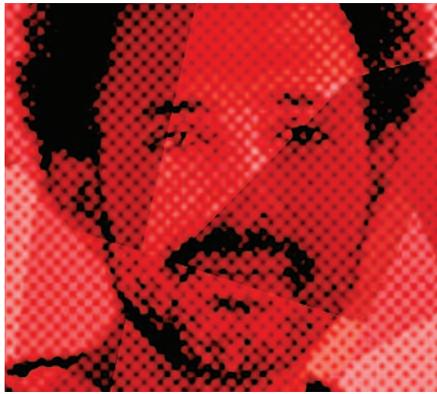




NEXT EINSTEIN FORUM

An  AIMS initiative in partnership with the Robert Bosch Stiftung



Meet the 2017-2019 NEF Fellows



> Meet the 2017-2019 NEF Fellows

The NEF Fellows is a select two-year programme that recognizes Africa's best young scientists and technologists. These top rated researchers and emerging leaders, at least 40 percent of whom are women, have the opportunity to advance their scientific career by among other opportunities, presenting their work at unique NEF Spotlight Sessions at NEF Global Gatherings. The NEF Fellows are automatically entered into the NEF Community of Scientists - an exclusive network

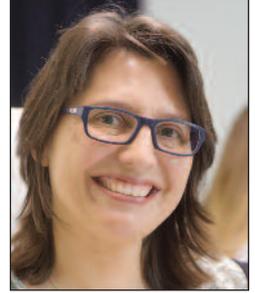
that offers members opportunities for consulting, grants, research collaborations, speaking opportunities and career mentorship. In return, members participate in national and continental policy formulation, cross-cutting research and innovation activities, lead public engagement around science and technology in Africa, and provide mentorship to early-career scientists and students. A key driver of the NEF Fellows Programme is, through role modeling, research collaborations and public engagement, to inspire the next generation of African scientists and innovators.

All Fellows are under 42 years old, have citizenship from an African country - although they may live and work anywhere in the world - hold a PhD in STEM or social science fields with outstanding academic and research qualifications and maturity measured by publication record or patents, prizes, leadership in independent research groups, and raising funds from various sources etc. Fellows have demonstrated that their research has impact in both their field of research and for wider society. They are passionate about raising Africa's scientific profile and are preparing the next generation of scientific leaders.



Vinet Coetzee

South Africa • Non-Invasive Measures of Health • University of Pretoria



Vinet was born in South Africa. She lived in various different places, from a low-cost apartment to an upmarket suburb which provided her with a unique perspective on the abundant similarities in people of various socio-economic backgrounds. Her love for science, and biology, were cemented by a high school biology teacher who allowed students to figure things out for themselves instead of only teaching what was in the textbook.

In terms of her academic journey, Vinet studied at the University of Pretoria, where she completed a Bachelor of Science, an Honours and Master of Science in Genetics. During her honours year, she became interested in human mate choice research, or more generally research aimed at understanding why we judge people as attractive and healthy. The only problem was that no one in South Africa was doing this type of research, so she approached her supervisor, Prof. Jaco Greeff, who convinced Prof Louise Barrett (then from Liverpool, UK) to become Vinet's research supervisor. She completed her master's research on the role of genetic diversity in immune associated genes on facial appearance, before receiving a bursary from Prof Dave Perrett at the University of St Andrews, Scotland, to complete a PhD under his supervision.

Vinet's PhD work identified facial adiposity (or facial fatness) as a robust, but understudied, cue to health and attractiveness and also identified specific facial dimensions associated with weight. During her master's and PhD, she published five peer-reviewed papers and received several travel awards, including the Experimental Psychology Society Grindley Grant. Vinet returned to South Africa, where she completed two prestigious postdoctoral fellowships, joining the University of Pretoria as Lecturer then Senior Lecturer in 2017.

Her research focuses on developing fast, affordable and non-invasive methods to screen children for nutrient deficiencies and inborn conditions, by training computer models to recognise the links between physical features and these conditions. For instance, Vinet's team developed an affordable 3D camera at one tenth of the price of comparable commercial systems. Her team is currently using this system to identify the specific facial features associated with Down syndrome in African infants and plan to expand this research to other conditions. The long term aim of the project is to develop a facial screening tool that can help doctors identify a range of conditions more accurately. This tool will be especially helpful in situations where doctors have insufficient expertise in these conditions and inadequate funds for extensive testing. The 3D camera is also used in the ground breaking African Longitudinal Facial Appearance and Health (ALFAH) study, which she launched in 2016. The study will test the association between facial appearance, various health measures (e.g. hormones, blood pressure, body composition etc.) and genetic markers in 4000 African participants

Vinet applied for the NEF Fellowship to widen her network of collaborators within Africa, showcase her research to a global audience and help move science from Africa forward.

She has thus far published 22 papers in peer reviewed journals, which have been cited over 800 times. In 2015, Vinet was accepted as a member of the Royal Society of South Africa and has since received various awards, including an exceptional Young Researcher Award. She was also selected as a finalist for the National Science and Technology (NSTF) South 32 Emerging Researcher Award in 2016 and 2017.

Einstein Challenge:

Vinet hopes to develop fast, affordable and non-invasive methods to help doctors identify nutrient deficiencies and inborn conditions more accurately.

Abdigani Diriyee

Somalia • Cognitive Systems/FinTech • IBM Research Africa



Abdigani is from Somalia and did his schooling in the UK where his curiosity led him to the sciences. Abdigani went on to receive a Bachelor's in Computer Science and Math from Queen Mary University London, a Masters' in Advanced Computing from King's College London and a PhD in Computer Science from University College London in 2012.

During his PhD, he started developing new algorithms to cluster and mine documents and research new user interfaces for one of the largest search engines. During his PhD, he undertook several internships with Microsoft Research and Fuji-Xerox Palo Alto Labs before accepting a post-doctoral fellowship at Carnegie Mellon University to develop new approaches to combine machine and human-generated data to help people find and make sense of information more effectively.

Abdigani believes one of the challenges facing the development of Africa is access to financial services. The infrastructural challenges and sparsity of data about individuals and businesses exacerbates this challenge. His research is driven by the opportunity to address this data challenge and introduce intelligent systems that will create the necessary credit and financial profiles that could transform the continent. Further, this could lead to an increase of up to \$400 Billion (~12% GDP), and help in achieving several of the Sustainable Development Goals.

