For Women in Science

unesco FONDATION L'ORÉAL

2024 INTERNATIONAL AWARDS

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A word from Jean-Paul Agon

CHAIRMAN OF L'ORÉAL,
PRESIDENT OF THE FONDATION L'ORÉAL

There isn't a day that goes by without the news reminding us of the unprecedented scale of the threats facing humanity, which now take place more often and with greater intensity than ever before.

Yet too many women scientists throughout the world are prevented and even excluded from having the opportunity to contribute fully to creating solutions – despite the urgency to take action and the fact that science is a fundamental key to drive change.

For 26 years now, the Fondation L'Oréal has fought by their side to highlight this reality – the world needs science, and science needs women. This certainty forms the soul and raison d'être of the pioneering *For Women in Science* programme, which we created in 1998 in partnership with UNESCO – our precious ally since the first day in this noble, uphill battle.

Giving women scientists the place they deserve in research, fighting against the obstacles they encounter, inspiring future generations of young girls to pursue a scientific career, contributes directly to the progress and improved wellbeing of the majority.

This is how the Fondation L'Oréal works, with absolute determination.

We are proud to have supported, both personally and financially, more than 4,400 researchers in more than 140 countries.

We are proud to have rewarded 132 eminent scientists from every continent with the International L'Oréal-UNESCO *For Women in Science* Award for their excellent work and exceptional careers. They represent every continent and are at the cutting edge in every field.

In 2023, two of them – Anne L'Huillier and Katalin Karikó – also received the Nobel Prize for physics and medicine respectively. This brings the number of *For Women in Science* International Award laureates to receive this prestigious award to seven.

And the five inspiring profiles that you will discover through these pages illustrate the extraordinary advances spearheaded by our 2024 laureates in addressing cancer and infectious or chronic illnesses.

We are pleased to have initiated and supported an engaged and intergenerational community of women in science, united by their desire to share and disseminate their knowledge. Each of them has given their absolute best to the programme.

We are resolved to speak out regularly about the discrimination and abuse experienced by too many women scientists throughout their career. In science, as in other sectors of society, people must become more aware of these issues. This is a vital and collective leap that we must take to ensure equality, safety and career fulfilment.

We will remain vigilant and fully engaged, as the fight for real equality between women and men in science will take time. And the rights women have won are all too often fragile.

Beyond the question of equality, it is also important to give ourselves every opportunity of high quality scientific innovation that truly benefits all men and women.

More than ever, the Fondation L'Oréal is taking action alongside women in science so that they can continue to advance the boundaries of knowledge, accelerate scientific progress and amplify their impact.

A word from Audrey Azoulay

DIRECTOR-GENERAL OF UNESCO

In a world where science is essential in rising to contemporary challenges, we need to harness all talents. But even today, only one in every three researchers is a woman, and this figure falls to almost one in ten[1] in the artificial intelligence sector, resulting in numerous gender biases in emerging technologies.

Despite the considerable progress made in other sectors over recent decades, one fact remains: in the sciences, gender inequalities persist. Whether this concerns the number of publications, peer recognition, funding or career development, equality is still far from being a reality.

This situation is all the more shocking given that girls perform just as well in mathematics as boys – as shown in a 2022 UNESCO report.[2] Yet only two of the 44 Fields Medalists are women.

How do we explain this discrepancy? We already know the answer: there are still too many cases of discrimination and even gendered violence and harassment in the workplace; not enough female role models for girls to identify with; a lack of mentoring programmes to increase recognition of their work. Not to mention the gender stereotypes which, from childhood, drive many young girls away from scientific careers.

This glass ceiling is a very real obstacle. But it can be broken. And that is what we at UNESCO strive for every day.

First, by taking action early on, particularly in primary and secondary schools, where so much is already at stake. Every day, around the world, UNESCO trains teachers on reducing gender inequalities, and supports governments in developing education policies centered around ensuring real equality.

Advancing gender equality in the sciences is also the purpose of the partnership between UNESCO and the Foundation L'Oréal. Together, we have supported the careers of highly promising women scientists for 26 years: 4,400 women, including the 132 laureates of the L'Oréal-UNESCO *For Women in Science* International Awards.

These efforts are bearing fruit. Of the 25 women who were awarded Nobel Prizes in scientific fields between 1901 and 2023, 60% received this distinction after the creation of our programme in 1998. Six of these laureates first won a L'Oréal-UNESCO International Award.

At UNESCO, we are proud of all the exceptional scientists that we have supported during our 26 years of partnership with L'Oréal – and we thank the Foundation for its unwavering support, past and future.

"Prizes should not be an end in themselves," recently said French microbiologist Emmanuelle Charpentier, who won the Nobel Prize in Chemistry in 2020 and the L'Oréal-UNESCO Prize in 2016 (along with Jennifer Doudna of the United States of America). "However, they do allow us to give young girls an image of science that is not only masculine, but also feminine."

Because we need all women's talents, UNESCO will continue to do its utmost to support them. Yes, the world needs science, and science needs women.

[1] 12%, according to this press release: https://www.unesco.org/en/articles/artificial-intelligence-unesco-launches-women4ethical-ai-expert-platform-advance-gender-equality
[2] UNESCO Global Education Monitoring Report, 27 April 2022.

