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BLACK HISTORY

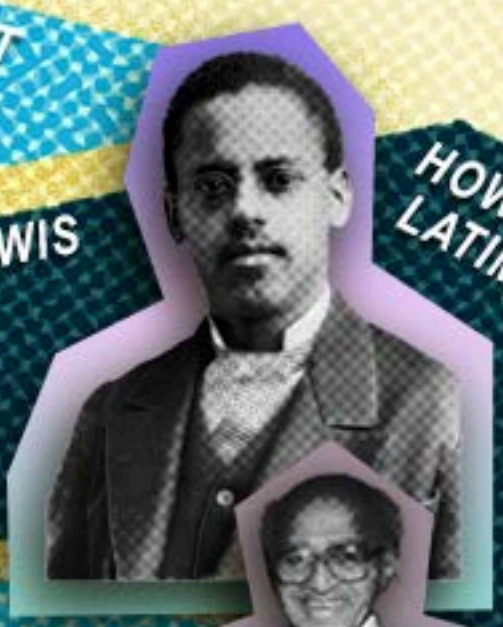
MONTH EDITION

NSB SCIENCE JOURNAL

STANDING FIRM IN POWER AND PRIDE

DR. KIZZMEKIA CORBETT

LEADING VIRAL IMMUNOLOGIST



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OCT-DEC 2025

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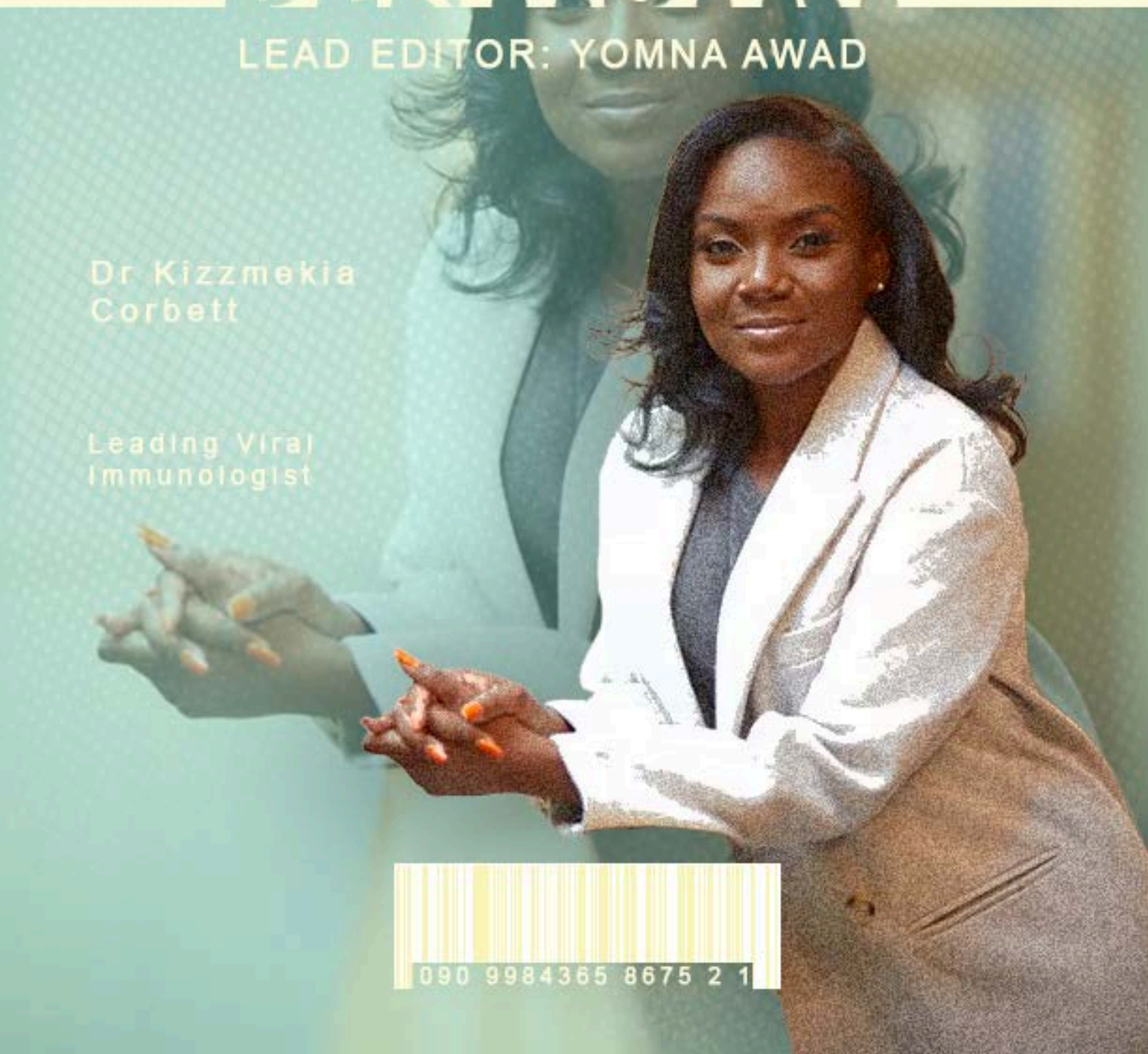

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DR KIZZMEKIA CORBETT: INNOVATING MRNA VACCINE SCIENCE

WRITTEN BY: ANISHKA GANTLA

Abstract:
The global COVID-19 pandemic was one of the most crucial public health crises in modern history. At the centre of this event was Dr. Kizzmekia Shanta Corbett, a black-American viral immunologist who participated in commemorative research of the COVID-19 vaccine's development. Her contributions in **immunology**, mRNA vaccine design, and nurturing diversity within STEM, are much to be accredited for.

Article:
Dr. Corbett's career began with a passion for biology and community service. She earned a Bachelor of Science in Biological Sciences and Sociology from the University of Maryland where she participated in the Meyerhoff Scholars Program- a renowned scholarship that supports students of ethnic minorities in STEM. In 2014, she went on to earn her Ph.D. in Microbiology and Immunology from the University of North Carolina, focusing her research on respiratory viruses. This training helped lay the foundation for her later work on coronavirus at the NIH (National Institutes of Health).

While working in a research team at the NIH, Dr. Corbett and her colleagues had already spent many years researching about viruses before the coronavirus outbreak in 2020. Specifically, they were researching the **spike proteins** of viruses. These proteins are significant for their entrance into the human body to begin infection. In less than 48 hours after Chinese researchers publicised the genetic sequence of the virus, they were able to rapidly design an mRNA-based vaccine. This vaccine instructed human cells to produce a harmless version of the virus's spike protein, training the immune system to recognise and fight it.

This was easily done since Dr. Corbett and other scientists had created experimental vaccines against SARS and MERS (other existing viruses). By swapping in the genetic code for the virus that creates COVID-19, they had a prototype they could already use. Dr. Corbett has referred to this ability to apply a template as the **"plug and play"** approach. This vaccine design became the basis for Moderna's mRNA-1273, better known as the Moderna COVID-19 vaccine. Within just 66 days of the **pandemic** and identifying the virus's genetic sequence, the first clinical trials began, making it one of the quickest vaccines to ever be produced. Dr. Corbett's innovation demonstrated the great potential of mRNA technology at revolutionising the development of vaccines.

Beyond her scientific contributions, Dr. Corbett is a passionate supporter of diversity in science and public trust in vaccines. As a black woman in a field that historically lacks representation, she has used her platform to inspire young scientists and bridge gaps in science communication. This has led her to receive multiple awards such as the Distinguished 400 Award in 2020 and the Key of Life Award in 2021. Her research made the Moderna COVID-19 vaccine possible, saving millions of lives, inspiring people across the globe to educate themselves on immunology and promoting inclusivity within healthcare.

Glossary:
Immunology - the study of the immune system that which protects our body from disease.
Spike proteins - They are the key component that allows the virus to bind to and enter a host cell, making them a major focus for vaccine and treatment development.
Plug and play – The concept in which the same vaccine platform is used as a base, but different genetic code is inserted to create a vaccine for the specific virus.
Pandemic - a widespread occurrence of an infectious disease over a whole country or the world at a particular time.

ARTICLE (EXTRA READING) CLICK:

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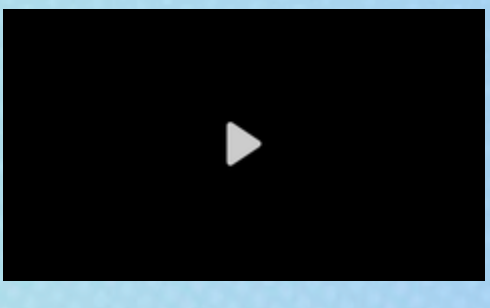

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MEDICAL ADVANCES IN PRE-COLONIAL AFRICA

WRITTEN BY: ROWAN WHITE

Abstract:
Historical medicine often has teachings that are euro-centric either focusing on the wonders of the Renaissance or the terrors of the Black plague. Yet many people do not know the enormous impact African indigenous civilisations have had on modern medicine. In this article, we will be exploring the similarities of modern day C-sections along with that of a 1879 C-section that took place in Bunyoro Kingdom in Western Uganda that follows the same scientific principles that were shunned and shamed in western society, despite their ability to significantly lower mortality rates.

Article:
Caesarean procedures were considered a last resort during childbirth, normally only considered when the mother was dead or dying, as a futile attempt to rescue the infant. They were extremely dangerous due to a lack of anaesthesia, antibiotics, and sterilisation often resulting in the deaths of both the mother and the baby.

However, a few thousand miles away in the Bunyoro Kingdom, C-sections were presumed to be regular and successful procedures with a low mortality rate. One such procedure, recorded by British traveller R.W.Felkin, appears to closely mimic modern-day C-sections, however performed with more **rudimentary tools** and equipment. His detailed account demonstrates that the medical practitioners of the Bunyoro Kingdom understood infection control, including post-operative care, controlling blood loss, minimising risk of **haemorrhaging** and other scientific principles now integral in today's society.

Felkin depicts how the indigenous healer used local banana wine as an **inebriant** to sedate the mother prior to the operation, much like anaesthesia, and as an antiseptic measure to sterilise her abdomen and his hands. During this era of the late 19th century, the generalisation of the use of carbolic acid as an antiseptic was only just gaining traction in western society and the regulation of hand washing before surgical procedures was also a **new-fangled** idea met with scepticism and unease. However, these medical hygiene breakthroughs were seen during this procedure as well-rehearsed, integral steps to the clear and unhurried routine of the operation. He goes on to describe how a midline incision was made, a technique still used in modern day medicine, and how **cauterisation** was done to prevent haemorrhaging. After the baby was removed, the wound was pinned with 7 specialised iron spikes, much like modern day staples, and dressed in a paste of roots and a bandage of a porous grass mat.

The practitioners would then remove the needles every other day, clean the wound gently and reapply the paste, demonstrating the understanding of post-operative care. This allowed the mother and infant to be fully healed, comfortable, and alive after only 11 days, a vast difference to the endings of European c-sections at that time.

Despite the success of this procedure, other little evidence has been recovered surrounding the experience and intelligence of the medical practitioners of the Bunyoro Kingdom. This is due to the prejudice of not only the European travellers, but also the western areas that believed traditional African medicine was rooted in witchcraft and superstition, rather than experimentation and scientific principles. However, this understanding ensured the best possible medical care, despite the global lack of knowledge at the time, surrounding the anatomy of women, marginalised communities as well as infection and disease.

Glossary:
Haemorrhaging – loss of blood from a damaged blood vessel either internally or externally
Cauterisation – the medical practice of burning body tissue with heat to remove unwanted tissue or close of a part of it to prevent infection
Rudimentary tools- simple, basic, and not very well-developed tools
New-fangled- different from what one is used to; objectionably new
Inebriant – a substance that causes intoxication

VIDEO (CLICK):

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DR. ALEXA IRENE CANADY

WRITTEN BY: ANNA MORRIS

Abstract:
Dr Alexa Irene Canady was the first African American female neurosurgeon in the United States of America. She took up this post in 1981 at the age of 31 and received the American Medical Women's Association Award in 1993. Retired in 2012, she remains an important voice for encouraging young women to follow careers within neurosurgery and medicine.

Article:
Dr Alexa Irene Canady was born on the 7th of November 1950 in Michigan. Her father was a dentist, and her mother was a teacher and civil rights activist. Due to their backgrounds in education, they installed strong moral emphasis on education, hard work and dedication. These values were instrumental in Dr Canady's determination to continue her career despite the numerous racial barriers and challenges she had to overcome.

Initially, she enrolled to follow a mathematics course at the University of Michigan, however, later changed this to follow a **zoology** course. This change in direction took her down a new path, where she discovered her vocation. During the period of uncertainty between the different courses her brother informed her of a paid experience: a Health programme scholarship for minority students. This included a mix of science lectures and hands-on experience in a human genetics laboratory. It was within this programme that she "fell in love with medicine". After she graduated with a bachelors in Zoology, she continued at the University of Michigan's medical school and planned on becoming an intern. She later became intrigued by neurosurgery. Despite a lack of support and hardship of finding an internship, she preserved and eventually became an intern at Yale-New Haven hospital in 1975.

Whilst completing her internship she experienced prejudice and many racially offensive comments. On her first day, one of the hospitals top administrators dismissed her as a "new equal-opportunity package". Despite the cruel discriminatory language she faced, Dr Canady believed that: "The greatest challenge [she] faced in becoming a neurosurgeon was believing it was possible".

Following her residency, she specialised in **paediatric** neurosurgery and trained at the Children's Hospital of Philadelphia. Upon her return to Michigan to work at the Children's Hospital, Dr. Canady became the Chief of neurosurgery at the age of 36. There she looked after and treated children with a range of life-threatening diseases.