Currently, as Research Manager with IBM Research Africa, Abdigani's team is developing new approaches to mine, model and score people, identifying the right amount of credit and appropriate products.

Last year, they developed a machine learning approach that leverages new data sources (mobile phone behavior) to evaluate the financial profile and credit score of hundreds of millions of people in Africa. This technology was deployed in East Africa and now is being used to credit score millions of people so they can access financial services through their phone.

He is also currently working on conversational agents and deep learning techniques to personalize content relevant to people's context.

Abdigani applied for the NEF Fellowship to share his life's work, and to inspire young Africans to join the sciences. He believes science, technology, mathematics and engineering are fundamental to addressing the challenges facing Africa.

He has published over 35 papers and patents. Abdigani has been the recipient of a TED Fellowship, and been named on MIT Technology Review's 35 Innovators under 35. He also co-founded Somalia's first Startup Accelerator and Technology Fund and co-founded the largest professional body for Somalis, 'Worldwide Somali Students and Professionals'.

Einstein Challenge:
Abdigani hopes to develop new techniques and platforms to help people mine, analyze and utilize the data they generate to access services (e.g. financial services).

Kevin Dzobo

Zimbabwe • Stem Cell Biology and Regenerative Medicine • International Centre for Genetic Engineering and Biotechnology & University of Cape Town



Kevin was born and grew up in Mutare, Zimbabwe. He grew up seeing people suffering from different diseases such as malaria and HIV/AIDS and this sparked a desire to find cures for these diseases. He always knew that his career would be health-related and he drew inspiration from his mother, who he calls his greatest teacher and motivator.

Kevin obtained a Bachelor of Science and an Honours Degree in Biochemistry with Distinction from the University of Zimbabwe. He was awarded the University Book Prize for his efforts. He then spent the next four years working in the private sector in a pathology laboratory and a production company. Kevin then went on to pursue a Master of Science in Molecular and Cell Biology at the University of Cape Town.

Once he completed his master's degree, he immediately started his PhD in Medical Biochemistry at the University of Cape Town with his research focusing on understanding tissue growth and repair, specifically focusing on a specialized cell type called fibroblasts. These cells synthesize the structural scaffold of tissue called the extracellular matrix. The extracellular matrix and fibroblasts are important constituents of the tumor microenvironment and influence processes such as carcinogenesis, tumor invasion and metastasis.

As a postdoctoral fellow, Kevin then expanded the use of the extracellular matrix into stem cell differentiation and regenerative medicine. Much of his work focuses on utilizing biomaterial systems including the extracellular matrix to direct embryonic and mesenchymal stem cells to create functional body tissue in the laboratory. In 2011, he was awarded the competitive Arturo Falaschi International Centre for

Genetic Engineering and Biotechnology (ICGEB) International Postdoctoral Fellowship to conduct research on stem cell differentiation and cancer. In 2014, he was awarded the prestigious South African National Research Foundation Research Career Award to study stem cell differentiation for use in tissue engineering and regenerative medicine and the role of cancer stem cells in carcinogenesis.

Kevin believes the understanding and utilization of stem cells will unlock breakthroughs in longevity and therapeutic solutions to chronic diseases and regenerative medicine. Kevin's research hopes to address fundamental questions regarding signaling molecules in stem cell differentiation and diseases which would translate into better therapies and possible quantitative biomarkers of cancer.

Kevin is leading an inter-university collaboration between ICGEB/University of Cape and the University of Pretoria on developing a 'stem cell-ECM' bandage or patch which when fully developed can be used on injured tissue. Kevin is currently a Senior Research Scientist (as a principal investigator on STEM Cell and Cancer Biology) with ICGEB and a Lecturer at the University of Cape Town in the Department of Integrative Biomedical Sciences.

Kevin is an Associate Editor of the Biomedical Research and Therapy Journal and Editorial Board member of the Annals of Stem Cell Research and Therapy Journal. He was also recently elected founding Vice President of the African Tissue Engineering and Regenerative Medicine International Society (ATERMIS) for three years.

Einstein Challenge:
Kevin hopes to bring stem cell-based treatments to patients. To do this, he hopes to develop easier and cheaper methods or technologies to stimulate stem cells into tissue-forming cells that can be used to treat several diseases and pathological conditions.

Jonathan Mboyo Esole

Democratic Republic of Congo • String Geometry • Northeastern University



Jonathan was born in Kinshasa, in the Democratic Republic of Congo (DRC). He moved to Belgium when he was three years old as his father was pursuing his PhD. After six years, he went back to the DRC where he finished his primary and high school studies. For the national baccalaureate exam, he was the top student in Kinshasa and second in the country. He went on to pursue a Master in Science in Mathematics at Université Libre de Bruxelles where he won the award for the Best Thesis in the Sciences.

Subsequently, Jonathan was awarded a Philippe Wiener-Maurice Anspach Foundation Grant to pursue a Certificate of Advanced Study in Mathematics and Physics at the University of Cambridge. He then went on to complete his PhD at Leiden University in the Netherlands. During his PhD, he was a visiting student at Stanford University. He also visited the African Institute for Mathematical Sciences (AIMS) in its maiden year via a grant from the Ford Foundation. He went on to be a Marie-Curie Fellow in Leuven University followed by another postdoctoral position at Harvard University in the Department of Physics.

Jonathan then moved to the Department of Mathematics at Harvard University where he was mentored by Fields Medalist Professor Shing-Tung Yau. He was later named a Benjamin Pierce Fellow (Assistant Professor) in the Department of Mathematics at Harvard University. This is one of the most prestigious positions in mathematics, lasting for three academic years. In September 2016, Jonathan joined the Department of Mathematics of Northeastern University where he is on fast track for tenure. His research is supported by a grant from the US National Science Foundation (NSF).

His research is at the interface of string theory and mathematics. He explores the geometry of string theory. String theory is an attempt to unify all the fundamental interactions of nature into a unique consistent and elegant theory. Interestingly, this endeavor has produced a lot of new ideas and insights in many different areas of mathematics. It has built bridges between communities of scientists. Experimental proofs of string theory have yet to be established but it serves as a source of inspiration for mathematicians.

