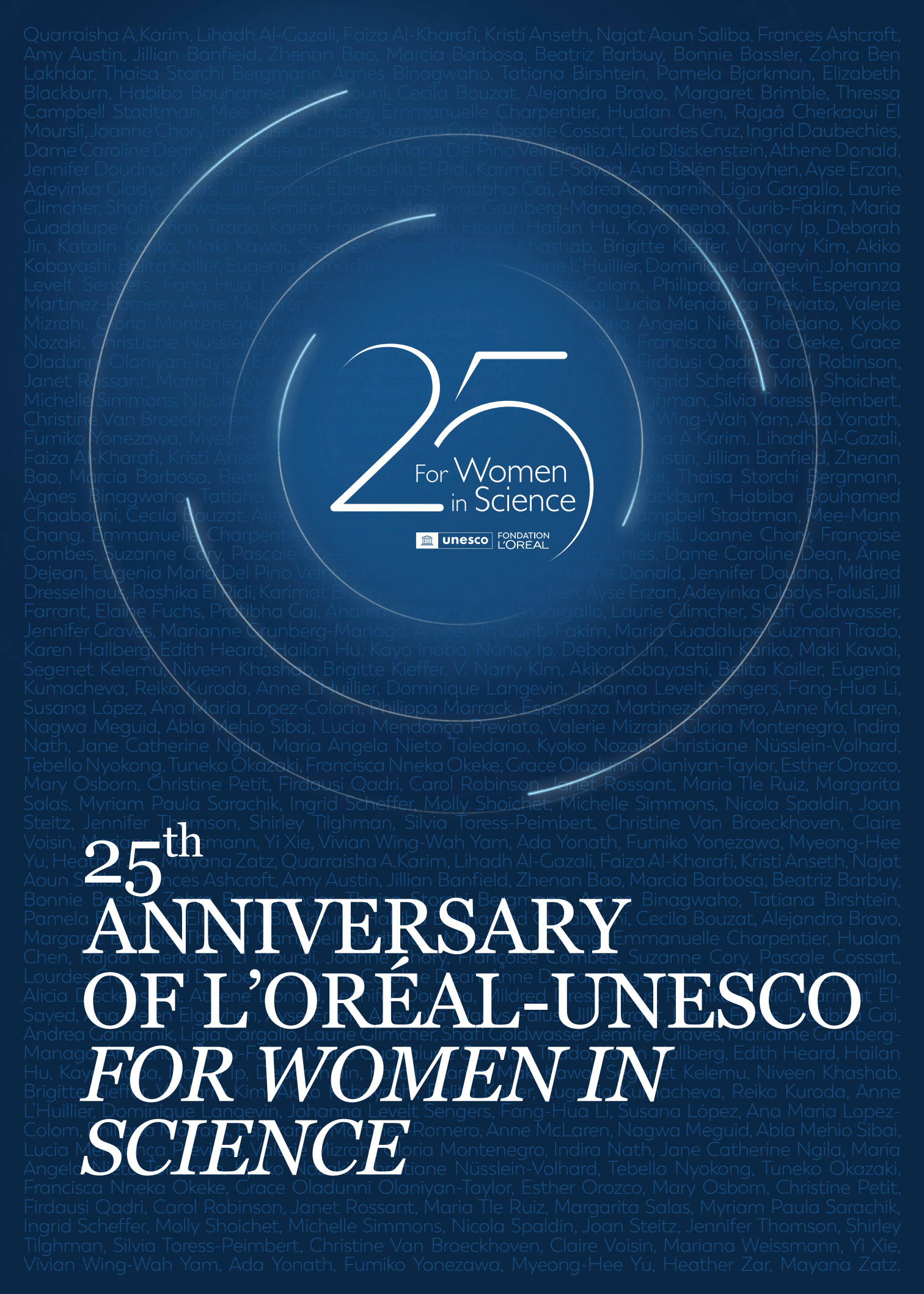


25th ANNIVERSARY OF L'ORÉAL-UNESCO *FOR WOMEN IN SCIENCE*

Welcome to this edition of the L'Oréal-UNESCO *For Women in Science* International Awards. This is a special milestone, as we are celebrating 25 years of promoting gender equality and empowering women in science. Join us in recognizing and rewarding the outstanding researchers who are this year's winners. As we honour their achievements and our collective progress in breaking the glass ceiling in science, let us remember that there is still a long way to go. We remain committed to promoting women in science, as we renew our efforts to create a world where girls and boys can fulfil their dreams to become scientists who contribute equally to solving humanity's greatest challenges.

SUMMARY

A word from
Jean-Paul Agon

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

Some 25 years ago, L'Oréal chose to engage in the fight for equality in science.

A fundamentally necessary fight, in a world that had been used to rendering invisible and hindering women for centuries – just because they dared to invest in science.

So it was a pioneering fight. Well before people demanding real equality in all spheres of society had finally been heard.

An obvious fight in our eyes, which drew nourishment from our own history and values. Because L'Oréal was founded by a chemist, research is written in our genes. Because equality and inclusion sit at the heart of our commitments.

To lead this fight, we joined forces with UNESCO. For a quarter of a century, our partnership has been based on the confidence and the unwavering will to give female scientists the place they deserve.

The figures speak for themselves. Only a third of researchers in the world are women. This proportion falls by nearly half at a senior level. And less than 4% of women have been awarded a Nobel Prize for Science.

In 25 years, the time of a generation, the *For Women in Science* program has contributed to creating a transformation.

We are proud to have supported more than 4100 researchers throughout the world, recognising eminent scientists each year with a prize for excellence – such as those whom you're going to discover in these pages – and by giving young promising scientists doctoral and post-doctoral bursaries in more than 110 countries. We are proud to have raised the profile of women representing every continent and ahead of every field.

We are happy to have begun and contributed to establishing a community of female scientists who are ever more united and influential. They all agree that the first rate training, networking and exchanges to which they have access, thanks to our efforts, are career accelerators and confidence boosters.

After 25 years of commitment, the number of female scientists has progressed in the world, but far too slowly. Our determination is greater than ever.

We are convinced that we must intensify our activities for more impact.

In particular, among the new generations, by investing in the education of young girls and promoting scientific careers, in order to help them develop or pursue a dream of science and assure them that they have a place there.

But also among institutions, partners, public authorities, the scientific and academic world, in order to promote a real cultural change throughout society. We must all take our part in the responsibility of staying vigilant, as the rights women have obtained remain fragile.