After 18 years of working as a neurosurgeon, she left to move into **academia**. She spent her academic career at Wayne State University where she was the professor and vice-chair of the department of neurosurgery. She received the teacher of the year award from the children's hospital of Michigan and the distinguished service award from the Wayne State University. There, she became a co-inventor of a programmable **anti-siphon shunt** system which aimed to treat **hydrocephalus**.

Dr Canady briefly retired in 2001 but returned to establish a paediatric neurosurgery department in Pensacola after realising that the children's hospital of Pensacola lacked paediatric neurosurgery, forcing families at times to travel up to 5 hours to the nearest hospital that provided appropriate services. Once she felt her duty was complete and that the department was fully functional, she fully retired in 2012. Though she remains an avid advocate for women in medicine.

Glossary:
Hydrocephalus- when there is too much fluid called cerebrospinal in the brain.
Anti-siphon shunt- a long needle that drains the extra fluid in the brain.
Paediatric- a branch of medicine that specialises in children.
Zoology- the scientific study of animals.
Academia- a community of researchers and teachers who work in universities to study, teach and expand their knowledge.

YOUTUBE VIDEO (CLICK)

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DR. REBECCA LEE CRUMPLER

WRITTEN BY: SEHRISH WAJAHAT

Abstract:
In an era where racism and sexism were severe obstacles for Black women, Dr. Rebecca Lee Crumpler became the first African American woman in the United States to earn a medical degree in 1864. Persevering in the face of discrimination and professional **hostility**, she is a symbol of resilience who challenged systemic barriers.

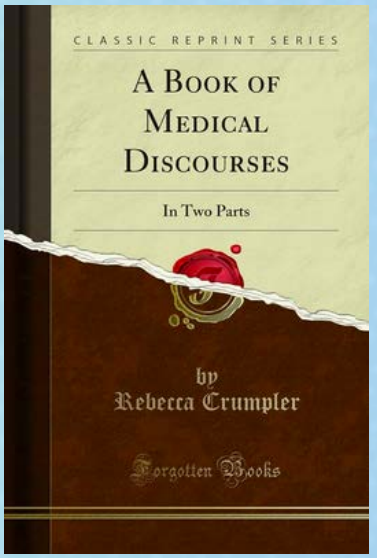
Article:
Born in 1831, she was raised by her aunt in Pennsylvania, who cared for her sick neighbours. Dr. Crumpler experienced the effects of care and compassion from an early age. Before formal nursing schools existed, she served as a nurse in Massachusetts, earning a reputation for her exceptional skill, intellect, and empathy. In 1860, she was admitted to the New England Female Medical College in Boston, a rare opportunity for a Black woman in the mid-nineteenth century. This was through personal endorsements by doctors who may have **vouched** for her capabilities, which carried significant weight in admissions for people outside of the typical social networks of the time. In 1864, she graduated with her Doctor of Medicine degree.

Soon after, Dr. Crumpler began her practice in Boston but as the Civil War raged on, she turned her attention and efforts to the South where the needs were higher. After the Civil War, she joined the **Freedmen's Bureau** in Richmond, Virginia and dedicated her work to caring for the newly **emancipated** African Americans. Many of whom had endured brutal slavery, poverty, and malnutrition with an almost complete lack of access to medical care. For them, her presence was a reminder that healing is a right, not a privilege.

In 1883, she published her book "A Book of Medical Discourses", which was one of the first medical texts written by an African American. By focusing on women's and children's health, it offered practical advice taken from years of practice and experience. It was also a declaration of authority – proof that a Black woman's mind and experience could contribute meaningfully to science and society. Her actions inspired future generations of Black physicians and scholars to pursue paths once considered unreachable.

Dr. Rebecca Lee Crumpler's life opened doors that were deemed shut and made space in medicine for those long excluded by the societal barriers. Her courage paved the way for other Black doctors, nurses and researchers who now carry forward her mission of care and equality. During Black History Month, her story reminds us that progress often begins with a single steady voice – a woman who dared to heal in a world that told her she could not.

Glossary:
Emancipated - free from legal, social, or political restrictions/ liberated.
Freedman's Bureau – a United States government agency established in 1865 to help formerly enslaved people and poor whites post-Civil War in the South.
Vouched- confirm that someone is who they say they are or that they are of good character.
Hostility- unfriendliness or opposition



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A HISTORY OF VILLAIN DISFIGUREMENTS IN POP CULTURE

WRITTEN BY: AVANTIKA SINGH

Abstract:
From Darth Vader and Scar to James Bond's many scarred enemies, storytellers have long linked physical **disfigurement** with villainy throughout pop culture [2][3]. This article will explore how the 'disfigured villain' trope originated, why it persists, the historical use of scars and disabilities and how these portrayals intertwine with racist history and medicine.

Article:
In media, a scar or any deformity provides an instant shorthand for 'evil.' This trope is so common that nearly 40% of people with visible differences say they have seen someone who looks like them cast as a movie or TV villain rather than a hero. Classic literature and film also often reinforce the idea that beauty means goodness while deformity or ugliness equates to being evil. For instance, in Snow White the Evil Queen is a villain merely because she is uglier than Snow White [4]. Although it is a convenient and obvious storytelling device, it is rooted in old biases [3]. In fact, it could be argued that perhaps using physical differences to signify character trait is a lazy way to separate character without any deeper development.

These biases were shaped by the history in which people of colour were dehumanised. In the late 19th and early 20th centuries, people with visible differences were exploited as spectacles. One such case was The Muse brothers, George and Willie, who were African American siblings with **albinism** that were kidnapped and forced to perform in a circus under names like "Sheep-Headed Cannibals." Meanwhile racist **caricatures** during the **Jim Crow era** exaggerated facial features to portray Black people as '**grotesque**', therefore linking blackness itself as a deformity and such criminalising both disability and race. [6][7]

Medicine also reflects similar biases. Early plastic surgery, developed after WW1, excluded most Black doctors and patients due to segregation. In fact, plastic surgery became one of the most segregated medical specialties in 20th century America. For instance, Dr. Charles DeHaven Hinkson, a Black surgeon and a WW1 veteran, defended the use of reconstructive surgery for people disfigured in war and even taught courses on it, yet systemic barriers kept most Black doctors out of mainstream plastic surgery until the 1960s. Later, "ethnic plastic surgery" even promoted procedures that made Black features appear more 'refined' and '**eurocentric**'. However, conditions like **keloid scarring**, more common in darker skin, remain under researched, leaving patients feeling unaccepted. [8]

Recognising the power of media to shape public opinion, **advocates** have begun to push back. Campaigns like "#IAmNotYourVillain" urges filmmakers to stop using scars as a villain trope and instead portray characters with facial differences in more positive or complex roles [2][5]. Healthcare experts likewise stress the need for a more responsible and accurate representation of health conditions on screen [1]. Additionally figures like model Winnie Harlow, who has vitiligo, are redefining real life beauty [9]. In doing so, pop culture can become more inclusive and ethical, showing that courage, kindness, or even cruelty have nothing to do with one's face. When we celebrate resilience, we must include those who have faced both racial and physical **prejudice**. The next generation of viewers deserve villains who are not defined by disability and heroes who look as varied as the real world.

Glossary:
Disfigurement – a change or damage to a person's face or body that makes than look different from what is usual.
Advocate – a person who supports a cause or speaks up for the rights of others
Keloid Scarring - raised, thickened scar tissue that grows larger and wider than the original injury.
Eurocentric – seen from the point of view of Europe / European people, considering them to be most important. In plastic surgery it is a procedure that promotes Western beauty standards.
Albinism – a rare genetic condition characterised by a partial or complete absence of pigment (melanin) in the skin, hair, and eyes.
Jim Crow era - a time in America where unfair laws forced Black people to use separate schools, restaurants, buses, and other services.
Grotesque - comically or repulsively ugly or distorted.
Caricature – a picture, description, or imitation of a person in which certain striking characteristics are exaggerated to create a comic or grotesque effect.
Prejudice – a negative opinion or feeling about a person or group that is formed without knowing facts.

Hollywood's Disfigured Villain Trope Does Major Harm to Disabled People
Dr. Poison from "Wonder Woman" is one of the latest.
Teen Vogue | Jul 5, 2017

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12. American Plastic Surgeons. Plastic and Reconstructive

DR. IDA GRAY NELSON ROLLINS

WRITTEN BY: RIYA PATEL

Abstract:
Dr Ida Grey Nelson Rollins, born on the 4th of March 1867, in Clarksville, Tennessee, was the first female African- American dentist. Her interest in health and sciences started from a young age which fuelled her passion for dentistry alongside her working with Dr. Jonathan Taft, a major figure in the development of dental education, dental literature, clinical innovation etc. Dr. Rollins promoted and enhanced patient-centred care as well as diversity into the field of dentistry, resulting in all patients getting treated with equality regardless of their background.

Article:

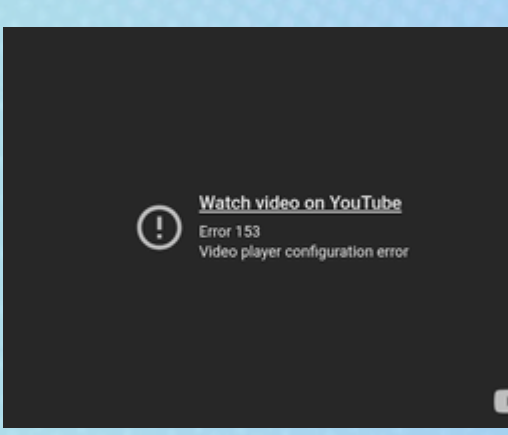
Contributions to Dentistry.
The pioneering work Dr. Rollins provided has left a long-lasting impact on the field of dentistry especially around the inclusivity and diversity of patient care. We are now aware that the priority of healthcare professionals is to provide patient-centred care. Due to figures such as Dr. Rollins, positive change has been established to ensure patient safety and comfort, not only in the field of dentistry, but in the healthcare profession as a whole. Additionally, her involvement in various community initiatives aimed at improving dental health awareness and accessibility for minority groups. She also contributed to education in dentistry as she provided lectures to emphasise the crucial aspect of inclusivity to younger aspiring dentists.

Awards and Achievement.
Dr. Rollins was the first female African- American to graduate with a Doctor of Dental Surgery in the United States after completing her 3- year course at the University of Michigan School of Dentistry. The Ida Gray Award, now given by the University of Michigan, highlights the extent of her inspiration and influence in the world of dentistry. The University also often commemorates her legacy through events and lectures. Dr. Rollins was also the first black female oral surgeon, which illustrates her diligence and skill in dentistry. She opened her own practice in Ohio but then moved back to Michigan with her husband to continue her practice, demonstrating her passion for dentistry and her willingness to continue learning.

Impact on Society and Future generations.
Dr. Rollins' determination has influenced and inspired countless individuals to pursue careers in dentistry and other fields. Society can observe that with perseverance, excellence can be achieved which is evident from her accomplishments. Therefore, her work extended beyond her lifetime, as she now has a major impact on today's future dentists' as she inspires them to achieve their goals and not to let their identity block their way to success but rather to be proud of who they are. The achievements Dr. Rollins has accomplished still serves as an inspiration for young black women as they pursue their careers in dentistry.

In conclusion, Dr. Rollins was a crucial figure in the history of dentistry as she promoted diversity in the profession while encouraging young people to follow their ambition. Her determination for equality in dentistry inspired the values of integrity, empathy and honesty which dentists must demonstrate towards their patients and other members of their team today.

Glossary:
Pioneer – develop or be the first to use or apply (a new method, area of knowledge, or activity)
Patient- centred care - putting the patient's needs, wishes and values at the heart of their care.
Diligence – working carefully and putting in steady effort to do something well



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CHALLENGING THE BARRIERS OF CARDIOTHORACIC SURGERY: DR DANIEL HALE WILLIAMS

WRITTEN BY: UMMUR ALI

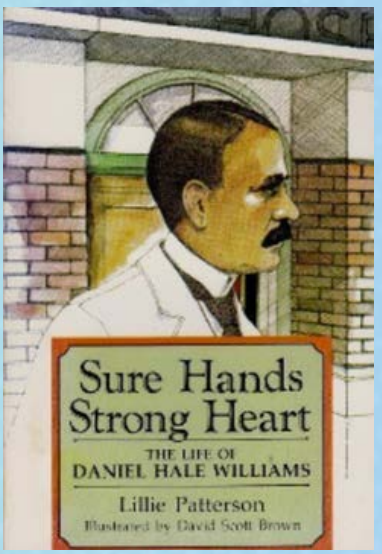
Abstract:
Cardiothoracic surgery is a constantly advancing field that continues to evolve before our eyes. Its primary goal is to treat cardiac defects that impair the heart's ability to circulate blood throughout the body, which results in insufficient delivery of hormones, nutrients and oxygen to tissues. As a highly invasive field of surgery, it is reserved for cases where laparoscopic procedures prove unsuccessful. In the late 19th century, due to the high risks of infection, **haemorrhage** and a lack of modern **anaesthesia**, cardiac surgery was widely considered impossible. This perception shifted after the ambitious surgeon, Dr Daniel Hale Williams, challenged the field of cardiac surgery by performing the first recorded open-heart surgery, pioneering a groundbreaking field of medicine.

Article:
Before revolutionising the cardiac field, Dr Daniel Williams already had an innovative reputation. He trained at Chicago Medical College and was one of the few black graduates in his era. After graduating in 1883, he apprenticed under Dr Henry Palmer, who was a general surgeon, respected by his peers, having strict sanitary standards and a strong grasp of human anatomy. At this point, germ theory was only beginning to gain acceptance in the medical community, meaning that sterile conditions while operating were not implemented in the majority of hospitals, leading to high rates of infection after surgery. Dr Williams advanced his mentor's methods and became one of the first surgeons to operate under sterile conditions.