Specifically, Jonathan studies the geometry of elliptic fibrations as seen from the point of view of string theory. Elliptic curves are some of the oldest, and most prominent objects across mathematics with applications in number theory, algebraic geometry, cryptography and more. His research has direct applications to gauge theories, Grand Unified Theories, and the study of topological defects in conformal field theories. While at Harvard University, he introduced a new topological invariant known as the orientifold Euler characteristic, which is now used daily by physicists working in F-theory. Jonathan has also solved problems in supergravity open for more than twenty years.

Jonathan applied for the NEF Fellowship to give back to Africa by helping young people who are thinking of having a career in the sciences. He believes the sciences will help Africa take its place in the world.

Jonathan has received many awards and grants including the Prize for Top Academic Achievement ("Prix d'Excellence") of the Association of Congolese Journalists for Progress. In 2016, he was a keynote speaker at Aframath and recently a Colloquium Speaker at University of Illinois at Urbana-Champaign.

Einstein Challenge:
Jonathan hopes to understand the geometry of string theory, which is a door to quantum gravity.

Yabebal Fantaye

Ethiopia • Cosmology • African Institute for Mathematical Sciences (AIMS)



Yabebal was born and raised in Addis Ababa, Ethiopia. As a teenager, he spent most of his time rearing doves and playing many types of street games like Korki (ቆርኪ) and others. At 15, the inability to sleep at night led him to the realization of the power of reading books. By studying hard in the last two years of high school, he scored the required marks to gain entry to Addis Ababa University.

He started his academic journey with a Bachelor of Science in Physics and Mathematics from Addis Ababa University (AAU). During his undergraduate time at AAU, he co-founded the AAU Experimental Group, which produced improved tools for energy production and land ploughing. In his second year at AAU, he helped fix a broken 8-inch telescope and managed to observe the craters of Moon and the moons of Jupiter. This was Yabebal's first close up interaction with the heavenly bodies. He then started studying the night sky and reading about constellations and bright objects on the sky. He learnt that Cepheus, Cassiopeia and Andromeda are also known as the Ethiopian King, Queen and Princess. This gave him the inspiration he needed to pursue a career in investigating what lies up in the cosmos - and what science knows about the beginning, evolution and fate of the Universe we live in.

After his bachelor's degree, he pursued an Honours and Master's degree at the University of Cape Town through the National Astrophysics and Space Science Program (NASSP). Following that, he went to the School for advanced studies (SISSA) in Trieste,

Italy, for his PhD in Cosmology. In 2013, while a postdoctoral researcher at the University of Oslo, he joined the Planck Satellite Consortium, European Space Agencies' experiment. After completing a second Postdoctoral fellowship at the Department of Mathematics in the University of Rome Tor Vergata, Yabebal moved to the African Institute for Mathematical Sciences (AIMS) South Africa to take up the AIMS-ARETE Junior Chair.

Yabebal's research investigates the statistical properties of the Universe using the Cosmic Microwave Background (CMB) data from the Planck satellite. His research tries to address questions like, is there any evidence in our data that is not compatible to our assumption of a Universe without any preferred direction or preferred time? His second research area focuses on developing machine learning and other advanced statistical methods for harnessing the African GIS and social Big Data for extracting actionable insights to help Africa meet the UN Sustainable Development Goals.

Yabebal believes Young Africans should study science because it offers the best way to solve real world problems.

He is a member of the Planck and Euclid Consortium and has spent the last two years leading an outreach program in Ethiopia called Astrobus Ethiopia that includes social scientists, fashion designers, artists, innovators and scientists to deliver holistic stimulation for scientific thinking.

Einstein Challenge:
Yabebal wants to have a significant impact in understanding the statistical properties of the Universe. He also wants to enable data abundance in Africa by extracting useful data locked in satellite images and social network structures.

Aminata Garba

Niger • ICT Technologies and Policy • Carnegie Mellon University Africa



Aminata was born in Niamey, Niger. Following her curiosity for science and engineering and encouraged by her family, particularly her father, she went on to pursue a Bachelor in Electrical Engineering at Laval University and Master and PhD in Electric Engineering at McGill University in Montreal, Canada.

Her research interests include ICT infrastructure, technologies and policies, Internet of Things (IoT) applications, cybersecurity, ICT4D, high data rate transmission and higher education. In her research projects, Aminata is interested in finding key policies, technologies and applications relevant to the development of ICT, particularly in rural and underserved areas. She is also interested in methods that allow for increasing the data rate of communication systems by shaping and reducing interference.

Aminata is Assistant Professor at the Department of Electrical and Computer Engineering at Carnegie Mellon University Africa and Director of the Kigali Collaborative Research Center. She previously served as the Director General of the Multisector Regulatory Authority of Niger and worked on engineering, management, research and teaching in telecommunications at Orange (Niger), the National Institute for Scientific Research (Montreal), the National Center for Scientific Research (France) and the Telecommunication and Signal Processing

laboratory and McGill University (Montreal).

Further, she served as a Director at the African Network Information Center and Chair of the West African Telecommunication Regulatory Assembly (WATRA). She has also served as member of the Executive Board of the African Water Association, member of the Consultative Committee of the ECOWAS Regional Electricity Regulation Authority, member of the Experts Group for the Preparation of the 2013 World Telecommunication/ ICT Policy Forum and member of the Steering Committee for the Africa Higher Education Centers of Excellence Project.

She applied for the NEF Fellowship to promote the integration of ICT to different socio-economic sectors in Africa where ICT can serve as a central lever for the regional development. She will use the NEF platform to share these ideas with a large and diverse audience, particularly policy-makers and decision-makers.

Aminata has co-authored several publications including journal and conference articles, invention disclosures and patents applications. She is a member of the Global Young Academy, the Institute of Electrical and Electronic Engineering (IEEE) and the African Scientific Institute. She has received several grants and fellowships including from the Natural Sciences and Engineering Research Council of Canada and Fonds Québécois de la Recherche sur la Nature et la Technologie.