INTERNATIONAL AWARDS

The outstanding contribution of women to science

Each year since 1998, the Fondation L'Oréal and UNESCO honour five brilliant female scientists, promote their work globally and empower them to act as role models for aspiring women scientists and future generations. The Laureates are recognised for their scientific achievements and remarkable contributions to advancing research on a global scale. To support women-led scientific excellence in addressing societal needs worldwide, one Laureate from each of the five major regions of the world is awarded: Africa and the Arab States; Asia and the Pacific; Europe; Latin America and the Caribbean; and North America.

A RIGOROUS SELECTION PROCESS

More than

350 nominations from scientists

FROM NEARLY 80 COUNTRIES

62 shortlist candidates

WORLDWIDE

evaluated by eminent peer-reviewers

Final selection of the 5 Laureates

by the International Jury

The 2024 jury is proud to present five women with exceptional scientific careers. More than ever, they show that science knows neither gender nor borders. Our laureates are role models for today's young women.

BRIGITTE LINA KIEFFER,
PRESIDENT OF THE 2024 INTERNATIONAL JURY
IN LIFE AND ENVIRONMENTAL SCIENCES

2024 JURY

LIFE AND ENVIRONMENTAL SCIENCE

An independent, international scientific jury selected the five laureates.

PRESIDENT OF THE JURY

Professor Brigitte Lina Kieffer

FRANCE
NEUROSCIENCES

Professor USIAS University of Strasbourg, INSERM Research Director Emeritus, Member of the French Academy of Sciences, L'Oréal-UNESCO Laureate 2014

Professor Kristi S. Anseth

UNITED STATES OF AMERICA
HEALTH BIOTECHNOLOGY

Distinguished Professor, Tisone Professor of Chemical and Biological Engineering, Member of the US National Academies of Science, Engineering, and Medicine. Associate Director of the BioFrontiers Institute, University of Colorado Boulder, L'Oréal-UNESCO Laureate 2020

Doctor Khaled Machaca

QATAR
PHYSIOLOGY AND CELL BIOLOGY

Professor of Physiology and Biophysics, Senior Associate Dean for Research, Innovation, & Commercialization. Weill Cornell Medical College, Doha

Professor Anne Dejean

FRANCE
MOLECULAR BIOLOGY

Professor at the Institut Pasteur, Research Director at INSERM Institut Pasteur. Member of the French Academy of Sciences, Paris, L'Oréal-UNESCO Laureate 2010

Doctor Xiangbin Pan

CHINA
CLINICAL MEDECINE

Director of Cardiovascular Surgery, Fuwai Hospital, Chinese Academy of Medical Sciences

Professor Appolinaire Djikeng

KENYA
AGRICULTURE SCIENCES AND BIOTECHNOLOGY

Director General of the International Livestock Research Institute (ILRI) and Managing Director, Resilient AgriFood Systems (CGIAR)

Doctor Firdausi Qadri

BANGLADESH
IMMUNOLOGY

Director for Centre for Vaccine Sciences of International Centre for Diarrhoeal Disease and Research (ICDDR,B), L'Oréal-UNESCO Laureate 2020

Professor Andrea Gamarnik

ARGENTINA
VIROLOGY

Director of the Instituto de Investigaciones Bioquímicas de Buenos Aires-CONICET. Superior Investigator of the National Research Council (CONICET), Fundacion Instituto Leloir, Buenos Aires, L'Oréal-UNESCO Laureate 2016

Professor Augusto Rojas-Martínez

MEXICO
HUMAN GENETICS

Professor of Human Genetics, School of Medicine and Health Sciences, Research Professor at The Institute for Obesity Research Monterrey, Tecnológico de Monterrey

Professor Philip Hieter

CANADA
MOLECULAR GENETICS AND MEDICINE

FCAHS, FRSC, Professor of Medical Genetics, Michael Smith Laboratories, University of British Columbia

Professor Boshra Salem

EGYPT
ENVIRONMENTAL SCIENCES

Emeritus Professor at the Department of Environmental Sciences - Faculty of Science, Alexandria University

2024 LAUREATES

LAUREATE FOR AFRICA AND THE ARAB STATES

Professor Rose Leke

Former Head of the Department of Infectious Diseases and Immunology, Faculty of Medicine and Biomedical Sciences, and Former Director of the Biotechnology Center, University of Yaounde 1, Cameroon.

Rewarded for her dedicated leadership, outstanding research and pioneering efforts to improve outcomes in pregnancy-associated malaria and support of polio eradication and improved immunization in Africa, as well as efforts to improve the career path of young scientists. Doctor Leke's national, regional, and global influence has profoundly impacted public health in her native Cameroon and across Africa. Her achievements position her as a role model, leading educator and advocate for young women scientists.

LAUREATE FOR ASIA AND THE PACIFIC

Professor Nieng Yan

University Professor, School of Life Sciences, Tsinghua University, Founding President of Shenzhen Medical Academy of Research and Translation, Director of Shenzhen Bay Laboratory, China.

Rewarded for discovering the atomic structure of multiple membrane proteins that mediate the traffic of ions and sugars across the cell membrane, revealing principles governing membrane transport. Her exceptional research has informed multiple disorders like epilepsy and arrhythmia and guided the treatment of pain syndrome. As a leading authority in her field, Doctor Yan inspires women scientists globally and is a strong advocate for gender equality in research and science education.

LAUREATE FOR EUROPE

Professor Geneviève Almouzni

Director of Research from The National Centre for Scientific Research (CNRS) at the Curie Institute, Member of the Academy of Sciences, France.