This fight for inclusion overtakes the question of gender. Through their exceptional discoveries, the impact these extraordinary women have on the world is immense. Scientific and technical progress, and progress in itself, which we so need, won't be achieved without them.

Alongside all women in science, today and tomorrow, the Fondation L'Oréal will continue to be fully active so that they have the opportunity and the capacity, on equal terms, to build a better world, for all women and men.

More than ever, the world needs science and science needs women.

A word from Audrey Azoulay

DIRECTOR-GENERAL OF UNESCO

This year, the L'Oréal-UNESCO *For Women in Science* Program celebrates its 25th anniversary.

Twenty-five years represents 127 female scientists of 42 different nationalities who have received the L'Oréal-UNESCO International Awards, including five who have also received the Nobel Prize. It represents around 4000 young women researchers, entrepreneurs and inventors, at least half of whom are from developing countries, who have been supported and accompanied early in their scientific careers. It represents 25 years of joint efforts to ensure that the role of women is fully recognized in mathematics, in biology, in neuroscience, in physics, in medicine, in agronomy – in all scientific fields and their applications.

We have everything to gain from making the sciences more open – not only to women but also more generally. Because when science is open, it is more effective and more relevant. Closing off science, preventing it from opening up to other goals, other methods and other perspectives, impedes scientific innovation. This is the conviction that underpins UNESCO's recommendation on Open Science, adopted by our Member States in November 2021. It is also the conviction at the heart of the L'Oréal-UNESCO *For Women in Science* Program.

Although real progress has been made, as underlined in UNESCO's 2021 Science Report, much remains to be done when it comes to women in science. Indeed, according to this same report, just one in three researchers is a woman.

We must therefore step up our efforts to promote access to science for all women worldwide and encourage them to take up careers in this field. At UNESCO, where gender equality is a transversal priority, we have committed to supporting inclusive scientific policies, as well as scientific education for girls and women.

We must also continue to combat stereotypes and affirm that scientific excellence has no gender or nationality, by supporting women in their scientific careers, and by honouring both promising young researchers as well as accomplished scientists – who offer new role models, new perspectives, to all girls dreaming of science.

That is the aim of this program, led for the past 25 years by UNESCO and the Fondation L'Oréal, which I thank.

Together, let us continue to celebrate female scientists, to uphold this simple but powerful message: the world needs science and science needs women. Long live women in science!

For 25 years, the Fondation L'Oréal and UNESCO have worked together to promote women in science through the *For Women in Science* International Awards, and Young Talents Programs, putting female scientists in the spotlight and contributing to breaking the glass ceiling in science.

CELEBRATING 25 YEARS OF EMPOWERING WOMEN IN SCIENCE

2022 *For Women in Science* International Awards Ceremony

Celebrating 25 years of empowering women in science

For 25 years, the Fondation L'Oréal and UNESCO have worked together to empower and promote women in science through the *For Women in Science* program. 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 longstanding commitment to supporting women's rights and fighting for gender equality and has contributed to the advancement of gender equality as a global UNESCO priority.

1998 *For Women in Science* International Awards Ceremony

Understanding the gender equality challenge

Women are still highly underrepresented in science, yet we need their talents and perspectives more than ever to deliver gender-balanced solutions to the great social, economic and environmental challenges we face today. When the L'Oréal–UNESCO *For Women in Science* program started 25 years ago, most countries were not collecting gender-disaggregated statistics on researchers. Today, the majority of countries are doing so. In 2013, women accounted for 28% of researchers. Today, they account for 33%. This is an improvement but we are still far from gender parity. Women pursuing scientific careers still face numerous challenges and only a small proportion hold leadership positions, preventing women from determining and directing important scientific research programs and projects and from serving as role models for younger generations. For example, only 18% of senior scientific roles are occupied by women in Europe, only 12% of the membership of national science academies globally are women and just 4% of Nobel Prizes in physics, chemistry and physiology and medicine have been awarded to women since 2011.

2018 *For Women in Science* International Awards Ceremony

What impact has the L'Oréal-UNESCO *For Women in Science* program had on women in science over the years?

The program has supported and raised the profile of more than 4100 women through research grants for young female scientists. The L'Oréal-UNESCO International Awards have celebrated and recognized 127 Laureates for the excellence of their research and their positive impact on the advancement of scientific knowledge.

> *"I gained significant visibility in Canada and... internationally, which opened more doors in science."*

The program has established a network of 52 national and regional programs covering more than 110 countries. It has mobilized some 500 scientists and forged partnerships with 50 scientific institutions around the world to select the most promising female scientists.

According to a recent survey of the alumnae of the *For Women in Science* network, the program has contributed to retaining female talent, with 97% of alumnae still working in science-related fields. The same study also showed that the program has increased these women's visibility, helping to advance their careers. "I gained significant visibility in Canada and internationally, which opened more doors in science," explains Professor Molly Shoichet, Laureate of the 2015 International Award for North America.

2003 *For Women in Science* International Awards Ceremony

Winning the award has also raised the alumnae's self-confidence at work. According to Dr Lucie Barblu-Levast, who was recognized as a young talent by the *For Women in Science* France program in 2018: "This award came at a key moment in my life, which allowed me to build confidence in myself and continue in the world of research."

Recipients of the award have discovered more professional opportunities. For example, Professor Marie Abboud, 2009 International Fellow from Lebanon, has affirmed that "the prize has been the catalyst of my scientific career".

For many alumnae, the *For Women in Science* program has provided a source of inspiration and drive to create positive change for the next generation of female scientific leaders. Some 88% of respondents have felt more engaged in supporting this cause since winning the award. "I am part of many women's associations and I am leading a group of girls in research under my supervision," says Dr Soupi Nkeutcha Marietta Solange, 2010 International Fellow from Cameroon.

> *"I can affirm that the prize has been the catalyst of my scientific career."*

2000 *For Women in Science* International Awards Ceremony

2000 *For Women in Science* International Awards Ceremony

The *For Women in Science* community is ready to play a major role in bringing about positive change. Created in 2021, a dedicated online platform uniting the alumnae of the program is already connecting more than 2000 female scientists; it continues to provide leadership training and real opportunities for women to advance personally and professionally. It enables women to share their experiences and research, develop new collaborations, learn about professional opportunities and become ambassadors of the program to attract more female scientists.

What does the future hold?

Inclusion is the only way forward to deliver solutions to the pressing challenges of our time – from resource scarcity and climate change to social inequality, pandemics and the negative effects of the steep rise of artificial intelligence.

