



*International*  
AWARDS

# Summary

L'ORÉAL-UNESCO FOR WOMEN IN SCIENCE

## THE L'ORÉAL-UNESCO INTERNATIONAL AWARD FOR WOMEN IN SCIENCE 21<sup>ST</sup> EDITION

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# The 2019 laureates

## 5 outstanding female scientists



LAUREATE FOR AFRICA AND THE ARAB STATES

*Professor Najat Aoun Saliba*

Awarded for her pioneering work on the identification of carcinogens and other toxicants in air pollutants in Middle East countries and waterpipe and emerging nicotine delivery devices.



LAUREATE FOR ASIA-PACIFIC

*Professor Maki Kawai*

Awarded for her seminal work on the manipulation of individual molecules in atomic scale to transform matter and create innovative materials.



LAUREATE FOR EUROPE

*Professor Claire Voisin*

Awarded for her outstanding work in algebraic geometry.



LAUREATE FOR LATIN AMERICA

*Professor Karen Hallberg*

Awarded for the development of state-of-the-art computational approaches to understand the physics of quantum matter.



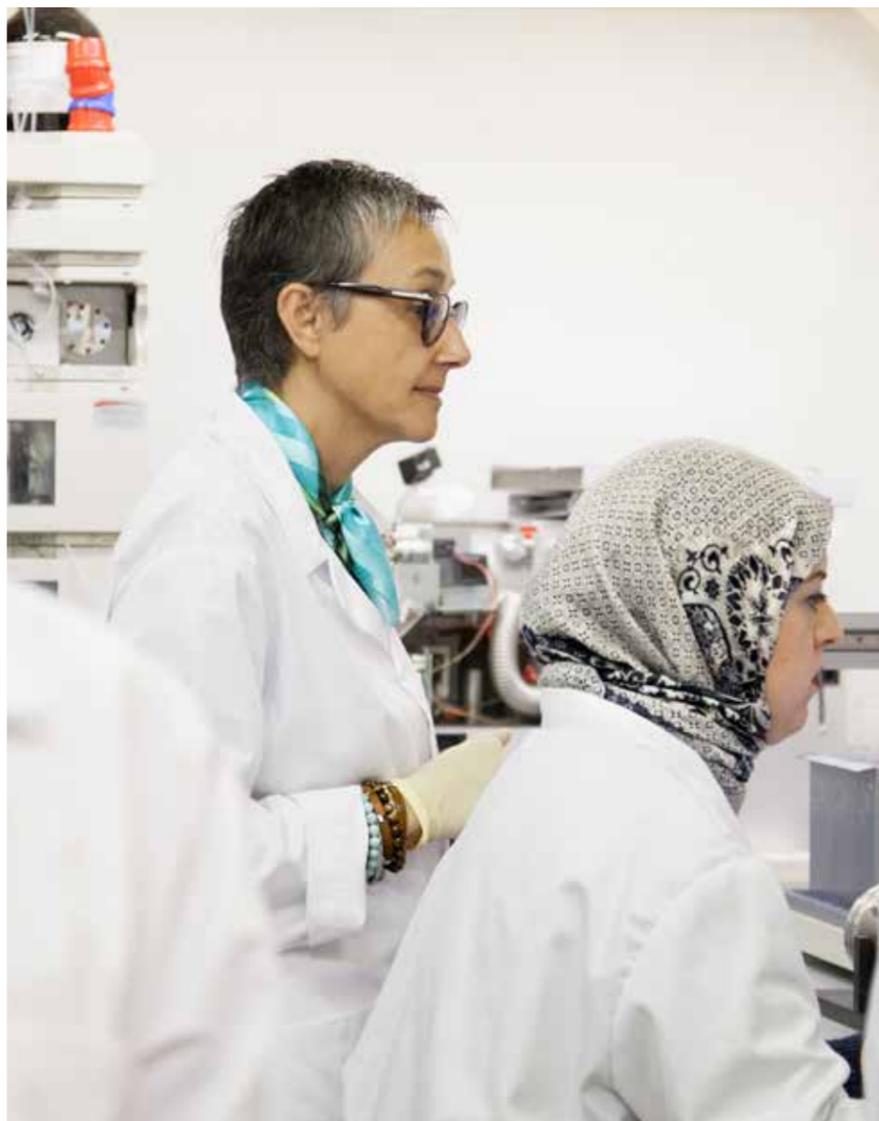
LAUREATE FOR NORTH AMERICA

*Professor Ingrid Daubechies*

Awarded for her outstanding contribution to digital image and signal processing, providing common and versatile algorithms for data compression.

AFRICA AND THE ARAB STATES

# Professor Najat Aoun Saliba



*Her innovative work in analytical and atmospheric chemistry will address the most pressing environmental challenges and push forward changes in health care policies and practices.*

Air pollution is the single greatest environmental health risk globally, with the World Health Organization (WHO) estimating that one in eight deaths is caused by ambient or indoor air pollution\*. L'Oréal-UNESCO Chemistry Laureate Professor Najat Aoun Saliba is conducting world-leading research on the chemical and toxic composition of polluted air, focusing on inhalable and atmospheric aerosols. She is a pioneer in assessing and understanding the transformations of ambient pollutants in Lebanon and the Middle East, and a recognised global expert in identifying toxic and carcinogenic substances emitted by combustible and non-combustible nicotine delivery systems such as hookahs and electronic cigarettes.

Importantly, Prof. Saliba is active in raising awareness of her discoveries among government authorities, global health organisations and communities, and seeks to influence public health policy. She established the first database of major atmospheric pollutants in Lebanon, and demonstrated that open incineration of the country's waste has multiplied the toxic content of air by a factor of 1,500%.

She is propelled on by her desire to understand the essence of health and environmental risks at a molecular level. *"It is the understanding of the nano-picture of the molecular structure and mechanisms of reactions that allows us to see the macro-picture of the climate and environment,"* she explains.

Growing up on her family's banana farm in rural Lebanon, Prof. Saliba shared her father's profound connection to the earth. Later, when civil war prompted a move to the city, disrupting her studies, she was awakened to the disturbing realities of air pollution, as scandals surrounding dirty fuel imports hit Lebanon. She has also witnessed relatives, friends and colleagues developing health issues as a result of exposure to toxic substances in the environment.

Having always wanted to be a teacher, she taught in secondary schools for six years, before deepening her scientific knowledge by continuing her studies in analytical and atmospheric chemistry in the US.

Back in Lebanon, established an interdisciplinary environmental research team at the American University of Beirut. *"Nothing deterred me from moving forward,"* she says. *"I was extremely focused on my work, I believed in the science I was creating and was certain that the impact would be imminent."* She believes the L'Oréal-UNESCO For Women in Science award will help to bring more recognition to scientists in Lebanon and other emerging economies, as well as reinforcing the

value of interdisciplinary research in advancing environmental science.