Rewarded for her seminal contributions to understanding how DNA is packaged with proteins inside the cell nucleus. Her pioneering work in epigenetics has been instrumental in understanding how cell identity is determined during normal development and disrupted by cancer. Her extraordinary successes in advancing world-leading research, training the next generation of scientists and promoting women in science are inspirational.

LAUREATE FOR LATIN AMERICA AND THE CARIBBEAN

Professor Alicia Kowaltowski

Professor of Biochemistry, University of São Paulo, Brazil.

Rewarded for her fundamental contribution to the biology of mitochondria, which are "the cell's main energy source, acting as their batteries". Her work has been critical in understanding the implication of energy metabolism in chronic diseases, including obesity and diabetes, as well as in ageing. Her outstanding contribution as an investigator and mentor as well as her advocacy for science in Latin America and its dissemination to the public are inspirational for young scientists.

LAUREATE FOR NORTH AMERICA

Professor Nada Jabado

Professor, Departments of Pediatrics and Human Genetics, Canada Research Chair Tier 1 in Pediatric Oncology, McGill University, Canada.

Rewarded for revolutionizing our comprehension of the genetic defects responsible for aggressive pediatric brain tumours. Her seminal discovery of the first-ever histone mutations in human disease, referred to as oncohistones, sparked a fundamental change in the cancer research sphere. Through her innovative research and effective leadership in establishing a global collaborative network, she has reshaped the medical approach to pediatric cancer, advancing both diagnostic capabilities and clinical treatments for young patients.

Professor Rose Leke

IMMUNOLOGY

Former Head of the Department of Infectious Diseases and Immunology, Faculty of Medicine and Biomedical Sciences, and Former Director of the Biotechnology Center, University of Yaounde 1, Cameroon

Pursuing a remarkable journey to fight malaria and eradicate polio

Professor Rose Leke is recognised for her leadership and for her outstanding malaria research, particularly her pioneering efforts to improve outcomes for pregnant women with malaria and her tireless involvement and support for polio eradication, as well as for her drive to immunize African children. Her work has contributed profoundly to improving public health in her native Cameroon and particularly across Africa. She has also acted as a role model, educator and advocate for young female scientists.

Her scientific journey has seen her explore the diagnosis of malaria during pregnancy, the acquisition of immunity among pregnant women and infants, and the role played by maternal immunity in reducing placental pathology. Importantly, her team's efforts have shed light on the potential of VAR2CSA-based vaccines for pregnant women, offering hope for improved maternal and child health. She has studied the acquisition of immunity among infants in their first year of life, uncovering valuable insights into their initial antibody responses and the role played by maternal antibodies. She has worked continuously with the World Health Organization and with the GAVI Alliance. She has also been involved in the deployment of the new malaria vaccine, RTS/S and R21. In parallel, she has served as a member of the World Health Organization Malaria Policy Advisory Committee and on the Malaria Elimination Oversight Committee.

In her capacity as Chair of the African Regional Certification Commission for Polio Eradication in the African region, Professor Leke read the declaration on behalf of the commission on the 25th of August 2020 announcing to the world that Africa was henceforth free from the indigenous wild polio virus. She is also one of six members and signatories of the Global Certification Commission that declares the world free from each of the strains of the polio virus.

"The triumph over polio amid the COVID-19 pandemic is a testament to the power of persistence, collaboration and science," she says. "The lessons learned from the collective effort to eradicate polio can inform our approach to combatting other diseases. I am hopeful for a breakthrough that could also completely eliminate malaria."

Nurturing a long-standing interest in solving illness and disease

Professor Leke's interest in science, disease and illness began when she was around eight years old. Her curiosity was reinforced when she suffered a lung abscess, undergoing an operation at a hospital in Limbe. "And whenever I or my brother had a fever, which was often malaria, my mother would boil a pot of lemon grass and fruit trees leaves and cover us over the boiling pot under a blanket," she says. "This was very relieving, and I became interested in learning more and helping to reduce suffering."

Professor Leke's interest in researching malaria among pregnant women arose from conversations with her husband, a gynaecologist, who told her that many women had fever with complications yet tested negative for malaria. This prompted her to lead the research that culminated in an important discovery at the time. Some 25% of pregnant women she tested for malaria in Cameroon at the time of delivery had parasites in their placenta smear but not in the blood taken from their finger, the only way that malaria was diagnosed in those days. This finding was a revelation, for it showed that blood tests alone were not sufficient to identify whether pregnant women had malaria.

This information was shared with the Society of Obstetricians and Gynaecologists in Cameroon as well as at conferences across the continent. To help prevent malaria among women, she encourages the use of bed nets and promotes maternal and prenatal testing, while advocating for the RTS/S and R21 malaria vaccines, the newest tools, to be used in conjunction with existing tools. She is co-author to a book entitled *'Practical Guide to the Fight against Malaria'*.

Fighting to take her place in science

Her journey as a woman in science in Africa has been far from straightforward. Although she was encouraged in her vocation by her parents, she initially only had access to biology lessons when studying at Cameroon's first secondary school for girls. She was also the only girl to pass a written exam to study in the United States of America, failing only when she was interviewed by an all-Cameroonian panel. However, a US director of the programme was undeterred and travelled 400 kilometres to find her, offering her the opportunity to undertake a scholarship for her BSc.