The highlight of his career was performing the first open-heart surgery in July 1893 at Provident Hospital in Chicago, one of the first interracial hospitals in the US. His patient was James Cornish, who was injured via a stab wound in the chest during a physical altercation. The stab resulted in a severe wound to his **pericardium**. At the time, the heart was seen by the field of cardiothoracic surgery as too delicate to operate on. Cornish's pierced pericardium resulted in a large **cardiac tamponade**, which highly increased the risk of a **collapsed heart**. Dr Williams didn't have modern-day anaesthesia, so he operated using crude anaesthesia, most likely administered as **chloroform**. He opened the chest cavity and sutured the wound in the **pericardium**, all while Cornish's heart was still beating. This was carried out under meticulous, sterile conditions, which was very rare at the time and greatly reduced the risk of infection. Any slip made during the surgery could have resulted in a punctured heart, which would have caused Cornish to bleed out within minutes. James Cornish made a full recovery and became known as the first successful patient of open-heart surgery.

In conclusion, Dr Daniel Hale Williams' 1893 pericardium repair was the first successful open-heart surgery. His widely accepted success revealed how important sterile conditions, planning, and accurate anatomy knowledge are when it comes to invasive surgeries. In addition to his revolution in the field of cardiothoracic surgery, he fought against segregation by founding Provident Hospital in Chicago, which was one of the first interracial hospitals in the US. Dr Williams was a great innovator in the 19th century and will be remembered for his invaluable contributions to the field of medicine.

Glossary:
Anaesthesia: Induced loss of sensation or consciousness to perform surgery without pain.
Cardiac Tamponade: Accumulation of fluid in the pericardial sac, compressing the heart and reducing cardiac output.
Cardiothoracic Surgery: Surgical specialty involving the heart and thoracic organs.
Chloroform: Early anaesthetic agent used for sedation during 19th-century surgeries.
Haemorrhage: Severe, uncontrolled bleeding.
Pericardium: Fibrous sac surrounding the heart, containing fluid to reduce friction during contraction.
Collapsed Heart: Failure of the heart to pump effectively, often secondary to trauma or tamponade.



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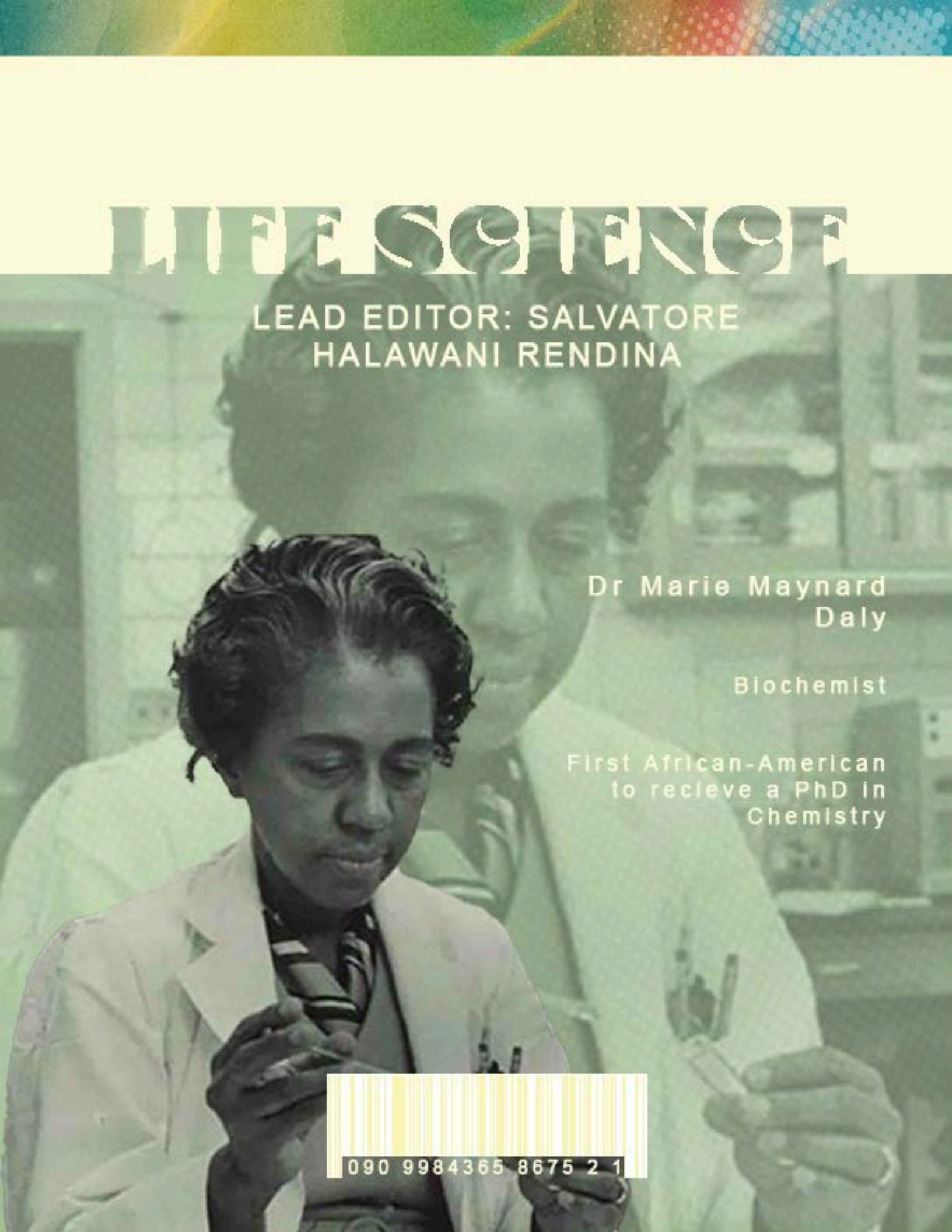

Dr Marie Maynard Daly

Biochemist

First African-American to recieve a PhD in Chemistry

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MARIE MAYNARD DALY – DNA AND HISTONES

WRITTEN BY: NADIA VIRCHENKO

Abstract:
Many of us have heard of Crick and Watson, and their discovery of the structure of DNA, however, not every prominent scientist gets a Nobel Prize. Marie Maynard Daly may not have become famous worldwide, but her work on **nucleotide bases** and **histones** laid the foundation for modern genetics as we know it now. A pioneer in biochemistry and advocate for black rights in science; her contribution revolutionised both medicine and opportunities for minorities in STEM.

Article:
Marie Maynard Daly was a biochemist born in New York, America. She was the first African-American woman to receive a PhD in Chemistry in the United States and the first African-American to receive a PhD from Columbia University. Born in 1921, Daly faced both racial and gender discrimination, but this did not stop her from embarking on a groundbreaking journey of research. “

So, what did she actually discover? Marie Maynard Daly confirmed the four nucleotide bases that make up DNA- adenine, guanine, cytosine and thymine (abbr. A, T, C, G). Daly did this using starch column **chromatography**, whereby she extracted and purified the **nucleic acids** (DNA) from different plant and animal tissues to be used in the experiment. The solutions were applied to the top of the starch column, and a solvent (e.g. ethanol) was added. The nucleic acids were carried with the solvent as it moved down due to gravity. Each of the nucleotide bases had a different affinity for the mobile and stationary phases, causing them to move at different rates which separated them out from each other. She then collected the bases at different levels and analysed them. A series of experiments on many different species showed that all DNA contains the same four bases in similar proportions, proving that the structure of DNA is universal in all **eukaryotes**.

Marie Maynard Daly was also a significant contributor to research on histones – the structural proteins that DNA coils around. These help DNA to condense to a smaller size to fit into a nucleus and also control **gene expression** by determining which parts are open to or shielded from transcription. Daly developed revolutionary methods which allowed her to analyse the structure of histones, leading to the discovery of **lysine rich histones** and better understanding of their functions.

Daly’s research has been recognised by many other scientists in the field of genetics since, notably Francis Crick and Jim Watson. They quoted one of Daly’s papers as a source of influence in their 1962 Nobel Prize speech after they discovered the **double helix** structure of DNA. It is safe to say that Daly’s work will still lay the foundation for many more discoveries in the future.

Aside from her research, Daly worked to provide better opportunities for minority students in science, launching an effort to admit black students to the Albert Einstein college of medicine in 1968 and founding a scholarship fund at Queens College in 1988.
Sadly, little more is known about Daly’s motivation for research and interest in genetics, however her efforts in contributing new knowledge and fighting racism will live on. Her example is one of hope: even if the path is difficult, you can pave it through hard work and help others walk it too.

Glossary:
Nucleotide bases – basic building blocks of nucleic acids that contain nitrogen**.**
Nucleic acids – chemical compounds that store genetic information and are found in all living cells (main examples are DNA and RNA).
Chromatography – a mixture separation technique where components are separated based on how much they are attracted to the stationary phase (e.g. paper or starch column) and the mobile phase (e.g. water or ethanol**).**
Histones – proteins that provide the structural support for DNA and chromosomes.
Gene expression – the process during which the information inside a gene is used to make a functional product, usually a protein.
Lysine rich histones – histones that contain a lot of the amino acid lysine.
Double helix – the shape of a DNA molecule that resembles a twisted ladder.
Eukaryotes – organisms whose cells contain a nucleus

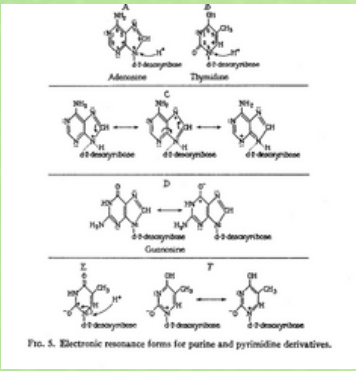

FIG. 5. Electronic resonance forms for purine and pyrimidine derivatives.

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WELTON TAYLOR: MICROBIOLOGIST AND ADVOCATE FOR RACIAL EQUALITY

WRITTEN BY: ALEX DIXON

Abstract:
Welton Taylor was an African American microbiologist who had major breakthroughs in the field of food safety and against food-borne pathogens- particularly Salmonella. After many inventions and major contributions to the field, his achievements were formally recognised in 2016 when he was inducted into the National Inventors Hall of Fame. In addition, he had a newly discovered bacterium named after him (Enterobacter taylorae).

Article:
Taylor was born in November 1919 in Birmingham, Alabama and this came with many challenges, especially the stark racism towards black communities at the time which he was exposed to from a young age. Just weeks after his birth, his mother inadvertently discovered the identity of a local Ku Klux Klan leader and the family were forced to move from Birmingham to Bronzeville, Chicago out of fear for their safety.

Despite the racial prejudice, he graduated from high school in 1937 as the **valedictorian** of his class, and in 1941, earned a bachelor's degree in **bacteriology** from the University of Illinois. After fighting in WW2 (as a pilot), he returned home in 1948 and completed a PhD in "The growth and toxin production of Clostridium botulinum in cottage cheese ".

Taylor's first discovery came in 1948, when he and colleague Milan Novak found that the antibiotic penicillin could be used as **prophylaxis** for both gas gangrene and tetanus, which had military implications as it improved healthcare at war. Between the years 1954-1959, he worked at Swift and Company (a food processing company) and it was here that he and colleague John Silliker developed an accurate way to test the presence of salmonella in egg yolks, which is still in use today.

In 1959, Taylor left the company and moved to the position of Microbiologist-in-Chief at the Children's Memorial Hospital in Chicago. In 1961, he aided in the development of methods to try and prevent salmonella poisoning from imported meat, and upon returning to the Hospital in 1962, he produced two other test procedures for both Shigellae and Enterobacteriaceae (both bacteria causing food poisoning). Taylor's methods were recognised and used across the world. Following these breakthroughs, he became a consultant for 11 hospitals within Chicago, 3 government agencies and the Centre for Disease Control, where he studied subjects such as Legionnaire's disease, AIDS and toxic shock syndrome.

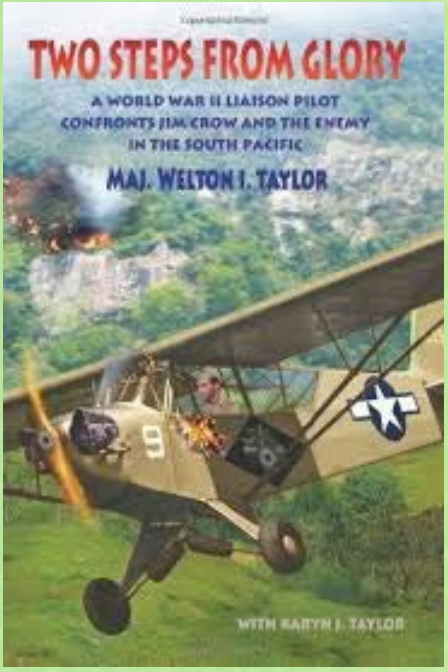
His most well-known discovery came in 1965 when he developed the Xylose lysine deoxycholate (XLD) agar, used to grow and isolate both the Shigella and Salmonella bacteria from food and lab samples. To this day, this specific agar is used frequently for diagnostic research on Salmonella enterica, helping to prevent illness from food containing Salmonella strains.

In 1975, Taylor- alongside others- founded the Journal of Clinical **Microbiology**, in which articles and discoveries were published monthly. Soon after, he was issued a patent for his invention of combining varying culture mediums to forge a medium that clearly and accurately shows the existence of different bacteria in a clinical environment. This medium was approved by the **FDA** alongside food safety agencies in Canada and Europe, and his product was then put into use.

In addition to his microbiological breakthroughs, he was also a passionate civil rights activist, advocating for racial equality, specifically with hopes to de-segregate restaurants, public swimming pools and cinemas. Taylor was one of the first African Americans to **de-segregate** the Chatham neighbourhood in Chicago, and he was also the president of the Community Council of the Chatham Avalon Park.