Among her many achievements, Prof. Saliba has established robust analytical methods to measure the principle toxic ingredients of tobacco smoke. She was the first to identify carcinogenic compounds (such as formaldehyde) in hookah, and has also measured large quantities of major toxic compounds (polycyclic aromatic hydrocarbons) consumed with just one hookah inhalation. More recently, she has become the first to report that electronic cigarettes can generate carbon monoxide, contrary to popular belief.

Prof. Saliba has won the American Psychology Association's award along with her interdisciplinary research team, and the National Lebanese Council's Scientific Research award, in the environmental category.

In the future, Prof. Saliba wants to help create a holistic, integrated approach to finding adaptive solutions to climate change challenges in the Middle East. Her dream is to collaborate with fellow scientists to understand the effects of inhalable and atmospheric particles on human organs, and in particular, how they contribute to the development of diseases such as Alzheimer's, dementia and cancer in children.

She is passionate about more women entering science, and goes further by stating that science will *"do justice to the world"* when women scientists outnumber their male counterparts. *"Women are more inclusive, they are not afraid of sharing and are highly open to collaboration, which is vital to developing efficient, holistic approaches,"* she says.

Prof. Saliba has never bowed to the prejudice or gender stereotyping, maintaining a clear focus on her goals and detaching herself from criticism: *"I am proud of who I am, and I've always acted as me - a smart, elegant, and highly sensitive woman."*

To break the glass ceiling, she believes women scientists must overcome social and cultural barriers at the personal, local and international levels. *"Women in science is a way of life,"* she says. *"It's a state of mind based on strong logic and driven by scientific evidence."* The way forward, she believes, is leading by example and sharing success stories - she herself was inspired by her postdoctoral supervisor, Dr. Barbara Finlayson-Pitts, a leading figure in atmospheric science. Above all, she asks her women students to *"stand up for their rights, develop high confidence in their work... and dare to dream"*.

\*[https://www.who.int/phe/health\\_topics/outdoorair/databases/en/](https://www.who.int/phe/health_topics/outdoorair/databases/en/).

ASIA - PACIFIC

# Professor Maki Kawai



*Her exceptional work has contributed to lay the foundations of nanotechnology leading to the discovery of new chemical and physical phenomena, which has the potential to improve energy efficiency; tackling critical environmental issues.*

Chemicals have brought great benefits to humans, but have also created significant environmental pollution. Now, a leading woman scientist has uncovered a way to manipulate surface atoms and molecules that could lead to the discovery of new chemical and physical phenomena, and address pressing energy and environmental issues.

Prof. Maki Kawai specialises in surface science, the study of fundamental aspects of physics and chemistry that occur at a wide range of surfaces and interfaces (such as between solids and liquids or solids and gases). In particular, she explores surface chemical reactions at a nanoscopic level using vibrational spectroscopy. For example, she and her team are helping to unveil the complexity behind the chemical reaction in catalysis, and exploring the heterogeneous charge distribution at the interface of solids that function as molecular devices.

*"The global ambition of science and technology is to support the sustainable development of our planet," she says. "We must strengthen the fundamental research that can be applied to the many examples of chemicals that have proved to be noxious for the environment, such as micro-plastics."*

Prof. Maki Kawai's success in manipulating surface atoms and converting the energy absorbed to generate certain chemical reactions on a surface is considered as foundational to nanoscience. In particular, this could lead to ground-breaking physical and chemical discoveries, and pave the way to creating innovative materials with improved characteristics - better performing photovoltaic cells, for example. It could also contribute to energy conversion, which could help to reduce the carbon emissions associated with energy.

She also hopes that the scanning probe microscope, which allows her to create images of surfaces at an atomic level and is central to her research, could become a general tool for characterising surface defects and molecules at different adsorption sites in ambient conditions.

As the daughter of two university physics professors, and a regular visitor to the local science museum with her father, it is perhaps not surprising that the young Maki became interested in science from an early age.

*"I was curious to understand the "why" behind everything," she explains. "I was fascinated by the beauty of nature, and phenomena such as*

*atmospheric pressure and the acceleration of gravity."*

Prof. Maki Kawai began her studies at the University of Tokyo in 1971, and gained her first contract with RIKEN, one of Japan's most prestigious research institutes, in 1980. She later became Executive Director of the institute. She was a Professor at the University of Tokyo, before becoming Director General of the Institute for Molecular Science in 2016. Her accolades include the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology, Prize for Science and Technology (2008), and the Chemical Society of Japan Award (2009). She won her first award for being an outstanding women scientist in 1996, the Saruhashi Award.

Throughout her distinguished career, Prof. Maki Kawai has experienced both challenges and 'eureka moments'. After completing her PhD and before finding an opportunity to engage in long-term research, she undertook various positions across governmental organisations, academic institutions and businesses. In retrospect, this multi-dimensional experience provided her with an array of different perspectives, and she particularly enjoyed working at Osaka Gas.

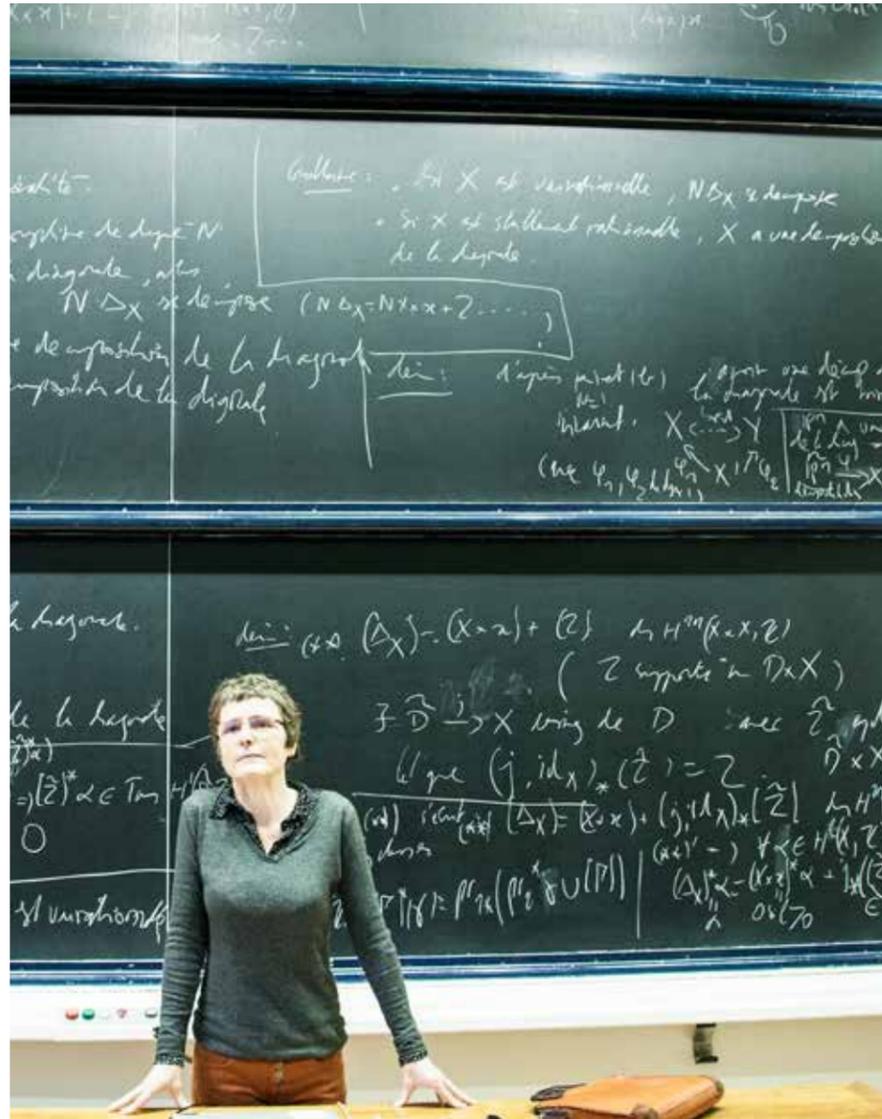
However, it is research that truly inspires her. The freedom to explore and the joy of discovery have remained with her, particularly when she uses new theories or ways of thinking to explain unexpected experimental findings. *"It's important to have a dream and move forward with positivity and courage towards your next target,"* she says. She recently combined data and theory to explain the differing spin nature of iron phthalocyanine molecules according to the adsorption site.