Much remains to be done to advance gender equality in science. A systemic change is required to empower women, in order to close the gender gap in science and factor gender into the outcomes

> *"I am part of many women's associations, and I am leading a group of girls in research under my supervision."*

of science, technology and innovation. Above all, as a society, we must invest in the education of girls and encourage them to aspire to become scientists – to know that this is possible and that it will lead to a meaningful and fulfilling career. We want to catalyse a cultural transformation and shape a world where both girls and boys have the right to pursue science to the highest level.

By continuing to promote women's rights and support a more equitable representation of women in science, we remain committed to achieving the goal of gender equality in science for the benefit of both female scientists worldwide and science itself.

KEY FIGURES

MORE THAN
4100
FEMALE SCIENTISTS SUPPORTED

52
PROGRAMS COVERING OVER
110 COUNTRIES

NEARLY
50
PARTNER SCIENTIFIC INSTITUTIONS

MORE THAN
500
SCIENTISTS INVOLVED EACH YEAR

127
LAUREATES REWARDED FOR THE EXCELLENCE OF THEIR WORK

5 OF WHOM HAVE RECEIVED A NOBEL PRIZE FOR SCIENCE

For Women in Science

unesco FONDATION L'ORÉAL

25 YEAR TIMELINE

- 1998 -

LAUNCH OF THE INTERNATIONAL LIFE SCIENCES AWARD

- 2000 -

LAUNCH OF THE YOUNG TALENT AWARDS WITH AN INTERNATIONAL DEPLOYMENT

- 2003 -

THE AWARD IS EXTENDED TO PHYSICAL SCIENCES,
UNDER THE LEADERSHIP OF PIERRE GILLES DE GENNE,
NOBEL PRIZE WINNER AND PRESIDENT OF THE JURY

- 2006 -

LAUNCH OF THE AIRPORT CAMPAIGNS

- 2009 -

ADA YONATH, 2008 LAUREATE, RECEIVES THE NOBEL PRIZE IN CHEMISTRY,
ELIZABETH H. BLACKBURN, 2008 LAUREATE, RECEIVES THE NOBEL PRIZES IN PHYSIOLOGY OR MEDICINE

- 2018 -

20 YEAR ANNIVERSARY, LAUNCH OF THE INITIATIVE MEN *FOR WOMEN IN SCIENCE*,
LAUNCH OF THE WOMEN IN SCIENCE ACADEMY

- 2019 -

THE AWARD IS EXTENDED TO MATHEMATICS
AND COMPUTER SCIENCE

- 2020 -

EMMANUELLE CHARPENTIER AND JENNIFER A. DOUDNA, 2016 LAUREATES,
RECEIVE THE NOBEL PRIZE IN CHEMISTRY

- 2021 -

LAUNCH OF THE *FOR WOMEN IN SCIENCE* COMMUNITY PLATFORM
AND ONLINE TRAINING PROGRAMS,
1st *FOR WOMEN IN SCIENCE* FESTIVAL ON YOUTUBE

- 2023 -

25 YEAR ANNIVERSARY

Each year since 1998, the Fondation L'Oréal and UNESCO have honoured five brilliant female scientists, promoted their work globally and empowered them to act as role models for aspiring female scientists and for future generations. The laureates are recognized for their scientific achievements and remarkable contribution 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 recognized: Africa and the Arab States; Asia and the Pacific; Europe; Latin America and the Caribbean; and North America.

The Fondation L'Oréal and UNESCO are honored to announce the five 2023 laureates selected by an independent jury chaired by Professor Artur Àvila* for the 25th L'Oréal-UNESCO International Award *For Women in Science* in the categories of Physical Sciences, Mathematics and Computer science.

2023 LAUREATES

* Professor at Institute of Mathematics University of Zurich, Switzerland, Extraordinary Researcher at IMPA (Instituto de Mathematica Pura e Aplicada) Rio de Janeiro, Brazil, and Fields medal winner in 2014

LAUREATE FOR AFRICA AND THE ARAB STATES

Professor Suzana Nunes

Professor, Chemical and Environmental Science and Engineering,
Vice Provost for Faculty and Academic Affairs
King Abdullah University of Science and Technology, Saudi Arabia.

Awarded for her outstanding work in developing innovative membrane filters to achieve highly efficient chemical separations with a lower carbon footprint. Her research has proven to be particularly beneficial to the water, petrochemical and pharmaceutical industries in achieving a more sustainable environment.

LAUREATE FOR ASIA AND THE PACIFIC

Professor Lidia Morawska

Distinguished Professor, School of Earth Sciences and Climate,
Queensland University of Technology, Australia.

Awarded for her excellent research in the field of air pollution and its impact on human health and the environment, with a specific focus on atmospheric particulate matter. Her extraordinary dedication and impact have built a bridge from fundamental science to real-world policy and practice to provide clean air for all.

LAUREATE FOR EUROPE

Professor Frances Kirwan

Savilian Professor of Geometry, University of Oxford, United Kingdom.

Awarded for her exceptional work in pure mathematics combining geometry and algebra in order to develop techniques to understand the classification of geometric objects. These techniques have been used by theoretical physicists searching for mathematical descriptions of our universe. Her recent work has the potential to help scientists to extract crucial information from large complex data sets.

LAUREATE FOR LATIN AMERICA AND THE CARIBBEAN

Professor Anamaría Font

Professor of Physics, Central University of Venezuela.

Awarded for her important contributions in theoretical particle physics, in particular to the study of String Theory. Her research has resulted in a greater understanding of the consequences of the theory for the structure of matter and quantum gravity, relevant also for the description of black holes and the first moments after the big bang.

LAUREATE FOR NORTH AMERICA

Professor Aviv Regev

Executive Vice President and Global Head of Genentech Research and Early Development, Genentech/Roche, San Francisco, United States of America.

Awarded for her pioneering work applying mathematics and computer science to revolutionize cell biology. Her research enables scientists to discover and characterize the trillions of cells within the body and enhances their ability to decipher and target the mechanisms that cause disease, in order to develop better diagnostics and therapies.

Professor Suzana Nunes

CHEMISTRY

Professor, Chemical and Environmental Science and Engineering, Vice Provost for Faculty and Academic Affairs, King Abdullah University of Science and Technology (KAUST), Saudi Arabia

Breaking new ground in energy efficient separation processes for industry

Professor Suzana Nunes is rewarded for her outstanding work in developing innovative membrane filters to purify or separate valuable resources, such as water, oil, or pharmaceutical compounds more efficiently and using significantly less energy than traditional methods.