As a female scientist in Africa, Professor Leke has faced considerable challenges. She has discovered for example, that her opinions were not always heard. These barriers, perpetuated by entrenched gender stereotypes created environments where she felt invisible. For example, at the University of Yaounde 1, where she worked for over 30 years, it took 12 years (rather than six) for her to be promoted from Senior Lecturer to Associate Professor. "And because my research was progressing well, I was thrown out of a room that hosted my work and equipment by the director of the institution," she explains.

"My entire career, my journey, has been an experience in getting through the glass ceiling, and doing my best, remaining confident and always striving for excellence," she continues. "However, I believe the ceiling can truly be shattered through collective action. In my microcosm in Cameroon, I have already seen significant strides in the female scientific landscape."

Empowering more African women to become scientists

Importantly, Professor Leke is determined to help empower her fellow women in science in order to help more women enter and thrive in research. She founded the Higher Women Consortium, Cameroon, to harness senior female scientists as positive role models and mentors. Through a holistic mentorship approach combining support for writing grant proposals with support for the development of technical and life skills, these young scientists are gaining more self-confidence and are resilient in handling day to day problems, be they academic or in relation to research, their work–life balance, motherhood or life in society.

She and her colleagues encourage young scientists to pursue their dreams of a career in scientific research. "When I encounter obstacles, I jump over or go around them and if a door closes, a window opens," she concludes.

> *"I am hopeful for a breakthrough that could completely eliminate malaria."*

Professor Nieng Yan

STRUCTURAL BIOLOGY

University Professor, School of Life Sciences, Tsinghua University, Founding President of Shenzhen Medical Academy of Research and Translation, Director of Shenzhen Bay Laboratory, China

Delivering insights that pave the way for new treatments

Professor Nieng Yan is rewarded for paving the way to new health treatments by discovering the atomic structure of proteins that facilitate the transport of chemical substances, such as glucose and ions, across the cell membrane. Taking place through particular carriers and channels, this transport is essential to maintaining the effective functioning of cells. Any malfunction in this cross-membrane transport can lead to illness. She reveals the principles governing their behaviour using cryo-electron microscopy – a breakthrough technology that enables scientists to identify the physical and structural atomic form of membrane channels. In this way, Professor Yan provides a molecular interpretation for ineffective functioning or mutations that can lead to pain or diseases such as epilepsy and arrhythmia. These insights also deliver a comprehensive view of how drugs or toxins act on the proteins in the body, while offering definitive clues to the development of novel therapeutics and drugs, such as non-addictive pain killers.

Pushing back the boundaries of knowledge

"We aim to push the envelope of human knowledge," she says. "Using pioneering technology, I have transformed my work from the exploration of physiological and cellular processes to achieve a more precise view of potentially effective health solutions. Ultimately, I'd like science to understand the universe, the origins of life and the basis of consciousness."

In particular, she is exploring proteins called voltage-gated sodium channels, which control the firing of electrical signals in our body that allow us to respond rapidly to a wide range of stimuli. For these channels to function effectively and consistently, the channels open and close quickly. Professor Nieng helped to establish this finding in 2017 using cryo-electron microscopy to highlight, in high resolution, the structure of a sodium channel isolated from electric eels. This observation will also enable scientists to see the active mechanism of medicines and toxic substances and develop pathways for new solutions.

"In structural biology, we always proudly say that seeing is believing," she says. "Observing the structure at an atomic resolution allowed us to solve the puzzle immediately – I felt it was a miracle created by nature."

Understanding that girls are good at science

As a child, Professor Yan was inspired by a traditional Chinese mythical novel '*A Journey to the West*', in which the main character turns into any object of any size, wondering what the world would be like at a sub-microscopic scale. Discovering the concept of Mendelian inheritance, which enables life to be coded and decoded in genetic material, further confirmed her passion for life sciences. She initially wanted to be a writer but her real strength lay in chemistry and physics and she was encouraged by her head teacher Ms Yi Guan, who "always told us that it was nonsense to say girls were not good at science." She began her academic career at Tsinghua University, studying biology. Curious about discovering other cultures and ways of life, she subsequently applied for graduate programmes in the United States of America without yet having a clear idea about her future career.

At the Department of Molecular Biology of Princeton University, she discovered a nourishing work environment and explored programmed cell death, discovering a long-lasting and genuine interest in scientific exploration, with her PhD supervisor inspiring her to develop bold ambitions. "Gradually, I could not imagine myself not being a scientist," she says. Eventually she returned to Tsinghua, where she enjoyed reliable funding and a good research environment and could attract talented post-doctoral students. Throughout her career, Professor Yan has benefitted significantly from the complementary expertise and different ways of thinking that come with international collaboration.

Fighting for women's rights in society

"We must change the historical and cultural bias against women in academia and society by establishing gender equality and creating more female role models to show that women can and do lead, and deserve fair recognition," she explains.

Professor Yan feels grateful for the consistent encouragement and support provided by her parents. However, she has had to fight for her female students to be given equal opportunities and to take her place on scientific and leadership committees, frequently reminding her male colleagues to take gender equality into consideration. Highlighting stories of discriminatory behaviour has won her 1.3 million social media followers, providing her with a platform for influencing aspiring young female scientists, to whom she says "be brave and be confident and never shy to reach out for help."