To conclude, Welton Taylor was a true inspiration for black innovators and scientists, as he proved that no matter what burdens and prejudice you're met with, these can always be overcome. His countless microbiological breakthroughs and lifelong dedication to activism served as an antidote to the racist contemporary views of people at the time.

Glossary:
Valedictorian- an academic title given to the highest ranked student among the graduating cohort (only in North America)
Bacteriology- the study of bacteria
Microbiology- study of microorganisms
Prophylaxis- treatment to prevent disease, instead of trying to cure it once an individual is affected by the disease
FDA- American food and drug administration
De-segregate- ending the separation between different groups of people, usually based on race in public places, schools and the workplace



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THE ROLE OF TUSKEGEE SYPHILIS STUDY IN ETHICS WITHIN RESEARCH

WRITTEN BY: ZULEIKA KHOESHAL

Abstract:
The Tuskegee Syphilis study remains among the worst examples of unethical practices in medical research in history, where 399 African Americans with syphilis were recruited for a study and blatantly lied to about its contents whilst being denied treatment. As a direct result of this, congress was forced to pass **legislation** and set up new establishments to prevent future occurrences.

Article:
In 1932, in Tuskegee, Alabama, a group of 399 African American men with Syphilis were recruited for a study under the guise of receiving free medical care for **'bad blood'** when in fact they were lied to regarding the contents of the study. The researchers actively withheld the cure for syphilis which could've easily saved their lives despite the fact that penicillin- the standard treatment- had become readily available everywhere since the 1940s. Throughout the study, the researchers worked to ensure that the subjects didn't receive the treatment they needed (e.g. even men who had been drafted into the army were removed from their position after being diagnosed with syphilis in order for the study to be continued).

In 1947, the **Nuremberg** code was written in response to the Nazi medical experiments, conducted during World War II, and stated that participants must give voluntary consent after being fully informed of the purpose and nature of the experiment. Furthermore, in 1964, the World Health Organisation released the **Declaration of Helsinki**, which built upon the work of the Nuremberg code, yet the USPHS (United States Public Health Service) continued the research, showcasing the reality that having preventative laws and codes meant nothing to researchers who still carried out their work unethically.

It was only until 1972 when information was leaked to the New York Times, that the full contents of the study were revealed to the public in a front-page article on November 16th, 1972. At this point however, only 74 of the original 399 participants remained alive after 40 years of being left untreated whilst believing they were being given the best care because that was all the information they had been given by the very organisations meant to protect them, thus further highlighting the blatant disregard for the lives of African Americans during this time period.

Largely in response to this, congress passed the **National Research Act** in 1974 which aimed to make sure that all research involving human subjects was conducted ethically and all studies now required an institutional review board (IRBs), which was carried out to review and therefore allow certain research to be approved before being allowed to take place. As well as this, the Office for Human Research Protection was established within the USPHS. However, it remained far too little, far too late and to this day none of the public health officials, doctors or researchers were ever actually prosecuted for their actions. Despite how many lives were taken due to their purposeful misinformation and malicious actions towards the innocent participants, they managed to remain in their positions, with some even retiring honourably or receiving awards due to their roles in the study.

This plainly illustrates the many reasons that legislation regarding the ethical and moral faucets of studies being undertaken in medial environments today have to be closely monitored and it was only as a result of such a horrific part of history that such hasty ramifications were able to be made in order to prevent something of this gravity from ever taking place again.

Glossary:
Bad blood – a vague local term used for several illnesses (like anaemia or fatigue).
Legislation – laws that are passed by the government.
Declaration of Helsinki – an international set of ethical principles developed by the World Medical Association (WMA) for medical research involving human subjects.
Nuremberg code – A foundational set of 10 ethical principles for human experimentation.
National research act – A US federal law that was passed in response to the Tuskegee Syphilis study and established the creation of the Belmont report.

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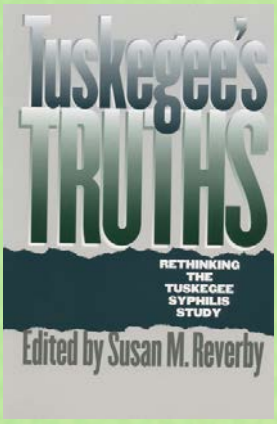

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CELEBRATING THE LEGACY OF WANGARI MAATHAI

WRITTEN BY: MISHCA COORAY

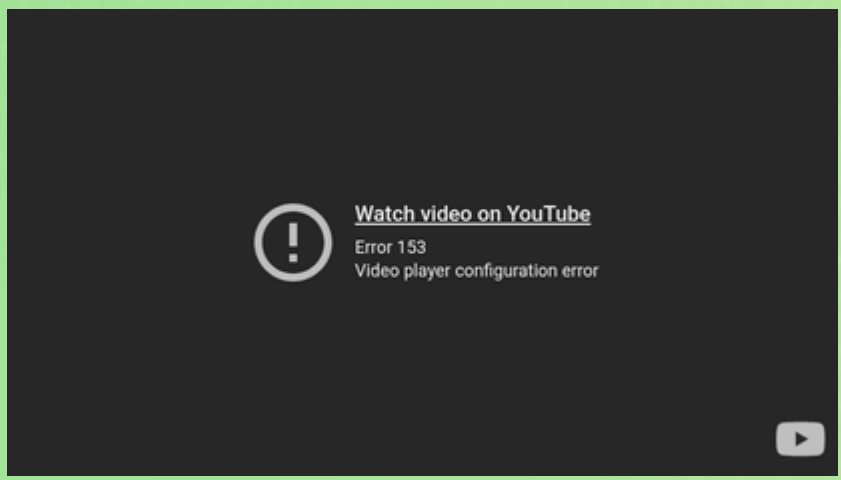
Abstract:
Who was the first African woman and environmentalist to win the Nobel prize? Who was the first woman to become a professor in Kenya? This inspiring person is Wangari Maathai. She founded the Green Belt Movement in 1977, with an incredible outcome of over 51 million trees and counting being planted across Kenya. But beyond the **accolades**, her work has empowered woman through grassroots campaigns, and she has addressed global challenges in a **holistic** approach which embraces woman's rights, sustainable development and democracy. Her battle against climate change and woman's rights is both on a local and global scale.

Article:
Wangari Maathai saw how deforestation **perpetuates** poverty and hunger, entrapping women in that vicious cycle. **Deforestation** leads to less **evapotranspiration** from trees, leading less rainfall and ending up with more deforestation. The changes to the rainfall pattern causes drying up of local water supplies, increased food insecurity, and wildlife habitat loss. This environmental degradation has a dire impact on women's lives and their abilities to feed their families and earn an income. People rely on imported goods and fertilisers which degrade the soil, leading to women walking further to collect firewood for heating and cooking.

Maathai's work was at the intersection of feminist theory and environmental protection. She saw self-empowerment as essential—helping people overcome apathy and recognize their ability to make a difference. The green belt movement has trained 30,000 women with skills such as forestry so they can earn money and help protect the local environment. The trees helped to prevent soil erosion and retained groundwater following rains. This replenished streams and the trees planted offer food, fodder and fuel – maintaining the livelihoods of community. In 1989, plans were revealed to build a large tower block in Uhuru Park – the largest park in Nairobi, however, Maathai protested in the park. She lobbied and started writing letters aimed at the Kenyan government and press, which caused her to be ridiculed and scrutinized by the government. Environmentalists and protestors under her leadership were labelled as 'the ignorant few'. In the end, her work was successful as foreign investors eventually dropped out of the project causing it to be shelved.

She regularly opposed and protested privatisation of Kenya's forests, shedding light on the illegality of such moves. Over the years she was regularly arrested, harassed, threatened, beaten and jailed by the Kenyan police forces. Nevertheless, she persevered and continued to campaign for environmental issues and social justice.

To conclude, she will forever be a totemic figure in African and global environmentalism. Professor Wangari Maathai's ability to unite social development, women's rights and the environment has forged a new and holistic pathway for **socioeconomic** growth and social justice. Her work has transformed lives and shaped Kenya into a more democratic country. She brought hope for rural women and touched the hearts of people across continents. Her legacy proves that when science and courage meet, we can bring everlasting change for the better.



Glossary:
Accolades - an award or privilege granted as a special honour or as an acknowledgement of merit.
Holistic – Looking at the whole situation and how all parts are connected, instead of focusing on just one part.
Deforestation – The cutting down or removal of large areas of trees, often causing environmental damage.
Perpetuates – continuation
Evapotranspiration – The process where water is released from the land and plants into the air and becomes water vapour.
Socioeconomic – Related to both social (people's lives, education, rights) and economic (money, jobs, resources) factors.

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DR CHARLES RICHARD DREW – "THE FATHER OF BLOOD BANKING"

WRITTEN BY: BLESSING OPPONG

Abstract:
In the 20th century, blood transfusion was a vital tool in supporting surgeons and saving the lives of soldiers on battlefields. Though attempts were made to improve the efficiency of this, it was one man's groundbreaking discovery that revolutionized the system forever. In a political and social system set up against him, Dr Charles Richard Drew's resilience in the face of discrimination as a black man led him to change the future of blood storage and donation.

Article:
Born in 1904 Washington D.C., Dr Charles Drew grew up in a segregated USA, where many black children lacked ambition for futures in science. Instead, they were stuck to a narrow path built upon stereotypes, being either an athlete or a "slave to the American system". Despite this, Charles Drew's ambition for surgery started at an early age after the [1]death of his sister Elise during the Great Influenza Epidemic in 1918.

Being one of the few black surgeons, Charles faced **institutional racism** whilst at medical school, being segregated and denied positions solely due to his skin colour. Charles was an advocate for racial equality in medicine, [2]protesting blood donor segregation and campaigning for better treatment of black doctors.

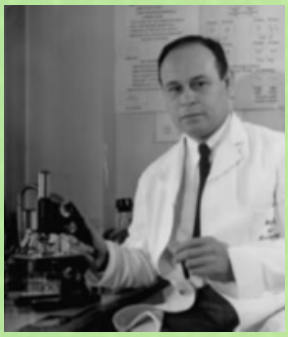
During his time at university, the idea of being African American [3]prevented him from privileges afforded to his white peers, especially access to patients. This led to behind-the-scenes pioneering where he and his mentor, John Scudder realised getting donated blood wasn't easy as it wouldn't stay preserved for long. This helped spark the discovery that all blood components (**RBC, WBC**, platelets, and plasma) could be separated into just the blood plasma using **centrifuging, sedimentation**, strict air and ultraviolet conditions for long-term storage, supporting blood transfusions as a surgeon.

The discovery wasn't a walk in the park: it took resilience, patience and a lot of hard work. Balancing the demands of clinical practice as a surgeon with blood preservation research wasn't easy especially being worsened by racial prejudice. This was piled upon with the [4]demand of blood for soldiers during World War II, saving countless lives.

But why was the discovery so **revolutionary**? Not only did Charles beat societal expectations as a black surgeon but also as a visionary. Even with the lack of technology, a system was created in which blood could now be [5]stored longer without refrigeration, won't deteriorate when agitated during transportation, could be used with any blood type and injected through various methods at large doses.

In conclusion, the recognition of black pioneers such as Dr Charles Richard Drew is vital to understanding how medical systems have advanced overtime through the discoveries of those often unrecognised. In the past, no matter how revolutionary his work was, Charles lacked his deserved recognition simply because of his black heritage. Today we carry on his legacy continually using his methods and must value his contribution to our medical system.

Glossary:
Revolutionary- involving or causing a dramatic change
Institutional racism- when systems or organisations unfairly treat people of certain races through their rules or practices, even without meaning to.
RBC- Red blood cells, transportation of gases around the body
WBC- White blood cells, involved in the body's defence against pathogens
Centrifuging- separation of blood components by density
Sedimentation- separation of particles from a liquid



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DR HADIYAH-NICOLE GREEN- CANCER NANOMEDICINE

WRITTEN BY: MINI LIU

Abstract:
Dr Hadiyah-Nicole Green is a groundbreaking scientist in cancer **nanomedicine**, known for developing a revolutionary laser-activated nanoparticle treatment that targets cancer cells with precision. Her innovative work blends with physics and **nanotechnology**. Dr Green not only contributed to oncology development; she represents one of the few Black Female Physicists in the U.S – inspiring future generations of scientist to see the representation of Black communities' brilliance and intelligence.

Article:
Dr Hadiyah Nicole Green, a physicist and medical researcher has developed an alternative approach that uses nanotechnology and laser physics to eliminate cancer cells painlessly and effectively. As cancer requires extreme precision, it often relied on aggressive methods such as chemotherapy and radiation- causing suffering that Dr Green wishes to eradicate.

At the core of her innovation – **nanoparticles**. These particles are engineered to interact with light. Dr Green coats these nanoparticles with molecules that can bind only to cancer cells. Once injected, they travel through the bloodstream and attach themselves to malignant cells while avoiding healthy issues – **targeted therapy.**

After the nanoparticles has targeted its cancer cells, a low energy laser is used, causing high temperatures which are strong enough to destroy the cancer cells inside out- the nanoparticles absorb the light and convert it into heat. However, Dr Green understood the laser could cause side effects within healthy cells such as mutations by radiation, so the laser she uses isn't strong enough to harm healthy cells. This is known as **photothermal therapy** and relies in the physical principle of light absorption at the nanoscale.

This technique stands out for being non-toxic. Chemotherapy and radiation attack healthy cells and lead to side effects such as hair loss, nausea and fatigue. Nanomedicine, however only attacks intended cells. This intelligent selectivity not only reduces patient suffering as well as providing faster treatment.