Working at the intersection of chemistry, chemical engineering, materials science and environmental science, her research leads to the creation of high precision membranes. Her group synthesizes new polymers and uses them for the manufacture of flat-sheets and hollow fibers with highly controlled pore sizes in the submicron or sub-nanometer level (down to a millionth of a millimetre). The membranes have selective layers able to separate pharmaceutical compounds from a complex mixture or specific hydrocarbons from crude oil.

Some 50% of the energy currently consumed by the chemical industry is used to separate chemicals. In developing specific filters for each type of separation, Professor Nunes is helping to revolutionize conventional approaches with viable, sustainable, large-scale solutions, lowering the industry's carbon footprint.

"To help create a fully sustainable society, I am harnessing membrane technology as a lever to transform the chemical industry by achieving zero emissions and eliminating waste," she explains. "Ultimately, I want to help prevent global warming and protect our planet's biodiversity for future generations."

A lifelong passion for scientific discovery

Professor Nunes has always enjoyed mathematics and science. On her seventh birthday, she was given a chemistry set, prompting her life-long love of chemistry. At fourteen, she joined a specialist chemistry high school, following her calling to become a scientist. It was at university that she determined to study the behaviour of bigger and more complex macromolecules. One of her

Eureka moments occurred soon after her move to Saudi Arabia when she made a breakthrough in understanding the mechanism of pore formation of block copolymer membranes using electron microscopy. This led to the publication of her first paper in the country and enabled her to replicate the findings on different materials and for different applications. Her subsequent discoveries have brought her many accolades, including membership of the Royal Society of Chemistry since 2015.

An international journey to promote environmental sustainability and inspire women

Professor Nunes has worked on three continents, including her native South America, Europe and in the Middle East, collaborating with scientists in multiple disciplines. When she arrived at the King Abdullah University of Science and Technology in Saudi Arabia in 2009, it was to address environmental challenges and inspire women to study engineering. The university was a brand-new venture that was creating a centre of academic learning almost from scratch. Importantly, it was the country's first co-education university and the first to offer high-level chemical engineering programs to girls. The opportunity to attract more women into science appealed to her even more than the intellectual challenge and promise of research excellence and international collaboration. Holding administrative roles, such as Associate Dean and Vice-Provost, have further enabled her to fulfil this purpose.

In addition, she has helped to lead international workshops and symposia encouraging women to pursue chemistry and engineering. "Saudi Arabia is changing rapidly, especially in the last few years, and I dare to believe that our work in education has been contributing to this evolution," Professor Nunes highlighted.

Breaking the glass ceiling

Professor Nunes was fortunate to have supportive parents and teachers and to be born in a country where women had the opportunity to study and have role models in science, technology, engineering and mathematics (STEM). She started her academic career in Brazil and continued to flourish at Helmholtz Research Centre in Germany. When her freedom of research and access to resources started to wane and the glass ceiling started forming, despite her being a leader of a successful research group, she moved to the King Abdullah University of Science and Technology where she found the support and conditions needed to excel. "More support must be directed towards enabling and assisting senior female scientists to navigate the challenging journey to leadership", she believes.

She encourages girls and young women interested in science to follow their hearts and natural inclination to pursue a career in science. "Never give up – the path to success is not always smooth and straight – persevere and success will come."

> *"Ultimately, I want to help prevent global warming and protect our planet's biodiversity for future generations."*

LAUREATE FOR ASIA AND THE PACIFIC

Professor Lidia Morawska

EARTH AND ENVIRONMENTAL SCIENCES

Distinguished Professor,
School of Earth Sciences and Climate,
Queensland University of Technology, Australia

Harnessing air quality science to inform public policy and save lives

Professor Lidia Morawska is recognized for her outstanding contribution to understanding and improving indoor and ambient air quality, and in particular, the impact of air pollution on human health and the environment. Her leadership has enabled policymakers in the public health sector to develop pathways for improving air quality and prompted discussions on better building design and operation.

"Nothing is more fundamental than the air we breathe," says Professor Morawska. "In modern life, we mostly breathe indoors, however, the internal atmosphere is highly complex and variable. Through my research, I am helping to redefine the science of air pollution and transform the way in which society can mitigate and prevent related risks, linking science with real-world practice and policy. My dream is that science should inform decisions that protect the Earth and contribute positively to society."

Delivering in-depth insights on air pollution

With a focus on particles suspended in the air, Professor Morawska's work delivers in-depth insights into the sources of air pollution, relevant physico-chemical processes and the transformation of airborne particles, along with the fate of pollutants. This knowledge can be harnessed to reduce exposure to pollution and risks. Among her most important research, she detects ultrafine particles in the air, explores combustion as a source of ambient urban air pollution, investigates virus-laden particles and promotes a better understanding of indoor air quality. Professor Morawska has produced more than one thousand publications highlighting the risk to human health of exposure to indoor pollutants, chemical substances and biological agents, together with gas and particulates within multiple environments, including urban areas and major indoor environments such as homes, schools, sports facilities and public transportation.

Innovating ahead of her time

Professor Morawska's interest in science began at an early age. She was keen to understand the wonders of the world around her, from planetary systems to the intricacies of pollination and interactions between insects, plants and the environment, and enjoyed mathematical puzzles. At primary school, with the support of her teachers and parents (who encouraged her to believe she could achieve anything she wanted), she decided to become a nuclear physicist, a feat accomplished through studies culminating in her physics doctorate in 1982. Her career interests gradually evolved towards atmospheric, building and human exposure science. What has remained a constant throughout her life and career is her desire to lead research with purpose.

She describes her Eureka moments as being those moments when she recognizes a particular scientific problem. For example, discovering high concentrations of ultrafine airborne particles in central Toronto as a post-doctoral researcher prompted her to explore their source and impact on health and the environment. This knowledge can be harnessed to reduce pollution, exposure and risks. She convened 20 scientists from four countries to explore the impact of ultrafine particles from traffic emissions on children's health, proving that they were associated with systemic respiratory inflammation. In 2015, this prompted the World Health Organization and a number of countries to review national norms, in order to protect children and reduce their exposure to ultrafine particles.

In recognition of her pioneering work, Professor Morawska was listed in 2021 by *TIME 100* among the hundred most influential people in the world. She is also a member of the Australian Science Academy, a Vice-Chancellor Fellow of the Global Centre for Clean Air Research University of Surrey, United Kingdom, and an adjunct professor at the Environmental and Climate Institute of the University of Jinan in Guangzhou, China.

