



August 2024
Women of Impact

WOMEN OF *impact*

A BOOK BY
WOMEN IN SCIENCE
challenging norms, unlocking doors

GENERATIONS OF IMPACT

Legacy, Leadership, and the
Next 30 Years

Foreword

As we celebrate Women's Month with a Women of Impact special edition, we aim to honour the tremendous impact by women in science across the African continent.

This year's theme - Generations of Impact: Legacy, Leadership and the Next Thirty Years, encapsulates both the profound legacy of trailblazing women, on whose shoulders the new generation stood, poised to lead us into the future with resilience and empowered to overcome many challenges.

Five years ago, as the world grappled with the COVID-19 pandemic, a bold vision was born. We embarked on a journey to create a platform to serve as a beacon of hope, support and recognition for Africa's growing community of female scientists. Little did we know the magnitude of the storm we would face, yet our resolve was unwavering. We were driven by the belief that in the face of adversity, the seeds of innovation and resilience would flourish. Today, we are humbled and proud to have met and profiled hundreds of extraordinary women from across the continent. Their stories of struggle and triumph have not only inspired us, but have illuminated the vital role of women in the scientific community.

The global outpouring of support and recognition has been overwhelming as women from diverse backgrounds continue to find inspiration and a sense of belonging in our shared mission.

This edition of Women of Impact is more than a celebration; it is a reflection of the remarkable contributions of women who have shaped the landscape of science and technology in Africa. As we commemorate 30 years of freedom and democracy, we honour these women whose ground-breaking work laid a solid foundation for future generations. Their legacy of

leadership, resilience and innovation serves as a guiding light for the young women in STEM who will lead us into the next 30 years and beyond.

Yet, as we celebrate these achievements, we are also acutely aware of the barriers continuing to hamper the progress of women in science. The journey towards a sustainable and prosperous Africa, powered by scientific discovery, demands that we confront these challenges head-on. It is imperative that we build inclusive systems to empower and nurture the next generation of female scientists, ensuring their voices are heard, their ideas cultivated and their contributions recognized.

In this edition, we shine a spotlight on women of impact, who are not only breaking new ground in their fields, but are also paving the way for others to follow. We delve into the issues that matter most: barriers to progress, the role of science in building a sustainable Africa, the empowerment of women in the workplace and the profound impact of AI on gender equality.

As we look to the future, let us carry forward the lessons of the past 30 years and let us continue to build a world where the dreams and ambitions of every young woman in STEM can take root and grow. Together, we can shape the next generation of impact, ensuring the legacy of African women in science continues to thrive for decades to come.

With gratitude and hope for the future,

Nthabiseng Mokake

Managing Director

Socials

 [womeninscience.africa](https://www.instagram.com/womeninscience.africa)

 [womeninscience_](https://twitter.com/womeninscience_)

 [womeninscience.africa](https://www.facebook.com/womeninscience.africa)

 www.womeninscience.africa

Contents



**Nurting
Future**
The Power of
Mentorship for
Girls in STEM

04

**Mae
Jemison**

08

**Dr. Evelyn
Boyd Granville**



28

**Breaking
Barriers**

29

**The Urgent
Need to
Empower
Women in
Tech**

30

**Dr. Cindy
George**

34

**Dr. Nadia
Carstens**



38

**Empowering
Africa**

40

**CSIR
celebrates
Women's
Month 2024**

58

**Women in
Science**

68

**Artificial
Intelligence and
gender equality**

Nurting Future Innovators

The Power of Mentorship for Girls in STEM

In the realm of science, technology, engineering, and mathematics (STEM), opportunities for innovation and creativity abound. However, women remain significantly underrepresented, particularly in leadership positions. According to a UNESCO report from 2015, only 30% of researchers worldwide are women, and a mere 3% of Nobel Prizes in science have been awarded to women. In the United States, women constitute just 26% of the STEM workforce. Addressing this disparity is crucial, especially as STEM fields continue to grow and offer lucrative career prospects. One effective solution lies in the availability and commitment of mentors to guide girls in STEM.

Why Are Girls Underrepresented in STEM?

Several factors contribute to the underrepresentation of girls in STEM. Societal norms and stereotypes often discourage girls from pursuing these fields, instilling in them they are not good at math or science or that they will not succeed in a STEM career. Overcoming these barriers requires targeted interventions, and one of the most impactful is mentorship.

The Role of Mentorship in STEM

Mentorship involves a relationship between a more experienced person (the mentor) and a less experienced person (the mentee) who share similar goals or interests. A mentor provides guidance, support, feedback and encouragement, acting as both a role model and a source of inspiration. This relationship is especially vital for girls in STEM, as it offers a supportive environment to explore interests, develop skills, and gain confidence.

Mentors serve as role models, sharing their experiences and success stories. They provide invaluable guidance and support, helping girls to see themselves in STEM roles and believing in their potential. By witnessing the achievements of mentors who resemble them, girls are inspired to overcome challenges and pursue their dreams.

Mentors also offer insights into various STEM disciplines, helping girls navigate the complex world of science and technology. They guide educational pathways, recommend resources and lead practical experiences such as internships and workshops. Through mentorship, girls gain knowledge, develop technical skills and become better equipped to thrive in STEM fields.

Mentors tailor their support to the unique needs and aspirations of each mentee. They help girls set goals, identify strengths and work on areas needing improvement. This personalized guidance fosters personal and professional growth, nurturing essential skills such as critical thinking, problem-solving, communication and leadership. By focusing on skill development, mentorship creates a strong foundation for future success.

Networking and Opportunities

One of the significant benefits of mentorship is expanded networks. Mentors connect girls with professionals, experts, and industry leaders, opening doors to internships, research projects, and job opportunities. Building a strong network early in their STEM journey enhances girls' chances of success and empowers them to navigate the field with confidence.



Mentorship Resources

WAAW Foundation

The WAAW Foundation's mentorship programme connects aspiring girls in STEM with experienced professionals passionate about supporting and nurturing the next generation of women in STEM.

Techbridge Girls

Techbridge Girls is a non-profit organization providing after-school and summer programmes for girls from low-income communities to explore STEM through hands-on projects, field trips and role models as mentors.

Million Women Mentors

Million Women Mentors is a movement aiming to mobilise one million mentors to support girls and women in STEM through online platforms, events, and partnerships with schools, universities and corporations.

Women in Engineering Pro-Active Network (WEPAN)

WEPAN is a network of academic institutions, professional societies and industry partners working to advance the inclusion and success of women in engineering through research, advocacy and mentorship programs.

Association for Women in Science (AWIS)

AWIS is a global network of professionals, students and allies supporting women in STEM through mentoring circles, webinars, awards and scholarships. Mentorship is a powerful tool in guiding girls toward

successful STEM careers. By providing encouragement, building knowledge and skills, fostering personal and professional growth and creating networking opportunities, mentors play a crucial role in addressing the gender disparity in STEM. Investing in mentorship programmes and initiatives can significantly impact the future of girls in STEM, empowering them to achieve their full potential and drive innovation in these vital fields.





STS-47

GIBSON APT BROWN
LEE DAVIS JEMISON MOHRI

MAE JEMISON



WOMEN OF IMPACT

Mae Jemison

Let us Never Forget the Female Pioneers

BY: Alex Rose-Innes

As a doctor, engineer, NASA astronaut, Mae Jemison has always reached for the stars. In 1992, she became the first African American woman to travel in space. She has also written several books and appeared on many television programmes including an episode of Star Trek: The Next Generation. In addition to her many awards, Jemison has been inducted into the National Women's Hall of Fame and the International Space Hall of Fame. Jemison was born on October 17, 1956 in Decatur, Alabama. The youngest of three children, her mother was an elementary school teacher and her father a maintenance supervisor. A few years after her birth, Jemison and her family moved to Chicago, Illinois. In addition to her love for dance, Jemison knew she wanted to study science at a very young age. Growing up watching Apollo flights on TV, she was upset that there were no female astronauts.

Star Trek to the Rescue

Jemison was inspired by African American actress, Nichelle Nichols, who played Lieutenant Uhura on the Star Trek television show. Jemison was determined to one day travel in space. In 1973, she graduated from Morgan Park High School when only 16 years old and left Chicago to attend Stanford University in California.

As one of the only African American students in her class, Jemison experienced racial discrimination in school. She later served as president of the Black Student Union and choreographed a performing arts production - Out of the Shadows - about the African American experience. She graduated in 1977 with a Bachelor of Science degree in Chemical Engineering and a Bachelor of Arts degree in African and African-American studies.

After graduating from Stanford University, Jemison attended Cornell Medical School. While in medical school, she travelled to Cuba to lead a study for the American Medical Student Association. She also worked at a Cambodian refugee camp in Thailand. She graduated from Cornell with a Doctorate in Medicine in 1981. Shortly after her graduation, she became an intern at the Los Angeles County Medical Centre and went on to practice general medicine. Fluent in Russian, Japanese and Swahili, Jemison joined the Peace Corps in 1983 and served as a medical officer for two years in Africa.

After working with the Peace Corps, Jemison opened a private GP. However, once Sally Ride became the first American woman in space in 1983, Jemison decided to

apply to the astronaut program at NASA. She applied in 1985, but after the Space Shuttle Challenger exploded in 1986, NASA took a break from accepting new people.

Chosen From Among Thousands

Jemison applied again in 1987 and was one of 15 people chosen out of more than 2,000 applications. She was selected for the NASA Astronaut Group 12, the first group chosen after the Challenger explosion. Jemison trained with NASA and worked on projects at the Kennedy Space Centre in Florida and the Shuttle Avionics Integration Laboratory.

She received her first mission on September 28, 1989 when she was selected to join the STS-47 crew as a Mission Specialist. On September 12, 1992 Jemison and six other astronauts soared into space on the shuttle Endeavor. This voyage made Jemison the first African American woman in space. The team made 127 orbits around the Earth and returned to the Kennedy Space Center in Florida on September 20, 1992.

Jemison left NASA in 1993 after serving as an astronaut for six years in total. She started The Jemison Group, a consulting company encouraging science, technology and social change. She also started teaching environmental studies at Dartmouth College and directed the Jemison Institute for Advancing Technology in Developing Countries.

After hearing that she was a fan of the Star Trek television show, actor LeVar Burton asked Jemison to appear in an episode. Jemison agreed and became the first real astronaut to be on Star Trek: The Next Generation. She played Lieutenant Palmer in the episode, "Second Chances."

In 1994, Jemison created an international space camp for students 12-16 years old called The Earth We Share (TEWS). She also created a non-profit organization - the Dorothy Jemison Foundation for Excellence. Jemison later accepted a position as the Andrew D. White Professor-at-Large at Cornell University in 1999. She went on to write her first book in 2001, Find Where the Wind Goes, a children's book about her life.

Currently, Jemison is leading the 100 Year Star ship project through the United States Defence Advanced Research Projects Agency (DARPA). This project works

toward making human space travel to another star possible within the next 100 years.

Memberships and Board Appointments

- Board member of the Kimberly-Clark Corp., Scholastic, Inc.
- Board member of Valspar Corp.
- Morehouse College,
- Texas Medical Centre,
- Texas State Product Development and Small Business Incubator,
- Greater Houston Partnership Disaster Planning and Recovery Task Force
- National Institute of Biomedical Imaging and Bioengineering
- Member of the National Academy of Sciences' Institute of Medicine
- Inducted into the National Women's Hall of Fame
- National Medical Association Hall of Fame
- Texas Science Hall of Fame.
- She has received multiple awards and honorary degrees including the National Organization for Women's Intrepid Award and the Kilby Science Award.
- World Sickle Cell Foundation from 1990 to 1992
- Advisory committee member of the American Express Geography Competition
- Honourary board member of the Center for the Prevention of Childhood Malnutrition

Additional Honours and Awards

In recognition of her accomplishments, Jemison received a number of accolades, over and above those cited above.

This includes:

- several honorary doctorates
- 1988 Essence Science and Technology Award the Ebony Black Achievement Award in 1992
- Montgomery Fellowship from Dartmouth College in 1993
- She was also named Gamma Sigma Gamma Woman of the Year in 1990
- In 1992, an alternative public school in Detroit, Michigan, the Mae C. Jemison Academy, was named after her.