Einstein Challenge:
Aminata hopes to develop new communications technologies, policies, infrastructures and applications adapted for underserved and rural areas and to explore the frontiers between policies and technologies.

Mamadou Kaba

Einstein Challenge:
As a key medium- to long-term goal of Mamadou's research group (the African Microbiome and Epidemiology Research Group (AfriMERG)) over the coming years is the development of early diagnostic tools for altered human microbial profiles associated with specific diseases, and the development of microbial-based therapies (containing a mixture of missing protective microbes) for the prevention or treatment of diseases.

Guinea • Medical Microbiology • University of Cape Town



Mamadou was born in Boffa, Guinea. He became interested in fighting infectious diseases because of his medical training in Guinea where he witnessed high mortality rates due to infectious diseases. After his medical studies at the Gamal Abdel Nasser University of Conakry (Guinea), he undertook training in biomedical research, which led to a PhD in Infectious Diseases at Aix-Marseille University, France. He completed a successful PhD research project, with 10 publications on the hepatitis E virus infection. In addition, during his PhD training, He was awarded the "Infectiopôle Sud Scientific Foundation Research Fellowship" as well as the prize for the best poster presentation of the "15th Actualités du Pharo" in Marseille, France.

Currently, Mamadou is a Wellcome Trust Research Fellow and Senior Research Officer at the University of Cape Town and the Director of the newly-established African Microbiome and Epidemiology Research Group (AfriMERG) within the Division of Medical Microbiology at the University of Cape Town, South Africa.

In terms of research interests, Mamadou is currently conducting a prospective longitudinal study on how the composition of the respiratory tract and gastrointestinal microbial communities (microbiota) influences the development of respiratory diseases in African children. His group (AfriMERG) is now at the stage where they have produced large microbiota datasets, associated with very detailed clinical data, which they will analyse for association, predictive value and to better understand respiratory disease pathogenesis.

Prior to joining the University of Cape Town, he worked as a Research Associate in the Department of Medical Microbiology, Aix-Marseille University, France. Mamadou's research projects led to better understanding of the risks of transmission of hepatitis E virus (HEV) from animals (pigs and wild boars) to humans. Notably, the result of one of his projects was

influential that it led the French authorities to recommend preventive measures against the transmission of HEV from pigs to humans.

In 2011, he returned to Africa to work as a Carnegie Postdoctoral Research Fellow in the Division of Medical Microbiology at the University of Cape Town. The two-year postdoctoral project aimed at investigating the role of the nasopharyngeal microbial communities (microbiota) in the development of pneumonia in young children within the Drakenstein Child Health Study (DCHS). This work led to updated recommendations on sampling methods from the World Health Organization (WHO) Pneumococcal Carriage Working Group.

Later, as part of a Wellcome Trust Training Fellowship grant, Mamadou investigated the role of faecal microbiome in wheezing illness in children within the DCHS. As part of this fellowship, he published a paper that contributed to the validation of faecal DNA extraction protocols for microbiome profiling. In addition, the pilot data showed that meconium samples are not sterile and their microbiota are distinct from those of the infant faecal microbiota collected later in life, as well as those of their mothers. Primary drivers of infant faecal bacterial profiles were early-life feeding practices and HIV exposure.

Since 2007, Mamadou is a board certified physician by the Guinean Medical Council. In addition, he is currently a member of the African Society for Laboratory Medicine (ASLM), International Society for Infectious Diseases (ISID), African Organisation for Research and Training in Cancer (AORTIC), and African Society of Human Genetics (AfSHG). Mamadou has authored 20 scientific articles and 19 conference papers, and he is an ad-hoc reviewer for eight international peer-reviewed journals.

Rym Kefi

Tunisia • Human Genetic Diversity and Metabolic Diseases • Institut Pasteur in Tunis



Rym was born in Tunis, Tunisia. Since her early childhood she has been fascinated by biology. She fed her curiosity through documentary films, science magazines and science fiction films. Her parents encouraged her by buying her encyclopedias, scientific novels and taking her to visit zoos, nature reserves and scientific exhibitions. She spent her free time catching insects, worms and small salamanders to experiment on. Since then, her dream has been to become a biological scientist.

After high school, she obtained a Bachelor of Science, with honours, in Biology from the University of Tunis El Manar in 2000. She won an "elite scholarship", a highly selective scholarship granted by the Tunisian Ministry of Higher Education to the brightest students to pursue doctoral studies in France in scientific fields that do not exist in Tunisia (Molecular Anthropology). In 2001, she obtained a Master in Science at the Medical School La Timone, University of the Mediterranean, (Marseille- France) – again with honours. This opened her way for a BDI-PED scholarship granted by the CNRS (Centre National de Recherche Scientifique-France) to the most talented young students with masters degrees. Her thesis focused on the study of ancient DNA obtained from Middle Age French skeletons with dislocation of the hip.

Rym continued her doctoral studies in the same laboratory where she worked on mitochondrial DNA diversity in current and ancient Human populations (6000 to 15,000 years) in North Africa. She also contributed to several other studies especially, mitochondrial variability in ancient cattle from the archaeological site of Lattara (Southern France) and molecular analysis of neurodegenerative diseases in

the French population. She obtained her PhD in 2005 at the age of 26, which made her the youngest student with a PhD at the Medical School La Timone, University of the Mediterranean (Marseille- France). After her PhD and post doctoral training carried out in France, she joined, in 2006, the Molecular Investigation of Orphan Genetic Diseases Research Unit in Institut Pasteur in Tunis as a Researcher. Rym is currently Associate Professor and Team Leader in the Laboratory of Biomedical Genomics and Ontogenetic at Institut Pasteur in Tunis.

As team leader, Rym is mainly involved in research on human genetic disorders, genetic diversity in North Africa and the impact of consanguinity on health. She is also responsible for the genetic typing core facility where she works to enrich the portfolio of service of Institut Pasteur by reinforcing the research on ancient DNA and providing genetic profiling for paternity tests and human forensic identification. Indeed, the molecular diagnosis of genetic diseases leads to the reduction of the prevalence of these diseases and improves the treatment of patients and their families.

Rym applied for the NEF Fellowship to present her work and establish research partnerships which will contribute to the development of scientific excellence in Africa and strengthen the capacities and skills of young scientists.

