a uranium atom as if it were a marble. This causes it to split into two new atoms, releasing a large amount of energy. Elements such as uranium, protactinium, and meitnerium –named in her honor– are also depicted in the background.

Grace Murray Hopper

(1906 ~ 1992)

Developed the first compiler for a programming language, a program that translates from "human language" to "machine language". For this reason, her Nobel Run card gives Money, since this invention saved thousands of hours of learning and programming, and it gives even more Money when published because eliminating programming errors avoids large losses of money. She developed the precursor of COBOL, a programming language still used today. In the illustration, she is observing a moth because she is credited with having popularized the term "debugging" to correct errors. When she was working at Harvard, she had to remove a bug that was stuck in one of the relays of the Mark II computer. She received numerous awards and distinctions, including the title of "Man of the Year" (sic) in 1969. The World Computer Day is celebrated on December 9 to commemorate her birth.



Dorothy Crowfoot Hodgkin

(1910 ~ 1994)

Chemist who revolutionized the field of X-ray crystallography, using this technique to study the three-dimensional structure of proteins. As a result, she discovered the crystalline structure of insulin and confirmed the structures of vitamin B12 and penicillin (in the illustration, she is creating this protein). In 1964, she won the Nobel Prize in Chemistry, becoming just the third woman to receive it, after Marie Curie and Irène Joliot-Curie. In Nobel Run, her card gives Money because her contribution has generated enormous economic benefits, but it takes Prestige points away from your rival when publishing it because the press tried to belittle her award with headlines such as "Oxford housewife wins Nobel". She was also a strong advocate of nuclear disarmament and fought for this cause as president of the Pugwash Conference. She donated most of her Nobel money to causes such as providing scholarships for students, and establishing day care centers for university students and staff.

Chien-Shiung Wu

(1912 ~ 1997)

Transformed the world of physics by conducting the Wu Experiment in 1956, which contradicted the Law of Parity Conservation that had been widely accepted for 30 years. In Nobel Run, her card gives Effort due to the number of hours she spent in the lab, but takes Prestige away from your rival by publishing it because it was her colleagues Tsung-Dao Lee and Chen Ning Yang who won the Nobel Prize in Physics for the theoretical development of her discovery, while Wu was excluded from the award. Playwright Clare Boothe Luce said at the time: "When Dr. Wu eliminated that Principle of Parity, she established the Principle of Parity between men and women." During World War II, she participated in the Manhattan Project to create the atomic bomb. The illustration shows her developing a process to enrich uranium ore that produced large quantities of uranium-235, a fuel for the bomb.

Hedy Lamarr

(1914 ~ 2000)

Austrian-born Hollywood actress and inventor. She was a woman who wanted to make her mark on the world, but that world could not see beyond her face. In Nobel Run, her card gives you Data because she created the first version of Frequency Hopping Spread Spectrum with George Antheil. Her card gives you more Data when you publish it because this technology is the basis for Wi-Fi or Bluetooth networks. When she tried to join the National Inventors Council, the director told her that she could better serve his country by promoting war bonds, belittling her scientific contributions. She designed a faster airplane than those at the time, working for Howard Hughes, and created a pill that could be dissolved in water to make it Coca-Cola flavoured. Her other inventions included an improved traffic light and a precursor of drones. International Inventors Day is celebrated on November 9 commemorating her birth. In the illustration, she appears in the role of Delilah, her greatest film success, as she sees in the mirror her overshadowed side.

Katherine Johnson

(1918 ~ 2020)

American physicist, space scientist, and mathematician who contributed to U.S. aeronautics and its space programs with the early adoption of digital electronic computers at NASA. In Nobel Run, her card gives you Data because she is known for her precision in astronomical navigation. The illustration shows her performing trajectory calculations for the Mercury project and the Apollo 11flight to the Moon in 1969. In 1962, when NASA began using electronic computers to calculate astronaut John Glenn's orbit, he insisted that "the girl" (she was 43 years old by that time) check the calculations by hand made on a brand new computer: "If she says they're OK, I'll be ready to take off". She got the recognition she deserved thanks to the book and subsequent movie "Hidden Figures". A year after its release, she was inducted into NASA's Langley Hall of Honor along with Dorothy Vaughan and Mary Jackson.