A woman of conviction

During the pandemic, Professor Morawska gathered nearly 240 scientists from around the world to raise awareness of the risks ot health of SARS-CoV-2 airborne particles, prompting the World Health Organization and some national authorities, such as the US Centers for Disease Control and Prevention, to update their advice on airborne transmission, thereby preventing millions of infections and saving lives. In 2020, she joined a working group publishing in *The Lancet* which explored safety at work, school and during travel, with a particular focus on transmission risk factors in buildings. Her determination and conviction in influencing and collaborating with scientists to highlight risks to public health define her vision as a scientist.

To girls and young women considering science as a career path, she says: "Pursue your interests and dreams and don't think for a moment that there is something you cannot achieve." Balancing the pressures of research and motherhood has proved challenging, yet not insurmountable. She has overcome conventional perceptions of how a leader should spend their time, feeling proud of devoting time to her family, while accepting the delay this brought to certain achievements. She believes more flexible structures should be made available to young scientists, who should "never have to choose between family and a career."

> *"Nothing is more fundamental than the air we breathe."*

LAUREATE FOR EUROPE

Professor Frances Kirwan

PURE MATHEMATICS

Savilian Professor of Geometry,
University of Oxford, United Kingdom

Harnessing mathematics to shine a light on complex questions

Professor Frances Kirwan is rewarded for her exceptional work in pure mathematics and, more specifically, for her studies of the algebraic and topological properties of geometric objects. She explores classification in algebraic geometry, which leads to the study of the so-called moduli spaces that help us understand the relationships between shapes and how they change and are used to represent objects and classify space. What is now called the 'Kirwan map' helps to describe the topology (i.e. the shape) of these moduli spaces. Her research has been used by theoretical physicists in the search for mathematical descriptions of the Universe.

Potential applications of her more recent work could help scientists to illustrate the shape of large, complex data sets, a research area known as topological data analysis.

"Algebraic geometry has a long and rich history going back to the ancient Greeks," Professor Kirwan says. "It builds on many other areas of mathematics, with diverse interactions with other sciences. The flow of ideas from algebraic geometry to practical applications has often been very slow, with the real scientific impact only becoming apparent over time. In recent years, however, the process has been accelerating, with the new research area of applied algebraic geometry developing fast."

Finding inspiration in mathematics

One of her first mathematical memories is of her father explaining a proof to her that the angles of any triangle add up to 180 degrees. The idea that something like this (or the theorem of Pythagoras) could be proved to be always true was very appealing. In her childhood, the Apollo missions to the moon and the possibility of mathematical descriptions of the movement of the planets and stars caught her attention. Although she was also interested in history and classical languages, at university, Professor Kirwan dedicated her studies to mathematics, keen to deepen her knowledge of this fascinating discipline.

One Eureka moment happened when she was collaborating with the Canadian mathematician Lisa Jeffrey to prove a famous physicist's formula; while she was bathing her children one evening, a potential mathematical argument occurred to her and it turned out to complete the proof they were seeking. The collaboration with Professor Jeffrey was critical to building momentum in Professor Kirwan's career and many other subsequent local and international collaborations have been equally important.

Diversity and collaboration in science is the way forward

Professor Kirwan has been fortunate to have supportive teachers and colleagues throughout her career. During her time as a graduate student and later as a faculty member in Oxford's Mathematical Institute in the 1980s, there were ten women with permanent faculty positions in the department, enabling her to have both female and male mentors and role models. She is fully supportive of greater gender diversity in science. "It's very important to have diverse role models ," she says, noting that this is particularly crucial in areas such as mathematics, theoretical physics and computer science. She believes in the importance of the flow of ideas between different scientific disciplines, which requires the hard work of many individuals working across traditional boundaries to transform mathematical discoveries into game-changing practical applications. When she began her research career, she was excited by the emerging interactions between algebraic geometry and theoretical physics and, more recently, she has observed important connections with biological sciences. Indeed, collaboration with diverse scientists has enabled her to build significant momentum on her own scientific journey.

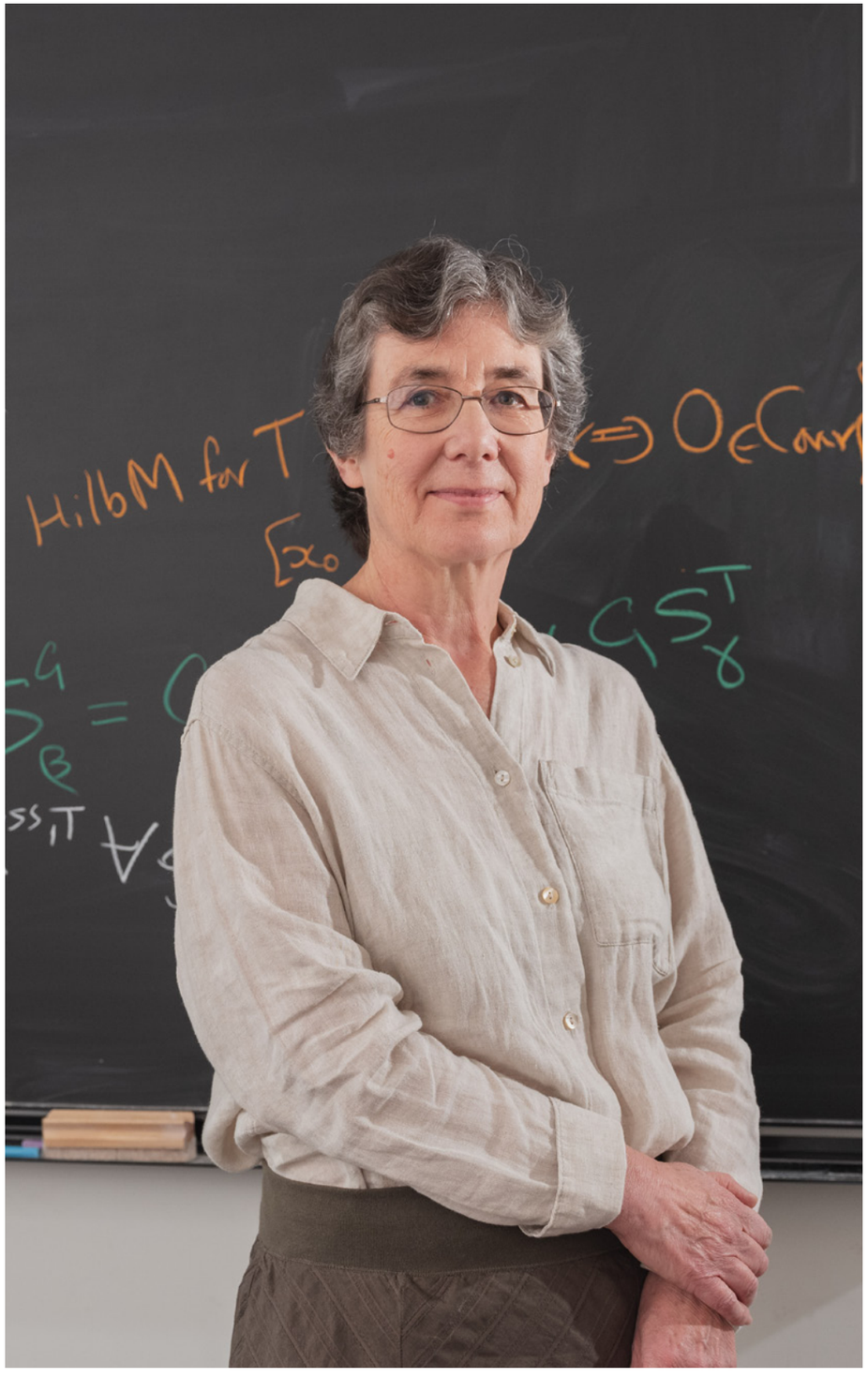
Beyond this, her dream is that "science in general will provide solutions to the climate crisis that politicians worldwide will be willing to adopt in time to protect the environment for future generations".