WOMEN OF IMPACT

Dr Evelyn Boyd Granville

1924 – 2023

Evelyn Boyd Granville was only the second African-American woman to receive a PhD in mathematics from an American University. She worked in computing.

BY: Alex Rose-Innes

goals to be like them. We accepted education as the means to rise above the limitations that a prejudiced society endeavoured to place upon us.” – Evelyn Boyd Granville ”

Granville attended elementary, junior high and high school in Washington D.C. She was happy and excelled at school as an outstanding pupil. From this time on she aspired to a career as a teacher. “I saw black women - attractive, well dressed women - teaching school and I wanted to be a teacher because that’s all I saw. I was not aware of any other profession,” she said.

Her Studies

The secondary school she attended, Dunbar High School, was an academically oriented school for black students which aimed to send their pupils to the top universities and there, Granville was strongly encouraged by two of her mathematics teachers, Ulysses Basset and Mary Cromwell. While at Dunbar High School she decided that she wanted to continue her studies at Smith College after graduating but she fully realised that her mother was not in a position to support her financially through College. “I did not receive a scholarship the first year at [Smith College] and I was told later that they didn’t see how in the world a poor child as I could afford to go there. The first year, my aunt helped my mother. Of course after the first year I got scholarships. I lived in a co-op house, worked during the summers and I was able to pay] It was not a financial burden after the first year.:

In fact Granville’s mother and aunt gave her \$500 to finance her studies for a year before she won the scholarships which helped fund the remainder of her time at Smith College. During the summer she worked work at National Bureau of Standards.

On entering Smith College in 1941, Granville studied French as well as mathematics but, although she enjoyed the language, did not find French literature to her liking and soon concentrated on mathematics, theoretical physics and astronomy. Among her teachers at Smith College was Neal McCoy who was particularly supportive of women mathematicians, perhaps in part because his own sister was a mathematician.

I was fascinated by the study of astronomy and at one point I toyed with the idea of switching my major to this subject. If I had known then that in the not too distant future the United States would launch its space programme and astronomers would be in great demand in the planning of space missions, I might have become an astronomer instead of a mathematician.

Granville graduated with distinction in 1945 and was awarded a scholarship from the Smith Student Aid Society of Smith College to undertake studies for her doctorate. Both the University of Michigan and Yale University offered her a place but only Yale was able to provide the additional financial support she required.

Evelyn’s family name was Boyd. The name Granville, by which she was later known, is the name she took after her second marriage.

Dr Granville’s father, William Boyd, had various jobs including that of a janitor, chauffeur and a messenger. Evelyn’s mother, Julia Boyd, worked as a secretary before her marriage but gave up work to raise her children. The Great Depression began in 1929 when Evelyn was five years old and by 1932, 25% United States workers were unemployed. Granville’s father started selling vegetables and, although the family were poor, they always had food and a home.

Her Early Years

William and Julia Boyd separated while Evelyn was still young and, with her elder sister who was about eighteen months older, she was brought up in the African American community in Washington, D.C by her mother. Julia Boyd’s sister also played a big part in Granville’s upbringing and, being more academically inclined that Granville’s mother, she strongly influenced and encouraged Granville in that direction. After separating from William Boyd, Julia returned to work to support her family earning a living as a maid. Eventually she worked for the Bureau of Engraving and Printing in Washington as a currency and stamp examiner. Julia’s sister, having failed to get a teaching post, also got a job with the same organisation.

“As a child growing up in the 30’s in Washington, D.C., I was aware that segregation placed many limitations on Negroes (sic). However, one daily came in contact with black people who had made a place for themselves in society; we heard about and read about individuals whose achievements were contributing to the good of all people. These individuals, men and women, served as our role models; we looked up to them and we set out

Entering Yale in the autumn of 1945, she began research in functional analysis and wrote a doctoral thesis On Laguerre Series in the Complex Domain and in 1949, together with Marjorie Lee Browne who graduated from the University of Michigan in the same year, she became the one of the first black American women to be awarded a Ph.D. in mathematics. After completing her Ph.D. from Yale, Granville spent a postdoctoral year at the New York University Institute of Mathematics working on differential equations with Fritz John. Rather sadly, neither Hille nor John encouraged her to submit her research for publication. During this year she also taught as a part-time instructor in the mathematics department of New York University. After applying unsuccessfully for a teaching post at the Polytechnic Institute of Brooklyn, she accepted an offer of an associate professorship at Fisk University in Nashville, taking up the post in 1950.

In the final analysis, however, Granville - who wanted to become a teacher since she was a little girl - was unable to accept the highly restrictive terms under which black women could hold academic posts in the early 1950's. As she considered her options, it was natural for her to think about the possibility of government employment. In the spring of 1952, Granville decided to seek a government job and return to Washington, D.C.

The job she was offered at the National Bureau of Standards gave her twice her previous academic salary where she consulting with ordinance engineers and scientists on the mathematical analysis of problems related to the development of missile fuses.

"I met several mathematicians who were employed as computer programmers. At that time the development of electronic computers was in its infancy. The application of computers to scientific studies interested me very much, which led to my giving serious consideration to an offer of employment from International Business Machines Corporation."

A Pioneer at IBM

In December 1955, Granville left the National Bureau of Standards and began to work for IBM in January of the following year. At first she worked in Washington writing programmes for the IBM 650 computer. In 1957 she moved to New York City to take up a post as consultant on numerical analysis at the New York City Data Processing Centre of the Service Bureau Corporation, part of IBM.

When the United States space programme began to rapidly move forward, NASA contracted IBM to write software for them. Granville was happy to return to Washington D.C. as one of a team of IBM mathematicians. "I can say without a doubt that this was the most interesting job of my lifetime - to be a member of a group responsible for writing computer programmes to track the paths of vehicles in space.

In November 1960 Granville married and relocated to Los Angeles where she continued her work on orbit

calculations for the space programme at the Space Technology Laboratories.

In 1967 Granville's marriage broke up and she returned to the academic world, accepting a teaching post at California State University in Los Angeles. Her job involved undergraduate teaching and she taught both numerical analysis and computer programming.

Another role was in mathematical education and she was involved in the mathematical education of those training to be elementary school teachers. This interest in mathematical education led to her involvement with the Miller Mathematics Improvement Programme, teaching mathematics for two hours each day at an elementary school in Los Angeles during 1968-69.

From this experience came her joint publication with Jason Frand Theory and Applications of Mathematics for Teachers (1975). The book was well received and adopted in many schools. Three years later a second edition was published, changing methods in teaching mathematics the book ceased to be relevant to current courses.

Sharing her Unique Talent and Knowledge

Evelyn taught at Texas College from 1985 to 1988, while still married to her husband; teaching a newly instigated computer science course. Still Granville did not want to leave the academic world and also taught at the University of Texas at Tyler, where she held the Sam A Lindsey Chair and retired in 1997.

Granville gave her views on the current problems of teaching mathematics in American schools in a lecture at Yale University. "I believe that math is in grave danger of joining Latin and Greek on the heap of subjects which were once deemed essential but are now, at least in America, regarded as relics of an obsolete, intellectual. Math must not be taught as a series of disconnected, meaningless technical procedures from dull and empty textbooks.

We teach that there is only one way to solve a problem, but we should let children explore various techniques, but we're not training teachers to provide this new approach. ”

Children end up crippled in mathematics at an early age. Then, when they get to the college level, they are unable to handle college classes. It's tragic because almost every academic area requires some exposure to mathematics. Make children learn how to add, subtract, multiply and divide, and they won't need calculators. How do you teach the beauty of mathematics, how do teach them to solve problems, to acquaint them with various strategies of problem solving so they can take these skills into any level of mathematics? That's the dilemma we face," she concluded.



WOMEN OF IMPACT

Prof Quarraisha Abdool Karim

Trailblazer par Excellence

BY: Alex Rose-Innes

An infectious disease epidemiologist and co-founder and Associate Scientific Director of CAPRISA, Professor Karim's list of achievements has changed the face of female health and is especially known for her fight against HIV.

This medical and scientific pioneer also boasts a professorship in Clinical Epidemiology from Columbia University in New York and Pro-Vice Chancellor for African Health at the University of KwaZulu-Natal in South Africa. With her pioneering work in HIV, she is also the UNAIDS Special Ambassador for Adolescents and HIV and co-chairs the UNAIDS Advisory Group to the Executive Director.

History and Education

Karim was born in Tongaat in South Africa in 1960 where she attended Vishwaroop state-aided school, the Victoria school, and Tongaat high school. She gives credit to her grandmother and parents as some of her mentors who instilled in her a passion for knowledge.

In 1981, she graduated with a Bachelor of Science from the University of Durban-Westville and added a bachelor of science honours degree in Biochemistry to her growing curriculum vitae. For her master's degree in Parasitology from Columbia University, she moved to the United States, but returned to her roots in 2000, completing her PhD in Medicine from the University of Natal, in South Africa.

Various Medical and Scientific roles

With her 32 years of HIV research, she accumulated prestigious positions and during the Covid 19 epidemic, her outstanding intellect and knowledge led her to being selected as Executive Group Member of the Steering Committees for the WHO Covid-19

Solidarity Therapeutics Trial and the WHO Covid-19 Solidarity Vaccines Trial. She co-chairs the United Nations 10-Sustainable Development Goal 10 Member Technology Facilitation Mechanism (TFM); is a member of the PEPFAR Scientific Advisory Board and serves on the Board of Directors of Friends in the USA in the Global Fight Against AIDS, Tuberculosis and Malaria.

Just when one assumes that she simply does not have any additional time to follow her many passions, she became Deputy-Chair of the WHO Alliance for Sexual and Reproductive Health; the Scientific Advisory Board Member of the Indlela Behavioural Insights for Better Health and Member of the CAPRISA Board of Control.

Her research over three decades focussed mostly on preventing HIV infection in adolescent girls and young women. This includes conducting clinical trials from early phases, through proof of concept and implementation of new discoveries. Her landmark study, the tenofovir gel CAPRISA 004 trial, demonstrated for the first time that anti-retrovirals can prevent HIV infection.

Top 10 Scientific Breakthrough

The study which changed the lives of those with HIV/AIDS was highlighted by the journal Science as one of the top 10 scientific breakthroughs in 2010. She has over 200 peer reviewed publications; edited several books, contributed several book chapters including co-editing the 6th and 7th edition of the Oxford Textbook on Global Public Health.

She has played a central role in building the science base in southern Africa through the Columbia University - Southern African Fogarty AIDS International Training and Research Programme that has trained over 600 scientists in southern Africa. She is an elected member of the National Academy of Medicine (USA) and Fellow of The

World Academy of Science, Royal Society of South Africa, Academy of Science of South Africa and the African Academy of Science. She is a South African National Research Foundation A1 rated scientist.

Women-initiated Technologies

Prof Karim's scientific contributions, highlighting the vulnerability of young women and the need for women-initiated technologies and integration of HIV prevention efforts into sexual reproductive health services, has been recognised by more than 30 local and international prestigious awards including South Africa's highest honour, the Order of Mapungubwe, from the President of South Africa.

More Awards

In 2020 Abdool Karim received three prestigious awards for her scientific work in HIV prevention and women's health: The John Dirks Canada Gairdner Award for Global Health; the Christophe Mérieux Prize from the French Academies of Sciences and the 500 years of the Straits of Magellan Award from the Chilean government.

She is the 2021 John F.W. Herschel Medal recipient from the Royal Society of South Africa, as well as the African Union's Kwame Nkrumah Prize for Science and Technology; the TWAS-Lenovo Prize from The World Academy of Sciences (TWAS); the ASSAf Science-for-Society Gold Medal; the South African Medical Research Council Gold Medal; the 2016 L'Oréal-UNESCO Women in Science award for Africa and the Arab States; the Lifetime Achievement Award from the Institute of Human Virology in the USA and the 2018 HPTN Ward Cates Spirit Award.