She is a TWAS (The World Academy of Sciences) Young affiliate, a member of the Global Young Academy and a member of the Young Scientist Community of the World Economic Forum. She has won several prizes at international scientific events such as the prize of The African Society of Human Genetics in 2009.

Einstein Challenge:
Rym hopes to better understand the pathogenesis of Type 2 diabetes, to improve its diagnosis and treatment thereby reducing its prevalence not only in Tunisia but also in Africa.

Aku Kwamie

Ghana • Health Policy and Systems Research • Consultant



Aku was born in Accra Ghana, grew up in Canada, and returned to Ghana where she now lives and works. Her mother is a nurse and father a doctor, and she was always oriented towards the sciences. Even the toys she played with were scientific, a chemistry set, a fractions kit, and a text book on the human brain. Her parents fed her love for books and reading and she won the primary school math prize. In high school, she was determined to go to medical school and this drove all her academic pursuits but once she began university, she struggled. During this time, Aku volunteered at the Princess Margaret Hospital in Toronto in the Ultrasound Department to gain more exposure to clinical life. But she soon veered into work in a genomics lab in the pathology department. During this time, the research bug bit Aku and she moved away from medical school.

Aku completed her Bachelor of Science in Human Biology at the University of Toronto. After this, she pursued an opportunity to work in a Cancer Care UK research lab. The work was slightly different to what she had been previously exposed to, working with proteins instead of genes, and using different research methods and assays. She excelled in this domain, and went on to complete a Master in Science, with Distinction, in Biomedical Science Research at King's College London.

When she completed her master's degree, Aku could not find a job. While she looked for a job, she read a lot about broader public health issues – access to medicines and the social determinants of health, and it piqued her interest. She applied for an internship at the World Health Organization and that set her on the path of international public health. After working for several years in different community settings across Africa in women's health, HIV, and health information

systems, Aku pursued a PhD in Health Policy at Wageningen University in the Netherlands.

Aku's current research is in the area of health systems governance, looking at how and where within health systems decisions get made. She is interested in issues of management and leadership, accountability and organizational innovation, and in particular applying complexity theory to these issues. Her research has led her to highlight the need for changing approaches to training health managers, such that newly-learned management and leadership practices can be sustained in highly- bureaucratized organizational contexts.

In the last year, Aku was the project coordinator on a West Africa-wide initiative to support the development of research and leadership capacities in health policy and systems research for policy-makers in ministries of health, health system managers and academic researchers. She has previously worked with the International Development Research Centre (IDRC) Canada, as a programme officer for an initiative in Nigeria seeking to strengthen capacities for evidence-based health planning (2006-2011).

In 2012, sponsored by the Institute of Tropical Medicine (Antwerp), Aku was selected as one of 50 Emerging Voices for Global Health. Aku sits on the Board of Directors of Health Systems Global, the governing body of the international membership organization of health policy and systems research globally where she represents the Africa region. She also sits on an advisory committee for the World Health Organisation Regional Office for Africa on health systems governance. Aku is a mentor with the Young African Leaders Initiative (YALI). She is currently studying to be a lay minister.

Einstein Challenge:
Aku hopes to deepen understanding of how the governance of health systems influences their ability to deliver appropriate health care to people at their point of need, and how the overall stewardship role of governments can be improved. She is especially interested in issues of accountability and innovation within the public health sector, and how system-wide transformation can lead to better health service delivery.

Justus Masa

Uganda • Electrochemistry • Ruhr-University Bochum / Kyambogo University



Justus Masa grew up in Buginyanya, located at an altitude of 2044 meters on the highlands of Mount Elgon, in Uganda. The challenges imposed on life by this geography naturally helped Justus seek to improve livelihoods in his community and beyond. He figured out rather early, with the strong influence of his parents, especially his mother, that only science, engineering and technology could offer the solutions to most of these challenges.

Justus joined Makerere University with a state scholarship to study Physics, Mathematics and Chemistry. He came second in the National Mathematics contest in 2001, and 5th in 2002. Afraid of being unemployed due to the under-appreciation of fundamental sciences, he majored in Industrial Chemistry. In 2003, he joined the Fish Oil sub-project in the framework of the Norwegian Programme for Development, Research and Education (NUFU) support to Makerere University. He received a prize for demonstrating the extraction of omega-3 rich oils, which have potential pharmaceutical applications. In 2005, he won a scholarship from the Germany Academic Exchange Service (DAAD) to support his Master in Science in Chemistry at Makerere University, followed by a Research Fellowship in 2006 at Ruhr-University Bochum. Following this, Justus earned a doctorate, with a distinction (summa cum laude), in Natural Sciences (Dr. rer. nat) from Ruhr-University Bochum in 2012.

After this, he became a visiting scholar in the Physical and Theoretical Chemistry Laboratory at the University of Oxford in 2013, where he worked on harmonizing mismatch between experimental and theoretical kinetic data of nanoparticle-modified electrodes in hydrodynamic voltammetry. He returned to Ruhr-University Bochum as a Senior Research Scientist and Group Leader of the Electrocatalysis and Energy Conversion Group at the Center for

Electrochemical Sciences (CES) in the Department of Analytical Chemistry. He is a co-inventor of four patents, three of which won the prize for the best innovations at Ruhr-University Bochum. Justus has also been a Lecturer at Kyambogo University since 2013.

Justus' research aims to use electrochemistry to create green and sustainable energy systems for both portable and grid-scale energy conversion and storage, particularly, the reversible interconversion of water into hydrogen and oxygen in a solar powered water electrolyzer, and the recombination of hydrogen and oxygen to water in a fuel cell thereby harnessing the energy of the reaction. The ultimate goal is to couple harnessing of intermittent energy systems with advanced electrochemical energy storage and conversion systems, to improve the overall efficiency of the energy tapped from renewable sources. To this end, Justus leads several research projects in the field of electrocatalysis and energy conversion, focused on the development of advanced low-cost catalysts and electrode materials for electrochemical energy systems, including fuel cells, electrolyzers (power to gas energy conversion), rechargeable metal-air batteries and other modern battery systems.