In keeping with the tradition of female scientists fighting for other women to enter the scientific workplace, she has organised an annual forum since 2015 dedicated to women in science. "It is now my turn to create a similarly nurturing environment for young scholars, particularly women," she says. She is also acting on this commitment within her own laboratory and beyond, gradually recruiting a greater number of female principal investigators and leading two research institutes where more than half of senior leaders are women.

> *"I could not imagine myself not being a scientist."*

LAUREATE FOR EUROPE

Professor Geneviève Almouzni

MOLECULAR BIOLOGY

Director of Research from The National Centre for Scientific Research (CNRS) at the Curie Institute, Member of the Academy of Sciences, France

Advancing knowledge of the optimal organisation of DNA in human cells

Professor Geneviève Almouzni is rewarded for shining a light on the dynamic behaviour of DNA within cells, tissues and organisms. Her research centres on understanding how the genome is organised within the cell nucleus. In particular, she explores how two-metre long DNA molecules are packaged and function within the cell nucleus, which measures just a few thousandths of a millimetre. DNA wraps around protein building blocks (histones) to make a complex called chromatin. The way DNA is packaged within the nucleus enables each cell in an organism to read the code in a specific manner, influencing the cell's destiny. Professor Almouzni studies the mechanisms controlling this packaging during the normal cell cycle in development and identifies when these processes are disrupted. In this way, she highlights their relevance in the context of diseases, including cancer, creating a foundation for numerous applications for diagnostic, prognosis and treatment.

"Ultimately, my research could provide better treatment for patients and help detect earlier signs of disease in order to promote healthier ageing and a better quality of life," she says.

A long-standing fascination for the origins of life

Professor Almouzni's fascination with scientific observation and the origins of life began when she was a child observing tadpoles and frogs at different stages of development in a pond. Her work was subsequently guided by a central question: how can an entire organism develop from a single cell? "I am passionate about how much we can learn from evolution and the diversity of organisms on Earth," she explains.

For Professor Almouzni, the most interesting aspects of chromatin biology are understanding DNA packaging, and its assembly and disassembly in replication and other processes in cells over time. Major technological advances in recent decades have enabled her to study individual cells and even a single molecule within cells more effectively,

using sequencing and imaging. She has discovered that it is possible to make chromatin in different ways, using different histone variants. “This was exciting, as it enabled us to add versatility in shaping chromatin,” she says. It was the mutation of these histone variants that was proven to lead to brain tumours in 2012, bringing her discoveries to the world stage.

Her real eureka moment came when she understood that histone ‘building blocks’ were not all the same, with numerous variants, among which some are fundamental for using chromatin at the right moment or organising it differently, for example. In this way, she has been able to shine a light on how these blocks position themselves appropriately within the genome in order to convey a particular piece of information in each cell.

Leading important collaborations towards better research outcomes

Interdisciplinarity has formed an important part of Professor Almouzni’s journey. For example, at the Curie Institute, she has interacted with physicists to design the first system capable of tracking chromatin assembly on DNA using microfluidic devices and microscopy, with immunologists to better understand the immune system and with doctors to find medical applications for her discoveries.

Today, she contributes to the European Research Council, which promotes diverse research through a bottom-up, flexible approach to tackling new and unexpected challenges. In terms of international collaboration, she has also played a leading role in the European LifeTime Initiative, which is exploring the cellular and molecular mechanisms involved in the development of complex diseases, with a view to redefining the role of artificial intelligence in precision medicine and improving patient outcomes.

Viewing failures as steps toward success

As a woman in science, Professor Almouzni has experienced first-hand the lack of support for mothers: in her case, she navigated her work–life balance with support from her husband and colleagues. She believes that better childcare, paternity leave and a more equal role place for men as parents could contribute significantly to enabling more female scientists to flourish.

Prof, Almouzni is unequivocal about the need for more women to take their place in science. “We must tap into the skills and abilities of the whole of humanity in order to deliver the diverse views and capacity we need to innovate and create scientific solutions to the challenges we face as a society,” she says. “More needs to be done to support girls at an early age, helping them to gain the confidence they need to become scientists.”