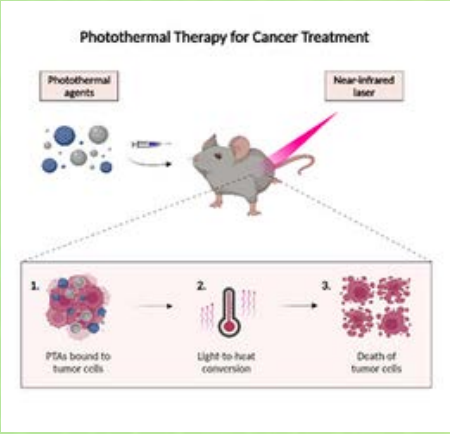
Dr Green uses cross disciplinary work, combining physics, chemistry and biology to tackle complex medical problems. Her story also represents the importance of diversity in science. She was the 2nd Black woman and 4th Black person ever to earn a PhD in physics at the University of Alabama- a historic achievement that inspires generations of young scientists to pursue STEM careers.

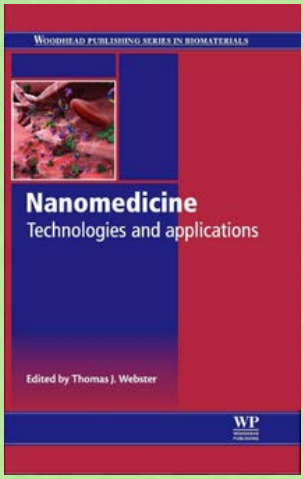
Beyond the laboratory, Dr Green founded the Ora Lee Smith Cancer research Foundation, aiming to make the nanomedicine treatment affordable available across the world, ensuring that scientific breakthroughs are not limited to wealthy hospitals or countries, but accessible to every patient who potentially needs it.

Dr Green's work could expand more in the future, even beyond cancer. **Photothermal nanoparticle** technology could one day fight bacterial infections, repair damaged tissues or deliver drugs directly to specific cells.

Dr Hadiyah-Nicole Green's research stands on the boundaries of physics and engineering. Her research in laser activated nanotechnology offers hope, not only for cancer patients but for all fields of medical science. As nanomedicine continues to evolve, Dr Green's work reminds us that innovation thrives where disciplines meet – and where compassion guides discovery.

Glossary:
Nanoparticle – a particle about one billionth of a metre in size, often used in nanotechnology.
Targeted therapy – a treatment that attacks only diseased cells while sparing healthy ones.
Nanomedicine – the medical use of nanotechnology for diagnosing and treating diseases.
Nanotechnology – the science of manipulating and controlling matter at the atomic/molecular scale (nanoscale)
Photothermal therapy- refers to the usage of electromagnetic radiation in medical treatment
Photothermal nanoparticle- nanoparticles that efficiently convert light energy into heat





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GEORGE WASHINGTON CARVER

WRITTEN BY: WILFRED PECK

Abstract:
At age 11, Carver left home to pursue an education in the nearby town of Neosho. He was taken in by an African American couple, Mariah and Andrew Watkins, for whom he did odd jobs while attending school for the first time. Disappointed in the school in Neosho, Carver eventually left for Kansas, where for several years he supported himself through a variety of occupations and added to his education in a **piecemeal** fashion.

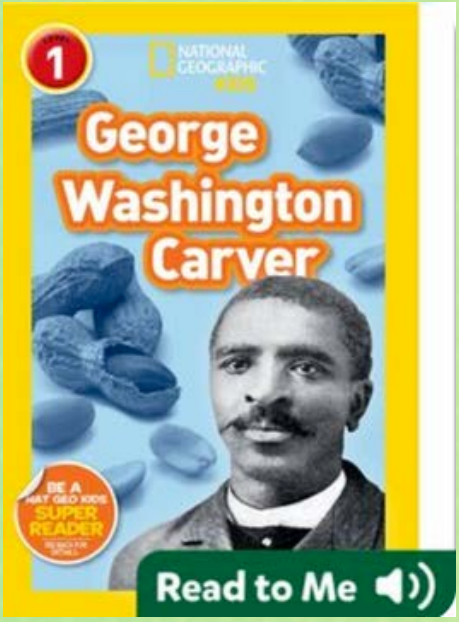
Article:
He eventually earned a high school diploma in his twenties, but he soon found that opportunities to attend college for young black men in Kansas were non-existent. So, in the late 1880s Carver relocated again, this time to Iowa, where he met the Milholland's, a white couple who encouraged him to enrol in college.

Carver briefly attended Simpson College in Indianola, studying music and art. When a teacher there learned of his interest in **botany**, she encouraged him to transfer to Iowa State Agricultural College (now Iowa State University), dissuading him from his original dream of becoming an artist. Carver earned his bachelor's degree in agricultural science from Iowa State in 1894 and a master's in 1896. While there he demonstrated a talent for identifying and treating plant diseases.

Carver's primary interest was in using chemistry and scientific methodology to improve the lives of impoverished farmers in southeastern Alabama. To that end he conducted soil studies to determine what crops would grow best in the region and found that the local soil was perfect for growing peanuts and sweet potatoes. He also taught farmers about **fertilisation** and **crop rotation** as methods for increasing soil productivity.

The primary crop in the South was cotton, which severely depleted soil nutrients, but by rotating crops—alternating cotton with soil-enriching crops like **legumes** and sweet potatoes—farmers could ultimately increase their cotton yield for a plot of land. And crop rotation was cheaper than commercial fertilization. But what to do with all the sweet potatoes and peanuts? At the time, not many people ate them, and there weren't many other uses for these crops.

Glossary:
piecemeal – bit by bit/gradually
botany – the study of plants
fertilisation – the process after pollination and germination
crop rotation – planting different plants in the same area
legumes – vegetables that are part of the pea family



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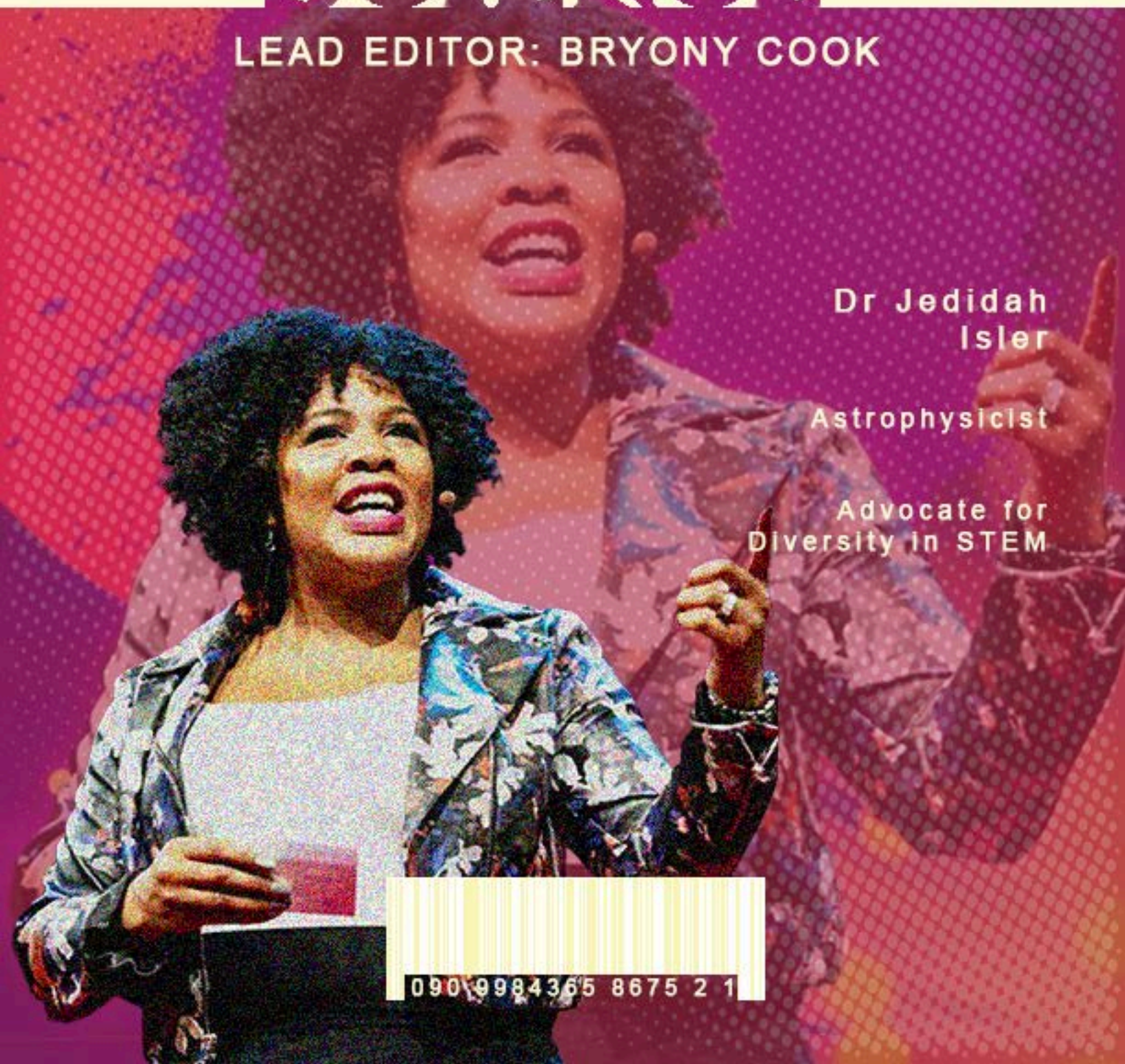
PHYSICAL SCIENCE

LEAD EDITOR: BRYONY COOK



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HOW DR. JEDIDAH ISLER REDEFINED SPACE IN SCIENCE

WRITTEN BY: DION BAHO

Abstract:
As one of the first African American women to earn a PhD in astrophysics, Dr Jedidah Isler was a transcendent in her studies. She graduated from Yale in 2014, during that time she faced immense challenges, fighting for her place to belong. Her passion for the night sky fuelled her success in her studies and later her research into **black holes**. She has become a role model for others, growing into a **vanguard** for diversity and equality in STEM.

Article:
Growing up in Virginia, Isler was fascinated by the stars. This passion was infused in her from an early age and helped to drive her through school to thrive in mathematics and science. She later attended Norfolk State University to study physics, later achieving her master's from Fisk University, going on to a PhD in astrophysics at Yale. As one of the only black women in her class, she felt an immense amount of isolation and bias during her studies. Working tirelessly to prove herself, Isler felt others questioning her place on the course. Despite this, she was determined and continued to focus on her goals, showing others that it is possible. This determination made her an inspiration to others, she went on to find the Stem en Route to Change Foundation (SeRCH), providing the support, mentoring and role models to other young scientists, that she did not have.

After all this, she began focusing her work on **Blazars**. Blazars are the '**nucleus**' of the galaxy. They are powered by black holes; these black holes can be up to billions of times the mass of our sun. They are surrounded by an **accretion disk**; these swirl around the black hole at tremendous speeds causing the particles to collide. These collisions create friction between the particles; this **friction** causes the matter to heat to millions of degrees and releases vast amounts of **radiation**- radio waves to gamma rays. These are then shot into jets at near the speed of light transcending thousands of light years in space. What makes blazars different is their orientation. They are pointed towards Earth; this alignment makes the blazars appear extremely bright and easy to observe. The blazars seem to often flicker and change intensity as we are observing straight into the jet where the particles are moving so fast that the light is boosted by relativistic effects due to Einstein's **Theory of Relativity**. Isler studies from the jets to explore their formation, effect on space and galaxies, helping our understanding of **particle acceleration** and black holes.

Her journey is one of power and perseverance, highlighting that anyone can aspire to do anything they put their mind to. Defying the expectations of society, her career in astrophysics is testament to hard work, dedication and a passion for the night sky. Dr Isler is an inspiration.

Glossary:
Vanguard - a group of people leading the way in new developments or ideas.
Blazar - a type of quasar that is an intense, irregularly variable source of highly polarized light, thought to arise from a plasma jet pointing in the direction of the earth
Accretion disk - a rotating disk of matter formed by accretion around a massive body (such as a black hole) under the influence of gravitation.
Nucleus - a supermassive black hole at the centre of a galaxy that is actively consuming matter
Black Hole - a region of space having a gravitational field so intense that no matter or radiation can escape.
Friction - the resistance that one surface or object encounters when moving over another.
Radiation - the emission of energy as electromagnetic waves or as moving subatomic particles, especially high-energy particles which cause ionization.
Theory of Relativity – the theory that describes the relationship between space, time, mass, and gravity.
Particle Acceleration - the process of using electromagnetic fields to increase the speed and energy of charged particles, like electrons and protons, often to near the speed of light

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DR. SYLVESTER JAMES GATES JR

WRITTEN BY: RUPERT HANLEY

Abstract

"The laws of physics are the same for every human being, and that's a powerful message about equality." – Dr Sylvester James Gates Jr.

As one of the first African Americans to earn a PhD in theoretical physics, Dr Sylvester James Gates Jr. faced a career governed by isolation and subtle bias. At MIT in the late 1960s, Gates was often the only black **theoretical physicist** within his classes, with few mentors to share his background. He often recalls having to "invent his own image of what a Black **theoretical physicist** could be", demonstrating the social obstacles he faced whilst navigating an environment where stereotypes and casual racism were daily occurrences.

Article

Despite this prejudice, Gates excelled academically, earning recognition for his groundbreaking work within **supersymmetry** and **string theory**. Gates pioneered the first comprehensive textbook (alongside other physicists in his field) to present the full mathematical framework of supersymmetric field theories, soon becoming one of the most important areas within modern physics. Superspace, often coined "the bible of **supersymmetry**", provided a new way of writing physical laws that include **supersymmetry** – the idea that matter and force are two sides of the same coin, and that the universe is more balanced and symmetrical than it seems. **Supersymmetry** is a vital area of research within modern physics as the discovery of potential **superpartners**, the idea that every particle in the universe has a hidden "**superpartner**", could help explain deep mysteries such as why particles have the masses they do, and even what **dark matter** could be.