Justus is a member of the International Society of Electrochemistry (ISE) and has published more than 70 peer-reviewed papers and 2 book chapters. In 2015, he was appointed as the Head of the Salt Cluster, Technical Working Group (TWG) on Mineral Value Additional, of the Presidential Investors Round Table (PIRT V), which is chaired by HE President Yoweri Museveni. He is also a Fellow of the African Good Governance Network (AGGN), which is comprised of highly educated African academics who are dedicated to good governance principles.

Einstein Challenge:
Justus hopes to develop functional electrochemical energy storage and conversion systems coupled to renewable energy sources for mini-grid and off-grid applications, and to develop efficient systems to convert CO₂ right at its source of generation into hydrocarbon fuels and commodity chemicals.

Sanushka Naidoo

South Africa • Plant Genetics • University of Pretoria



Sanushka is currently Senior Lecturer in the Department of Genetics at the University of Pretoria and a candidate for Associate Professor. Sanushka is President of the South African Genetics Society (2017-2018) and was awarded a Y-rating by the South African National Research Foundation (2015-2020).

Her research is dedicated to plant defense in the forest species, with an emphasis on Eucalyptus. Forest trees are long-lived organisms that are challenged with multiple pests and pathogens in their lifetime. Sanushka is focusing on mechanisms that can confer broad-spectrum, long lasting resistance by dissecting gene families and responses to pests and pathogens. She has adopted genome editing technology (CRISPR) to develop plants with desired traits. With the development of new technologies, novel genetically modified crops are poised to increase yield and protect against pests and pathogens under harsh African climates. Sanushka believes we are better equipped to harness this knowledge to address one of Africa's biggest challenge- that of food security.

Sanushka was born in a small community outside Durban, South Africa. Her parents were teachers who encouraged her to ask questions about the world around her. She participated in mathematics and science Olympiads through school, and was inspired by her science teacher to initiate a wildlife club. The club built a pond, establishing a complete ecosystem on the school grounds, to facilitate biology lessons. Sanushka participated in a wilderness leadership school organized by the South African National Parks

Board. The weeklong hike through the Umfolozi Game Reserve in KwaZulu Natal cemented her love and curiosity of natural systems and species interactions.

Sanushka's academic journey began with a Bachelor's of Science at the University of KwaZulu Natal, where she majored in Environmental and Cell Biology, subsequently specializing in molecular biology for her master's degree at the University of Stellenbosch. Her research focused on the expression pattern of a key enzyme in the sucrose pathway in sugarcane. Perseverance and passion culminated in a distinction and the gene was patented. Before continuing on to her PhD, Sanushka worked at the University of Cape Town as a Microarray Scientific Officer. She subsequently received the Mellon Foundation Mentoring Award to complete her PhD degree in Plant Biotechnology at the University of Pretoria receiving the award for best PhD paper, presented by the South African Society of Plant Pathologists.

Sanushka applied for the NEF Fellowship to expand her access to impactful collaboration and deliver next generation thinking with African scientists, social scientists, schools, communities and government leaders. She wishes to facilitate education and acceptance leading to an increased impact of plant biotechnology on society. She believes Africa's youth should study science, technology, engineering and mathematics to discover robust, tangible, natural patterns. Knowledge of such patterns can be harnessed to address the continent's unique challenges.

Einstein Challenge:

Sanushka hopes to improve understanding and acceptance of plant biotechnology as a means to enhance crops in Africa.

Maha Nasr

Egypt • Nanotechnology for Cancer and Neurodegenerative Diseases • Ain Shams University



Maha was born in Giza, Egypt. Despite being raised in a family of engineers, no one forced her to pursue a similar career, respecting her choice to pursue the pharmaceutical sciences. She began her scientific journey with a Bachelor and Master of Science in Pharmaceutical Sciences at Ain Shams University in Egypt. In 2011, Maha was awarded a Certificate in Pharmaceutical Bioinformatics from Uppsala University in Sweden. She went on to pursue her PhD at Ain Sham University with expertise in Pharmaceutics and Industrial Pharmacy.

Maha's research integrates pharmaceutical science and nanotechnology with other medical, biological and chemical sciences. She focuses on advanced technologies such as nanotechnology based drug carriers and composite delivery systems. She is currently investigating the possibility of creation of novel carriers for treatment of diseases, mainly for cancer and Alzheimer's.

For her work, Maha was awarded two research travel grants (six months each) at the University of Central Lancashire, United Kingdom, where she was a Visiting Scientist and Researcher in School of Pharmacy and Biomedical Sciences and Institute of Nanotechnology and Bioengineering, and the University of Leiden, Netherlands, where she was a Postdoctoral Fellow in Division of Drug Delivery Technology. She was also awarded the Daniel Turnberg UK/Middle East Travel

Fellowship for initiation of a research collaboration with the University of Bradford, funded by Wellcome Trust.

Maha has extensive teaching experience as Lecturer at the British University in Egypt, Misr International University and Ain Shams University. She is currently an Associate Professor of Pharmaceutics and Industrial Pharmacy in the Faculty of Pharmacy at Ain Shams University.

She currently leads a large team of researchers in several projects, some non-remunerated, others funded by agencies in Egypt, in collaboration with several Egyptian and foreign universities as well as Egyptian pharmaceutical companies and research institutes. Maha is a peer reviewer and editor in more than 40 international scientific journals. She has won several awards from funding bodies like Fondation pour l'Universite' de Lyon, TWAS/Biovision Unit in Bibliotheca Alexandria, FIP foundation for Education and Research, the National Academy of Sciences and Robert Bosch Stiftung.

She sees the NEF Fellowship as an opportunity for career building and believes Africa's youth must study science in order to meet the challenges the continent - and the world - faces.

Maha is an Africa Science Leadership Program Fellow, a TWAS ARO Young Affiliate, a member of the Global Young Academy and a member of Arab-German Young Academy of Sciences and Humanities.

Einstein Challenge:
Maha hopes to explore what lies beyond nanotechnology in treatment of diseases, through the combination of novel biomaterials and formulation of new delivery systems.