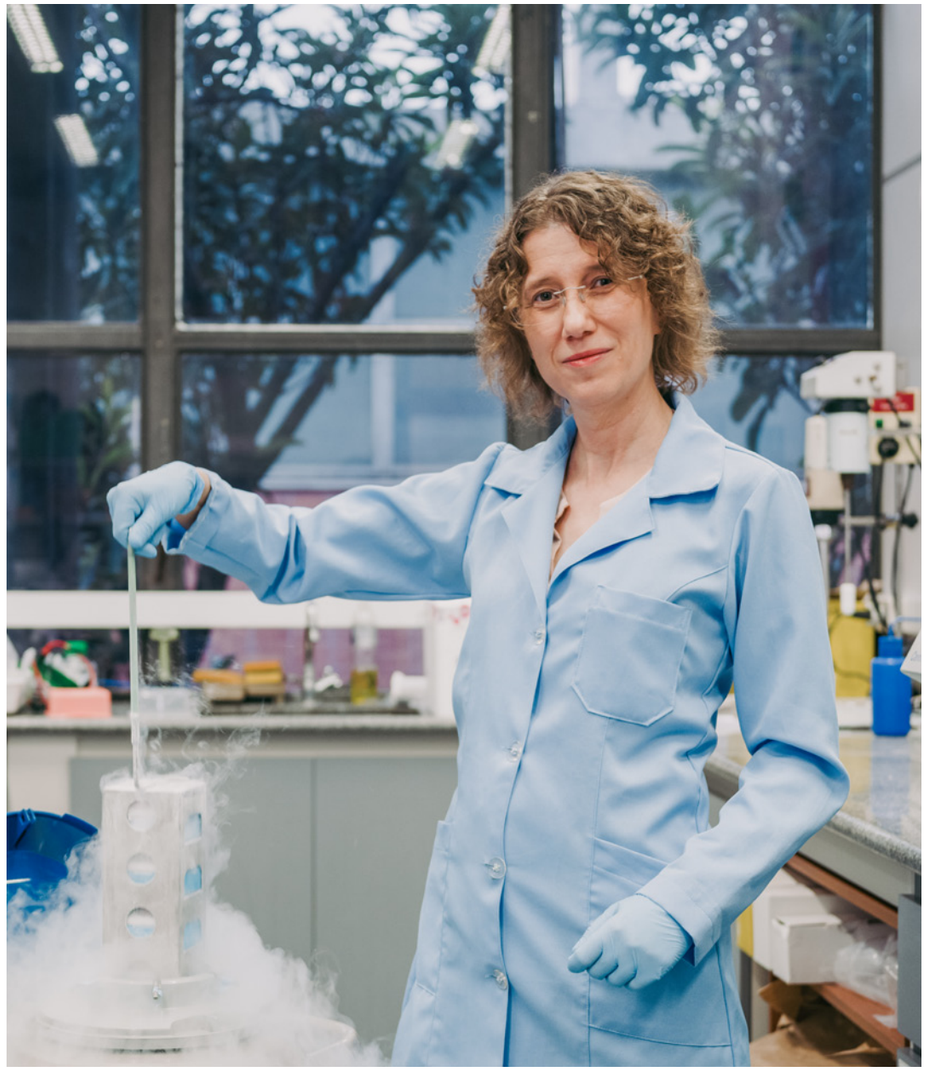
In order to encourage up and coming young scientists, she has chaired the European Network of Excellence EpiGeneSys. There, she also promoted gender and diversity to support ‘research without borders’, and to enable women to benefit from equal opportunities. She also promotes gender equality in academia through the European Union–Life alliance LIBRA project.

To future female scientists, she says: “Simply be yourself to progress in science and consider failures as steps towards success. Most importantly, as a scientist, trust in yourself, follow your curiosity and do not hesitate to seek help. You are stronger with others at your side.”

> *“Ultimately, my research could provide better treatment for patients and help detect earlier signs of disease.”*

Professor Alicia Kowaltowski

BIOCHEMISTRY



Professor of Biochemistry, University of São Paulo, Brazil

Understanding biochemical reactions in humans to improve health outcomes

Professor Alicia Kowaltowski is rewarded for her groundbreaking research on energy metabolism, the biochemical reactions that enable humans to derive energy from food in order to live and function. In particular, she explores the reactions within cells that happen in mitochondria, the cell's main energy source, which act as its batteries. By better understanding how we break down molecules to produce energy and recording any changes that could lead to disease, she is helping to shine a light on pathways to improve the outcomes of aging and diverse diseases, including obesity, diabetes, heart attacks, stroke, fatty liver disease, cancer and immune diseases.

Exploring her natural curiosity

With an inherent curiosity and explorative nature towards the world, Professor Kowaltowski has always thought of herself as a scientist. Her parents, both academics, supported her interests and she particularly enjoyed lessons on the human body and interactions between hormones and organs, opting to specialize in biochemistry at secondary school. As a medical student, she was invited by her mentor to explore mitochondria and metabolism. "I fell in love with the field," she says. "Metabolism is fascinating because it sits at the very core of life - all technical definitions of life must include metabolism and the flux of molecules being transformed within us."

At a practical level, Professor Kowaltowski believes that science involves "pursuing new understandings of the world around us" and that asking good questions is the best way to make progress in research, with 'eureka moments' being less important. For her, the majority of scientists' work involves understanding more each day, formulating good theories to explain the initial questions and being open to experimental results proving these theories incorrect "in a fascinating, complicated way, leading to more interesting questions".

Expanding scientific horizons through increased collaboration

"Importantly, we are generating new findings as a community of scientists, explaining and improving treatment options for a myriad of diseases," she explains. "My dream would be for us to have the best possible environment to pursue research, overcoming policy and bureaucratic challenges, and achieving the infrastructure and fundamental technical support we need to take our research to the next level."

The opportunity to pursue part of her PhD and subsequent post-doctoral studies with supportive mentors in the United States of America was highly formative in building her confidence, before she returned to Brazil as a professor at the University of São Paulo. In particular, they were instrumental in giving her the freedom to pursue her curiosity, advance in science and deliver cutting-edge results. However, her time in the USA also highlighted more constraints for female scientists in reaching senior leadership roles, particularly in terms of maternity leave and childcare.

Today, she encourages Brazilian students to undertake fellowships abroad, supported by the São Paulo funding agency FAPESP, in order to stimulate their research, broaden their horizons and deliver pioneering results. "It also makes the world a little less unequal, as we all learn that we are more alike than we are different," she says.

"My advice to up and coming scientists: be curious, ask good questions, be open to unexpected results, find supportive supervisors and never give up," she continues. "Exploring the limits of knowledge gives us the resilience to continue pushing boundaries and breaking barriers."