Gates' most notable innovation was 'Adinkras' – diagrams which represent **supersymmetry**. Due to the incredibly complicated nature of **supersymmetry** equations, in 2004, Gates and his student Michael Faux developed Adinkras as a graphical way to picture those equations. Each Adinkra looks like a network of dots and connecting lines. Each dot represents a particle or mathematical components whilst each of the coloured lines show how those components transform into one another through **supersymmetry**. By using these diagrams, scientists can uncover hidden relationships that would be nearly impossible to spot solely using equations.

The name "Adinkra" comes from the Adinkra symbols, a traditional West African icon used by the Akan people of Ghana and Côte d'Ivoire. These symbols portray ideas about wisdom, creativity, unity and the human spirit. Through naming his diagrams "Adinkras" Dr. Gates made a powerful statement that African culture and scientific innovation are not separate worlds, symbolising the idea that science is a universal subject that belongs to everyone despite the colour of their skin.

"Adinkras show that ideas from African culture can illuminate the deepest laws of physics. They're proof that creativity has no colour." - Dr. Sylvester James Gates Jr.

Glossary:

Theoretical Physicist - A scientist who uses mathematics, abstract reasoning and modelling to explain, predict and understand physical phenomena, without necessarily conducting practical experiments.

Supersymmetry - The idea that every particle in the universe has a hidden "superpartner" – every matter particle has a matching force particle and vice versa.

String Theory - A theoretical model which says that everything in the universe is made up of tiny vibrating strings instead of point-like dots – like notes in music, each "string" vibrates in a different way to produce different particles.

Dark Matter - A mysterious kind of matter that doesn't give off light or energy, so we cannot see it directly. Scientists know it exists because its gravity affects how stars and galaxies move – Dark matter is invisible material that forms most of the universe's mass and holds galaxies together.

Matter Particle (Fermions) - These are particles that make up all the "stuff" in the universe.

Force Particle (Bosons) - These are the particles that carry or mediate forces between matter particles.

Superpartner - The hypothetical twin of each known particle predicted by supersymmetry. For example, an electron's superpartner would be called a "selectron."

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DR MAE JEMISON

WRITTEN BY: ZOFIA FIEGA

Abstract:
In a world where underrepresented voices were still concealed, Mae Jemison became the role model she was deprived of. Becoming the first Black woman in space was an extraordinary achievement; it paved the way for other marginalised women. She continues to advocate for representation in science and has become a role model she needed for women and people of colour who desire to achieve the unthinkable.

Article:
Before ever stepping foot on a space craft, she was already making an impact in the sphere of medicine. She served as the president of the Black Student Union at Stanford University, advocating for black individuals in education. She graduated with a degree in Chemical Engineering and African American studies in 1977. Jemison changed career paths and started her medicine degree at Cornell Medical School. During medical school, Jemison travelled to remote, developing regions of East Africa, providing medical care to those who would otherwise go without. Her travels inspired her to partake in further operations abroad and she became a medical officer. At 26 years old, she became Area Peace Corps medical officer for Sierra Leone and Liberia, which required her to be flexible, courageous and constantly determined.

Following her childhood interests in astronomy and planet earth, she set her aspirations high and applied for the astronaut program at NASA in 1985. Despite being rejected, Jemison reapplied in 1987 and was fortunately accepted, granting her the title of the first African American woman to be accepted into NASAs training programme. She was one of 15 people chosen out of over 2000 applicants, demonstrating her unwavering perseverance and thirst for space exploration. Following rigorous years of training, September 12th, 1992, marked the momentous occasion, officially naming Dr Mae Jemison as the first African American woman in space and showcasing to the world that, if given the same opportunities, minorities can contribute to science.

Without straying from her medical background, Jemison conducted experiments related to human's adaptation to weightlessness and the impact of microgravity on human health, using the crew (and other living material like cultured animal and plant cells, frogs and fungi) as test subjects. During her 8-day mission, she helped further our understanding of the effects of space travel on the human body. Jemison's historic journey into space was a testament to her belief in the power of possibility and constant battle to break down barriers and fight for inclusion and diversity.

She worked as an astronaut for six years, until her desire to educate took over. Jemison has spoken publicly countless times and founded the Jemison group (a technology consulting firm) further highlighting the importance of diverse voices within science. Her legacy extends beyond her historic flight, encompassing her contributions to medicine. She inspires future generations of scientists. Jemison made space for herself in a world where she was told she didn't belong.
"You have as much a right as anyone else to be in this world and to be in any profession you want" – Dr Mae Jemison

Glossary:
Microgravity- The conditions where the effects of gravity are greatly reduced, typically experienced in space, allowing objects and astronauts to float as if they are weightless

BOOK (CLICK)

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UNSUNG WOMEN OF NASA

WRITTEN BY: ROHAN BHEEMAPPA

Abstract
If I were to ask you to think about the Moon landing in 1969, things that may spring to mind are astronauts on the Moon, rockets launching and the words: “That’s one small step for man, one giant leap for mankind.” However, very few recall the team of Black female mathematicians and physicists whose calculations allowed these steps to be taken. Katherine Johnson and Dorothy Vaughan worked in a segregated system to overcome obstacles no machine could solve at that time. Their work not only paved the way to success in the Space Race, but they essentially redefined what it meant to belong in science.

Article
In 1969, humanity made history and walked on the Moon. As the astronauts and rockets made the news, the success of the mission rested on the backs of a group of Black women working backstage. Their names would remain largely unknown for decades, their achievements overshadowed by the more visible heroes of the Space Race. At NASA’s Langley research centre in Virginia, these women were referred to as “Human Computers”. They were tasked with computing critical calculations for NASA’s rockets and flight trajectories. These calculations would ultimately decide whether a spacecraft reached orbit or burnt up on re-entry. It was a job that required ultimate precision and accuracy. Even a single slip by a fraction or decimal point would result in the direst consequences for the astronauts. Johnson and Vaughan were segregated daily from separate dining rooms, offices and toilets but their brilliance could not be separated.

Katherine Johnson’s work was indispensable. Her understanding of the dynamics of orbit allowed astronauts to orbit around the world and travel to the Moon safely. Her calculations provided the exact paths for their space flights to take place. When NASA began using electronic computers, John Glenn insisted that Johnson personally verify her own work. If she had not been so persistent and meticulous, America would have reached space much later. Johnson proves that perseverance and knowledge allowed her to overcome both gravity and prejudice.

Dorothy Vaughan anticipated the computing future ahead of time. When NASA started making the transition to digital computers, she independently taught herself how to code in **FORTRAN** and then taught her staff. This ensured many Black women did not lose their jobs and were essential to NASA and the Space Race. Vaughan’s leadership and vision were not only in mathematics, as she prepared others for a future that would have otherwise forgotten them.

Together, these women all had a hand in one of the most important achievements in human history. The contrast between scientific progress and social inequality could not have been more striking. Today their story continues to resonate. The same precision that guided the rockets can be applied to fairness in opportunity: both require attention and the courage to face one’s mistakes. As we celebrate Black History Month, the story of Katherine Johnson and Dorothy Vaughan stands as a powerful reminder of what it means to stand firm in pride and power.

Glossary
Aerodynamics - The study of how air moves around objects such as aircraft and rockets. Understanding aerodynamics helps scientists design spacecraft that can’t travel safely through the atmosphere.
FORTRAN - An early computer programming language widely used for scientific and engineering calculations.
Orbit/Orbital Mechanics - The branch of physics that studies how objects move in space under the influence of gravity.

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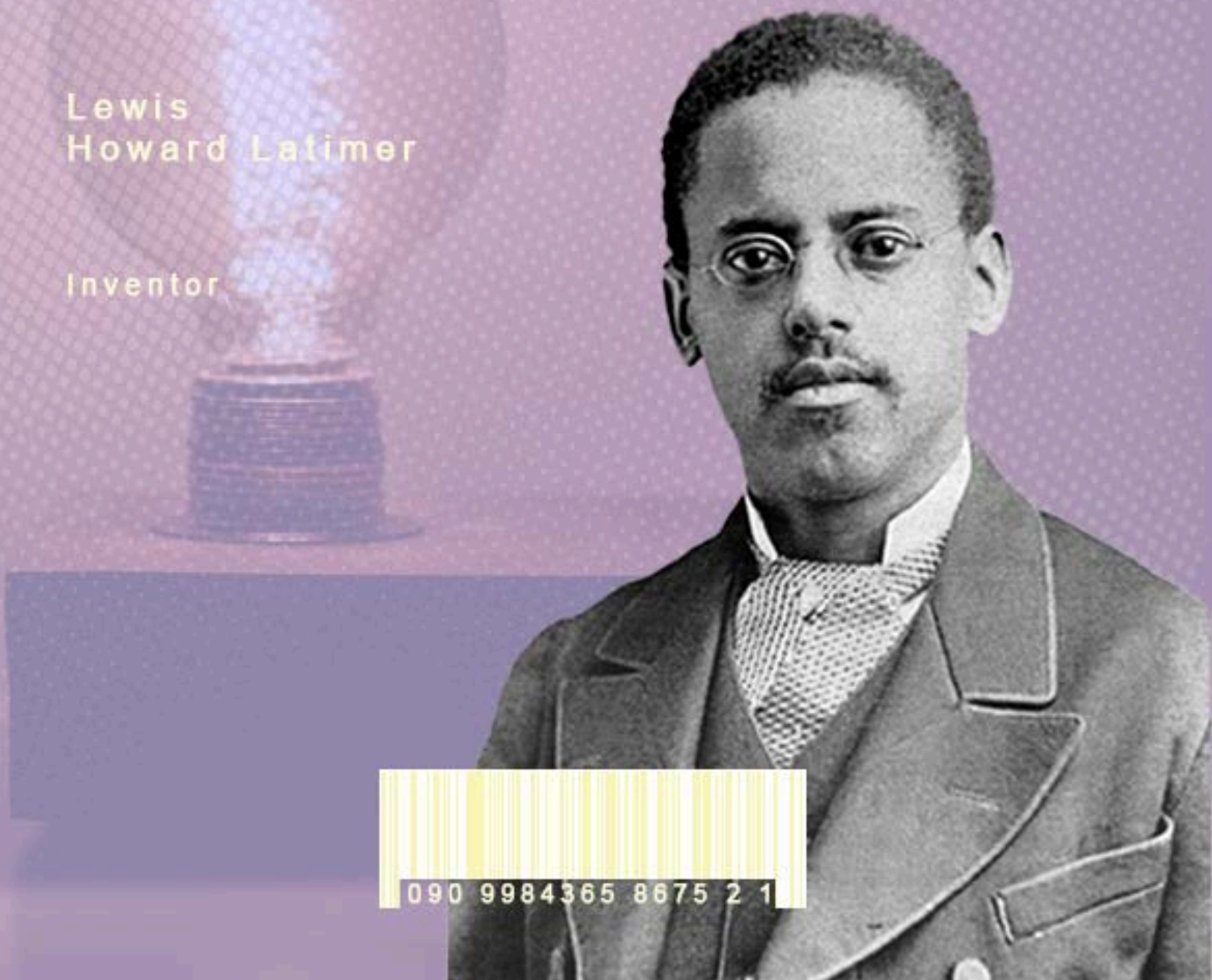
ENGINEERING & TECHNOLOGY

LEAD EDITOR: JASMINE CARTER



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LEWIS HOWARD LATIMER

WRITTEN BY: SOPHIE ADELEYE AND ALEX HU

Abstract:
The lightbulb is an unremarkable object, a fixture that billions of people simply take for granted. When asked, “Well, who invented it?” most would confidently answer Thomas Edison and technically they would be correct. Edison did indeed popularise the lightbulb and give it the iconic shape we know today, however behind that familiar name lies another lesser-known inventor, Lewis Howard Latimer.

Article:
The sweeping industrial progress of nineteenth-century America transformed the world, with engineers constantly creating inventions that laid the foundations for modern technology. While history celebrates names such as Thomas Edison and Alexander Graham Bell, many of the most important innovations were made possible by lesser-known individuals. Among the most influential of these was Lewis Howard Latimer, whose brilliance and perseverance helped shape the age of electricity.

Born on September 4, 1848, in Chelsea, Massachusetts, Latimer was the son of George and Rebecca Latimer, self-**emancipated** slaves who had escaped from Virginia before his birth (Hidden Voices). His early life was marked by hardship—his parents faced threats of re-enslavement, and the family was forced apart for safety. At sixteen, with little formal education, Latimer enlisted in the U.S. Navy, serving for a year before being honourably discharged.

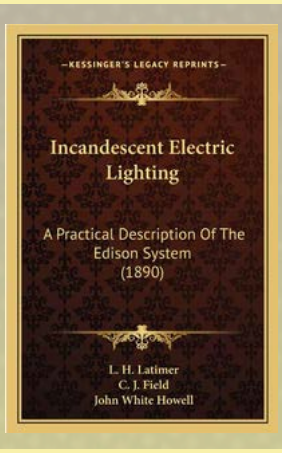
After his service, Latimer began working as an office boy at the Crosby, Halsted & Gould patent law firm, where he taught himself mechanical drawing (Lewis Latimer House Museum). His precision and skill soon earned him promotion to **drafter**, a pivotal role in the era’s technological boom. Drafters like Latimer turned ideas into detailed **schematics** that manufacturers could bring to life, while **patent** lawyers ensured inventors’ work was legally protected (Valkoinen). Without these professionals, the Industrial Revolution would have advanced far more slowly (Spelled).

Latimer’s drafting expertise soon connected him with some of the century’s greatest innovations. He worked on the patent for Alexander Graham Bell’s telephone and later improved Thomas Edison’s **incandescent** lightbulb (Huber). At the time, a major issue with lightbulbs was their fragile **filaments**, which burned out quickly. In 1881, Latimer and Joseph V. Nichols patented a new method for producing and connecting carbon filaments, dramatically extending the bulb’s lifespan (Krutka). His refined **carbonization** process—wrapping the filament in cardboard to achieve greater purity—made lightbulbs more durable, affordable, and practical.