Sidy Ndao

Senegal • Micro & Nanoscale Thermal/Fluid Sciences • University of Nebraska-Lincoln



Sidy was born in Dakar, Senegal, where he started his elementary education. At the age of 16, he moved to the United States where he graduated as Valedictorian of his high school class in 2001. By then, he was already interested in science and technology, even carrying a notebook with him where he drew designs of space rockets and mechanical systems.

Sidy completed both a Bachelor and Master in Mechanical Engineering from City College of New York. He completed his PhD in Mechanical Engineering at Rensselaer Polytechnic Institute in New York State in 2010. His graduate training at RPI was in the area of two-phase heat transfer at the micro/nano- scale, specifically in the study of the two-phase heat transfer and critical heat flux on functionalized micro/nano structured surfaces. Before joining the University of Nebraska-Lincoln in 2012 as a tenure-track faculty, Sidy spent about 2 years as a Postdoctoral Associate in the Chemical Engineering Department and the Institute of Soldier Nanotechnologies at the Massachusetts Institute of Technology (MIT). His research work at MIT focused on MEMS (Micro-Electro-Mechanical Systems) Thermoelectric and Thermophotovoltaics power generation and the development of high temperature 2-D photonic crystals.

Currently, he is an Assistant Professor in the Department of Mechanical and Materials Engineering at the University of Nebraska-Lincoln (UNL). At UNL, he is the Director of the Nano & Microsystems Research lab with research interests in Nanotechnology and Thermal-Fluid Sciences. His recent research work in High Temperature NanoThermoMechanica Memory and Logic Devices has garnered much interest in the scientific community because it changes what's possible and how we think about computing. About four years ago, a colleague of Sidy's from NASA Jet Propulsion Lab (JPL) brought him the problem of how to record

data on the surface of planet Venus where the average surface temperature is about 400 Celsius? Clearly current state-of-the-art computing technologies could not function at such elevated temperatures. In the pursuit of alternative technologies, the research community has been focused on two main approaches, namely material research (i.e. alternative wide bandgap semiconductor materials), and NanoElectroMechanical memory and switches, both of which still depend on Semiconductor properties and/or electricity.

Taking a completely different approach, Sidy's research group has recently developed the world's first high temperature thermal rectifier, a building block for future High Temperature Thermal Memory and Logic Devices, i.e., thermal computer. Unlike electronics, thermal memory and logic devices use heat instead of electricity to record and process data. Basically, Sidy's research group is creating the world's first thermal computer that can one day unlock the mysteries of outer space, explore and harvest our own planet's deep-beneath-the-surface geology and harness waste heat for more efficient energy utilization. He was awarded the UNL College of Engineering Henry Y. Kleinkauf Family Distinguished New Faculty Teaching Award in 2016.

One of Sidy's major accomplishments is the creation of the Dakar American University of Science & Technology (DAUST) in Senegal. DAUST provides instruction and research opportunities for undergraduates and graduates in fields of engineering and technology that are useful in developing technological solutions to address Africa's societal needs and challenges. He is also the founder of SenEcole, an organization whose goal is to promote STEM education for the sustainable development of Africa. One of SenEcole's main program is the Pan-African Robotics Competition (PARC).

Einstein Challenge:
Sidy hopes to develop the technology to control the flow of heat at micro/nanoscale. The ability to control and manipulate heat transfer at the micro/nanoscale is of great importance to many engineering applications such as thermal management, energy conversion, and thermal computing.

Peter Ngene

Nigeria • Nanomaterials/Nanotechnology • Utrecht University



Peter was born in Enugu, South East Nigeria. His interest in science started in elementary school because of a tutor who showed him how science and technology had changed the world. His interest was then fostered by his high school physics teacher who mentored him. From this mentorship, he was sure he wanted to be a scientist and focused his courses in subjects like physics, chemistry and mathematics. After secondary school, he went on to study Chemical Engineering at the Federal University of Technology Owerri (FUTO), Nigeria, where he graduated in 2002.

After his bachelor's degree, he worked for two years as a Process Engineer in Dangote Sugar Refinery to gain some practical experience. During this period, he was fascinated by the emerging field of nanotechnology and its potential to revolutionize almost every aspect of our life. Based on this, he enrolled in a dual master in Microsystems (MEMS) and Nanotechnology in 2006. The master's degree program was jointly offered by ESIEE (École Supérieure d'Ingénieurs en Électrotechnique et Électronique) in Paris and Nanyang Technological University (NTU) in Singapore. This was a turning point for his scientific career because it gave him the opportunity to be engaged in cutting edge research in the areas of nanomaterials, especially their application in renewable energy (energy storage). After graduating in 2007, he got a PhD position in the group of Prof. Krijn de Jong and Prof. Petra de Jongh at Utrecht University, the Netherlands, completing his PhD in 2012.

After his PhD, Peter was a Postdoctoral Research Fellow for 3 years in the Materials for Energy Conversion and Storage (MECS) group, Department of Chemical Engineering, Delft University of Technology in the Netherlands. There, he continued to work on nanostructured materials for energy applications and sensing. In 2015, he returned to Utrecht University where he is currently an Assistant Professor in the

Inorganic Chemistry and Catalysis group, Debye Institute for Nanomaterials Science.

In a nutshell, Peter's goal is to develop new materials that will enable the widespread use of energy from renewable and sustainable sources such as wind and solar. The major problem with these energy sources is that they are intermittent, therefore requiring some form of storage. Peter and his team are investigating several options to overcome this challenge. For example, he is developing novel materials that will enable energy to be stored efficiently via hydrogen or ammonia, materials for next generation rechargeable batteries for long driving range electric vehicles, heat storage and catalysts for energy conversion processes.

His work has had a high impact in the field of energy storage using metal hydrides. For example, Peter developed a strategy which is now widely used to make complex hydride nanocomposite materials for reversible hydrogen storage applications and solid-state electrolytes for rechargeable batteries. He was the first to demonstrate that the kinetics of hydrogen release from complex hydrides can be improved significantly by co-confinement with catalysts in nanopores of carbon. He also developed inexpensive eye-readable hydrogen sensors for the diagnosis of lactose intolerance via hydrogen breath test.