Empowering women to enter science and mathematics

Supporting more women wishing to embark on a career in mathematics is a passion for Professor Kirwan, and she has devoted much of her time and resources to encouraging girls and young women into mathematics at the national, European and international levels. Through the London Mathematical Society and the United Kingdom Mathematics Trust (whose Councils she chaired at different times), she was involved in the organization of enriching activities for girls at secondary school level, such as a mathematics competition called the *European Girls' Mathematical Olympiad*. For some time, she was deeply involved with the European Women in Mathematics association, through which she helped to coordinate the first international conference of women mathematicians in Hyderabad, India, in 2010, organized in partnership with the International Congress of Mathematicians. She is the recipient of multiple accolades, including being the first woman elected to one of the oldest and most prestigious mathematics chairs at Oxford University (Savilian Professor of Geometry), established in 1619.

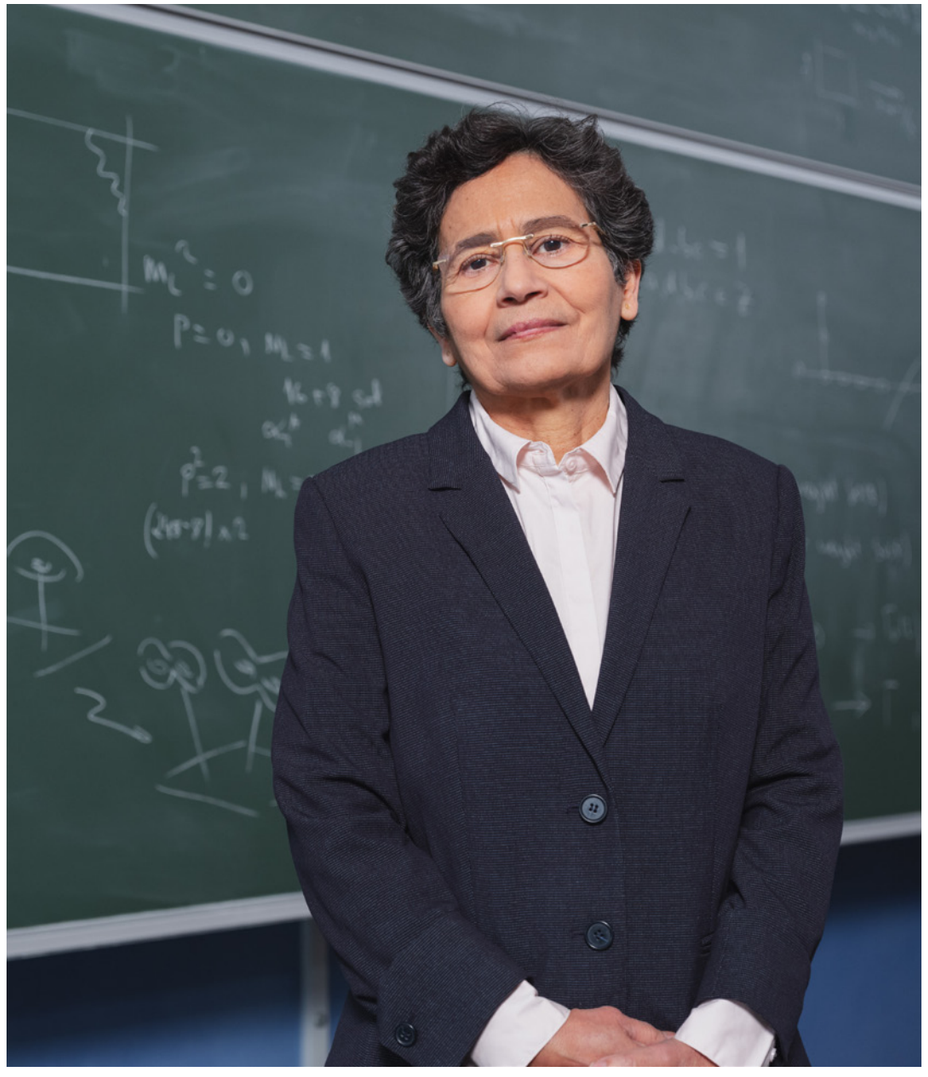
Professor Kirwan believes that many women mathematicians are committed to helping achieve a societal or environmental benefit through their research. "I would wholeheartedly recommend a career in mathematics. There are so many interesting areas to explore and opportunities to collaborate with scientists from multiple disciplines towards discoveries that could help to transform our world for the better."

> *"It's very important to have diverse role models, women in particular, but also other sorts of diversity."*



Professor Anamaría Font

PHYSICS



Professor of Physics,
Central University of Venezuela

Pioneering theories to uncover the structure of the universe

Professor Anamaría Font is recognised for her work in theoretical particle physics, with a particular focus on the theory of superstrings. This theory seeks to describe the fundamental building blocks of the Universe, suggesting that, at the most fundamental level, everything in the Universe, including particles and forces, is composed of tiny, vibrating strings rather than point-like particles.