In 1884, Latimer joined the Edison Electric Light Company, a remarkable achievement for an African American man in an era of widespread racial discrimination. He later supervised the installation of public lighting systems in cities including New York, London, and Montreal. Beyond his work with light, Latimer also patented several inventions of his own, including an early design for an evaporative cooling system, a precursor to modern air conditioning (Latimer).

Though often overlooked beside more famous inventors, Lewis Latimer’s contributions made the lightbulb accessible to millions. His life reminds us that progress depends on collaboration and persistence—and that true innovation shines brightest when shared.

Glossary:
Drafter – A person who makes detailed drawings of objects, used in engineering, construction and architecture.
Emancipated – formerly enslaved people who gained their freedom.
Schematics – detailed technical drawings or diagrams that show how something works or is constructed.
Filament – a thin wire inside a lightbulb that glows when electricity flows through it.
Incandescent – Emitting light due to being heated.
Carbonization – the process of converting organic material into carbon, typically by heating in a vacuum.
Patent – A government license giving a right for a set period, especially giving the sole right to exclude others from making, using or selling an invention.



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JERRY LAWSON

WRITTEN BY: OMARI KHUSHALL

Abstract
Jerry Lawson, a brilliant African American engineer, changed the face of video games forever with his invention of the **cartridge**-changing games, which allowed players to swap out games. His creativity, determination, and leadership opened doors for countless others to demonstrate that innovation has no racial barrier. The Black History Month theme best represents Lawson's professional life, 'Standing Firm in Pride and Power', as he turned his hardships into opportunity, and his passion for engineering into a legacy that continues to inspire.

Article:
When we look at video games today, swapping discs, downloading titles, or gaming on powerful PlayStation and Xbox consoles, it's easy to forget that these luxuries were first made possible because of one man's imagination. That man was Jerry Lawson, an engineer whose curiosity and **perseverance revolutionised** the video-gaming world. His story is not just about invention; it's about pride, resilience, and the power of ingenuity.

Born in 1940 in Brooklyn, New York, Gerald "Jerry" Lawson showed an early fascination with electronics. As a child, he built radios in his bedroom and repaired television sets to understand their inner workings. This demonstrates the resilience of Lawson in a time when very few African Americans had jobs in science or engineering. Also, with the help of his supportive parents, Lawson transferred to a better school where his talent could continue to grow.

In the 1970s, Lawson joined Fairchild Semiconductor in Silicon Valley, where he led a small team that created the extraordinary Fairchild Channel F. This became the first home video game console to use interchangeable **cartridges**, changing the possibilities within the gaming world. Before Lawson's breakthrough, consoles such as Pong were limited to a single built-in game. His idea to separate the game software from the console hardware opened an entirely new world of creativity and accessibility. Players could now buy, swap, and trade games freely, resulting in the multi-billion-dollar global gaming industry we know today.

Lawson's brilliance didn't stop there. He continued to found his own company, Video-Soft, one of the first Black-owned video game development firms. Despite working in an industry that often overlooked pioneers like him, Lawson's contributions laid the groundwork for modern gaming consoles and digital entertainment.

Today, Jerry Lawson's name is finally receiving the recognition it deserves. His invention changing not only how games are played, but also how technology can bring people together. His life reminds us that true innovation comes from courage, curiosity, and **determination**. During Black History Month, Lawson's legacy stands as a symbol of Pride and Power, a **testament** to staying true to your dreams, no matter the barriers.

Glossary:
Cartridge – A removable container that stores a video game's data and can be inserted into a console to play different games.
Testament – something that serves as clear proof or evidence of a fact, quality, or achievement.
Revolutionised – to change something radically or fundamentally.
Perseverance – trying to do something despite its difficulty or delay in achieving success.
Determination – the act of trying to achieve something that is extremely difficult.

(WATCH VIDEO HERE)

(WATCH VIDEO HERE)

GLADYS MAE WEST

WRITTEN BY: KARL EDOCHIE

Abstract:
Dr. Gladys Mae West, born on 27th October 1930, is an American mathematician known for her contributions to the mathematical model of the shape of the Earth, and her work on the satellite geodesy models, which were later incorporated into the Global Positioning System.

Article:
Do you ever stop to wonder how **GPS (Global Positioning System)** calculates your position so accurately? It seems rather impossible that satellites located thousands of miles away are able to pinpoint your exact location within a metre. Often, we struggle to comprehend the limitless use of location in our daily lives, whether that includes predicting traffic congestion for journey times, providing data to emergency services to improve response times, or even providing personalised search results.

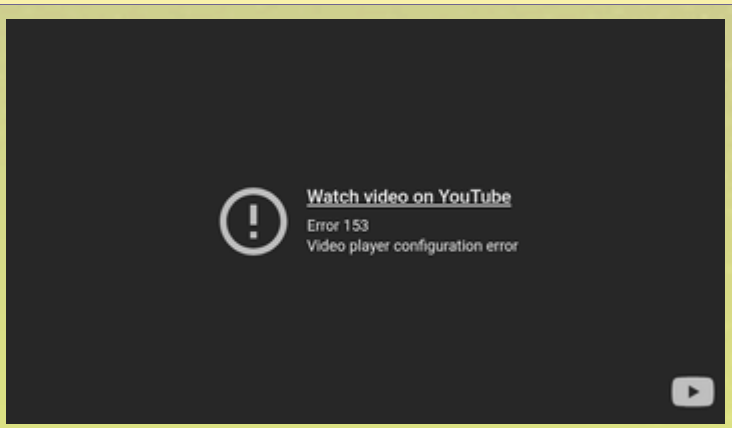
For decades, engineers struggled to create a model of the Earth that was accurate enough for satellites to achieve the kind of pinpoint precision that was accurate within a few metres. Previous models of the Earth used a shape called an '**oblate spheroid**'(1), which is a sphere slightly flattened at the poles. However, this shape was very limited for modelling the shape of the Earth because it ignored multiple variables – including gravity variations for sea level.

In the 1950s, West was working at the Naval Proving Ground in Dahlgren, Virginia(2), where she contributed towards a more suitable mathematical model of the Earth for satellite positioning and navigation. It was here that she would conduct the calculations by hand, as well as using some of the world's earliest **mainframe computers** to create a new model for the Earth. This model uses an irregular surface called a 'geoid'(3), a surface defined by a complex numerical model based on gravity. The shape offered several advantages over the simplified 'oblate spheroid'. Geoids consider the gravitational field around the Earth and because of this, they also accounted for the gravitational variations that shape the Earth's surface and sea level.

Remarkably, the shape that West had developed to model the Earth could pinpoint a position on the Earth with ground-breaking accuracy, in fact it reduced the errors from tens or even hundreds of metres(4), to just a few metres. Now, up until this point, the first GPS hadn't yet been developed because the level of accuracy required to make it viable wasn't available, but with West's finding they were made possible.

West's work was incredibly foundational for the development of the sub-metre or even centimetre level of accuracy of GPS that we have today. Most of the GPS systems that we have today use a mix of the two models. Using West's model to achieve the extraordinary accuracy we now take for granted on top of an 'oblate spheroid'.

Often in our curriculums, the innovations of black people are brushed over, instead highlighting a history of oppression. But perhaps stories like this—unsung heroes guiding the world—could provide a glimpse into the fundamental fingerprints of black excellence that shape the world we live in today.



Glossary:
Oblate Spheroid – A type of sphere that is flattened at the poles; it is often used for simple models of the shape of the Earth.
Mainframe Computers – Very large, powerful computers designed to handle huge amounts of data and complex calculations.
GPS (Global Positioning System) – A satellite-based navigation system that provided accurate location, velocity, and time information anywhere on the world.

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MATHEMATICS

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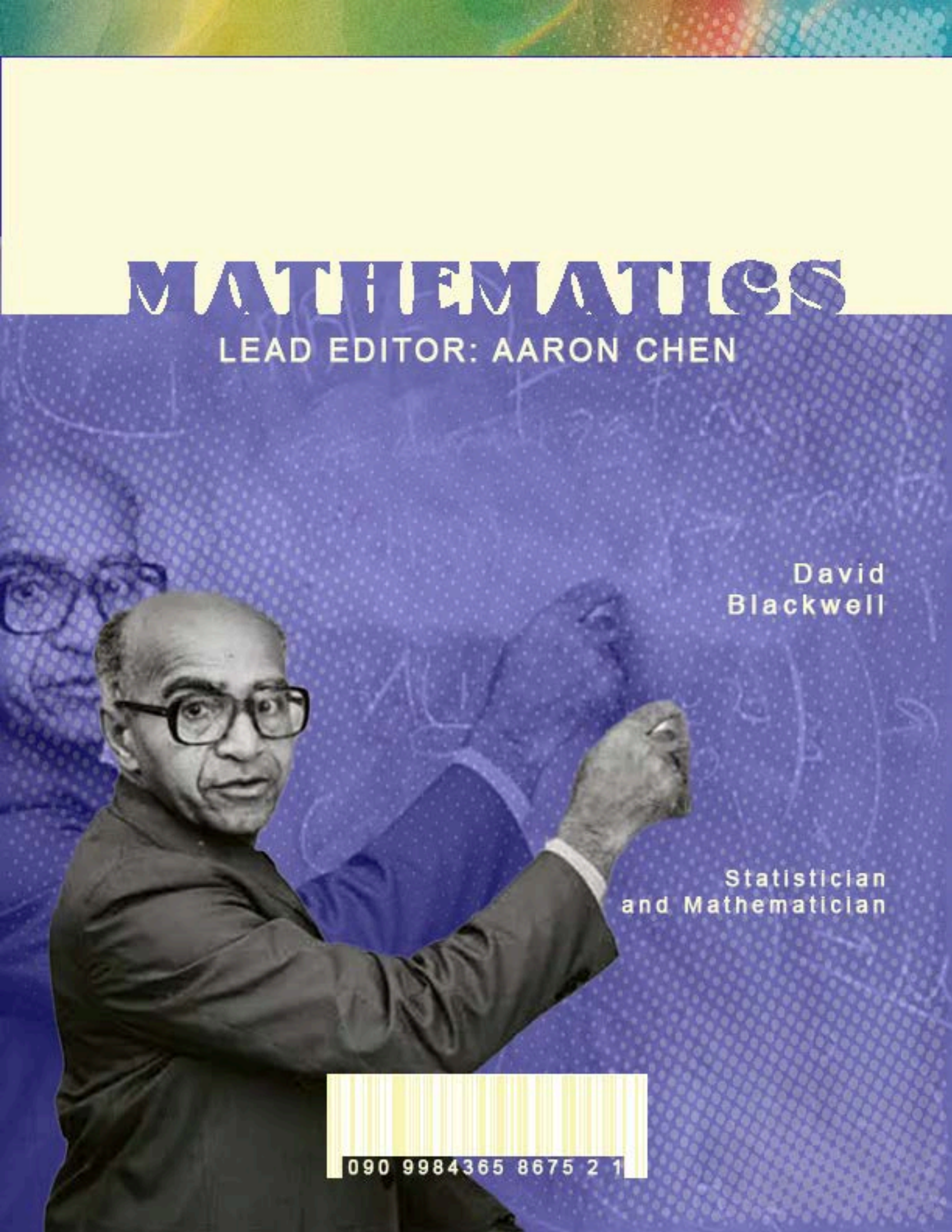

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DAVID BLACKWELL – GAME THEORY

WRITTEN BY: RISHI KOTECHA

Abstract:
Game Theory is a mathematical study about how individuals or groups make strategic decisions when the choices that everybody makes influences the outcomes. The field was significantly advanced by the African American mathematician and statistician known as David Harold Blackwell.

Article:
Imagine you are trying to outsmart a friend in a **game** or deciding whether to change the price of a certain product. These situations involve immense levels of **strategy**. This is what the Game Theory is all about; it studies the strategy behind why decisions are made knowing that the consequences could have substantial impacts on everything around them.

Game Theory first began in with mathematician John von Neumann and economist Oskar Morgenstern, who sought to use mathematics to understand economic competition and cooperation. It was then expanded by John Nash by adding the concept of the Nash equilibrium (where no **player** can benefit by changing strategies unless others do so as well). However, one of the most important figures in the Game Theory is David Blackwell. He studied how people can make optimal decisions when facing uncertainty with no idea of what other players will do.

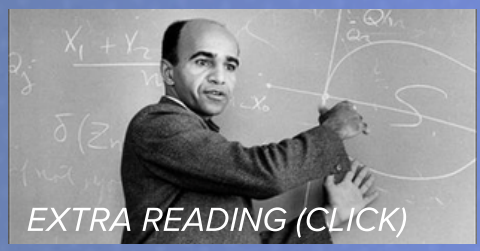
Blackwell's work tackled two types of games: zero-sum and non-zero-sum. In zero-sum games, a player can only gain what another player loses. An example is in a game of poker, where the overall amount of money at the table remains the same. Blackwell extended the theory on zero-sum games with his Approachability Theorem. He showed that in a zero-sum game, a player can ensure that the average outcome of the game will come close to a desired **payout**, regardless of what any opponents do. This means that a player can learn or adjust their strategies over time to get consistent results. In the modern era, the Approachability theorem is fundamental in developing artificial intelligence and reinforcement learning. AI does this by learning and adapting through every interaction, strengthening its response to the users by learning from its mistakes.

Conversely, in non-zero-sum games, players can both benefit and lose depending on their choices, such as social dilemmas or trading. Blackwell focused on decision making under uncertainty. He did this through his study called the Comparison of Experiments. This provided a framework for determining if a source of information is more important than another when making decisions. This explains why players may use information and strategies to mutually help each other for beneficial outcomes and not just to compete against one another.