He has published 28 peer reviewed articles, including in high impact journals like *Angewandte Chemie*, *Energy and Environmental Science*, *Nano Energy*, *Advanced Functional Materials* etc., with high number of citations. He was the Chair of the renowned Gordon Research Seminar on Metal-Hydrogen Systems in 2013, and was the recipient of the prestigious KNCV (Royal Dutch Chemical Society) prize for the best PhD thesis in 2012/2013.

Einstein Challenge:
Peter is working to develop novel energy storage materials that will enable an energy revolution. This includes nanomaterials for efficient production of hydrogen from renewable sources, and its storage, so that hydrogen (in combination with fuel cells) can be used as an energy carrier for vehicles and stationary applications.

Tolulope Olugboji

Einstein Challenge:
Tolulope hopes to use new advances in computational geophysics, statistics and high-performance computing to image Africa's continental interior in 3-dimensions, enabling the global earth science community to better understand earthquake hazards, history and drivers of plate tectonics, and the composition and evolution of the ancient continental core of Africa. To make this possible, Tolulope hopes to obtain an infrastructure grant to build and operate a truly continent wide, state-of-the-art, geophysical observatory owned and operated by world-class African scientists.

Nigeria • Geophysics/Seismology • University of Maryland



Tolulope was born in Lagos, Nigeria. He derived his primary inspiration and initial scientific training from his mother, a civil engineer, who has devoted her entire life to teaching science, mathematics, physics, and technology to high school students in Nigeria. Tolulope counts himself one of her success stories.

Regarding his education, Tolulope obtained a Bachelor of Science in Computer Science and Engineering from the Obafemi Awolowo University, Ile Ife in Nigeria. Here he gained early exposure to the mathematical and computational sciences, e.g., Physics, Chemistry, Engineering Analysis, Artificial Intelligence and Numerical Computation. As a result of this broad exposure, he decided to pursue a research career in exploration geophysics because it allowed him to retain a broad interdisciplinary interest, while creatively studying the most complex and exciting physical system- the Earth.

Tolulope then applied for, and was selected to, a competitive and fully funded doctoral graduate fellowship to study Geophysics at Yale. He completed his Ph.D. in 2014. As a Postdoctoral Research Associate at the University of Maryland, he has gone on to study the Earth using geophysics, seismology and computational statistics as his primary tools of investigation.

Tolulope's research aims at improving the understanding of the architecture and composition of the solid Earth interior - in particular, the structure of continents and the cause of the transition from stable to weak behavior in the rocks that make up the outer exterior of our planet, which is what allows plate tectonics to operate. To do this, he builds sophisticated

computer models and designs novel remote sub-surface imaging techniques. In simple terms, seismologists like Tolulope 'see' into the interior of the planet, by developing the 'brains (computational algorithms)' to translate the data from Earth's many sources of vibrations (e.g., earthquakes, ocean waves, ice-quakes, etc.) into images of the interior of the Earth.

He believes, like the NEF, that the next Einstein can come from Africa and that is why he applied for the NEF Fellowship. In his experience, it is impossible to achieve real global leadership, independence, and recognition in the area of scientific research without a robust and rigorous foundation in Science, Technology, Engineering and Mathematics (STEM).

Tolulope was a recipient of the Fred Earl Ingerson Fellowship, which supported his doctoral education at Yale University. He is a member of the American Geophysical Union, with leadership experience in convening scientific sessions.

He is passionate about promoting earth science amongst high school students and the general public. Most recently, he has been doing this as one of the Nifty-Fifty (times 4) speakers nominated by the USA Science and Engineering Festival in the DC, Maryland, and Virginia areas. The 'Nifty Fifty (times 4)' is a program of Science Spark, a group of 200 noted Science and Engineering Professionals who fan out across the country to speak about their work and careers at various middle and high schools.

As of July 2018, Tolulope will be taking up an Assistant Professorship in the Department of Earth and Environmental Sciences at University of Rochester.

Hamidou Tembine

Mali • Strategic Decision-Making/Game Theory • New York University



Hamidou was born in Orsongo, Dogon Country, Mali. He was initially interested in music in elementary school. His interest in science and engineering started when his tutor offered him a music book that explained the form, rhythm, harmony of the notes with elementary mathematics.

From there, Hamidou obtained a Bachelor of Mathematics from the University of Grenoble, France. Hamidou then completed a Master in Science in Applied Mathematics and Economics at Ecole Polytechnique, Palaiseau, France. His thesis on learning and optimization problems under uncertainty inspired him to switch tracks from stochastic optimization to multi-agent strategic decision-making problems.

Hamidou completed the PhD in Computer Science at the University of Avignon, France. Subsequently, he accepted the position of Assistant Professor at CentraleSupélec, France's Institute of research and higher education in engineering and science, where he taught until 2013. Since 2014, he has been Global Network Assistant Professor with New York University.

Hamidou's research investigates game theory and aims to contribute significantly to existing knowledge on the interactive decision-making problems with incomplete information, and in the presence of self-regarding, other-regarding, altruistic, spiteful, risk-sensitive, and irrational agents. Game theory is an interdisciplinary area. Hamidou is working with

economists, engineers, psychologists, biologists and computer scientists.

He applied for the NEF Fellowship to exchange ideas around science and innovation in Africa. Hamidou has won many awards including the Outstanding Young Researcher Award by the IEEE (Institute of Electrical and Electronics Engineers) Communications Society in 2014. He has also won seven best article awards, all in the application of strategic learning and game theory to wireless communication networks, internet-of-everything, smart energy systems and intelligent transportation systems.

He is the author of the book "Distributed Strategic Learning for Wireless Engineers", published by CRC Press, Taylor & Francis in 2012. He also co-authored the book "Game Theory and Learning for Wireless Networks", published by Elsevier Academic press, 2011.

Hamidou has more than 150 peer-reviewed publications including books, magazines, journals, letters, and conferences that have been cited more than two thousand times. He was recently awarded by the US Air Force Office of Scientific Research for investigating foundations of mean-field-type game theory. He is an Associate Editor of IEEE Access journal, the Open Access Game Theory Journal, and the AIMS Electronics and Electrical Engineering journal. He is a senior member of IEEE.

Einstein Challenge:

Hamidou is working on the fundamental limitations of deep learning and mean-field-type game theory to explain complex multi-agent interactive systems found in natural, societal infrastructures and the environment.



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