She received honorary doctoral degrees (Honoris Causa) from the University of Johannesburg (2017) and the University of Stellenbosch (2020) in South Africa. She is a Living Legend for the City of Durban – an honour bestowed by the city for citizens who have made an exemplary contribution to increase the profile of the city nationally and internationally.

HIV Research

In the 1990's, South Africa was gripped by an HIV epidemic. During this time, Karim started her socio-behavioural studies in relation to HIV in South Africa. She conducted population-based surveys to understand the spread of the epidemic in women, as well as focussing on additional factors such as gender, age and migration. In 1992, Abdool Karim et al. published a paper, showing that women were more vulnerable to HIV infection. The study also found a correlation between migration and HIV, emphasised among men. Also during the 1990's, Karim conducted numerous studies and wrote various papers on the infection and highlighting the different groups who were most at risk.

In 2007, CAPRISA conducted a landmark clinical trial, named CAPRISA 004 with Prof Karim as principal investigator. The underlying aim of this study was to

investigate the effects of Tenofovir gel in reducing the risk of HIV contraction. This trial also resulted in a proof of concept for Microbicides. Overall, the study demonstrated protection against the HIV infection with a 39% reduction in infections. At the XVIII International AIDS Conference, 2010, the results of their CAPRISA 004 study led to a standing ovation, an uncommon occurrence at a scientific meeting. In 2017, with other leaders from the project, Karim edited The CAPRISA Clinical Trials: HIV Treatment and Prevention.

Since this project, Abdool Karim has continued to research and publish papers about HIV/AIDS in South Africa such as her book HIV/AIDS in South Africa with her husband and research collaborator Salim Abdool Karim in 2005, with the second edition published in 2010. In 2015, she co-edited the sixth edition of the Oxford Textbook of Global Public Health and was appointed by the executive director of the Joint United Nations Programme on HIV and AIDS (UNAIDS) as the UNAIDS Special Ambassador for Adolescents and HIV.

Leadership and working for equality

Outside of her research in HIV and AIDS, Prof Karim has also worked to improve education and training for scientists in South Africa and serves as an advocate for women in science. Through the Columbia University-Southern African Fogarty AIDS International Training and Research Programme, Abdool Karim has trained more than 600 scientists in the region since 1998. She has also spoken and given interviews explaining the difficulties associated with being a woman in research as well as encouraging more young women to pursue the sciences.

Awards and Honours for AIDS Research

Prof Karim has won many awards for her work on AIDS research. This includes the TWAS-Lenovo Science prize, the first female recipient, receiving the \$100,000 prize.

- **2010:** CAPRISA 004 Trials highlighted by Science as one of the Top 10 scientific breakthroughs of the year
- **2011:** Olusegun Obasanjo Prize
- **2013:** Order of Mapungubwe (Bronze)
- **2014:** TWAS-Lenovo Science Prize
- **2014:** SAMRC Scientific Merit Award (Gold)
- **2014:** ASSAF Science-for-Society Award (Gold)
- **2015:** eThekweni Living Legends Award
- **2016:** L'Oréal-UNESCO Award for Women in Science
- **2020:** Canada Gairdner Global Health Award
- **2020:** Christophe Mérieux Prize
- **2020:** Straits of Magellan Award
- **2022:** VinFuture Prize

In 2017, the BBC named Abdool Karim as one of the seven trailblazing women in science.[25] Quarraisha Abdool Karim is married to the South African epidemiologist, Salim Abdool Karim, whom she sometimes collaborates with on research. She has three children.



WOMEN OF IMPACT

Dr Aayesha Kholvadia

Addressing disparities in healthcare access
between the public and private sectors

BY: Thabo Mohlala

A casual visit to her uncle's surgery in Carletonville, Gauteng, is all it took to inspire the young Aayesha Kholvadia to pursue a career in healthcare. True to form, after she completed her high school education, she enrolled for a degree in biokinetics. Today she is a senior lecturer and the Head of Department: Human Movement Science in the Faculty of Health Sciences at the Nelson Mandela University.

Visit to uncle's surgery

"My visits to my uncle's surgery sparked an early interest in healthcare. I would help clean patients' wounds or hold a tray during a procedure, fascinated by the healing process. Sometimes, I would act as a receptionist, listening to people's stories, and observing how my uncle's work impacted lives," she says about her early influences. Her passion for health was further cemented after one of her relatives was struck by a lightning, a tragedy that needed long sessions of physiotherapy and rehabilitation.

Making a tangible impact

Dr Kholvadia's family subsequently re-located to Port Elizabeth where she registered for an under-graduate degree in biokinetics at the University of Port Elizabeth. It was a completely new environment and experience for her, particularly as a young Muslim female of colour. She continued her studies in the same field until the PhD level, thanks to the financial support from the National Research Foundation (NRF). The funding not only enabled her to do further research, but it also made it possible for her to network and present her findings at various local and international forums. While doing her Master's degree, she veered "into the use of whole-body vibrations therapy as a tool for improved health outcomes". Today, she adds, I am proud to be part of a profession that allows me to make a tangible impact on people's lives.

Enrolling for a PhD degree

The NRF funding came in handy given the fact that her family had limited financial means to pay for her studies. "As the eldest of three children, I was aware of the financial constraints my family faced, and the NRF

funding provided a vital opportunity for me to continue my education. This support not only enabled me to complete my Master's degree but also contributed to writing my first peer-reviewed publication," says Dr Kholvadia. She moved back to Gauteng and enrolled for a PhD degree at Wits University focusing on the use photobiomodulation therapy to manage conditions such as osteoarthritis.

Disparities in healthcare access

Dr Kholvadia says currently her work involves the field of biokinetics and the exploration of collaborative patient-centred care, particularly within the context of rehabilitation medicine and public health. "My research focuses on using innovative therapies and methods to improve health outcomes for patients, with an emphasis on integrating advanced technologies and collaborative practices into healthcare," she adds. A significant aspect of her work also involves supervising 11 Master's and nine PhD postgraduate students. Says Dr Kholvadia: "I am guiding their research projects, which are often centred around improving preventative and allied healthcare measures in both the public and private sectors. My research group is dedicated to exploring the disparities in healthcare access and outcomes between different population groups, with the goal of developing sustainable solutions to bridge these gaps."

She says her focus on innovative therapies and integrated healthcare practices aims to improve health outcomes and quality of life for patients, particularly in the areas of rehabilitation medicine and preventative care. Furthermore, she says, her research provides new pathways on how to manage chronic conditions by exploring advanced treatment modalities such as photobiomodulation therapy and whole-body vibration therapy.

Developing a pool of future healthcare professionals

Kholvadia's main objectives as a health practitioner is to address disparities in healthcare access and outcomes, especially between the public and private sectors. The focus on equitable care is crucial for South Africa,

where disparities in access to healthcare services persist, she observes. She says mentoring postgraduate students and conducting research is her way of contributing to the development of future healthcare professionals and researchers. Dr Kholvadia believes this can meaningfully help drive progress and innovation within the field. In the end, she adds, this will lead to improved healthcare delivery and patient outcomes across the country and beyond.

Some of key milestones in her academic journey include successful completion of both her Master's (in two years) and PhD degrees, particularly being the first member of her family to do. In 2023, Dr Kholvadia received the ASAIPA Healthcare Leadership Award in recognition of her work in the field.



WOMEN OF IMPACT

Dr Charissa Button

A PhD astrophysics graduate is ready to
lend a hand to SKA

BY: Thabo Mohlala

Dr Charissa Button is a big proponent of the Square Kilometre (SKA), which he cannot wait to become a part of. She recently made history by becoming the University of Pretoria (UP)'s first PhD graduate in astrophysics. The SKA is by far one of the world's biggest radio telescope infrastructure projects that will not only create huge investment and economic opportunities for South Africa, but it will also help develop a pool of young and brightest scientists in Africa. Once completed, the SKA will leverage the capability of radio astronomy to provide the highest-resolution images of the Milky Way galaxy with the least radio interference.

High-profile global initiatives

Dr Button says she is excited to grow astronomy at UP and the country especially as SKA and MeerKAT are such vital and high-profile global initiatives in which the university is also involved. She first took interest in pursuing post-graduate studies in radio astronomy because of its ability to explore and interrogate fundamental questions in physics including the nature and effects of dark matter, and the expansion of the universe.

The outer discs of spiral galaxies

"During my studies in radio astronomy, I became interested in the vast array of physical processes that contribute to galaxy formation and evolution. This has included the neutral atomic hydrogen gas (HI) found in the outer discs of spiral galaxies, as well as hydroxyl megamasers (OHMs), typically found in the inner regions of merging galaxies, which both provide valuable information on the star formation taking place in these galaxies. Due to the intrinsic faintness of these emission lines, studies of them have historically been limited to the nearby universe," explains Dr Button.

Finding gravitational lensing

Dr Button's PhD programme focused on exploring gravitational lensing as an approach to probe the more distance universe. "My thesis explored methods for finding gravitationally lensed HI sources and OHMs in upcoming SKA surveys, which will significantly increase

their scientific yield. Gravitational lensing, which Einstein predicted in his general theory of relativity, arises when a massive object, like a galaxy, lying in the foreground of a more distant galaxy, bends the light rays from the distant galaxy (like a raindrop on a window), thereby amplifying the signal of the distant galaxy that would otherwise be too faint to detect with current instruments,” says Dr Button.

Influence from a decorated academic

Although Dr Button has been pursuing astronomy as part of her postgraduate studies, it was Professor Roger Deane who influenced her decision. Professor Deane is a respected figure within the astronomy community. He is credited for setting up UP’s Radio Astronomy Research Group in 2018 and currently he serves as an Extraordinary Professor in the Department of Physics in the Faculty of Natural and Agricultural Sciences, and SARChI SKA Chair in Radio Astronomy at the University of the Witwatersrand. And this is why Dr Button didn’t hesitate to enrol for her a postgraduate degree in astronomy.

Power of smart algorithms

Commenting on Dr Button’s recent achievement as a scientist in astronomy, Professor Deane said: “Dr Button’s PhD is an excellent example of how a bright young mind can use the power of smart algorithms and big data to make new important cosmic discoveries with next-generation telescopes like the Square Kilometre Array. I’m excited that we’ll soon be able to test her predictions with the SKA, building on a strong foundation of experience with MeerKAT,” says Professor Deane.

Forging partnership with international researchers

Dr Button says she would build on international partnerships that she forged during her PhD studies with the Universities of Oxford and Western Australia as she pursues a broader research portfolio. She says UP’s membership of the Inter-University Institute for Data-Intensive Astronomy has facilitated such partnerships and networks.

Dr Button’s full-time postgraduate studies were funded by the South African Radio Astronomy Observatory (SARAO). She is currently a SARAO postdoctoral fellow at UP. As part of her studies she made presentations on her research at various conferences internationally, such as in Bristol in the UK, and locally. This gave her a valuable platform to engage and interact with the broader international radio astronomy community.

Dr Button is the face of a new generation of the brightest minds, innovative and enterprising minds within the science field. Her passion for astronomy would no doubt go a long way in motivating more young girls.



WOMEN OF IMPACT

Mwangala Mauunga

A young Zambian wonder kid dazzle
the world with her innovation

BY: Thabo Mohlala

Mwangala Maunga captured the imagination of the world when, at the age of 12, she invented a solar water purifier to provide clean potable water to both rural and urban areas in and around Lusaka, Zambia. She displayed such an amazing charitable spirit and kind heartedness that at her tender age she could harness the power of STEM to address a profound and pressing social challenge. Her feat certainly deserves a mention or maybe even a chapter in the annals of science history books.

Water purifier built from a shoe-string budget

Her water purifier prototype was built from simple and cost effective materials; a combination of wooden and metal sheet enclosures, black paint for insulation, heat absorbent black trays, reflective materials, sheets of glass, glue and catch troughs. During an interview with PlanetForward, young Maunga said: “The main reason I developed the water filter was because I wanted to provide clean and safe water in the simplest way possible, as opposed to a complicated water purification system.” The idea of Maunga’s invention came about after she realised the prevalence of waterborne diseases not only around her locality but has also hit many African countries. Some of the common diseases associated with contaminated water range from diarrhoea, dysentery, to typhoid fever, e-coli infection, and salmonellosis.