Rosalind Elsie Franklin

(1920 ~ 1958)

English chemist and crystallographer who took part in the discovery of the structure of DNA. The journal "Nature" published three scientific papers under the single title "Molecular Structure of Nucleic Acids". The first paper, written by Watson and Crick, was in the spotlight of the revelation of this scientific discovery; the second one was written by Wilkins; and the third, by Franklin. Unbeknownst to Franklin, Wilkins showed Watson the decisive photos she obtained (the famous photo 51 seen in the illustration), the results of which she had not yet published. For this reason, her Nobel Run card takes Data away from your rival. It took several years for Franklin's important contribution to be recognized. This great discovery was made possible due to the images she took with the X-ray diffraction technique. This is only a small part of her legacy, as she also made important advances in carbon science, and became an expert in the study of viruses that cause diseases in plants and people.

Gladys Mae West

(1930 ~)

Mathematician known for her contribution to the foundations of Global Positioning System (GPS), although for many years she remained hidden. Her contributions were not known widely until a former student from her sorority read a brief biography about her. West directed the altimetry project of the Seasat satellite, the first to remotely detect a wide range of oceanographic conditions and features including wave height, currents, winds, icebergs, and coastal features. The illustration shows her holding a model of this satellite. Out of this work came Geosat, a satellite programmed to create computer models of the Earth's surface, enabling GPS to make accurate calculations of any point. She has never lost her curiosity or her desire to learn, and even earned her PhD degree at the age of 70 after a stroke. For this reason, in Nobel Run, her card gives you Effort, and even more Effort by publishing it due to her perseverance.

Raye Jean Montague

(1935 ~ 2018)

American naval engineer credited with creating the first computer-generated rough draft of a U.S. naval ship. When she was 7 years old, her grandfather took her to see a German submarine captured during World War II. She was fascinated and asked what she had to study to create something like that. They answered: "You'd have to be an engineer, but you don't have to worry about that", alluding to her lack of chances as a black woman. That didn't stop her and, in fact, she created the first program to design ships by computer. In Nobel Run, her card gives Money because she saved millions of dollars thanks to this achievement. President Nixon wanted the Navy to build ships more quickly and, when he learned of her breakthroughs, requested her to sketch a warship in one month (a task that normally took two years). For this, Nixon gave Montague unlimited staff and budget. But she and her team needed only 19 hours to have the first computer-designed warship in history. For this reason, her Nobel Run card gives extra Effort when you publish it.

Margaret Hamilton

(1936 ~)

Director of the Software Engineering Division of the MIT Instrumentation Laboratory. She led the development of the on-board navigation software for NASA's Apollo Space Program that first landed humans on the Moon. In Nobel Run, her card gives you Effort because Hamilton worked hard to keep her software from failing (it overcame a critical error 3 minutes before the moon landing). Her card gives you Prestige by publishing it because, although late, she received the recognition she deserved from NASA. In the illustration, she is in front of the stack of printed code sheets that she personally wrote by hand. She also coined the term "software engineering" even though many NASA colleagues mocked her when she first used it. Time would prove her right and software engineering became a new branch of science.

Valentina Tereshkova

(1937 ~)

Russian cosmonaut and engineer. She was the first woman to fly into space and, at the same time, the first non-military person to do so. In Nobel Run, her card gives you Effort because Tereshkova worked very hard to achieve it. In fact, due to her humble background, she didn't go to school until she was 8 years old. Later, she was a textile worker while still studying by correspondence. Her card also gives you Prestige by publishing it because other women have completed missions in outer space, but none have done it again solo. The illustration shows Tereshkova in her Sokol SK-2 spacesuit, designed with the female anatomy in mind for the first time. Chaika, the Russian translation of seagull, was the alias she had on the 6th mission of the Vostok program, which was quite an odyssey. During the 3-day trip, she experienced severe nausea, cramps and headaches, but that did not stop her from correcting a trajectory programming error.

Margarita Salas

(1938 ~ 2019)

Spanish biochemist who discovered and characterized the DNA polymerase of the bacteriophage Phi29 virus, used in many biotechnological processes due to its extremely high DNA amplification capacity. She worked alongside pioneers such as Severo Ochoa, Alberto Sols, and Eladio Viñuela –her husband, with whom she initiated the development of molecular biology in Spain. In Nobel Run, her card gives Data because she published more than 350 articles and her 8 patents have been the basis of significant additional research. Her card gives Money if you publish it because she is the author of the most profitable patent in the scientific history of Spain. In 2003, she became the first scientist to become a chair of the Real Academia Española (RAE), the chair for letter "i" ("i for the investigations that filled my life", she said in her investiture speech as academic).