Commenting on the position of women in science, Prof. Maki Kawai says: *"Diversity in our science community is always a problem. We must work hard to increase the proportion of women scientists and ensure that men and women can contribute equally."*

She believes that confidence is the key to breaking the glass ceiling, and that collaboration is integral to learning and amplifying global scientific discussions.

EUROPE

# Professor Claire Voisin



*Her pioneering discoveries have answered fundamental questions on the geometry, the topology and Hodge structures of complex algebraic varieties.*

In today's instantaneous, media-driven world, scientific and mathematical challenges requiring deep thought and intellectual engagement with concepts and abstract theories rarely make the headlines. With the exception of a few more 'celebrated' branches of science, the contribution of scientists to society typically remains hidden, diverting government funding away from science, according to L'Oréal-UNESCO *For Women in Science* Mathematics Laureate 2019, Prof. Claire Voisin.

And with mathematics often presented to school pupils as a 'fixed', unimaginative discipline consisting of 'ready-made' definitions, rule and equations, Prof. Claire Voisin believes children are deterred from fully exploring the value of mathematics. "I'm in favour of a more open style of teaching, which would encourage students to push themselves and ask themselves more questions," she recalls.

With a naturally inquisitive mind, Prof. Claire Voisin began exploring mathematics from a young age, encouraged by her father. She was delighted, aged 12, to discover the beauty of congruences, the poetry of algebra and the joy of combining conceptual and abstract reasoning to prove a concrete result. "It was wonderful to understand so fully how things work," she says.

In her intellectual elasticity and bold, uncompromising and rigorous approach, Claire Voisin embodies the classic idea of a mathematician. Free from the distraction of a mobile phone, she regularly explores new ideas and conundrums as she walks through the streets of Paris. Her love of finding theories, hidden logic and precise structures extends beyond mathematics to art and poetry too, rendering her unique: an artist of mathematics.

The desire to explore complex subjects and push the boundaries has shaped Claire Voisin's studies and career, leading her to focus on abstract mathematics. She specialises in algebraic geometry, a discipline that studies intrinsic properties of geometric figures starting from their equations. Throughout history, geometry has played an important role in helping us to understand the structure of the world, and more recently, the universe. The first geometers calculated the radius of the Earth, and physicists have built on theories from algebraic geometry to make their own discoveries.

A large part of Prof. Claire Voisin's own pioneering research and achievements in complex algebraic geometry relies on the theory of Hodge structures (algebraic structures at the level of linear algebra) and uses it to address fundamental questions on the topology of complex varieties. The most important question in this field is the Hodge conjecture, a major unsolved problem in algebraic geometry.

Speaking about the value of mathematical research, Prof. Claire Voisin says that it is hard to predict what will remain important in the long term. The value of research in pure mathematics is not measured by immediate applications, but it is important particularly in terms of developing new ways of thinking. "It might be just one construction, one argument, or the main result that are important for the future," she says.

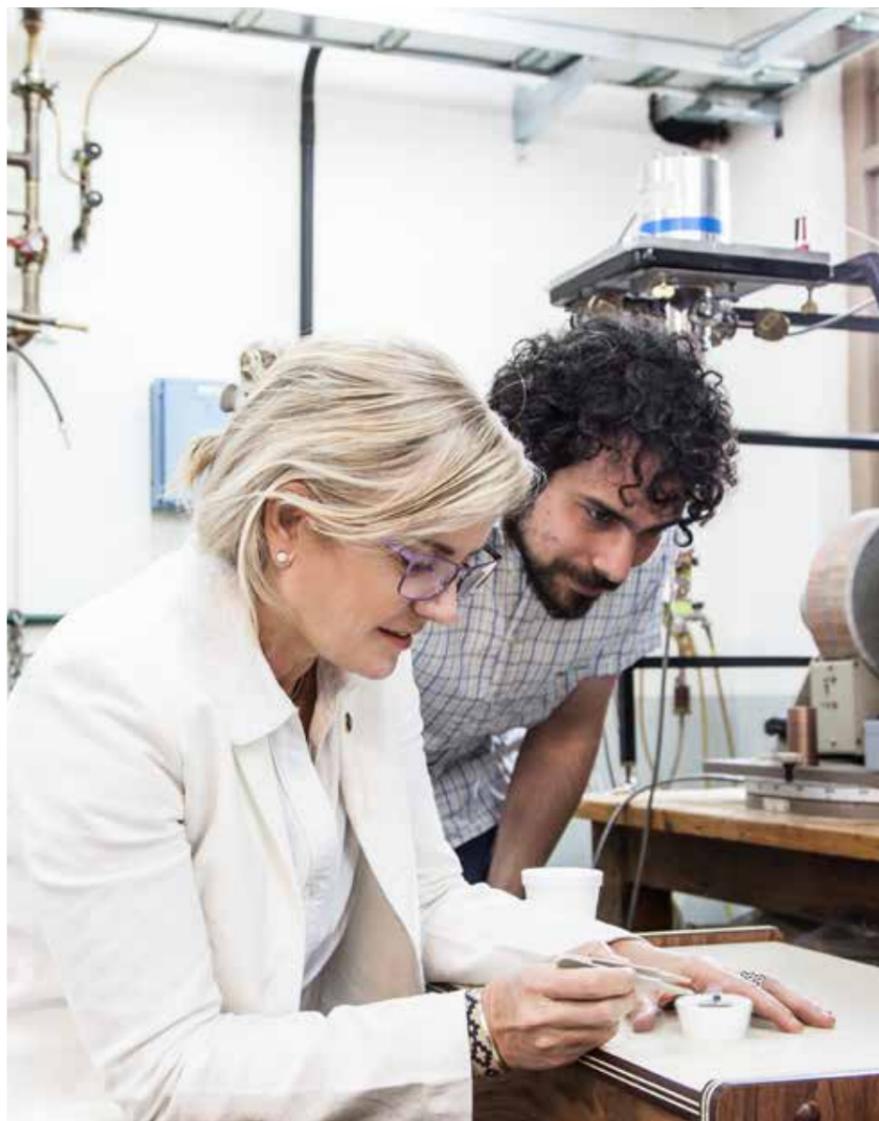
With a string of awards and accolades to her name, including membership of the Académie des Sciences, Prof. Claire Voisin is also the first woman mathematician to enter the Collège de France, the country's most prestigious research institution. She is also one of five women to have been awarded the gold medal from the CNRS (the French National Centre for Scientific Research).