Reducing reliance on fossil fuel

Maunga’s water purifier was launched just a few months before the Zambian government declared a cholera outbreak in October 2023 in the province of Lusaka. More significantly, her initiative, which relies on solar energy, aligns with the broader global idea of using clean and sustainable energy sources. In addition, it promotes

the UN's Sustainable Development Goal 6 - provision of clean water and sanitation. Governments across the globe are called upon to concretise the UN's Goal 6 by ensuring consistent provision of clean water to their citizens.

Clean drinkable water

According to the African Union Development Agency (AUDA), access to clean drinkable water is a basic human need and right for all African people as they cannot survive without water. The African Union Agenda 2063 and the UN have highlighted access to water as a critical component of socio-economic development. Based on the latest statistics from AUDA, over 418 million people still lack access to even the most basic level of drinking water service. In addition, approximately 779 million people need access to basic sanitation services and 839 million people lack access to basic hygiene services.

List of awards

Mwangala says the idea for her solar water filter dates back to when she was in Grade 5 but only got in motion when she was in Grade 8. She has received a string of awards and recognitions for her innovative and pioneering invention.

These include, among others, being the:

- youngest STEM Change Maker Award at the 2021 Genius Education Zambia Awards.
- youngest and only Zambian speaker at the 2020 virtual International Youth Day.
- youngest recipient of the Brenda Muntemba Award in 2019 as an (Emerging Young African Leader) at the Push Women Awards.

- best inventor in the Science and Tech category at the DStv Africa MultiChoice – Cartoon Network Powerpuff Girls' Awards.
winner of the best Inventor in the Science and Tech category in 2018 at the DStv Africa Multi Choice – Cartoon Network Powerpuff Girls' Awards.

Impacting lives of young girls

Maunga uses her success and influence to inspire and impact the lives of other young girls across Zambia and the continent. She founded the Girl Power Platform as a vehicle through which she exposes and assists young girls, mostly in rural areas, to access opportunities within the STEM field. To date, she has been able to interact and inspire over 600 girls in her school through STEM and climate advocacy activities.

But it has not been all plain sailing for her as she has to battle stereotypes in terms of age and gender. Some doubted and dismissed her dream simply on the basis of her age and the fact that she is female. But she never allowed these to distract her from her bigger mission. Mwanga wants to use her initiative not only as a lasting legacy and a timeless inspiration for other young girls to stop at nothing in fulfilling their dreams.

Her immediate goal is to mass produce her water filters, whose prototype has already gone through a battery of rigorous scientific tests, and ensure it is patented. Maunga's success will undoubtedly inspire many young girls to dream big and to never view age as a barrier. She is currently pursuing a Bachelor of Science in Computer Science from Copperbelt University.

Breaking Barriers

Insights from Women Rising The Unseen Obstacles

In *Women Rising: The Unseen Barriers*, published in Harvard Business Review, authors Herminia Ibarra, Robin J. Ely and Deborah M. Kolb, explore persistent challenges women face despite the well-intentioned efforts of many organisations, as they strive for leadership roles. It discusses traditional approaches to gender diversity, arguing that these well-meaning methods often overlook deeper complexities of leadership identity development and fail to address the subtle biases hindering women's progress.

This thoughtful critique discusses the frustration experienced by CEO's who, despite setting ambitious goals for female representation and implementing diverse candidate slates, see limited progress. This, according to the authors, is at the basis of fundamental strategies not addressing developing a leadership identity.

Becoming a leader is not merely about acquiring new skills or adapting to a role; it requires a profound shift in one's individual perception and that of others. ”

Subtle Forms of Gender Bias

The leadership journey involves a process of self-assertion and receiving feedback, addressing the individual's personal image and embarking on the growth process with confidence and visibility. This process is often disrupted by subtle forms of gender bias as the story of Amanda, an investment banker, displays. Her career advancement stalled until she gained support from influential female clients, illustrating how external validation and endorsement can significantly impact a woman's leadership trajectory.

Central to the article's arguments is the concept of second-generation gender bias. Unlike overt discrimination, this form of bias is subtle and ingrained in organisational practices and societal expectations. It creates an environment where women are less likely



to thrive and ascend to top positions despite their obvious talent. The authors emphasise the importance of recognising and addressing this bias to enable women to fully realise their potential.

Key Strategies for Inclusive Environment

To address these challenges, authors propose several key strategies. First, it advocates educating both women and men about second-generation bias. Understanding these subtle forms of bias can empower women to take counteractive proactive steps and seek support - an awareness fostering a more inclusive environment toward female career advancement.

Creating safe identity workspaces is another crucial recommendation wherein women can, without fear of judgement, explore and develop their leadership skills. These spaces provide valuable opportunities for feedback, mentorship, and peer support providing women with the necessary skills to navigate the complexities of leadership roles and enhance their confidence.

The article also strongly suggests that women should anchor their development efforts with a sense of purpose rather than conforming to gender expectations. By focusing on this, women can align their actions and particular strengths with their values and goals, reducing cognitive and emotional burdens associated with managing perceptions.

Overall, *Women Rising: The Unseen Barriers* offers an insightful critique of existing gender diversity initiatives and presents actionable recommendations for fostering genuine progress. By emphasizing the development of leadership identity, understanding second-generation bias and anchoring in reaching their ultimate goals, the article highlights a nuanced approach to addressing female barriers during their journey towards breaking the glass ceiling. Implementing these strategies could lead to more meaningful advancements and aid in unlocking the full potential of women in leadership across various sectors.



The Urgent Need to Empower Women in Tech

Africa stands on the precipice of technological revolution with the potential to leapfrog into a future driven by innovation and digital growth. However, this vision can only be realised by addressing the underrepresentation of women in tech roles. Currently, women occupy a mere 22% of tech positions across Africa, highlighting a significant gender gap in a sector vital for the continent's economic development.

An Economic Necessity

Bridging this gender gap is not merely about equity; it's an economic necessity. Despite recent global economic uncertainties and tech layoffs, Africa's tech sector continues to show resilience and potential for growth. Addressing the tech talent shortfall by increasing female participation could significantly bolster Africa's GDP and drive sustainable development across the continent.

According to McKinsey, Europe faces a tech talent gap of 1.4 million to 3.9 million people by 2027. In the article it the organisation makes it clear that women are desperately needed to overcome this shortage. If Africa could double the share of women in the tech workforce to about 45%, it could meet these tech talent needs and unlock billions in economic potential.

Understanding the Barriers

To understand this issue an in-depth analyses was undertaken by Opportunity International regarding the educational and professional pathways of women in Africa. The findings reveal two critical drop-off points: from secondary education to university and from university to the workforce.

Educational Drop-Off: While girls in primary and secondary schools perform comparably to boys in STEM subjects, there is a dramatic decline in the number of women pursuing STEM degrees at university level. This drop is particularly pronounced in ICT disciplines, which are crucial for tech roles. **Workforce Drop-Off:** Even among those who graduate with STEM degrees, a significant number of women do not transition into tech roles. This is often due to a lack of support and mentorship, gender biases in hiring and workplace cultures not conducive to women's career growth.

The Way Forward: Four Key Interventions

1. Redress Bias and Support Women in the Workforce

Companies must actively create environments wherein women can thrive. This involves addressing unconscious biases, ensuring equal opportunities for career advancement and establishing support networks. Programmes promoting mentorship and sponsorship can also play a crucial role in helping women navigate and succeed in the tech industry.

2. Improve Retention Rates

Retaining women in tech roles are essential. Flexible working arrangements, career development opportunities and a supportive corporate culture can help reduce the high attrition rates. Companies should integrate retention goals into their performance metrics and hold leaders accountable for achieving these targets.

3. Reskilling and Redeployment of Women into Tech

Many women possess the foundational skills needed for tech roles but lack specific training in emerging technologies. Companies should invest in reskilling programmes providing women with the necessary technical skills, such as coding and data analysis, to transition into high-demand tech positions.

4. Bolster STEM Education from an Early Age

Encouraging girls to pursue STEM subjects from a young age is critical. This involves creating programmes providing exposure to STEM careers, offering scholarships and establishing partnerships between schools and tech companies to provide hands-on learning experiences.

Call to Action

Africa's future in the global tech landscape hinges on its ability to harness the full potential of its talent pool, including women. By implementing targeted interventions to support women at every stage of their educational and professional journeys, Africa can close the gender gap in tech and pave the way for a more inclusive and prosperous digital economy.

The challenge is formidable, but the rewards are immense. Empowering women in tech is not just a moral imperative; it is a strategic economic priority that can drive innovation, competitiveness and growth across Africa. It's time African leaders, educators and business take decisive action and ensure that women are at the forefront of Africa's tech revolution.



WOMEN OF IMPACT

Dr Cindy George

A young scientist is taking on the
fight against chronic kidney disease

BY: Thabo Mohlala



Cindy George was intrigued, when she was growing up, by how things work, particularly the human body. Her inspiration to study biological science started at high school during biology classes, and this would deepen later at university where she was exposed to intricacies of cellular processes and genetics.

Igniting my passion

A turning point came during one of her biology classes when they were introduced to the cardiovascular system. “The detailed explanation by my teacher, coupled with graphical representation of the heart, ignited my passion for understanding living organisms. These experiences, combined with my innate curiosity about the world, inspired me to delve deeper into the biological sciences, aiming to contribute to advancements in medicine,” says Dr George. Currently, Dr George is a Specialist Scientist at the Non-Communicable Diseases Research Unit at the South African Medical Research Council (SAMRC), and she is the Group Lead for the Kidney Diseases Research Programme.

Novel markers of chronic kidney disease (CKD)

Her research focuses on characterising the burden of chronic kidney disease (CKD) in Africa and examining the risk factors and underlying mechanisms associated with CKD in African populations. “More recently I have focused my attention on novel markers of CKD, including genetic-related markers,” she says, adding that research in this area is vital as it affects over 840 million people worldwide with most cases being in low-to-middle income countries, most of which are in Africa.

Dr George’s responsibility includes managing the CKD-Africa Collaboration - a network of researchers conducting research related to kidney function and disease in Africa. She also designs and conducts new research activities to fill major gaps related to CKD in Africa and globally; sources funding both locally and internationally for the projects, supervises students and mentor post-doctoral fellows and junior staff, and publishes her research.

Preventative strategies

“The opportunity to uncover new insights into the mechanisms and progression of CKD is incredibly fulfilling, as it holds the potential to develop more effective treatments and preventive strategies,” says Dr George. She enjoys the collaborative nature of scientific research as it enables her to interact with a diverse team of experts, fostering an environment of continuous learning and innovation. She also finds satisfaction in mentoring and training the next generation of scientists. Seeing the mentees grow and succeed in their careers is immensely gratifying, Dr George notes.

Achievements and accolades

One of her recent achievements was being awarded the prestigious Africa-Oxford fellowship - a programme designed to allow exceptional African researchers to build international networks and focus on a project of their choice in collaboration with Oxford-based scholars. She says through mentoring and training young scientists, she is able to pass on her knowledge and skills thereby inspiring the next generation of researchers to continue the fight against CKD. By collaborating with interdisciplinary teams and integrating cutting-edge technologies into her research, adds Dr George, she can drive innovations that improve healthcare delivery and patient care for CKD.

Challenges faced by women

She says as a woman of colour she has faced several challenges within the STEM field. “I’ve encountered situations where my contributions were under-valued or overlooked in favour of either my white colleagues or my male colleagues,” shares Dr George. She says women are often under-represented in leadership positions, key decision-making roles, and prestigious awards. “This lack of visibility hinders career progression and limit influence within the field. Persistent gender biases and stereotypes often lead to women being undervalued and our contributions being overlooked,” Dr George points out. She says these challenges can be tackled by creating a more equitable and supportive environment that enables women to thrive in STEM fields.