Jocelyn Bell Burnell

(1943 ~)

Astrophysicist who co-discovered the first pulsar radio signal while still a PhD student. She published this finding together with her thesis supervisor, Antony Hewish, and Martin Ryle. Her card in Nobel Run gives Data, but also takes Prestige away from your rival by publishing it because Hewish and Ryle received the Nobel in Physics while Bell did not. If that weren't upsetting enough, she had to convince Hewish about the discovery, as he was initially skeptical about it and thought those signals were human-produced. 50 years later she won the Special Breakthrough Prize in Fundamental Physics for being the true discoverer of pulsars, along with her scientific achievements and inspirational leadership. She donated the $3 million prize to projects that promote diversity in science. In the illustration, she is wearing a T-shirt with Joy Division's "Unknown Pleasures" album cover, designed by Peter Saville using the pattern of CP 1919, the pulsar discovered by Bell.

Sally Kristen Ride

(1951 ~ 2012)

First American astronaut and third woman to reach outer space. Her Nobel Run card allows you to play an extra card because she was the first woman to operate a robotic arm in orbit, and she participated in its design and development. Her card also gives Money by publishing it because her breakthroughs have generated huge economic benefits. When she was going into space, only 4 out of 4,000 technicians at the Space Center were women. That explains why they estimated that she would need a makeup kit and 100 tampons for 6 days. In the illustration, she is shown enjoying the lack of gravity force on the Shuttle Challenger during the STS-7 mission. In the background, there is a communication pin worn by the Star Trek crew that was given to her by Kate Mulgrew, the actress who played Kathryn Janeway, the first female captain to be a lead character in the franchise. Ride worked to make STEM education more equitable and inclusive, with special emphasis on girls' participation.

Roberta Williams

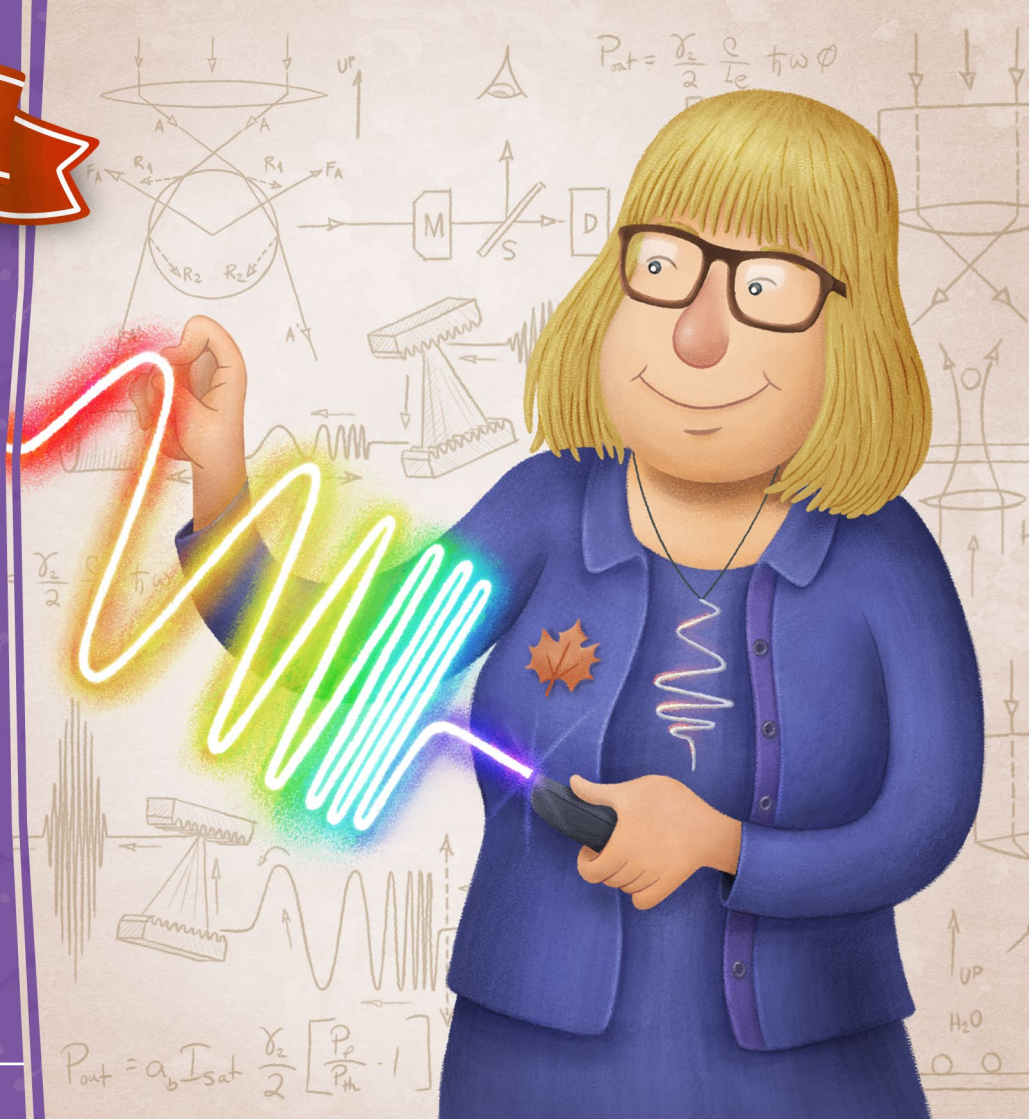
(1953 ~)