While Prof. Claire Voisin has not personally experienced gender discrimination during her career, she recognises that most women scientists do not achieve the recognition they deserve, and their work is often undervalued, or not considered as equal to men's work. "I think women have to make more effort than men, in particular at the beginning of their career, in order to be considered as serious researchers," she says.

Indeed, with too few women becoming mathematicians and scientists, particularly in her field, Prof. Claire Voisin believes that women in science are too often treated as a minority, rather than "scientists among scientists". The lack of women in research roles represents "a significant loss for science". She recommends that all young women scientists should be ambitious and overlook external perspectives, and hopes that her recognition as a L'Oréal-UNESCO *For Women in Science* laureate will help encourage more women to pursue mathematics, including pure mathematics.

L A T I N A M E R I C A

# Professor Karen Hallberg



*Her innovative and creative applications of these techniques constitute a fundamental contribution to the understanding of nanoscopic systems and novel materials.*

Renowned physicist Prof. Karen Hallberg is an expert in quantum condensed matter physics, the study of the structure and behaviour of matter. She has developed and improved numerical tools, including the 'Density Matrix Renormalisation Group' technique, to calculate the precise physical properties of novel materials at the microscopic level.

*"Studying this complex behaviour allows us to understand the basic mechanisms behind, for example, high temperature superconductivity or colossal magneto resistance," she says. "In short, we expect to contribute to the understanding of one of the most complex problems in physics: interacting many-body quantum behaviour."*

Superconductors are materials in which resistivity completely disappears under a certain temperature, the current range lying below approximately  $-160^{\circ}\text{C}$ . Without resistivity, it is possible to create very strong magnetic fields or to transport electricity for long distances without heat loss. Superconducting materials are used in diverse applications including medical equipment (such as magnetic resonance imaging scanners), digital circuits, sensitive magnetometers and detectors, and energy storage and generation. Today, there is a quest among the scientific community to create new materials that become superconductors at room temperature. To succeed in this endeavour, researchers, including Prof. Karen Hallberg, are seeking to deepen their understanding of what takes place at the atomic and electronic scales.

Prof. Karen Hallberg's scientific journey began early in life, when as a child, she continuously asked questions about the world, earning her the nickname of "*Señorita por qué*" ("*Miss why*"), and formed an all-girl science club with her friends.

*"I remember the sense of awe when I looked up at the stars," she says. "It always made me feel so insignificant, even more now that I am more conscious of the immense space-time distances!"*

Her enthusiasm and the joy of discovery have stayed with her throughout her career. While calculating the precise densities of states, she was recently fascinated to identify a new particle, a quasiparticle, and elaborated a theory to explain it.

In the future, she would be interested to understand the microscopic origin of high temperature superconductivity, and how scientists might be able to build materials atom by atom, giving them predetermined properties for new and important applications. Beyond her immediate field, she dreams of leveraging physics to understand consciousness, the behaviour of the human brain, and even the emergence of life.

Prof. Karen Hallberg won the John Simon Guggenheim fellowship in 2005, and was honoured by L'Oréal and the Argentine government's National Scientific and Technical Research Council in 2008 for her work on quantum properties and transport in nanoscopic and molecular systems. She is also a corresponding member of Argentina's National Academy for exact, Physical and natural Sciences, a member of the Argentine Committee on Ethics in Science and Technology and Senior Associate of the International Centre for Theoretical Physics in Trieste.

In addition to her studies, Prof. Karen Hallberg contributes to developing international scientific policy, as a council member of the Pugwash Conferences for Science and World affairs. She is also committed to supporting minorities and women in science. "*Physics, for example, is among the scientific careers that, regrettably, has the lowest participation of women,*" she explains. She believes more action is needed to support women scientists throughout their careers, particularly when it comes to balancing motherhood with the productivity levels and international travel that are vital to progressing and gaining recognition.

Prof. Karen Hallberg believes the L'Oréal-UNESCO *For Women in Science* Award plays an instrumental role in promoting collaboration between leading women scientists and helping women in science achieve greater visibility. "*I can't think of any other global initiative on gender issues in science with a broader impact,*" she says.

NORTH AMERICA

# Professor Ingrid Daubechies



*Her groundbreaking work on wavelet theory has led to the development of image processing and filtering methods used in technologies ranging from medical imaging to wireless communication.*

Prof. Ingrid Daubechies is a physicist and applied mathematician. Her remarkable research on wavelet theory has transformed the numerical treatment of images and signals for data compression, creating a new universal language for scientists and catalysing multiple innovations. An exceptional woman scientist, she is also engaged in the fight for equal opportunities, education and access to science in developing countries.

*"In maths, we always seek to understand magical things," says Prof. Ingrid Daubechies. "I hope that my work will also be instrumental in helping people see that mathematics is everywhere. Identifying patterns and applying them in a different setting is very natural, very human."*

Prof. Ingrid Daubechies' steadfast focus on recasting problems in a new light saw her building on the foundational work of wavelet pioneer Yves Meyer to establish the ultimate solution to wavelet decomposition. She describes wavelets as "mathematical building blocks" that can be used to extract the essential elements of images or signals (according to the required scale) without losing their quality. Meyer describes her work as a "revolution".

Wavelet decomposition has become an indispensable tool for working with signals, images and video. For example, it has enabled the reconstruction of early Hubble Telescope images, electronic sharing of highly detailed fingerprints, the detection of forged documents, the rise of digital cinema and even medical imaging. Similarly, it is a vital component of wireless communication, and is also used to compress sound sequences into MP3 files, so that music can be stored and transmitted via iPods and smartphones. Scientists even used construction akin to wavelets to help detect, in 2015, a gravitational wave generated by the collision of two black holes.

Born in Belgium and naturalised as American in 1996, Prof. Ingrid Daubechies' studies and career have spanned two continents. With an innate interest in how and why things work, she was encouraged towards science by her school teachers and parents, and remembers being particularly inspired by learning about light

refraction and prisms. *"I felt absolutely thrilled, and a little incredulous, trying experiments to see whether it was really true," she recalls. "The sense of combined wonder and awe, and the thirst to understand is what drives me still."*

After gaining her PhD in theoretical physics at Vrije University in Brussels in 1980, Prof. Ingrid Daubechies later joined the Mathematical Research Center of AT&T Bell Labs in New Jersey, United States, in 1987, before moving to Rutgers University and becoming the first woman 'Full professor' of mathematics at Princeton University in 2004. She currently resides at Duke University, where the mathematics department is classed by The Times Higher Education review as the tenth best globally. She received a Guggenheim fellowship in 2013 and was awarded the medal of the US National Academy of Sciences in 2000. She is also a foreign member of the prestigious Académie des Sciences in France.