Evolution of women’s role in 30 years’ time

Asked how she thinks the role of women in STEM will evolve over the next thirty years, Dr George says the future is bright. This is because of the ongoing efforts to promote gender equality, technological advancements, and societal changes. “I see an increased representation of women in STEM and increased women in leadership positions. I see more women leading ground-breaking innovative research,” she opines.

Tips for young girls

Her advice to young women aspiring to enter the STEM field is that: “your enthusiasm for your work will drive you through challenges and setbacks”.

- Identify and connect with mentors and role models who can provide guidance, support, and advice.
- Focus on gaining a solid educational foundation.
- Participate in research projects as early as possible.
- Stay persistent and resilient and learn from each failure or setback.
- Stay curious, keep learning, and be open to new ideas and methodologies.

Why Women’s Month is important

She believes in the significance of Women’s Month because it provides an opportunity to honour and celebrate the achievements of women in various fields, bringing to light the invaluable contributions of women to society, which are often overlooked or undervalued. “The celebration raises awareness about the importance of gender equality and the need to address disparities that women face in different areas of life. It provides encouragement to women to continue striving for excellence and breaking barriers in their respective fields,” Dr George observes.



WOMEN OF IMPACT

Dr Nadia Carstens

From doing little experiments in the family garden to being a genomics scientist

BY: Thabo Mohlala



Young Nadia Carstens loved playing with her brothers and cousins in the family's lush back garden. One of their favourite pastimes was doing little experiments; gathering little containers and filling them with squashed plants, bugs and whatever they could lay their hands on from the kitchen. "I loved these experiments!", she says.

HPSCA registered specialist

Today, Dr Carstens is an accomplished HPCSA-registered medical specialist in the field of medical genetics. She is a specialist scientist at the South African Medical Research Council (SAMRC) Genomics Platform. In addition, she holds an honorary research appointment at the University of the Witwatersrand. At school she enjoyed biology but only got exposed to the range of medical science careers at a university open day while in Grade 12. At the time "Many of the biological sciences were experiencing a boom due to emerging and rapidly accelerating technologies. The idea that I could be a part of the next technology wave that would revolutionise medicine really moved me," says Dr Carstens.

Genomics revolution

During her third year of her BSc undergraduate degree, she was drawn to genetics largely because she wanted to be part of the excitement generated by the start of the genomics revolution. "All organisms have a genetic blueprint which offers so many opportunities for research and real impact and a wide range of career paths. The first human genome was released during this time and I was just fascinated by the promise that it held for modern medicine," explains Dr Carstens.

Rare development disorders

Dr Carstens says medical scientists play a vital role in evidence-based medicine and technological advancements to improve treatments, disease diagnostics and pathogen surveillance. Regarding her current role and responsibilities, Dr Carstens says she specialises in a technique called next-generation sequencing (NGS). "This technology allows us to analyse the genetic material of any organism. I help other scientists and clinicians to incorporate this technology into their work as part of my role at the SAMRC Genomics Platform and I use this

technology for my own research on rare developmental disorders as part of my role at Wits,” she says.

Genetic diagnostics

Dr Carstens loves her work because she gets to collaborate with and learn from so many talented scientists and clinicians from around the globe. She also works hard to advance her field, for instance, she leads and contributes to a lot of local and international multi-disciplinary projects that use NGS-based approaches to improve genetic diagnostics in Africa.

Says Dr Carstens: “My first assay development project, an inherited diseases NGS panel, was implemented into the clinical service of the Division of Human Genetics (NHLS or Wits) in 2021. More than 300 research findings from my current and past rare disease projects have been communicated to the relevant patient’s clinician with a positive impact on clinical decision making and care.”

Proudest moments

Of all the projects she was involved in, Dr Carstens singled out the NICU Exomes study that she leads, and one she is particularly proud of. The study recently published its first paper to show that NGS-based testing can significantly improve diagnostic testing for genetic disorders in NICUs and PICUs within the South African State healthcare system. She is also proud of the SAMRC Genomics Platform’s Exome Diagnostics Development Initiative through which they successfully managed to bring down exome sequencing cost to R3 000 per sample. “This is a real game changer for South African researchers who are used to paying double locally. More researchers and clinicians will now be able to incorporate this into their research and clinics, a win for genomic medicine,” argues Dr Carstens.

Building next pool of genomics scientists

To contribute and build a next generation of genomics scientists, she ensures that trainees, post-graduate students and interns are accommodated into every possible space in the research and NGS services. Some of the challenges she encountered in the course of her work include striking a fine balance between her family and work commitments. But fortunately for

her she has a loving and understanding husband, and a supportive team.

Encouraging more women to enter the STEM field

Dr Carstens strongly believes that more women should be supported to enter the STEM field which is currently still dominated by men. “As a mother of two little girls, I think a lot about gender bias in early development. We can do more as a society, parents and educators to steer girls towards STEM fields,” says Dr Carstens.

She says there is already a big improvement in her girls’ generation compared to her own, adding “we are now more conscious as a society to break down career gender stereotypes and showcase representative role models, for example. Let’s continue the dialogues and engagements and change what we can to spark early interest and equip more girls to pursue careers in STEM”. She says more programmes are needed to encourage girls to choose and enjoy STEM-related subjects in schools, particularly in underprivileged settings. “Many girls are losing out on important early opportunities to build the educational foundation needed for a career in STEM,” she adds.

Future ambitions and legacy

Regarding her future goals and aspirations, Dr Carstens says her wish is to “build local and regional pocket of excellence for genetic sequencing technology. We have so much local talent and we need to challenge historic attitudes that technological advancements come from overseas”, she observes. In terms of her legacy, Dr Carstens says she would like to play a key role in helping to advance precision and genomic medicine in South Africa. Furthermore, “I hope to inspire more South African women in STEM to embrace new technologies as developers and not just end users. We can lead technological advancements,” she concludes.



Empowering

Scientific research has driven social and economic gains worldwide, but scientists still face significant challenges. In Africa, the situation is posing a substantial barrier to the continent's development.

Constraining Scientific Freedom in Africa

UNESCO's report "African Perspectives on Scientific Freedom," launched at the Sixth Science, Technology and Innovation Forum in Addis Ababa, Ethiopia, in April this year, highlights growing societal polarisation, erosion of democratic processes and rise in populism, misinformation and disinformation curtailing scientific freedom in Africa.

"Without the freedom and safety of scientists, the trust in science and culture of science-driven decision-making are eroded,"

- Gabriel Ramos, UNESCO Assistant Director-General for Social and Human Science

UNESCO emphasized the importance of scientific freedom through its Recommendation for Science and Scientific Researchers, calling for scientific freedom alongside responsible scientists in conducting and applying science with integrity, stewardship for the environment and respect for human rights.

The African Science Ecosystem

Science ecosystems in Africa are facing numerous challenges, making it crucial to restore trust in science and recognize the role of scientists in advancing human development and the need for increased collaboration between scientists and policymakers to foster science, technology and innovation.

The UNESCO study assessed scientific freedom in six African countries and found that scientific freedom was not uniformly understood or appreciated, necessitating a robust framework of laws and policies to promote research and publication.

Factors such as lack of resources and a shortage of scientists were identified as significant constraints. Despite representing 12.5% of the global population,



Africa

Scientific Freedom to Drive Africa's Progress

Africa contributes less than one percent to global research and spends even less on research and development.

Building a Scientific Culture

Lidia Brito, UNESCO's Assistant Director-General for Natural Sciences, calls for more investment in science and training more African researchers. She said it is about protecting the profession of scientists and creating a conducive environment to retain the scientists in the scientific careers, particularly important for women scientists," noting that many women leave scientific careers due to toxic work environments.

The study shows the underrepresentation of women STEM in Africa, with fewer than 31% female scientists in Sub-Saharan Africa. Addressing this gender disparity is vital for the continent's scientific advancement.

Plugging the Brain Drain

Africa faces a brain drain of scientists attracted by better conditions in other countries, especially in the global North. The World Economic Forum found that Africa has fewer than 100 scientists per million inhabitants and

will need to increase this to the global average of 800 by training millions of scientists, technicians and engineers to post-graduate levels over the next few years.

Busani Bafana, an African development expert, underscores the need for scientific freedom as a cornerstone of development for African countries to remain globally competitive.

Scientific freedom is not just a matter of principle but a necessity for Africa's development. By investing in scientific research, fostering a supportive environment for scientists and addressing gender disparities, Africa can harness the full potential of its scientific community to drive social and economic progress.

As Bafana says, "science needs space to develop. There is a need to interact with society to understand their needs and then through scientific endeavours provide solutions but in a co-designer, co-participating mode."

Women working to address plastic pollution - CSIR celebrates Women's Month 2024

Every year, in August, South Africa marks Women's Month. This year, the CSIR is shining the spotlight on some of its female researchers who are conducting research on plastic, waste and efforts to transition to a more circular economy. Prof. Suzan Oelofse, Dr Taahira Goga, Dr Valentina Russo and Dr Maya John are spearheading evidence-based research for decision-making to reduce plastic pollution.

Although plastics have many benefits, plastic pollution in the environment is an issue of global concern. There is a need to transition towards a more circular plastics economy, in which plastics are kept in the economy and out of the natural environment. In this article, an awesome foursome is sharing their stories on how they are addressing the problem of plastics in society to embrace a circular economy – one that allows for the protection of the natural environment, effective use of natural resources, promotion of industry growth and the creation of employment opportunities.

www.csir.co.za



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA



HAPPY *Women's Month*



“ This August, let us honour the
resilience and achievement of
South African women ”





Figure 1: Dr Maya John is a principal researcher at the Council for Scientific and Industrial Research.

WOMEN OF IMPACT

Dr Maya John

Developing bio-based materials for
a sustainable future



Dr Maya John has been devising materials and products that are more sustainable and environmentally friendly long before it became trendy. John joined the Council for Scientific and Industrial Research (CSIR) in 2006 as a postdoctoral researcher and became involved in research that makes materials from renewable resources, such as plants. Her current focus is on providing circular solutions to tackle the problem of plastic pollution, which she does by developing sustainable and environmentally friendly alternatives from biomass resources to replace single-use plastics in various industrial sectors.

“We also collaborate with industries to create opportunities for local manufacturing,” Matthew says. “The research work is unique as it contributes to reducing plastic pollution through different approaches. The development of environmentally sustainable alternatives and recycling of products or materials is to ensure resources are circulated within the economy.”

John holds a Master of Science degree in analytical chemistry and a PhD in chemistry from Mahatma Gandhi University in India. Her PhD focused on the development of plant fibre-based natural rubber composites.

“This kindled an interest in different kinds of natural and synthetic polymers and their applications,” she says. Her expertise lies in chemistry, polymer composites and biopolymers and now, as a principal researcher, John applies her mastery in the field of developing bio-based and compostable materials. At the CSIR, she leads research on bioplastics and biocomposites and their applications in developing bio-based materials such as biopolymer blends, natural fibre or filler-reinforced polymer composites for various industrial applications.

Bio-based materials are developed from renewable resources and consist at least partially of biological materials, such as plant fibres and biomass waste residues like post-harvest agro and industrial wastes.

Unlike plastics derived from non-renewable petroleum, bio-based materials are renewable.

Work is currently underway on an important research project she is involved in that deals with developing

compostable materials for use as single-use biomedical devices. The technical aspects of the research work deal with developing environmentally friendly materials for different application sectors. “Some of our earlier work on waste valorisation and bio-based materials is aligned with circular economy principles. Therefore, we have been implementing circular economy solutions long before it became a trending topic.” However, the greater impact is that the research work provides solutions to plastic pollution problems, reducing greenhouse emissions for a carbon-neutral society.

When it comes to plastics as a career, many career options are available for women who aspire to pursue research in this field. Encouraging women who aspire to follow a similar career path as her, Maya offers the following guidance: “The first thing is that there is no substitute for hard work. You need to put your blinkers on and forge your path. Try and be around positive people, male or female, who inspire and encourage you.” She acknowledges that for women to maintain both a professional and personal life efficiently, a healthy work-life balance is important, adding, “For women, it is more of a work-life juggle.”