Delivering better research outcomes through diversity

As a woman in science in Brazil, Professor Kowaltowski is part of a female majority in biological fields. She considers that understanding the enabling conditions for women to thrive in science could help to improve conditions worldwide for women in science. These include paid maternity leave, affordable childcare and extended time periods for evaluations for grants and projects, allowing for fairer and more equal opportunities.

In particular, she believes in the power of role models, including the potential for high-profile awards to inspire young girls to pursue their dreams. She is also a firm supporter of diversity, highlighting that numerous studies prove that diversity delivers better research outcomes. "We are still learning how to achieve ideal diversity and equality," she says. "I think we need a lot more scientific approaches to developing inclusion policies. Sound science should be the basis of everything, providing opportunities so that we retain real talents along the way."

> *"My advice to up and coming scientists: be curious, find supportive supervisors and never give up."*

LAUREATE FOR NORTH AMERICA

Professor Nada Jabado

HUMAN GENETICS

Professor, Departments of Pediatrics and Human Genetics, Canada Research Chair Tier 1 in Pediatric Oncology, McGill University, Canada

Leveraging genetic research to cure cancer among children and teenagers

Professor Nada Jabado is rewarded for revolutionizing our comprehension of the genetic defects responsible for brain tumours in children. Her team made a breakthrough in cancer research and created a milestone for biology by identifying the epigenome (the combination of chemical compounds that affects how genes are expressed) as a previously unsuspected hallmark of the development of brain tumors and other cancers. The changes her team observed in the epigenome were the first identified mutations in regulatory histones (a group of proteins) to be directly associated with human disease, linking one of the most evolutionary conserved proteins (known as oncohistones) with cancer. These histone proteins play an important role in the packaging and repair of DNA and within the genetic code, and had previously been considered as unchanging.

This ground-breaking discovery sparked a paradigm shift in cancer research, establishing a field of study for what we now know as epigenetic-driven cancers. In particular, it inspired further global studies of the clinical and biological consequences of histone mutations, providing valuable tools for investigating normal development and chromatin. In 2020, Professor Jabado's findings were selected as one of the most important discoveries in cancer in the last 20 years by Nature journal's 'Milestones in Cancer'.

Additionally, her leadership in establishing a global collaborative network has helped to advance diagnosis and clinical treatments for young cancer patients. Her team has helped to inform the 2021 World Health Organization classification for Brain Tumours, now the worldwide standard for establishing diagnoses and orienting therapy.

Understanding the secrets of the human body

From an early age, Professor Jabado was fascinated by the human body and how it is regulated, as well as by the differences between species. "I can't pinpoint a single moment, I just remember the sheer anticipation I had

for science classes," she recalls. At school in Lebanon, she showed an interest in languages and mathematics. However, science won the day and, having initially wanted to become a medical doctor or surgeon, she fell in love with immunology during her medical studies, admiring "the concept of designing complicated yet simple immune responses to recognise ourselves and kill foreign agents".

She highlights a defining moment in her career as being when she uncovered the mutations in histone H3 genes, which are vital to maintaining every biological process in the human body. Her research was key in understanding how these mutations slow development and block the ageing of cells – a new mechanism for generating cancer.

As a clinician scientist, "I'm seeking answers where there are none and helping to deliver better outcomes for patients," she says. "Our findings are guiding the field and could pave new avenues towards cancer therapeutics, helping children and young adolescents to live longer and healthier lives and alleviating the burden of disease."

Building a fighting spirit and mentoring power

Having left Lebanon as a teenager, Professor Jabado studied and trained in France then subsequently pursued her career in Canada, despite funding challenges, which remain an obstacle to translating her research into delivering meaningful outcomes for patients. In both countries, she encountered supportive mentors and role models who inspired her to understand the value of research for medicine and supported her with grant proposals and career advice. At Necker Children's Hospital in Paris, she met a doctor who completely changed her view of medicine. "We need to understand to be able to treat," Professor Jabado explains, "and therefore research is fundamental to making any advance." This idea has crafted her thinking ever since.

Collaboration has proved to be an essential element of her own success in science. She has established long-standing relationships with international scientists. "When I started my laboratory, I emailed 500 scientists across the world and seven replied. They remain my long-standing partners," she says. Establishing an international consortium among more than 20 countries, she has been able to recruit, investigate and identify targets in brain tumours. "Through this collaboration, I have been able to acquire expertise, new meaningful directions and results more rapidly to help improve patient care," she says.

Promoting diversity and inclusion to empower women in science

Professor Jabado was often one of the "rare women" at scientific or committee meetings. "I firmly confront people who place obstacles in my way, intimidate me or push me into making mistakes or actions I do not want to embark on," she explains. She fully supports initiatives that help women to reach their full potential. Fostering inclusivity, promoting diversity and challenging ingrained stereotypes and systemic biases will help to create an environment that values and rewards merit, irrespective of gender, she believes. Additionally, more women must be made aware that it is possible to balance a career as a senior scientist with having a family.

To up and coming scientists, she says: "Follow your passion for research, stay determined and embrace failure as a way to move forward. This is what builds us, strengthens us and opens many important doors – keep trying until you achieve your dream."