Beyond her mathematical prowess, Prof. Ingrid Daubechies has been active in helping to expand access to maths and science in developing countries, a cause that she pursued vigorously as the President of the International Mathematical Union from 2011 to 2014.

While she has not experienced gender discrimination on her own scientific journey, Prof. Ingrid Daubechies recognises that there are still many barriers to more women entering science, with too few role models and few women in positions of authority. In addition to mentoring for young women scientists, she believes a wholesale shift in perceptions is needed, both in terms of gender equality and the nature of mathematics as a subject. *"Many people see life as a scientist as rather narrow or uncreative - which isn't true at all - and I believe this discourages women more than men," she says.*

*"Diversity brings a wealth of ideas and more surprising ways of approaching issues, which is vital for any creative discipline," she concludes. "This is now more important than ever as scientists seek to address the existential challenges facing life on Earth."*



*The  
international  
rising talents*



*The young women  
which are the  
future of the science*

Since 2000, the L'Oréal-UNESCO *For Women in Science* programme has highlighted the achievements of younger women who are in the early stages of their scientific careers.

Each year, the International Rising Talents programme selects the 15 most promising women scientists among the almost 280 national and regional fellows of the L'Oréal-UNESCO *For Women in Science* programme. These young women are the very future of science and recognising their excellence will help ensure that they reach their full potential.

## AFRICA AND THE ARAB STATES



### Dr. Saba Al Heialy

L'ORÉAL-UNESCO REGIONAL  
FELLOWSHIP UNITED ARAB  
EMIRATES

*Mohammed bin Rashid University for  
Medicine and Health Sciences*

HEALTH SCIENCES

Asthma and obesity are increasing worldwide, as poor air quality and convenience lifestyles, characterised by unhealthy diets and physical inactivity, take their toll. Now, obesity is prompting a rise in the prevalence of asthma, with patients of this 'responding poorly to conventional therapy, such as steroid treatment. Dr. Saba Al Heialy is researching the still relatively unknown mechanisms underlying this phenomenon, in order to help identify new therapies for patients. Recently, adipocytes (fat cells) are emerging as pro-inflammatory cells capable of secreting cytokines and hormones. Moreover, adipose tissue is infiltrated with large amounts of T cells. This potential immunomodulatory role of adipocytes has led her to explore the implications of the crosstalk between T cells- an essential part of the immune system - and adipocytes (fat cells) in producing steroid hyporesponsiveness in obese asthmatics. *"Ultimately, the objective of my research is to contribute to the advancement in asthma research"*, she says.

Dr. Saba Al Heialy's father, an accomplished researcher, was an important inspiration and mentor in her childhood, instilling in the young Saba *"the core values and self-confidence that have allowed me to become the researcher I am today"*. At university, she gained valuable laboratory experience by taking ownership of an asthma and allergy project in the summer holidays, enjoying the sense of independence and deepening her curiosity in scientific research.

Despite her proven ability and enthusiasm, Dr. Saba al Heialy has had to work doubly hard to overcome gender and age prejudice throughout her career. *"For women to advance in science, we must challenge the perception that their work is in some way inferior to that of equally qualified male scientists"*, she believes.

*"Women could easily thrive in senior scientific roles - but they must be judged on merit and given equal opportunities in the workplace,"* she says. To create change, young girls must be offered the opportunity to participate in practical, interactive science programmes, and be shown examples of successful women in the workplace. *"I hope my story will inspire many girls and young women in the Middle East to pursue their scientific dreams and reach their full potential,"* she concludes.

## AFRICA AND THE ARAB STATES



### Dr. Zohra Dhouafli

L'ORÉAL-UNESCO REGIONAL  
FELLOWSHIP TUNISIA

*Center of Biotechnology of Borj-Cédria*

NEUROSCIENCES / BIOCHEMISTRY

Alzheimer's disease is considered to be the most common form of dementia globally, yet there is currently no cure for this devastating neurodegenerative disorder. Dr. Zohra Dhouafli is researching the theory that the misfolding, aggregation and brain deposition of the amyloid-beta protein triggers the disease. Through her upcoming research project, she will use one of the most promising approaches - a natural antioxidant extracted from henna tree leaves (discovered through her previous research) to inhibit, interfere and counteract the aggregation process. Among the innovative aspects of the project, the team will seek to preserve the molecule's stability and bioactivity, and optimise its passage through the blood brain barrier. In this way, Dr. Zohra Dhouafli aims to catalyse the development of more potent compounds for the prevention and treatment of Alzheimer's.

*"My dream is to find an effective treatment for Alzheimer's disease and improve quality of life for patients and their families,"* she says.

Dr. Zohra Dhouafli has always had an interest in biological sciences. Her longstanding focus on neurodegenerative diseases began during her first research experience in biochemistry at Sherbrooke University in Canada. Since then, she has participated in multiple international collaborations exploring the biochemical and molecular mechanisms involved in such diseases.

*"Women should have just as much responsibility in promoting human development as men,"* she says. *"Their actions must go hand in hand,"* she adds, pointing to the famous collaboration of Pierre and Marie Curie. She believes that women scientists have a complementary approach to that of their male counterparts, driven more by empathy, patience and a sense of social responsibility.

Having benefitted significantly from mentorship, Dr. Zohra Dhouafli agrees that talented mentors stand to inspire many more young women scientists, reinforced by far greater public recognition women scientists' achievements. *"An equal gender balance would greatly enhance the quality of scientific research,"* she concludes.

## AFRICA AND THE ARAB STATES



### Dr. Menattallah Elserafy

L'ORÉAL-UNESCO REGIONAL  
FELLOWSHIP EGYPT

*Zewail City of Science and Technology*

MOLECULAR BIOLOGY / GENETICS

DNA is the blueprint for life. The valuable information it carries decides the fate of all organisms. Dr. Menattallah Elserafy is researching DNA repair mechanisms to advance understanding of the fundamental processes in mammalian cells. She and her research team could identify new players that protect the cells from DNA damage. She also discovered that a protein in yeast cells is involved in preventing DNA damage caused by ribonucleotides misincorporation into the genome. Thereby, mutations in the human protein could be associated with diseases, neurological disorders and cancers. Her findings could help identify new disease-causing mutations, aid diagnosis and pave the way for personalised therapies according to the patient's genetic background.

Dr. Menattallah Elserafy early became passionate about molecular biology and genetics. *"I wanted to create a positive impact in society,"* she recalls. Today, she is convinced that raising research standards in Egypt could put her country *"back on the map of scientific research"*, and importantly, play a major role in solving pressing water, environmental and energy challenges.