Through its research on plastic, the CSIR aims to have a positive effect and impact on society, and John regards the organisation as a special place where one can not only do top-notch research but also experience an enabling environment that allows for the translation of research into the marketplace and making a positive impact in our society.

Now more than ever, the global spotlight is on renewable carbon technologies and transitioning to climate neutrality. “As material scientists, we are ideally positioned to lead and contribute to this space through multiple pathways, such as improved recycling and novel biomass-derived materials.”



Figure 1: Dr Taahira Goga, a researcher at the Council for Scientific and Industrial Research, where her research interests revolve around the themes of circular economy and sustainability.

WOMEN OF IMPACT

Dr Taahira Goga

Uncovering the potential of a circular and
low-carbon SA plastics sector



For many, it takes a bit of time to figure out what they are passionate about. This was the experience of Dr Taahira Goga. But today, the 34-year-old researcher finds meaning in working on, among other research topics, strategies to address the complex issues of plastics and the associated environmental impacts. Every bit of her winding road added a building block – a degree in chemical engineering laid a strong academic foundation; a Master’s in civil engineering introduced her to Life Cycle Assessment tools; and a PhD lifted the lid on the enormous potential of a circular and low-carbon South African plastics sector.

Before joining the Council for Scientific and Industrial Research (CSIR) as a researcher, Goga received her introduction to the organisation through her attendance at several CSIR webinars and workshops during her academic career. “This served as my orientation to the research council and the projects that it is involved in,” says Goga, who joined the organisation’s group of experts in sustainability, economics and waste in 2023.

Her geographical journey was as varied as her academic journey. She started at the University of KwaZulu-Natal for her undergraduate degree, then relocated to Johannesburg at the midpoint of her Master’s studies to work for the University of the Witwatersrand as a research assistant. She enrolled for a PhD at the University of Cape Town in 2020 - a mere month before the global Covid-19 outbreak. Today, Goga is based at the CSIR’s regional office in Stellenbosch.

A PhD unlocks her passion

Inspired to address a research topic of interest that could address real-life challenges, one that is topical and would benefit and be significant in South Africa, is what defined the subject matter focus for Goga’s PhD dissertation.

She was intrigued by the role waste reclaimers play in solving an environmental problem, as well as a form of informal job creation. “The idea for my doctoral research emerged when I was living in Gauteng. One day, as I was driving past an informal reclaimer (also commonly referred to as a waste picker or informal recycler), I spotted him navigating his trolley packed with recyclable materials. It triggered something within me, and I mulled over it, extending more thought towards whether recycling and the four major waste streams could be a research topic for my PhD.” With wise counsel from her supervisors, the scope of her study was extended to include a detailed analysis of the South African plastics sector. “My supervisors also introduced me to the concept and model of the circular economy as an alternative model.”

“I completed the majority of my PhD remotely as Covid-19 raged. I was fortunate that it was desktop research-based. I remain grateful that I had great supervisors,” she proclaims.

Passion does half the work

"In the end, my doctoral thesis investigated the potential of a circular and low-carbon South African plastics sector. The analysis was conducted using quantitative assessment tools such as Life Cycle Assessment and Material Flow Analysis. The purpose of the study was to evaluate circularity and decarbonisation strategies throughout the plastic lifecycle to determine their environmental impacts."

Goga was honoured with her PhD in June 2024 and continues to work closely with research teams at the CSIR on plastics-related projects. Currently, she is part of a project that focuses on quantifying plastic pollution in Zambia, using the Pathways Tool and another that is creating a national source inventory to reduce plastic pollution at the country level.

Dealing with unknown uncertainties

Challenges are inevitable, but to get the best results, Goga explains, "In general, I think it takes time to figure out what you are passionate about and what skill set you would like to enhance. Understanding your personality and how that fits into team dynamics is also key." She extends this idea to real-life applications in a plastic-reliant society. Increasingly, it is challenging to encourage pro-environmental behavioural change in the context of plastic pollution, as personal attitudes, beliefs and situational factors can often influence these individuals' actions to protect or preserve the environment.

Sharing career advice

Goga has learnt valuable lessons throughout her career. "There is a lot of advice that can be given, but it is always helpful to have a positive attitude and to treat challenges as a springboard to something better, especially when doing a PhD." Attaining a PhD requires innovation and novelty. Therefore, when it comes to the journey of being a researcher, she has the following insights and advice to offer:

- There is significant scope for women to be involved in plastic-related research. At the CSIR, women involved in plastic-related research come from different educational and academic career backgrounds.
- Research can be daunting to many, often leaving people feeling deterred by the process. To overcome this barrier, Goga suggests asking oneself, "How can we take this theoretical work, and how can it help us in our daily lives?"
- During the research process, it is common to have moments of self-doubt along the way, but it is important to be aware of one's limitations. The great thing about research is that any result is a result because an inquiry has been devised, analysis completed, and knowledge that was previously unknown has emerged.
- Understand that pursuing a PhD is a long-term commitment, and passion is what will drive you. There will be challenges that extend beyond research, such as personal and professional challenges.

- It is important to use your knowledge and experience to encourage those who wish to explore a research career and be open to learning from others who are more seasoned.

Goga is a strong advocate for paying it forward. In her spare time, she volunteers as a co-founder of the Muslim Postgraduate and Researchers Network, which aims to create a community of postgraduate students and researchers in Cape Town. "The platform is blossoming into a supportive community. I was inspired to get involved in it because I felt very isolated doing my PhD remotely, and I was also seeking to connect with more Muslim professionals," she explains. People of all faith groups are welcome to join, although the organisation embodies an Islamic ethos. We host regular academic and social activities."

Problematic but with beneficial properties

Society has been using plastics for generations due to their beneficial properties. But, it has inherent complexities, which need to be addressed through a combination of strategies. This, she states, is the significance of the work done at the CSIR. "I think evidence-based research is important, particularly with the advent of fake news and/or scientific misinformation. It's also important to highlight trade-offs when comparing strategies as research has shown that there is no single solution."

Some research gaps prevent us from fully understanding the full impact of plastic pollution. "Estimates in terms of how much plastic is littered and leaked are known, but its impact in terms of degradation and cause-effect mechanisms is still being investigated. This is exciting for those who want the opportunity to help close the knowledge gaps on the impact of plastic pollution."

To gain a holistic perspective, the social and economic dimensions of the plastic sector, as well as local conditions, should be understood and explored for further research. "What would the implications be if alternatives are introduced? Can we reduce our demand for plastics? Can we prevent or reduce single-use plastics that have a very short lifespan? Every time we reuse a plastic product, its impact is reduced. There are value choices we can make as individuals," Goga says.

Addressing plastic problems for the future

"For me," Goga concludes, "it comes down to making an impact and contribution, however minor. I am trying to develop my knowledge in terms of investigating the social impacts of systems to gain a more holistic view and explore other associated topics such as biodiversity, particularly in a diverse country such as South Africa."



Figure 1: Prof. Suzan Oelofse is a principal researcher at the Council for Scientific and Industrial Research

WOMEN OF IMPACT

Prof. Suzan Delafosse

The evolution of a career dedicated
to solving plastic pollution



evolving work on contextualising the largely untapped benefits of a circular economy.

At a time when South Africa was ushering in its democracy and change was in the air, Oelofse worked in government at the Department of Environment and the Department of Water Affairs, respectively. A botanist by training, she noticed a job opening at the CSIR in the waste space. “Along with Prof. Linda Godfrey, who is now the Manager for Circular Innovation SA, we worked on many waste-related projects,” she says. Their teamwork laid the foundation for building the waste research portfolio at the organisation.

“I did not set out to have a career researching plastics. It was just the way my career progressed,” she remarks. Her research mainly centred on waste management, including a few projects that involved wastewater management, integrated water and waste management, and skills development in municipalities on water-related matters. More recently, the research group has shifted its focus to broader aspects of the circular economy, with waste being the entry point – specifically, waste streams that have the potential for beneficiation.

Propagating plants pushed her to purpose

Oelofse completed all her academic qualifications at the University of Johannesburg, where she attained a Bachelor of Science in Botany and Zoology. “At the time, I was considering a teaching career, but following the completion of my undergraduate degree, I enrolled for an Honours degree in Botany. Thanks to securing NRF bursaries, I continued to also complete a Master’s degree focusing on plant tissue culture and a PhD in Plant Physiology.”

From cultivating cut flowers to curbing waste

Determined to seek greener pastures, Oelofse’s academic experience with plant tissue culture led to her securing a job in Hadeco’s plant tissue laboratory for a year. The routine role involved initiating virus-free cultures of bulbous plants for the cut-flower and horticultural markets. “I enjoyed this immensely. As fate would have it, I received a call from the Department of Environment Affairs for a job interview in the waste management sector. A position I had forgotten I had applied for a year prior.” The department was in the process of developing the policy on integrated pollution control and waste management and it was responsible for coordinating the stakeholder engagement processes involved in its formulation. “I thoroughly enjoyed this work, and I felt like I was making a difference.”

She soon learnt that her academic preoccupation with plant anatomy strongly influenced her appointment at the department as an environmental official. At the time, genetic modification of crops and food was receiving a great deal of attention, along with its pollution potential.

She was always conscious of issues related to waste. “When I worked at the Department of Water Affairs, I

Prof. Suzan Oelofse enjoys spending time in nature and feels affected when she notices plastic in protected nature reserves, knowing the impact that convenience products have on the environment when they are disposed of in public areas. These factors triggered her to be part of the solution, and today, she works in the fields of plastic sustainability and the circular economy.

Although she aspired to be a biology teacher, Oelofse’s experience in the genetic manipulation of cut flowers laid the foundation for a research career that focuses on the environmental impacts of food and waste management in South Africa. As a principal researcher at the Council for Scientific and Industrial Research (CSIR), she remains inspired in her career thanks to a powerful seed of self-belief that her mother planted in her. Today, she dedicates most of her time to spearheading the organisation’s

issued water-use licences to industries. I saw the waste streams at the waste piles in the industry, and it baffled me as to why there was no alternative means to deal with the waste or reducing the products that resulted in piles of waste.”

Recycle, reuse and reprocess

With the increasing international emphasis on addressing the impacts of plastic pollution, Oelofse’s research is directed at plastics. A host of local interventions were informed by international trends that have inspired the CSIR’s research group’s interests in plastic sustainability and the circular economy.

The CSIR secured funding from the Government of Japan through the United Nations Industrial Development Organization to investigate South Africa’s transition from conventional plastics to more sustainable alternatives.

“In a World Bank project focusing on transitioning to a circular plastics economy, we were able to identify existing projects and programmes on circularity in South Africa.

“In terms of waste management, we were able to identify the lack of waste separation at source as one of the major hindrances to our economy because you cannot build a circular economy unless you have collection systems for materials that can go back into the economy for recycling, reuse and reprocessing,” she adds.

Testing tools at the country level led to the

implementation of the Pathways Tool, a rigorous data-driven process that has resulted in the development of a plastics systems map for South Africa. This assisted the research team in identifying all the plastic flows in the country’s economy. The Pathways model has been deployed to test different scenarios to determine their impact on plastics leaking into the environment over time. The Pew Charitable Trust has since approached the CSIR to help roll out this tool in other African countries to support evidence-based strategy development.

The CSIR has also researched the impact of microplastics

on marine ecosystem services, quantifying the cost of marine plastic pollution in South Africa at R14 billion per year. “We also hope to be involved in a Global Environment Fund project that focuses on plastics in the food and beverage sector. Through this and with engagement with the World Wide Fund for Nature South Africa, the CSIR will also work on a global plastics inventory, exploring actual plastics and the regulatory environment and framework in collaboration with WWF-SA,” she says.

Making room for women in plastic-related research

Oelofse suggests that, in her observation, women tend to be more environmentally conscious and forward-thinking regarding the long-term impacts of plastic products when they are not managed properly. She also believes that there is a need for more women in the design and

manufacturing aspects of plastic products, which have traditionally been male-dominated career fields.

“It is the nature of women to be aware of human health and environmental management aspects.

Like many women, Oelofse is not immune to the challenges women face in their careers. Despite the odds, with experience, she has learnt to claim her power by embodying a spirit of enthusiasm, which she believes has helped her overcome some barriers.