> *"Our findings could pave new avenues towards cancer therapeutics, helping children and young adolescents to live longer and healthier lives."*

26 YEARS OF COMMITMENT

Empowering women scientists for 26 years

For 26 years, the Fondation L'Oréal and UNESCO have worked together to empower and promote women in science through the *For Women in Science* programme. This visionary partnership has placed the issue of gender equality in science firmly on the international agenda by highlighting the work of many outstanding female scientists, accelerating women's pathways to leadership in science, and inspiring the next generation of female researchers. This forms part of the Fondation L'Oréal's long-standing commitment to supporting women's rights and fighting for gender equality as one of the two transversal global priorities for UNESCO.

The World needs Science and Science needs Women

Today, women are still highly underrepresented in science: they represent only 1/3 of the researchers worldwide. Yet we need their talents and perspectives more than ever to deliver gender-balanced solutions to the complex social, economic and environmental challenges we face today.

Women pursuing scientific careers still encounter a multitude of obstacles and only a small proportion hold leadership positions, preventing them from leading important scientific research programs and projects and serving as role models for younger generations. Only 1/4 of senior academic positions in Europe are held by female scientists and there have been only 25 female laureates since the creation of the Nobel Prizes for science in 1901.

Our contribution to change the game

Over the past 26 years, the L'Oréal-UNESCO *For Women in Science* programme has helped identifying and highlighting successful role models at the highest level, support young promising talents at the beginning of their careers, and inspire young girls to pursue their scientific vocation.

More than 4,400 women scientists have been supported and mentored through the L'Oréal-UNESCO partnership. Working in life and environmental sciences, mathematics, engineering and computer science, they are changing the world through their research and serve as inspiring examples for future generations.

Every year, for the past 26 years, the *For Women in Science* International Awards have honoured five distinguished women scientists from all over the world, for a total of 132 Laureates to date.

Six of them – Ada Yonath, Elizabeth H. Blackburn, Emmanuelle Charpentier, Jennifer Doudna, Katalin Karikó and Anne L'Huillier – were first recognised by the L'Oréal-UNESCO *For Women in Science* International Awards and then received a scientific Nobel Prize.[3]

We also annually support over 250 young female researchers in their doctoral and post-doctoral careers through the "Young Talents" programs, covering over 140 countries.

[3] Christiane Nüsslein-Volhard was awarded the Nobel Prize in Physiology or Medicine in 1995 and the Special Prize "L'Oréal-UNESCO tribute for UNESCO's 60th Anniversary" in 2006.

KEY FIGURES

MORE THAN
4,400
FEMALE SCIENTISTS SUPPORTED

NEARLY
50
PARTNER SCIENTIFIC INSTITUTIONS

132
LAUREATES REWARDED FOR THE EXCELLENCE OF THEIR WORK

7 OF WHOM HAVE RECEIVED A SCIENTIFIC NOBEL PRIZE

53
"YOUNG TALENTS" PROGRAMS COVERING OVER
140 COUNTRIES

MORE THAN
500
SCIENTISTS INVOLVED EACH YEAR IN THE SELECTION PROCESSES

ABOUT THE

Fondation L'Oréal

The Fondation L'Oréal supports and empowers women to shape their future and make a difference in society, focusing on three major areas: scientific research, inclusive beauty and climate action.

Since 1998, the L'Oréal-UNESCO *For Women in Science* programme has worked to empower more female scientists to overcome barriers to progression and participate in solving the great challenges of our time, for the benefit of all. For 26 years, it has supported more than 4,400 women researchers from over 140 countries, rewarding scientific excellence and inspiring younger generations of women to pursue science as a career.

Convinced that beauty contributes to the process of rebuilding lives, the Fondation L'Oréal helps vulnerable women to improve their self-esteem through free beauty and wellness treatments. It also enables underprivileged women to gain access to employment with dedicated vocational beauty training. In 2023, over 23,000 women have benefited from these beauty and wellness treatments, and over 45,000 women have taken part in dedicated training courses since the programme began.

Finally, women are affected by persistent gender-based discrimination and inequalities, exacerbated by climate change. While they are on the frontline of the crisis, they remain under-represented in climate decision-making. The *Women and Climate* programme of the Fondation L'Oréal supports, in particular, women who are developing climate action projects addressing the urgent climate crisis and raises awareness of the importance of gender-sensitive climate solutions.

ABOUT

UNESCO

With 194 Member States, the United Nations Educational, Scientific and Cultural Organization contributes to peace and security by leading multilateral cooperation on education, science, culture, communication and information.

Headquartered in Paris, UNESCO has offices in 54 countries and employs over 2,300 people.

UNESCO oversees more than 2,000 World Heritage sites, Biosphere Reserves and Global Geoparks; networks of Creative, Learning, Inclusive and Sustainable Cities; and over 13,000 associated schools, university chairs, training and research institutions.

Its Director-General is Audrey Azoulay.

"Since wars begin in the minds of men, it is in the minds of men that the defenses of peace must be constructed" – UNESCO Constitution, 1945.

The Fondation L'Oréal and UNESCO would like to express their gratitude to their partners JCDecaux and Paris Aéroport for the support to the *For Women in Science* programme.

A powerful promotional display campaign raising awareness on the importance of women in science will be running throughout September in nine major airports around the world (Boston, Dubaï, Frankfurt, Johannesburg, London, Los Angeles, Paris, São Paulo, Shanghai)

All media resources for the
L'Oréal-UNESCO *For Women in Science* programme are available on
WWW.FONDATIONLOREAL.COM

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