According to her, gender equality should be a key focus for children's education, with girls encouraged to *"dream big and aim high"*. Dr. Menattallah Elserafy is inspired by many women scientists, including the first ever female doctor, an Egyptian woman living in 2700 BC, and Rosalind Franklin, the woman scientist who first presented an X-ray structure of the DNA molecule.

She herself is contributing to educating future generations of women scientists by supporting younger researchers in the laboratory. *"I believe the L'Oréal-UNESCO For Women in Science International Rising Talents fellowship will give me even more opportunities to talk to young women scientists and inspire them to make a difference,"* she says.

*"The contribution of women scientists creates a diverse vision that is invaluable in addressing the great challenges facing humanity."*

DR. MARIA MOLINA

## AFRICA AND THE ARAB STATES



### Dr. Priscilla Kolibea Mante

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP GHANA

*Kwame Nkrumah University of Science and Technology*  
NEUROSCIENCES

Expanding access to affordable, high quality medical care in Africa is a major focus for sustainable development. Specialising in neuropharmacology and neuroscience, Dr. Priscilla Kolibea Mante is researching alternative, plant-based therapeutic options to manage drug-resistant epilepsy and the neglected tropical disease, neurocysticercosis. She is currently exploring the anticonvulsant activity of the plant alkaloid cryptolepine and its solid-lipid nanoparticles in the management of neurocysticercosis-induced epilepsy. By identifying a way to help cryptolepine permeate more efficiently into the central nervous system, the risk of convulsion should be reduced, helping the patient to manage their condition as effectively as possible.

*"It's very rewarding to know that my research could significantly alter complicated structures like the brain and positively affect people's lives", she says.*

Dr. Priscilla Kolibea Mante believes the biggest challenge for women in science is managing negative perceptions of ambition in women and overcoming gender stereotypes. Having faith in the future, she is convinced that her generation has been fortunate to receive strong support, and believe women can tap into that and spearhead our careers to higher levels. *"The world will make room for us", she says. "The more women push for senior roles, the harder it will be to ignore them."*

The expert guidance of both men and women throughout her career has been so important that Dr. Priscilla Kolibea Mante now considers herself a "champion" of mentorship, regularly supporting younger scientists in pursuing their dreams. She concludes: *"Sometimes it's important to hold your mentee's hand and guide them towards opportunities they never knew existed."*

## ASIA-PACIFIC



### Dr. Sherry Aw

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP SINGAPORE

*Institute of Molecular and Cell Biology*  
NEUROSCIENCE

Neurodegeneration is a growing issue for an ageing global population. Dr. Sherry Aw is conducting genetic experiments in fruit flies to understand the causes behind neurodegenerative diseases, and support the development of novel treatments. In particular, by exploring how certain cells become affected and the functional results of their degeneration, she and her team have been able to pinpoint movement dysfunctions that resemble the effects of Parkinson's disease and Spinocerebellar ataxia 3 in humans. Her current goal is to understand how the tremor and other movement disorders experienced by sufferers of these diseases are generated at the physiological, cellular and molecular levels.

*"So that we can start to develop rational treatments for these debilitating symptoms, and eventually cure these diseases," she says.*

Her passion for scientific research was sparked when one of her university tutors suggested that she gain some practical research experience. Since then, she has always had strong – male – mentors who encouraged her to recognise and believe in her abilities.

As a woman in science, Dr. Sherry Aw says: *"Society generally judges women more harshly than men, and I believe this is a major barrier to women achieving our maximum potential. Women face a lot of pressure from everyone, including from ourselves."*

To create the next generation of women scientists, girls must see women in science as a mainstream trend, Dr. Sherry Aw believes. This starts with strong mentors and role models, and more exposure to women scientists in the media, including through initiatives such as the L'Oréal-UNESCO For Women in Science programme. *"Only then will we be attracting the best and brightest minds, of both genders, to solve the world's most important scientific problems," she concludes.*

## ASIA-PACIFIC



### Dr. Mika Nomoto

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP JAPAN

*Nagoya University*  
MOLECULAR BIOLOGY /  
PLANT PATHOLOGY

When plants become infected with biotrophic pathogens (fungi that feed on the living cells of their hosts), host resistance proteins trigger an acute immune response, including the eventual death of the affected cell. The infected tissues also produce signals that spark the accumulation of immune hormone salicylic acid and mobilise antimicrobial pathogenesis-related genes within the uninfected distal leaves. This plant-specific immunity is known as systemic acquired resistance (SAR). While it is effective in resisting biotrophs, it suppresses the plant's resistance response to herbivores, thereby exposing it to damage from pests. Dr. Mika Nomoto is researching how SAR is regulated at a molecular level in order to better understand its antagonistic interaction with herbivore resistance and help promote sustainable pest management.

*"I realised that by elucidating the molecular mechanism of plant immunity, I would be able to contribute towards ensuring food security for the world's population," she recalls. "That's why I decided to pursue a career in science."*

Growing up in southern Japan, Dr. Mika Nomoto was surrounded by a rich and diverse natural environment. She loved to study plants, flowers and insects, and became intrigued by different plants' reaction to mould and microbes. When she began her biology studies at Kagawa University, she was surprised to learn that plants possess sophisticated immune systems, like humans.

While she has not experienced the "glass ceiling" in her career, Dr. Mika Nomoto agrees there is a pressing need for more women scientists. *"I believe that science needs diversity and women are the key to advancing science," she says. "It's vital that we persuasively transform perceptions of women's role in society through media and politics."*

Finally, mentorship is invaluable, Dr. Mika Nomoto believes. She herself has gained a great deal of knowledge from her mentors, including how to establish a venture company and apply for patents, as well as conduct world-leading scientific research. *"In the future, I'd be happy to mentor young researchers – both women and men," she concludes.*

## ASIA PACIFIC



### Dr. Jacqueline Romero

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP AUSTRALIA

*University of Queensland*  
QUANTUM PHYSICS

Dr. Jacqueline Romero is a physicist working in the field of quantum physics, which explains the nature and behaviour of matter and energy at the atomic and subatomic level. In particular, she is exploring how an infinite number of possible shapes of photons - particles of light - can be used to encode information. Ultimately, this could lead to reliably secure communication, help conserve data privacy and guard against the growing risk of cyberattacks, and deliver more powerful computation.

Her journey to pushing the boundaries of quantum information began in the Philippines, where she was encouraged by her school teachers to pursue science, even participating in national physics competitions. *"It was just beautiful to me, how the rules of physics can describe the natural world so powerfully," she recalls. "I enjoy the creative and problem solving process. The fun I have is really the reward!"* At university, Dr. Jacqueline Romero joined an established optics research group, before identifying an opportunity to pursue an experimental quantum physics PhD at the University of Glasgow.

As part of a minority of women in quantum science, she believes improving the representation of women in science requires a fundamental cultural change, starting at school, where girls' and boys' sense of wonder and curiosity should be equally nurtured. In addition to mentorship, strong female role models at every stage of the scientific career path would send positive signals to aspiring women scientists, she suggests. Importantly, inclusivity and gender diversity should be framed in the context of productivity, with leaders creating the supportive environment that would help women scientists return to peak professional performance after having a child.