Video game designer. She developed the first adventure game with graphics (Mystery House), inspired by the novel "And Then There Were None" by Agatha Christie. In Nobel Run, her card gives Money because she was co-founder of Sierra Entertainment, a legendary company in the world of video games. Publishing her card gives more Money for her pioneering work in graphic adventures, and for creating a new genre that pushed the creation of new companies and work positions. In the illustration, she appears next to an old CRT monitor showing an image of the King's Quest saga, the first adventure game to feature a female protagonist. In the background, there is one of Apple's first mice, a peripheral device that marked a milestone in the world of adventure games. King's Quest V was the first video game to use the popular point and click system, in which only the mouse is used to interact with the environment.

Donna Strickland

(1959 ~)

Pioneer researcher in the field of lasers. In Nobel Run, her card gives Prestige by publishing it because she won the 2018 Nobel Prize in Physics (together with Gérard Mourou) for her work on Chirped Pulse Amplification. However, this card also allows you to blindly choose a card from one of the other players' hand to discard because months earlier, a draft Wikipedia article about her was marked for "fast deletion" and was deleted in less than 6 minutes. The reasons given were that she did not have enough references to show that the topic qualified for a Wikipedia article. When she was a little girl, her father (an electrical engineer) took her to the Ontario Science Centre, where he showed her the big laser in the museum and said: "You'll like to see this. Lasers are the way to the future." Little did he know how prescient his words were. Her invention offered the ability to make extremely precise cuts, and this is why it is used in medical fields such as corrective eye surgery, among others.



Alexandra Elbakyan

(1988 ~)

Software developer with expertise in computer security and neuroscience. The journal "Nature" included her in 2016 among the 10 most important people in science for creating Sci-Hub, a website where most of the scientific papers published by major academic publishers are shared for free. The idea to create Sci-Hub came to her as a student at the Russian Academy of Sciences, where she came up against paywalls on knowledge. For this reason, her Nobel Run card gives Data. It also gives Money by publishing it, since Sci-Hub has saved a lot of money for those who do not have institutional access to scientific papers. In the illustration, Elbakyan is shown handing the key to knowledge to the raven from the Sci-Hub logo. In the background, there is a reference to Open Access, a movement that advocates universal and free access to research. For Elbakyan, science thrives only when scientists shout their discoveries to the world.

NOBEL RUN

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THE SCIENTIFIC CAREER IS HARD BUT EXCITING!

Nobel Run is a **deck-building game** in which you'll manage a research team. Hire **predocs**, **postdocs** and **seniors**, publish **articles** and get funding through **international projects**. Top **scientists** and **inventors** will help you in your quest. Will you win the **Nobel Prize**?

If you want to know more about these scientists and inventors, check out their **full stories** by scanning the **QR code** or by visiting the following link

http://deus.to/nobel-run-stories

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GEARING ROLES

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