Her research has provided deeper knowledge of the consequences of superstring theory for the structure of matter and quantum gravity, which are also relevant to the description of black holes and the first moments after the Big Bang.

One of the significant aspects of string theory is that it postulates the existence of additional dimensions beyond the four dimensions with which we are familiar (time, length, width and height). Professor Font's research has contributed to our understanding of how extra dimensions could exist.

Through her groundbreaking research, She has also influenced scientific developments that led to the second-string revolution in 1995.

A life of dedication to science and education

Explaining the world around us has been a lifelong interest for Professor Font. As a child, she enjoyed mixing substances and watching the reactions. She was fascinated by chemistry and physics at secondary school, where she had highly supportive and enthusiastic teachers, most of whom were women. "I found it amazing that one could explain nature with formulas and universal laws," she says. "I vividly remember this desire to learn and discover." And as a senior scientist, she has been active in continuing the tradition of scientific tuition, teaching mathematics and physics in Venezuela and other Latin American countries, while also co-organising various scientific activities for students and early career scientists.

"Science and education are the basic pillars of sustainable development and I feel proud to have devoted my career to both endeavours," she says.

"I would like to solve unanswered questions such as the origin of the different masses of elementary particles, as well as the nature of the dark matter and energy that make up most of the Universe – and ultimately, to develop a theory that underlies all physical phenomena. I am convinced of the value of this research and its potential to lead to future applications."

Professor Font always relishes building compelling arguments, fitting details into place, finding solutions arising from systematic analysis and discovering powerful mathematics behind the physics. The Nobel prize winner Steven Weinberg, whose classes she attended while studying for her PhD, is a great inspiration to her.

Rising above challenging circumstances

Life as a scientist in Venezuela is not easy. When Professor Font began her career, the country was in a strong position scientifically. However, economic uncertainties have since created daunting challenges. In particular, state universities face funding shortages and deficient infrastructure, including poor computing and communications facilities. Scientists often struggle to conduct experimental or theoretical work, while earning low salaries and coping with soaring inflation. Yet, despite the difficulties and opportunities for a position abroad, Professor Font has remained committed to doing research in her country of origin. "I kept applying for funds to acquire, renew or repair equipment but had to make do with few resources, which required more time and energy," she says. "Luckily, I also had ingenious colleagues who were always ready to help."

International collaborations have been vital in supporting Professor Font's career, enabling her to remain at the forefront of her evolving field and champion the cause of science in Venezuela and beyond.

Stronger policies to break the glass ceiling

Thanks to her resilience, research strengths and overall professional merits, Professor Font progressed steadily towards her professorship at the Central University of Venezuela without facing any particular obstacles as a woman. However, she believes the glass ceiling exists due to a "mixture of prejudices and injustices," with conscious and unconscious biases, discriminatory practices and a lack of support for women that still hinders their fair representation in science. Stronger policies are needed to promote gender equality, together with encouragement and access to high quality education for girls, and greater visibility and recognition for the scientific contributions made by women.

Diversity will be central to achieving the complementary visions, approaches and insights required to advance the innovative science we need to address the great challenges facing humanity.

"The greatest accomplishment in this regard will hopefully be made by a young girl, somewhere out there, who is now getting ready to become a brilliant scientist despite the hardships inherent in her journey," she concludes.

> *"Science and education are the basic pillars of sustainable development."*

LAUREATE FOR NORTH AMERICA

Professor Aviv Regev

BIOINFORMATICS

Executive Vice President and Global Head of Genentech Research and Early Development, Genentech/Roche, San Francisco, United States of America

Leveraging mathematics and computation to revolutionize understanding of human cells

Professor Aviv Regev is rewarded for her pioneering work in single cell genomics, the study of individual cells. Her innovative experimental methods combine mathematics and computer science to enable scientists to discover and characterize the trillions of cells within the body. Importantly, this enhances our ability to decipher and target the mechanisms that cause disease, while developing better diagnostics and therapies. Her own laboratory has discovered previously unknown cells that play roles in healthy tissue or diseases including cancer, ulcerative colitis, Alzheimer's disease, cystic fibrosis and Covid-19. In 2016, she co-founded the Human Cell Atlas, a global open initiative. It now counts more than 2500 member scientists from 86 countries, and has profiled more than 100 million cells across the body, establishing itself as an important biomedical reference tool.

"The basic unit of life is the cell – the challenge is that we don't know the full identities and characteristics of all the cells that exist, let alone how they function individually or collectively in tissues," she says. "Leading the Human Cell Atlas has been an amazing journey - it is very humbling to be part of the great science and team work of our research community."

In 2020, Professor Regev became one of the first women to lead the research and development division of a major pharmaceutical company, Genentech. Prior to joining Genentech, she served as the founding director of the Klarman Cell Observatory and was Chair of the Faculty at the Broad Institute of Massachusetts Institute of Technology (MIT) and Harvard University, as well as Professor of Biology at MIT.

A ground-breaking journey

As a child, she showed a particular interest in mathematics, physics, languages and reading, supported by her family of science and engineering enthusiasts. Her first inclination was always towards mathematics and computer sciences, but she later became fascinated by genetics and evolutionary biology, leading to a PhD in computational biology.

Recognizing the benefits of leveraging mathematical approaches to a better knowledge of human cells with an unprecedented level of precision and scale, Professor Regev has since dedicated her laboratory work to innovative research. She has not been afraid to experiment, pioneering new and unexpected concepts. Together with her team, she has invented diverse methods of measuring the expression profile (or 'calling card') of each cell individually (i.e. cell activity and reactions in different situations) – for tens of millions of cells. And to make sense of this substantial amount of data, she has developed computational algorithms, including from machine learning, to identify patterns and discover different types of cells and their properties. Her methods allow scientists to determine where cells reside within tissues, the molecular circuits controlling them, and how they maintain our tissues in health or malfunction in disease. Her methods can also be used in clinical trials to characterize patients' specimens, for example in response to a drug, or to engineer cells that can be used as therapies.

Interdisciplinarity in science is the way forward

Professor Regev highlights the need to combine different scientific disciplines to solve biomedical questions. "In academia, we can do great biology, amazing chemistry and ground-breaking computer science, but we haven't traditionally put these things together in a way that delivers real benefits for patients" she explains, adding: "I want science – biology, chemistry, medicine and computer science – to provide clear solutions, making more and better medicines, using the best quality tools and at a lower cost to society. And I believe we, as a scientific and medical community, are closer to realizing this dream than we've ever been before."