“For women who aspire towards following a similar career path, I would encourage them to persevere. Do not get upset when things do not go the way you expect them to, but do stand your ground. I learnt to own my space and to speak with authority.”

Towards a plastic-conscious society

Oelofse believes that there is an increased awareness of the risks of plastic pollution – that less plastic packaging can be used for certain products and behavioural changes towards increased use of reusable shopping bags, with the exception that plastic bags are still available for purchase. The retail sector has observed a decrease in the use of plastics due to the perceived impacts of the Global Treaty for Plastic Pollution and increased government regulation – including the implementation of Extended Producer Regulations, which hold producers accountable for ensuring that their products are recyclable, recoverable.

Leaving a legacy

Oelofse describes the working environment at the CSIR as supportive, enabling her to pursue her interests. She has found a direct link between food waste and plastic waste, and her attendance at an international conference once unlocked the right set of circumstances for her to secure a Parliamentary Grant to fund research on food waste, which led to her publishing a peer-reviewed paper and securing external funding to further her research.

Currently, the United Nations Plastics Treaty is being

negotiated to reduce plastic pollution in the environment. Oelofse had an opportunity to be involved, as she was approached by the United Nations Industrial Development Organization to assist in drafting a policy brief on designing for circularity as input into the negotiations. Furthermore, she has provided input into case studies on work that the CSIR has done on plastics for the International Solid Waste Association, contributing towards the United Nations Plastics Treaty negotiations.

“Ultimately, I want to feel as though I have contributed something lasting. I still think about what my lasting legacy will be and remain determined to make a difference,” she concludes.



Figure 1: Dr Valentina Russo is a senior engineer at the Council for Scientific and Industrial Research

WOMEN OF IMPACT

Dr Valentina Russo

Getting future-ready with tools to make
life greener and empower women



From a young age, Dr Valentina Russo cared for the natural environment. Today, she plays an instrumental role in curbing plastic pollution in the economy as a senior engineer at the Council for Scientific and Industrial Research (CSIR). Moving from her native Italy to South Africa, she established a successful career spanning 18 years, refining the science of life cycle assessments. Now, she applies her systems engineering capabilities to assist in exploring nature-based solutions to address the problem of plastics for a competitive advantage in a circular economy.

Russo has been a researcher all her life. Her career journey started after completing her postgraduate qualification at Roma Tre University of Rome in Italy. She exclaims, “I realised, oh, I like doing this. I was fortunate enough to continue being involved in research after my graduation. I received a bursary and completed my PhD. That was almost 20 years ago, and I still find meaning in research.”

As a systems engineer, she completed all her academic training from undergraduate to PhD at the same university, coupled with a few specialisation courses on life cycle assessment in South Africa. “Being a systems engineer has granted me quite a diverse academic background because I can apply systems engineering skills and tools to study and assess any kind of system, whether it is the human body (an early career research topic in the field of biomedical imaging) to human activities (i.e. production systems).”

Where the journey with plastics started

Russo has been passionate about recycling since early childhood. “I have vivid memories of contributing my

unused comic, scrap and colouring books towards recycling initiatives at primary school. This activity was my first exposure to something environmentally focused. I have been an environmentalist – long before this term became a buzzword – for as long as I can remember,” she says.

Two eras in her life define her research career – the first being in her birth country. “When I was still in Italy, my research focused on biomedical engineering. I became involved in life cycle assessment research in the biofuels field, but I was longing to gain experience abroad and expand my horizons,” she explains.

The second era transpired when she set her sights on South Africa, which became her new home. She enquired about the research and implementation of the life cycle assessment in the country and was fortunate to connect with Prof. H. von Blottnitz at the University of Cape Town, who was conducting research in this field, leading to her securing a position as a postdoctoral research fellow. “I delved laboriously into life cycle assessment and environmental life cycle assessment research, with a lesser focus on plastic at the beginning. During 2018, when I was co-supervising a student conducting research on plastics, the seed was planted, and when a job opportunity became available at the CSIR to conduct a life cycle sustainability assessment study on plastic carrier grocery bags, the deal was sealed,” she says.

Evidence-based science for the win

At the CSIR, Russo’s focus is not limited to plastics but also includes waste-related projects. Currently, she is involved in the CSIR Life Cycle Assessment Guidelines to support the Extended Producer Regulations, with an initial focus on assisting those affected by the regulations.

“Increasingly, I am involved in policy-related work, and this is quite a learning curve for me. Never could I have imagined that I could be involved in assisting the government through evidence-based science, helping them with their decisions,” she expresses.

Russo is now also fostering a research interest in the hydrogen sector – thus somehow returning to sustainable fuels from where everything started – and unpacking the social life cycle assessment impacts of establishing or promoting a hydrogen economy in South Africa. “It is quite a new field of research, especially in the approach that we intend to use, which also means that we have to secure funding for it,” Russo explains. But that is part of the research journey, finding means to pursue your ideas.

“As a field of study, life cycle assessment is more established in Europe. In South Africa, it is still in its infancy, but there is increasing interest and uptake. It is a competitive field of work and time-consuming to build models,” she says.

Having a supportive and willing client can go a long way. “We offer life cycle assessment as a specialised service,

with a research component,” she says. Misperceptions abound, such as that conducting a life cycle assessment is inexpensive, and this is, unfortunately, often accompanied by a reluctance to invest fully in understanding the environmental impacts of plastic products, but this is not limited to those in the economy.

Demonising plastic is not the solution

Russo believes that raising awareness in society rather than demonising plastics can assist in reducing its impact and determining how it is fit for purpose because, in certain applications, the use of plastic is necessary, even compulsory. “In certain applications, we simply cannot walk away from plastics. For some items and products, plastic is the sensible choice,” Russo emphasises.

Avoiding the use of virgin materials for plastics is encouraged to help keep plastics circular in the economy. Russo is convinced that keeping plastic materials at the lowest volumes possible and applying circular economy principles is the best course of action.

Plastics manufactured from bio-based polymers can contribute to a more sustainable commercial life. This may open opportunities for careers in new material development or biomimicry, which relates to learning or mimicking nature when dealing with more sustainable/regenerative practices for human activities and new materials as an alternative to using plastics, which are fossil fuel-based. In plastic products and research, creating alternative value chains for small businesses where alternatives are offered to the use of plastic can create additional economic opportunities.

Women are the power

Regarding women pursuing research careers in plastic, Russo believes that women have a naturally caring nature towards the natural environment. “The role and contributions of women in the environmental sustainability research community are on the increase, and women are well suited and well equipped,” she says.

For women who aspire to embark on a career path similar to hers, Russo advises that the life cycle assessment is not the only instrument in the toolbox but one of many for addressing environmental and social problems. South Africa’s Department of Forestry, Fisheries and the Environment has introduced the Extended Producer Regulations 2020, an environmental policy that incorporates the Life Cycle Assessment. “Learn the tools. Have as many tools as you can, but do not be restricted by them. Think big!” she exclaims.

Russo aspires to collaborate with international entities and explore the development of tools that can be adopted across sectors and industries – all to address plastic pollution. Some of the ideas are already being adopted and replicated in Zambia, for example. “To prevent doing research in silos and venture into the unknown, I am actively seeking out opportunities for collaboration to explore what is possible,” she says.

Women in Science

Ambitious, Flexible and Underrepresented

Women in science are demonstrating unparalleled ambition, driven in part by the increasing availability of workplace flexibility. However, despite some notable gains, their overall representation in leadership roles remains insufficient. This is a key insight from the latest Women in the Workplace report by McKinsey & Company, conducted in partnership with Learn.Org.

This ninth edition of the report is the largest study of women in corporate America and Canada. Surveying 276 organisations employing over ten million people, including more than 27,000 employees and 270 senior HR leaders; the study provides an intersectional analysis of specific challenges faced by women of different races, ethnicities, sexual orientations and abilities.

Debunking Myths about Women in the Workplace
The report highlights and challenges four pervasive myths regarding women's experiences and career advancement:

1. Myth: Women are becoming less ambitious.
Reality: Women are more ambitious than ever, especially post-pandemic, with increased flexibility fuelling their ambitions.

Women and men at every level, including director roles, show equal interest in senior leadership. Notably, young women under 30 are especially ambitious, with nine in ten aspiring to higher roles. The pandemic has shown

women a novel model for balancing work and life and flexibility has become a crucial element in sustaining their career aspirations.

2. Myth: The biggest barrier to women's advancement is the 'glass ceiling.'
Reality: The 'broken rung' at the first step up to manager is the greatest obstacle.

For the ninth year in a row, women face significant hurdles at the entry-level promotion stage. For every 100 men promoted to manager, only 87 women achieve the same and the gap is even wider for women of colour. This disparity at managerial level sets back women's career progression from the outset.

3. Myth: Micro aggressions have a 'micro' impact.
Reality: Micro aggressions significantly harm women's mental health and career advancement.

Women, especially those with marginalised identities, face micro aggressions more frequently than men. These subtle, often unintentional comments and actions can have profound effects on their psychological safety and career trajectories. The stress from these experiences often leads women to consider quitting their jobs or feeling consistently burned out.

4. Myth: It's mostly women who want—and benefit from—flexible work.
Reality: Both men and women see flexibility as crucial with significant benefits for everyone. Flexibility in work arrangements is now a top benefit



for all employees, not just women. Women, particularly mothers, value it highly for balancing professional and personal responsibilities, but men also appreciate the enhanced work-life balance and reduced burnout that flexibility offers.

State of the Pipeline

Despite progress in senior leadership, with women in the C-suite increasing from 17% to 28% since 2015, representation at manager and director levels remains weak. This creates a fragile middle pipeline for the majority of women in corporate roles. Women of colour, in particular, experience slower progress, often lagging behind their peers at nearly every step.

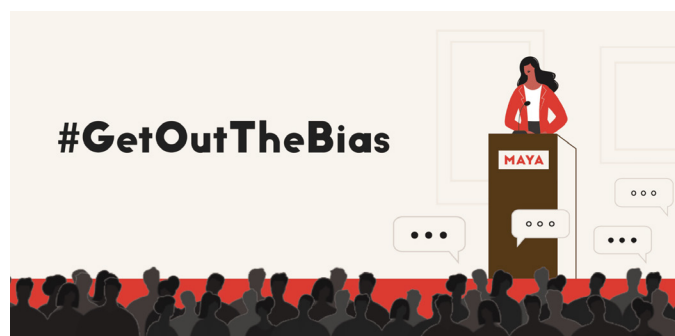
Recommendations for Companies To support and advance women effectively, organisations should focus on:

1. Tracking outcomes for women's representation: Measure and analyse data on hiring, promotions, and attrition, taking an intersectional approach to uncover specific barriers faced by women of different identities.
2. Empowering managers to be effective people leaders: Equip managers with the skills and support necessary to foster diversity, equity, and inclusion (DEI), and make these responsibilities a core part of their performance evaluations.
3. Addressing micro aggressions head-on: Establish clear policies against microaggressions, provide training to recognize and challenge them and create a culture

4. Unlocking the full potential of flexible work: Define clear expectations for flexible work arrangements, track its impact and ensure fair evaluations regardless of work model.
5. Fixing the broken rung, especially for women of colour: Implement safeguards to ensure equitable promotions, offer targeted career development programs and track outcomes to address biases in the promotion process.

Women in science are breaking barriers and defying outdated notions of work-life balance, yet significant challenges remain. By addressing these myths and implementing strategic changes, organizations can create a more equitable workplace where women can thrive and lead.

Source: Women in the Workplace 2023 report by McKinsey & Company, in partnership with LeanIn.Org





WOMEN OF IMPACT

Dr Brenda Namumba

wins prestigious Astro Society Award

BY: Alex Rose-Innes

Dr Brenda Namumba, SKA Chair Postdoctoral Fellow at the Wits Centre for Astrophysics, has made history by winning the prestigious 2024 award from the African Network for Women in Astronomy (AfNWA) Early Career Award. AfNWA forms part of the African Astronomical Society which celebrates outstanding achievements by African women in Astronomy.