Game theory is used across many instances such as economics, biology, computer science and even in everyday life. Companies use it to set prices, biologists to explain animal behaviours, and governments to plan negotiations. In conclusion, game theory teaches us to think carefully about other people's perspectives and choices. It is not just about winning in a game such as chess, but also about understanding how our decisions fit into a larger web of interactions.

Even when facing racial barriers near the start of his career, David Blackwell went on to become the first Black tenured professor at the University of California, Berkeley, and one of the most respected mathematicians of the 20th century. His contributions changed how we understand strategy and decision-making, but also stands as an example of resilience, excellence, and the ability of breaking boundaries within mathematics.

Glossary:
Game: Any set of circumstances that has a result dependent on the actions of two or more decision-makers (players).
Strategy: A complete plan of action a player will take given the set of circumstances that might arise within the game.
Players: A strategic decision-maker within the context of the game.
Payout: The value a player receives from arriving at a particular outcome. The payout can be in any quantifiable form, from dollars to utility.



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CHILD PRODIGY: J. ERNEST WILKINS JR.

WRITTEN BY: PATRICIA DINU

Abstract:
Imagine if, instead of going into Year 7, you were heading to university with students almost a decade older than you. This was the life of young Jesse Ernest Wilkins Jr, who attended the University of Chicago at the age of 13 in 1936, and later established himself as a driven mathematician and physicist. Today, we recognise Wilkins to be an inspiration to African American scientists, helping to recruit minority students despite often being a target of racism himself.

Article:
Today, Wilkins is recognised as a child prodigy for his rigorous and relentless academic pursuits. After becoming the youngest ever student at the University of Chicago, he graduated with an AB in mathematics at just 17. Wilkins' passion for the subject only grew as he continued onto a master's degree - delving even deeper into the fascinating world of mathematics and later a Ph.D. By 19, he had become the 7th African American in history with a doctorate in maths.

His dissertation: "Multiple **Integral** Problems in **Parametric** Form in the Calculus of Variations" explored a branch of maths focused on finding ways to manipulate surfaces and regions to change their size, laying the foundations for later advancements in the fields of both physics and geometry. Another one of his works; "the first canonical pencil" optimised family or "set" of integrals – a process similar to organising routes by properties such as length or smoothness.

One of Wilkin's most infamous achievements was his involvement (albeit unknowingly) in the Manhattan project – even being mentioned in the film Oppenheimer! Alongside Eugene Wigner, the two developed the Wigner-Wilkins approach, which enabled scientists to estimate the distribution of neutron energies within nuclear reactors. This created a blueprint for how nuclear reactors are designed to optimise people's safety today. Therefore, his work as a mathematician and physicist is what makes Wilkins such an inspiration, showcasing pure drive and a thirst for discovery. His research into Plutonium-239 was of special interest as it focused on producing **fissionable** nuclear materials at the Chicago Met Lab in 1944.

Unfortunately, Wilkins' career had been underpinned by prejudice as the Jim Crow laws, prevalent in the 1940s, prevented him from taking up a scientific post at Oak Ridge (where the rest of his research team had been transferred). Despite this setback, Wilkins rose above and continued to pursue his passion, teaching mathematics at the Tuskegee Institute in Alabama, where he often helped recruit students of ethnic minorities. Later in his career, aiming to improve communications between mathematicians and engineers, Wilkins earned two more qualifications: a bachelor's and master's degree in mechanical engineering, essentially qualifying him to design nuclear reactors. With a total of 5 degrees and an eagerness to share his knowledge with the world, Wilkins served as the distinguished professor of applied mathematical physics at Howard university, even founding its own PhD program in maths. His distinguished 70-year career serves as an important reminder of curiosity and perseverance, even taking up the position of president of the American Nuclear Society. Wilkins continued to be a prominent figure in the scientific world until his retirement in 2003.

Glossary:
Integrals- an estimate the area under a curve on a graph
Parametric- a system defined by certain limits or variables acting as guidelines
Fission- the process of an object splitting into two or more parts

PT PHYSICS TODAY

EXTRA READING (CLICK):

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MARY JACKSON – NASA ENGINEER

WRITTEN BY: OLIVIA BROCK

Abstract:
How hard would you fight to become the first African American NASA engineer? Petitioning to take the required engineering night classes at an all-white school as an African American, Mary Jackson relentlessly fought her way up. With the backdrop of racial tension, she worked day and night, alongside raising her two children at home, to achieve the accolade of becoming NASA's first African American engineer by 1958.

Article:

Early life

Born on the 9th of April 1921; Mary had to face the rising racial tensions in the US. Not only were killings by mobs (**lynching**) still occurring in the South, but the Tulsa race riots had begun. $1.5 million worth of property was destroyed, 300 died, and insurance claims were denied - making this one of the largest attacks on the black population in the US in history. Despite this, she excelled in maths and science at school, graduating with the highest honours; she went on to Hampton Institute and achieved a bachelor's degree in physics and mathematics.

Before NASA

Mary began her career as a mathematics teacher in Maryland at an African American school before returning to Hampton, her birthplace. Despite her ability limited opportunities, she was a bookkeeper, clerk, and then a receptionist. She then became pregnant with her first child and left employment for his birth. Later, she became a clerk at Fort Monroe, where her brilliance was finally noticed, and she was recruited at NACA (now NASA).

NASA

Mary worked her way up in NACA, progressing from human computer to a certified engineer in 7 years, beginning in a segregated group of African American women who solved calculations before electronic computers were established. In her human computer role, she proved her excellence quickly and was assigned to work with Kazimierz Czarnecki, an **aerospace** engineer at NACA at the time. Czarnecki quickly recognised her brilliance and invited her to join in on experiments rather than just solving equations. Later, he encouraged her to become a certified engineer and supported her petition to study at the University of Virginia, an all-white, segregated school. Mary needed a legal petition just to get her education, but after being granted the right to study, she attended night school and became a certified engineer in 1958, the first African American women to do so at NASA.

Helping Others

For 30 years, Mary was a girl scout leader, encouraging young girls to seek higher education in predominantly male subjects. Speaking at many schools and community centres, she shared her story to inspire others to fight for what they wanted. When Mary reached the most senior engineering position available to her at NASA, she took a demotion to an equal opportunity program, where she influenced hiring decisions and prevented segregation from affecting others. She worked against discrimination and **prejudice** in NASA from 1979 to 1985 before retiring with her husband, Levi.

Her Legacy

Mary Jackson still impacts our lives today, from her pioneering work in aerodynamics, working on **boundary-layer** transition & drag, lift, and nozzle design in **supersonic** flight, to her dedication and determination in pursuing the career she loved - she still inspires the masses. With Mary, what inspires most is not her brilliance in her fields but the attitude she had towards life, her determination, and her keenness to help others have more opportunities than she had. She shouldn't just be an inspiration to anyone interested in physics or mathematics, but she should be an inspiration to everyone for her courage and determination in striving for equality.

Glossary:

Lynching – Unlawful killing (often publicly – e.g. hanging) without a legal trial or due process.

Aerospace – the field of design, development, testing and operation of air & space craft, covering study of flight in our atmosphere and space.

Prejudice – Judging someone (without evidence) based on preconceived ideas or stereotypes.

Boundary layer – The layer of air around an aircraft where air flow is turbulent not laminar.

Supersonic – Travel that is faster than the speed of sound.

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KATHERINE OKIKIOLU

WRITTEN BY: AARON CHEN

Abstract:
Even to this day, mathematics remains a field with stubbornly low racial diversity. A recent government study showed that less than 1 in 10 STEM academics in the United Kingdom are black. However, someone who has exhibited both their intellect and passion for the subject (despite the lack of representation) is Katherine Okikiolu: a **contemporary** mathematician who has fought diligently against the status quo.

Article:
Born in 1965 and raised in London, Katherine always seemed to have a curiosity for education. Although she had parents who taught mathematics, she often learnt independently from textbooks in high school. Eventually, her admiration for the subject (particularly how straightforward and **ubiquitous** it was) led to her graduating from the University of Cambridge, and also travelling to the USA for a doctorate.

Katherine had contributed to a range of difficult and intricate topics within mathematics, such as spectral theory (which explains the physics behind vibrations) and harmonic analysis (breaking down complex waves into a lot of graphs). However, her most famous work solved a major problem, called the "Schwartz Kernel Problem": “Can every operator be represented by a kernel, even if it's not a smooth function?”. If that passed over your head, that’s perfectly normal! Let me explain.

First, what is an operator? In their most basic form, they are ways of transforming one function (the input) into another function (the output). Operators are used everywhere in physics and technology, from tracking how heat moves in a material to blurring an image in Photoshop. Meanwhile, the kernel is like a set of instructions on how to get from function to function. As a loose and primitive analogy, the operator “make tea” would have the kernel “steep a teabag in boiling water”. One particularly elegant way to describe such an operator is through an “integral kernel”, using two variables (for example, x and y) to fully label what the transformation does.

Now, the Schwartz Kernel Problem asks if this kind of representation is universal; that is, can every operator be built using integral kernels? As abstract and open as that question was, Katherine managed to prove it true, specifically for more complex and curved surfaces, called manifolds. The importance of Okikiolu's solution was formally recognised in 1997, when she was named a recipient of the **PECASE Award**. At the time, this was the highest honour bestowed by the US government upon scientists and engineers. Furthermore, her work was published in 2001, in the Annals of Mathematics, being the first black woman to do so in history.

Alongside her research career, Okikiolu has made ongoing contributions to challenge the underrepresentation of minority groups in mathematics (a hurdle that she herself overcame). As a professor at the University of California, San Diego, she created a comprehensive mathematics program for students in underserved San Diego public schools. She has focused on demystifying math and breaking down the cultural and psychological barriers that make too many students - especially from underrepresented backgrounds - believe they are not "math people.”

Glossary
contemporary – living or belonging to the present
ubiquitous – appearing everywhere
PECASE Award – ‘Presidential Early Career Award for Scientists and Engine

Khan Academy

VIDEO (CLICK)

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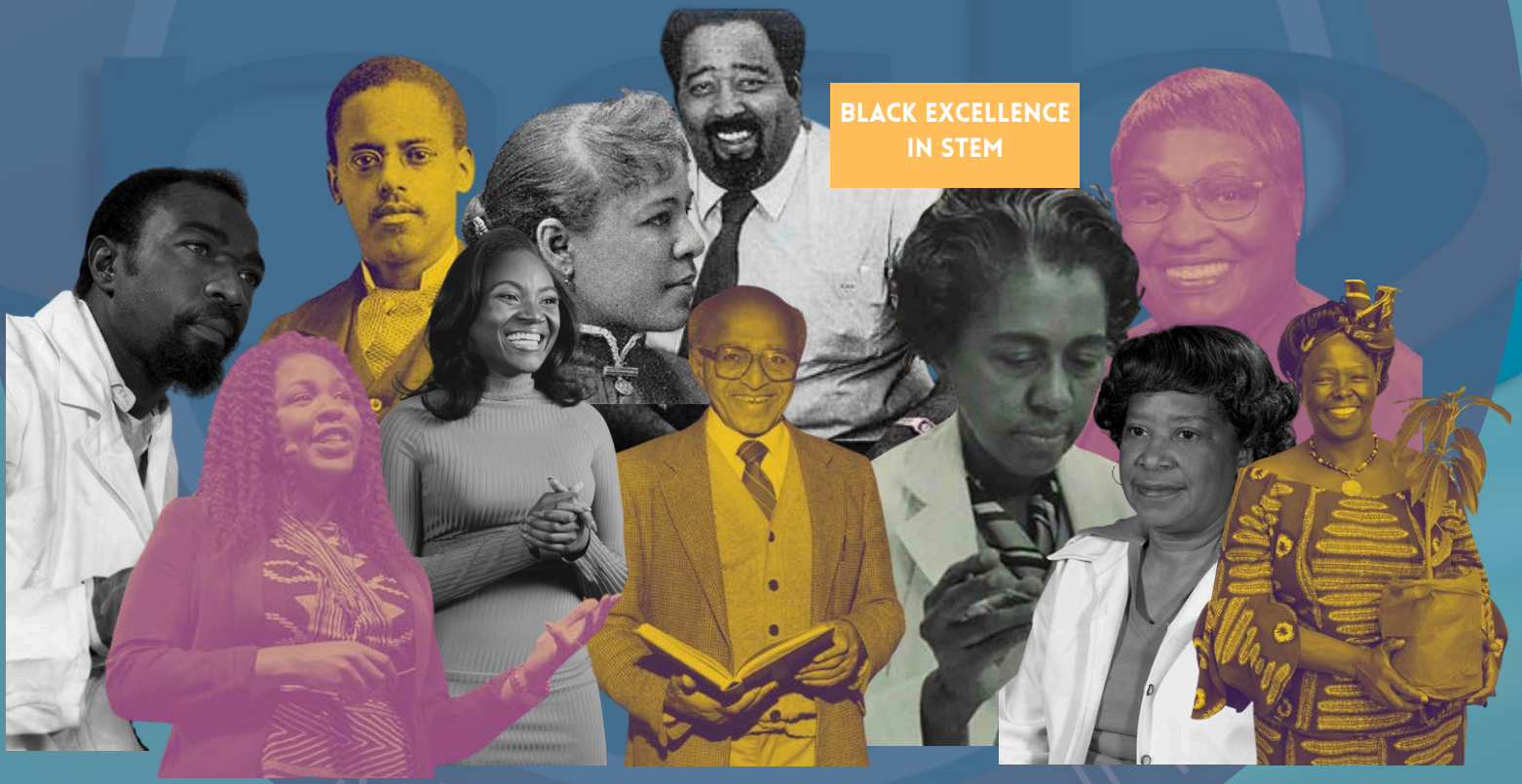

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