Professor Regev believes that creating greater diversity in science starts with encouraging girls to study science at school and continues with developing effective career paths and tackling unconscious bias and other prejudices in science, along with providing effective infrastructure for scientists with children. She also sees a responsibility for scientists to make science clear, accessible and part of everyday conversations in order to avoid disinformation.

The importance of female role models

Professor Regev recognizes that she has been fortunate in her career, with superb mentors, talented collaborators and sufficient funding for her ideas. However, she also recognizes the hard fight led by her predecessors to pave the way for her own path in science. This includes scientist Nancy Hopkins, whose report on the status of women at MIT in 1999 made waves at the university and at the national level. Professor Regev is determined to give back by supporting future female scientists, including by acting as a role model and mentor.

"I am optimistic [about the glass ceiling] but also realize that a lot remains to be done and we cannot take anything for granted, not even our current gains," she says, adding that "women have made some of the greatest discoveries of the past century, changing our world, developing new scientific fields, training new generations of scientists, leading institutions, curing patients and much more".

To future generations of women, she says: "It's important to feel empowered to do what you think is best, even if it seems unorthodox – you can be your own role model. And don't feel obliged to constrain yourself to one discipline – combining all the areas that inspire you is incredibly fun and rewarding."

> *"It's important to feel empowered to what you think is best, even if it seems unorthodox."*

An international, highly respected scientific jury selected the five laureates from more than 350 nominees from 79 countries, in recognition of their distinguished achievements on a global scale.

2023 JURY

PRESIDENT OF THE JURY

Professor Artur Àvila

MATHEMATICS

Professor at the Institute of Mathematics University of Zurich, Switzerland, Extraordinary Researcher at IMPA (Instituto de Mathematica Pura e Aplicada), Rio de Janeiro, Brazil, 2014 Fields Medal

I am honoured to be part of the jury for the 2023 edition. Awarding this prize of excellence to these five brilliant women proves to us, more than ever, that we need to show to our society an inclusive science where the question of gender equality will no longer arise.

PROF. ARTUR ÀVILA, PRESIDENT OF THE JURY

Professor Rajaâ Cherkaoui

PHYSICS

Professor of Nuclear Physics at the Faculty of Science, Mohammed V University, Morocco, L'Oréal-UNESCO Laureate 2015

Doctor Frederic Leroy

PHYSICS

Expert in Analytic Physics & Chemistry and former Director, Strategic Foresight, at L'Oréal Research and Innovation, France

Professor Ingrid Daubechies

MATHEMATICS

Professor of Mathematics and Electrical and Computer Engineering at Duke University, United States of America, L'Oréal-UNESCO Laureate 2019

Professor Catherine Ngila

CHEMISTRY

Interim Executive Director of the African Foundation for Women & Youth in Education, Sciences, Technology and Innovation, Nairobi, Kenya, L'Oréal-UNESCO Laureate 2021

Professor Gil Kalai

COMPUTER SCIENCE

Professor of mathematics at the Einstein Institute of Mathematics, Hebrew University of Jerusalem, Israel

Professor Fernando Quevedo

PHYSICS & ASTRONOMY

Professor of Theoretical Physics at the University of Cambridge, Department of Applied Mathematics and Theoretical Physics, United Kingdom

Professor Maki Kawai

CHEMISTRY

President of the National Institutes of Natural Sciences, Professor Emeritus at the University of Tokyo, Japan, L'Oréal-UNESCO Laureate 2019

Professor Alaa Salem

EARTH SCIENCES

Professor at the Department of Earth Sciences, Faculty of Sciences, Kafrelsheikh University, Egypt

Professor Eugenia Kumacheva

CHEMISTRY

Professor of chemistry and Canada Research Chair in Advances Functional Material at the University of Toronto, Canada, L'Oréal-UNESCO Laureate 2008

Professor Silvia Torres-Peimbert

ASTRONOMY & SPACE SCIENCE

Professor at the Institute of Astronomy, National Autonomous University of Mexico, Mexico, L'Oréal-UNESCO Laureate 2011

For the 2023 edition of the L'Oréal-UNESCO *For Women in Science* International Awards, to mark the 25th anniversary, the Fondation L'Oréal and UNESCO will, in addition to the five laureates, honour three female scientists with a special tribute.

25th ANNIVERSARY SPECIAL TRIBUTE

Special Tribute

There is a growing number of female researchers who are obliged to leave their home countries to continue their scientific careers due to threats to their lives and careers, such as war, conflict or verbal and physical threats. In recognition of their courage, resilience and determination to overcome the challenges they had to face in pursuing their scientific careers, the Fondation L'Oréal and UNESCO have chosen to honour three women scientists, by paying them a Special Tribute on the occasion of the 25th anniversary of the *For Women in Science* program.

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 and inclusive beauty and climate action.

Since 1998, the L'Oréal-UNESCO *For Women in Science* program 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 25 years, it has supported more than 4100 women researchers from over 110 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. On average, around 16,000 people have access to these free treatments every year and more than 35,000 people have taken part in professional beauty training, since the beginning of the program.

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* program 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

Since its inception in 1945, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has worked to create the conditions for dialogue among civilizations, cultures and peoples, based on respect for common values. UNESCO's mission is to contribute to the building of peace, the eradication of poverty, to sustainable development and intercultural dialogue through its unique expertise in education, science, culture, communication and information. The Organization has two global priorities: Africa and gender equality.

UNESCO is the only United Nations specialized agency with a specific mandate in the sciences, symbolized by the «S» in its acronym. Through its science-related programs, UNESCO contributes to the implementation of the United Nations Sustainable Development Goals, helps developing countries build their scientific and technical capacities and supports Member States in their efforts to develop science policies and scientific programs, as well as effective public policies that integrate local and indigenous knowledge systems.

UNESCO promotes scientific research and expertise in developing countries. The Organization leads several intergovernmental programs on the sustainable management of freshwater, ocean and terrestrial resources, biodiversity conservation and the use of science to address climate change and reduce disaster risk.

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* program.

A powerful promotional display campaign raising awareness on the importance of women in science is running throughout June around the streets of Paris, as well as in ten major airports around the world (Boston, Dubaï, Frankfurt, London, Los Angeles, Paris, Riyadh, São Paulo, Shanghai and Sydney).

JCDecaux

PARIS AÉROPORT

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

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