*"Winning a L'Oréal-UNESCO For Women in Science fellowship has given me a national platform to show that women, particularly mothers, can succeed in science," she concludes. "People are inspired by stories and I think my journey is a story that could do so much to inspire young girls and young women scientists."*

If science could achieve anything, Dr. Jacqueline Romero would like to see scientific research to help solve the major social inequalities that exist in our world.

EUROPE



*Dr. Laura Elo*

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP FINLAND

*University of Turku and Åbo Akademi University*

MEDICAL BIOINFORMATICS

Dr. Laura Elo leads a multidisciplinary team of 30 scientists at the Turku Medical Bioinformatics Centre in Finland. Together, they develop computational data analysis tools and mathematical modelling methods to identify more reliable early indicators of complex diseases such as type 1 diabetes or cancer, and predict potential disease and treatment outcomes. She and her team have developed several powerful computational models to interpret molecular and clinical data in a robust way, working closely with experimental and clinical teams and unique sample biobanks. Her ultimate goal is to help improve disease diagnosis, prognosis and lead to new treatment strategies with high potential for breakthrough findings and wide impact on medical research. "I hope our research helps future patients to get the best possible treatments," she says. "If we can improve the life of even a single patient, it is worth the effort."

Among the challenges faced by researchers, she believes the extensive competition for funding can be both unhealthy for the field of scientific research and create barriers to progress. "Within my group, I hope to encourage enthusiasm for making new discoveries through openness and communication," she explains.

As Research Director, Dr. Laura Elo recognises the distinct benefits that diversity brings to any team, commenting that "a good mix of people with different backgrounds and ways of working ensures open-minded and innovative research". Proving her worth as a woman scientist has seen her work harder than her male counterparts, she believes. Yet her achievements are undeniable: Dr. Laura Elo became Head of Turku University's Medical Bioinformatics Centre, Research Director and Vice Director of her research institute below the age of 40. Empowering more women to follow in her footsteps will require helping women build confidence, enabling an effective work-life balance, and ensuring strong mentorship throughout their careers.

On receiving a L'Oréal-UNESCO For Women in Science Regional Fellowship Finland, she says: "It's a great honour. I'd particularly like to thank my enthusiastic and talented research group, our collaborators, and all our supporters."

EUROPE



*Dr. Biola María Javierre Martínez*

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP SPAIN

*Josep Carreras Leukaemia Research Institute*

GENOMICS

The majority of interactions between the regulatory elements of a genome and the corresponding regulated gene are uncharted, a major missing link in understanding genome control. Dr. Biola María Javierre Martínez is researching chromatin interactions (crucial to cellular health), to help improve knowledge of tumour processes and provide new opportunities for diagnosis and treatment. Additionally, she is exploring the physical interactions between gene and regulatory elements to connect blood cancer genetic alterations to putative target genes. This could help prioritising new disease-candidate genes and pathways, reveal insights into the genomic regulatory mechanisms underlying cancer. It will also help to better predict patient outcomes and design improved and more personalised treatments.

Today, her dream is to help uncover more effective, gentler treatments for cancer, particularly for children.

As a scientist and mother, Dr. Biola María Javierre Martínez often feels that she has insufficient time to give of her best in either capacity. Addressing this common challenge among women scientists and empowering more women to participate in science would mean re-educating the whole of society, she believes. Women must also develop greater self-belief and learn to present their work more confidently.

Dr. Biola María Javierre Martínez sees mentors as essential on this journey, and is involved in a European Union project, the LIBRA Career Developmental Compass, to enable female postdoctoral fellows to become leaders through training and mentorship.

Commenting on the L'Oréal-UNESCO For Women in Science programme, she says: "It's vital to encourage women who dream of being scientists to succeed and not to clip their wings. We are women, mothers and scientists, and all this must be compatible."

EUROPE



*Dr. Kirsten Jensen*

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP DENMARK

*University of Copenhagen*

MATERIAL CHEMISTRY, STRUCTURAL ANALYSIS

Material chemistry has played a significant role in advancing technologies used to convert or store energy, such as batteries, solar cells and catalysts. Its strength is in forging an understanding of the relationship between material synthesis and the structure and properties of materials. Dr. Kirsten Jensen is exploring the potential of tailoring nanomaterials to optimise the efficiency of energy technologies. This starts with determining their atomic structure on the nanoscale. She and her research group at the University of Copenhagen are achieving this by using the latest high energy x-ray and neutron scattering tools, helping to both advance sustainable energy and the field of nanoscience itself.

"Chemistry is everywhere," she says. "I find it fascinating that by considering matter on an atomic level, we can understand the properties of everything around us and design molecules or crystal structures for new applications."

Progressing from roles as PhD student and postdoc to assistant professor in 2015 brought huge responsibilities, but Dr. Kirsten Jensen remained undeterred, adopting a positive attitude that enabled her to succeed. She acknowledges that she is fortunate to work in Scandinavia, where equal opportunities for men and women are fairly well established. However, the majority of her senior colleagues are still men, which she believes may be due to the challenges in balancing e.g. family life with the highly demanding nature of senior research roles, making more women seek careers outside of academia. Creating a better gender balance will mean re-imagining the system, promoting inclusive networking and cultivating strong mentors (male or female) who inspire and encourage young, talented female scientists.

As a women scientist who has never considered her opportunities as anything less than equal to her male counterparts, Dr. Kirsten Jensen concludes: "I don't want to be seen as a female scientist, just as a scientist."

EUROPE



*Dr. Urte Neniskyte*

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP LITHUANIA

*Vilnius University*

NEUROSCIENCE

The complexity of the human brain has yet to be fully understood. Dr. Urte Neniskyte is researching how our brains develop in early childhood (6 months to 6 years), with particular reference to anomalies that can lead to serious mental illness. She is currently exploring why excessive synapses sometimes remain, rather than being removed or "pruned" for optimum efficiency. Aberrations in this "synaptic pruning" process can result in neurodevelopmental diseases such as autism, schizophrenia and epilepsy. Dr. Urte Neniskyte's aims to uncover what determines which synapses should be maintained and which should be removed, and how the process could be modified to correct any errors, before a disease can develop.

"There is a philosophical question over whether a system, like the human brain, can understand itself," she says. "We might not be able to capture everything, but I want to get as close as we can and I'm happy to be contributing to this endeavour."

Born into a family of chemists, Dr. Urte Neniskyte has viewed life through the prism of science from an early age. "The first images I saw of bacterial plates sparked my passion to be a researcher of living things," she says.

As a mother of a young daughter and a neuroscientist, Dr. Urte Neniskyte is acutely aware of the importance of early childhood development. "We must raise our sons and daughters to take equal responsibilities in the home and value both women's and men's careers," she says. This includes educating children on gender equality from an early age.

To increase the number of women in science, she believes women scientists must gain the public recognition they deserve for their discoveries. She is unequivocal: "We must stop living in "pink and blue" world and acknowledge that gender-based divisions arise from the traditions of the society rather than how the brain works."