Dr Namumba was acknowledged for her ground breaking contributions to science and efforts to advance female representation, as well as mentoring the next cohort of African astronomers, particularly women. While Brenda won the Early Career Award, Prof Hasnaa Chennaoui Aoudjehane was the winner of the Senior Award for Women. These two exceptional women proved that African scientists are truly at the forefront of the Astronomical future.

During the annual conference of the African Astronomical Society last year in Morocco, her scientific contributions were highlighted and the huge impact on the advancement of the scientific community it had. The winners discussed their research and advocacy work, which led to winning the awards from the African Network of Women in Astronomy, a committee of the African Astronomical Society and the International Science Programme (ISP) of Uppsala University in Sweden.

These scientists had to overcome historical gender biases, but ultimately were lauded for embodying the mission and values of these associations.

Born in Zambia in 1986, science and mathematics were always her strongest subjects and pursuing a career in science was a natural choice for her.

As a physics undergraduate student in Zambia, she had the opportunity to attend her first academic, the International Heliophysical Year SCINDA workshop, thanks to a grant from the ICTP European institution. During this workshop she gained a deep understanding of astronomy and space science, sparking her curiosity

to learn more about the universe and our place in it as humans. This experience marked the beginning of my journey as an astronomer.

Upon completing my honours degree in space science and astronomy, she realised her passion for astronomy research and academia, motivating her to pursue a PhD.

Making History

She is the first woman to be awarded a PhD in Astrophysics in Zambia and is currently an SKA postdoctoral fellow at the University of the Witwatersrand in South Africa, studying the evolution of nearby galaxies, using SKA precursor telescopes at radio wavelengths.

Brenda has been involved in numerous research projects and published various research papers in high-impact journals. She has also successfully led MeerKAT observing proposals and is part of the MHONGOOSE survey team, one of the eight large MeerKAT survey projects. She collaborated with numerous international institutes and presented her research results at various international conferences.

Dr Namumba plays active roles in numerous initiatives aimed at encouraging young people, especially women, to pursue science in her home country, Zambia, and beyond. She spends time mentoring young girls who want to pursue STEM-related careers as part of Project Kuongoza. Brenda is also involved in giving presentations on science outreach and engagement.

Awards and Accolades

She has received multiple international awards for her consistent and impressive achievements including the L'Oréal Women in Science award in 2022 and the Women for Africa award in 2021, as well as numerous fellowships and grants.

African Challenges

While having the opportunity to follow her personal passion, Brenda says that as a woman in Zambia, as in

many African countries, science-related fields such as astronomy, is still considered male-dominated, affecting the number of women pursuing science careers, including astronomy. These societal norms impact young girls from an early age. "I was fortunate to have parents who did not limit my aspirations. They played a significant role in my achievements by allowing me to choose my career path and provided unwavering encouragement and support."

With her love for research, Brenda plans to continue her passion and make contributions by addressing existing questions regarding the universe. "I aspire to ensure that every girl across Africa has access to knowledge and quality education; having personally witnessed how education transforms one's life perspective, allowing her to experience different global cultures and understand that humans are just a small fraction of what constitutes the universe. I hope that every girl child can have the same opportunities for growth and learning."

**"If I can do it, then you can do it even better than what I have achieved" -
Dr Brenda Namumba.**

”



WOMEN OF IMPACT

Dr Demilade Fayemiwo

World Economic Forum

BY: Alex Rose-Innes

Currently a Senior Climate Policy Advisor at the Foreign Commonwealth and Development Office, Dr Fayemiwo focuses on environmental and economic goals to achieve net-zero commitments. She served as a fellow on the World Economic Forum's global future council on fragility and resilience and studied an MPP (Public Policy) at the University of Cambridge. She has extensive experience across various fields such as climate change adaptation, waste management, sustainable water systems and the circular economy.

AWARDS AND ACCOLADES

Demilade is a recipient of the prestigious 2017 Sub-Saharan Africa L'Oreal-UNESCO Foundation Fellowship, a TEDx Speaker, a Project Kuongoza mentor and an MPhil Candidate in Public Policy at the University of Cambridge.

**Believe in your ability. Commit to learning and excellence, focus on asking the right questions
- Dr Demilade Fayemiwo**

A multi-faceted person with a knack for learning and doing, Dr Fayemiwo has many irons in the fire; she is a highly experienced and versatile researcher with cross-disciplinary experience in environmental engineering, policy-related issues and project management. Demilade won the prestigious sub-Saharan Africa L'Oreal-UNESCO Foundation Fellowship in 2017 and the University of Johannesburg's three-minute thesis in 2018.

This chameleon of talent effortlessly adapts to any situation, including lending her experience to a non-profit leadership academy in Johannesburg; mentoring a science research programme for young people across Africa, developing their leadership skills and equipping them to address the unique problems Africa faces. Currently, she leads on climate and energy policy, facilitating collaborations between international governments and businesses to achieve net zero goals, and supporting the necessary inclusion of diverse talents in the net zero mission. Last year, in Canada, she spoke to a network of public sector officials on the importance of addressing the issues women in STEM face. Earlier this year, she led a UK-Canada campaign showcasing women in the nuclear energy sector and reinforcing the message that women belong in male-dominated fields.

Dr Demi's Early Years

Her journey to satisfy her enquiring mind, started at a young age and she was fortunate to have a father who guided her with a series of Teach Yourself books. Demilade taught herself scientific facts which suited her hunger for knowledge; electricity and calculus and various other aspects of science that fascinated her. Born and raised in Nigeria to a lower middle-income household, Demilade attended public schools in Lagos until the age of sixteen. She recalls with laughter that her high school did not provide chairs, so each student brought a wooden chair from home. Sometimes the chairs broke during the course of the school term with little financial leeway to replace them. Demilade recalls, with much joy and laughter, how she once spent part of the school term sitting on a three-legged chair propped up against the wall for stability! It is clear she recalled that time as truly special.

Following the completion of her high school education in Nigeria, Demilade moved to South Africa where she studied an undergraduate degree in Biotechnology and Microbiology at the University of Stellenbosch. Her parents, despite their financial situation, were big advocates of education and supported her with loans and contributions to rotating savings groups (stokvels). As her education at Stellenbosch was mostly in Afrikaans, the skills she had developed as a young girl teaching herself difficult concepts kicked into gear and enabled her to succeed. She went on to receive a partial scholarship for her master's degree in environmental engineering at the University of Pretoria (which she completed with distinction), and full scholarships at the University of Johannesburg, including the Global Excellence Stature Awards and the National Research Foundation Innovation and Scarce Skills bursary for her PhD in Chemical Engineering.

Her research earned her local and international recognition, including poster awards, conference speaker invitations and an award from the L'Oreal-UNESCO foundation. She also collaborated with the University of Johannesburg's Postgraduate School to facilitate research mentorship workshops for new graduate students and gave a TEDx talk on completion of her PhD about the issues women in science face.

The Challenges

Reiterating the same challenges as other African female scientists, Demilade hopes to see changes in scientific teaching, proving that the subject is not abstract. She says many believe medicine and computer science are the only degrees worth studying because they cannot comprehend the application and potential far-reaching impacts of other aspects of science. Her wish is to work on a programme to change how African educators teach science to increase female representation in Africa's science education sector. One of her projects during the pandemic was to start a Biology YouTube Channel for high school students, breaking down the concepts of the subjects for students to easily understand.

Many students attest that using the videos on the channel, they understand better and are scoring higher in their exams. Watch the video on <https://www.youtube.com/channel/UCLsOGeGmUG6FMuWrAGSjNjUg>.

Demilade, as every female scientist Women in Science (WINS) interviewed, said gender-based barriers for African girls in STEM is a major challenge. It is a male-dominated field and due to a lack of representation, young women are unable to envisage themselves in STEM careers.

Considering herself fortunate to have many role models, it remains a tough task to find these women in science as they are often in the background and very little information about their work is available. If she had to choose just one outstanding female scientist, it would be Prof Quarraisha Abdool Karim (see article on Prof Abdool Karim in this issue).

Her Journey towards Her Dream

Despite not always being positive, she says it has been enlightening and that she gained key transferrable STEM skills despite being treated with condescension and suffering harassment. She highlighted these constant challenges in one of her TEDx talks. With her can do attitude and a vision for her future, Dr Fayemiwo stood her ground and dealt with these obstacles immediately. She is not yet married and does not have children, but watch this space. A smart, supportive man could be important in the future.

Science is not smarter than you and it is not out of your grasp - Dr Demilade Fayemiwo

She agrees that women are breaking barriers and despite the challenges, are forging ahead. However, there is no denying that women are still considered as less important than their male peers in science and have to make huge sacrifices and work twice as hard to reach the top. She speaks of being a woman in science as constantly feeling watched and scared to make mistakes because she worries about how that will impact other scientists. Her success has come at the cost of navigating stress and burnout, and sometimes struggling to keep up with the demands of friendships and relationships. Despite that, Demilade says she is blessed with an amazing network of family and friends who support her and encourage her to do more. She considers herself to be in a much better position now that she works on science-related policy, doing the groundwork for large-scale changes needed to address climate change and environmental degradation.

Her message for Women's Month is "to give it your all. Do not be afraid to speak up and take good care of yourself. Do not allow others to suppress the authentic you. Live with joy and hope, believing that you too, deserve success."

Artificial Intelligence and gender equality

The world has a gender equality problem and nowhere is it more often mirrored than Artificial Intelligence (AI). Globally more women are accessing the internet every year, but in low-income countries, only 20% are connected. The gender digital divide creates a data gap reflected in the gender bias in AI.

What is AI gender bias?

A study done at the Berkeley Haas Center for Equity, Gender and Leadership analysed 133 AI systems across different industries and found that about 44% showed gender bias with 25 % exhibiting both gender and racial bias. Beyza Doğuç from Ankara, Turkey, encountered gender bias in Generative AI when researching ideas for a novel and prompted it to write a story about a doctor and a nurse.

AI made the doctor male and the nurse female despite more prompts, the AI chose gender stereotypical roles which it explained as “word embedding,” roles based on who designed the AI. If the AI is trained on data associating women and men with different and specific

skills or interests, it will generate content reflecting that bias.

Insights from Females Who Broke the Rules

Sola Mahfouz, a female quantum computing researcher at Tufts University is concerned. How much does it mirror our society’s patriarchal structures and inherent biases from its predominantly male creators?

Natacha Sangwa, a student from Rwanda who participated in the first coding camp organized under the African Girls Can Code Initiative last year said she noticed that [AI] is mostly developed and trained on datasets primarily based on men.

“When women use certain AI-powered systems to diagnose illnesses, they often receive inaccurate answers because the AI is not aware of symptoms that may present differently in women.” If current trends continue, AI-powered technology and services will continue lacking diverse gender and racial perspectives, resulting in lower service quality biased decisions regarding jobs, credit and health care.



How to Avoid AI Gender Bias?

Removing gender bias in AI starts with prioritising gender equality as a goal when AI systems are conceptualised and built. To prevent gender bias in AI, we must first address gender bias in society.

According to the Global Gender Gap Report of 2023, only 30% women are currently working in AI.

“When technology is developed with one perspective, it’s like looking at the world half-blind,” Mahfouz said.

She is currently working on a project to create AI-powered platforms connecting Afghan women and calling for more female AI researchers to reflect the unique experiences of women to shape the theoretical foundations of technology.

Critical Need for STEM and ICT Education

There is a critical need for drawing upon diverse fields of expertise when developing AI, including gender expertise, for machine learning systems to serve us better and support the drive for a more equal and sustainable world. In a rapidly advancing AI industry, the lack of gender

perspectives, data and decision-making can perpetuate profound inequality for years to come.

The AI field needs more women and that requires enabling and increasing girls’ and women’s access to and leadership in STEM and ICT education and careers.

The World Economic Forum reported in 2023 that women accounted for just 29% of all science, technology, engineering and math (STEM) workers despite more graduating and entering STEM jobs than ever before. However they are concentrated in entry level jobs and less likely to hold leadership positions.



DISCOVERY