## EUROPE



### Dr. Nurcan Tuncbag

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP TURKEY  
Middle East Technical University  
BIOINFORMATICS

Cancer is the second leading cause of death globally, according to the World Health Organization\*, and its prevalence is rising sharply. To address the inherent complexity and heterogeneity of cancer, developing personalised therapeutic strategies is crucial. Dr. Nurcan Tuncbag is leading an interdisciplinary research project to deliver a "precision medicine" approach by leveraging sophisticated computational analysis to interpret the increasing volumes of data obtained with high-throughput technologies. Analysing this "big data" could help to identify potential synergies, and reveal how biological pathways are organised and altered at molecular level in cancer, as well as how these networks can be targeted to disrupt the abnormal signals for treatment.

The field of bioinformatics has allowed Dr. Nurcan Tuncbag to combine her biological interest in diseases with her mathematical prowess and passion for engineering.

"I was lucky that all my mentors were supportive of gender equity in science," she recalls. However, as a woman, she still comes across barriers within the scientific community, when she sometimes feels obliged to prove her expertise or knowledge to male attendees, despite being equally qualified.

To empower women scientists and help achieve the necessary diversity to advance engineering sciences, Dr. Nurcan Tuncbag believes that far greater emphasis should be placed on science, technology, engineering and mathematics at schools, starting from an early age.

"Throughout history, women have influenced society and changed the world through their scientific discoveries," she concludes. "By enhancing the visibility of women scientists, the L'Oréal-UNESCO For Women in Science programme will enable more women to contribute valuable discoveries to our world."

\*World Health Organization, 2018 <https://www.who.int/news-room/fact-sheets/detail/cancer>.

## LATIN AMERICA



### Dr. Maria Molina

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP ARGENTINA  
National University of Rio Cuarto  
CHEMISTRY / MOLECULAR BIOLOGY

Antibiotics revolutionised medicine and have since saved many human lives, significantly slowing mortality rates associated with common infectious diseases. Yet the widespread overuse of these once powerful drugs has led to increasing bacterial resistance, creating a serious risk that people could once again lose their lives to common infections and minor injuries. In the race against time to uncover a solution, scientists including Dr. Maria Molina are developing antimicrobial therapies as a potential alternative treatment for bacterial infections. Her work focuses on developing multifunctional nanogels capable of releasing antibiotics to bacteria (notably *P. Aeruginosa*) in synergy with a thermal effect created via electromagnetic radiation.

As a child, Dr. Maria Molina dreamt of making a famous discovery that could solve a great human challenge, propelling her into the school text books. Committed to conducting research that improves people's quality of life, she still dreams of scientists uncovering solutions to other pressing issues, including expanding access to safe water and life-saving medicines in developing countries.

Dr. Maria Molina perceives that women scientists face an inherent inequality: to succeed at work while undertaking a disproportionate share of household responsibilities, they must be more efficient than men and naturally adept at multi-tasking. This becomes more problematic at the higher echelons of science, where heavy time commitments and inflexibility are the norm.

Empowering more women to undertake excellent scientific careers is vital. "The contribution of women scientists creates a diverse vision that is invaluable in addressing the great challenges facing humanity," she says. Overturning social stereotypes and entrenched perceptions must begin at school, Dr. Maria Molina believes. "Girls should be encouraged to follow their interests rather than conforming to what people expect," she says. Strong female role models are important, as are programmes that promote women in science, such as the L'Oréal-UNESCO For Women in Science programme.

## LATIN AMERICA



### Dr. Ana Sofia Varela

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP MEXICO  
Institute of chemistry, National Autonomous University of Mexico  
CHEMISTRY / ELECTROCATALYSIS

Carbon capture stands to play an important role in fighting climate change. Dr. Ana Sofia Varela is using electrocatalysis to convert carbon dioxide (CO<sub>2</sub>) into useful products, in a process known as CO<sub>2</sub> electroreduction. In generating this type of reaction, she uses electricity as a driving force and is exploring diverse catalysts, with a particular focus on new types of inexpensive catalysts comprised of abundant elements (carbon, nitrogen and transition metals). Affordability is central to the economic and technological viability of the process. Ultimately, CO<sub>2</sub> electroreduction will allow the use of renewable electricity and waste CO<sub>2</sub> to produce carbon-based chemicals (carbon and hydrocarbons).

"My dream is to help avert climate change and its negative impacts," she says. "I hope that CO<sub>2</sub> capture and utilisation will prove to be a key solution, alongside the development of clean energies and energy efficient technologies."

Both Dr. Ana Sofia Varela's parents are chemists, and encouraged her childhood curiosity in the world, providing science-based answers to her questions. Years later, as a fully fledged scientist, Dr. Ana Sofia Varela returned to Mexico, after completing her PhD and postdoctoral studies in Europe, to face the harsh reality of doing more with less funding. Nevertheless, she began her own research group and equipped her laboratory, an effort that has been significantly advanced by her L'Oréal-UNESCO For Women in Science Regional Fellowship.

While more women are undertaking scientific careers, Dr. Ana Sofia Varela believes they still risk not being taken seriously in a male-dominated field. "Women have to prove their value, while men's is taken for granted, and take care not to overstep the boundary between assertive and aggressive, particularly in seeking senior roles," she says. "This must change, as greater diversity in science will allow us to develop multiple approaches to the challenges facing humanity."

## NORTH AMERICA



### Dr. Jacquelyn Cragg

L'ORÉAL-UNESCO REGIONAL FELLOWSHIP CANADA  
University of British Columbia  
HEALTH SCIENCES

The global burden of neurological diseases has grown substantially over the past 25 years\*, as the world population expands and ages. Dr. Jacquelyn Cragg is using statistical algorithms to better understand the progression of such diseases, including Parkinson's disease, amyotrophic lateral sclerosis (ALS) and spinal cord injury. She is leveraging "big data" sources and machine-based learning to identify novel, reliable predictors of disease progression, and understand how diverse factors interact to predict long-term outcomes. She aims to be a leader in neuro-analytics, helping to uncover innovative treatment strategies and therapies for people suffering with neurological diseases.

"Growing up, I had great teachers whose dedication and willingness to answer my questions allowed me to pursue my passion for mathematics and biology," she says. Encouraged by teachers to enter mathematics competitions, explore lateral thinking at "Challenge Camps" and attend science fairs, Dr. Jacquelyn Cragg developed a strong knowledge of maths, statistics and science, creating a robust foundation for her future career. She continued to benefit from supportive mentors at the International Collaboration on Repair Discoveries in Vancouver, Harvard University and Balgrist University Hospital in Zurich.

Dr. Jacquelyn Cragg perceives major challenges for women in science. Despite the evidence that men and women have the same inherent scientific ability, she believes there are clear differences in the way that raw ability is nurtured over time, with distinct gender biases creeping in. "Overcoming gender stereotypes and encouraging girls to grow their interest in science should start from an early age," she concludes. "Girls and boys must know that everyone can do the same things."

\*The Lancet, 2017 <https://www.ncbi.nlm.nih.gov/pubmed/28931491>.



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