L'ORÉAL-UNESCO
FOR WOMEN IN SCIENCE
2017

INTERNATIONAL AWARDS

For Women in Science

FONDATION L'ORÉAL

For Women in Science

FONDATION L'ORÉAL

WOMEN IN SCIENCE
have the power to change the world

Marie Curie was born 150 years ago. As a pioneering woman scientist, she paved the way for so many others, including her own daughter, Irène Joliot Curie, who followed in her footsteps by becoming a researcher in physical sciences herself. Between them, they received 3 of the 18 Nobel Prizes in science awarded to women since the Prize was created in 1901 for their discoveries of radiation, polonium, radium and artificial radioactivity.

Today, only 28%* of researchers are women and only 3% of Scientific Nobel Prizes are awarded to them. This is why, for the past 19 years, the L'Oréal Corporate Foundation and UNESCO have been committed to women in science, to increase the number of women working in scientific research. Thanks to the prizes and fellowships awarded at national, regional and international ceremonies, the L'Oréal Corporate Foundation, together with UNESCO, awards and accompanies the most brilliant women scientists throughout their careers.

The L'Oréal-UNESCO *For Women in Science* awards celebrates and highlights researchers from each of the five continents. Each year, these five eminent and experienced scientists, whose work has been recognized at the highest international level, are honored for their world-changing discoveries in an annual award ceremony in Paris.

The program also supports more than 250 young women scientists who are the "scientists of tomorrow" by accompanying them at a key moment in their careers, during their PhD thesis or post-doctoral studies. A L'Oréal-UNESCO *For Women in Science* fellowship is awarded to these researchers at national and regional ceremonies that take place in more than 45 different countries. Since 2001, the L'Oréal Corporate Foundation and UNESCO have supported more than 2700 young women from 115 countries.

Each year, among the national and regional fellows, the fifteen most promising young researchers are also honored as "Rising Talents", during the international award ceremony.

To accompany and support these young researchers even further, the L'Oréal Corporate Foundation and UNESCO organize public-speaking and science popularization trainings, mentoring sessions and personalized coaching. These trainings, combined with grants and a communication campaign targeting the general public, help young women scientists to enhance their visibility and impact, therefore becoming a source of inspiration for future generations - for an ultimately more diverse and varied science.

Five exceptional researchers are awarded in 2017 for their outstanding research in physical sciences.

Let's celebrate these women in science who have the power to change the world!

Isabel Marey-Semper
General Manager L'Oréal Corporate Foundation

*UNESCO Science Report Toward 2030, 2015

WOMEN IN SCIENCE
have the power to change the world

Over the last 20 years, women have been strongly encouraged to pursue scientific careers. While their participation in science has increased significantly, progress remains far too slow and limited. Women are still under-represented in science, technology, engineering and mathematics (STEM) in many parts of the world. This is why special attention must be given to women and girls' role in these disciplines.

According to the latest UNESCO Science Report, women currently account for 53% of bachelor and master graduates globally, but their numbers drop off abruptly at PhD levels (43%). Each step up the ladder of the scientific research system sees a drop in female participation: women account for just 28% of global researchers and there are very few left at the highest echelons of scientific research and decision-making, especially among university vice-chancellors, heads of research institute or on boards of directors.

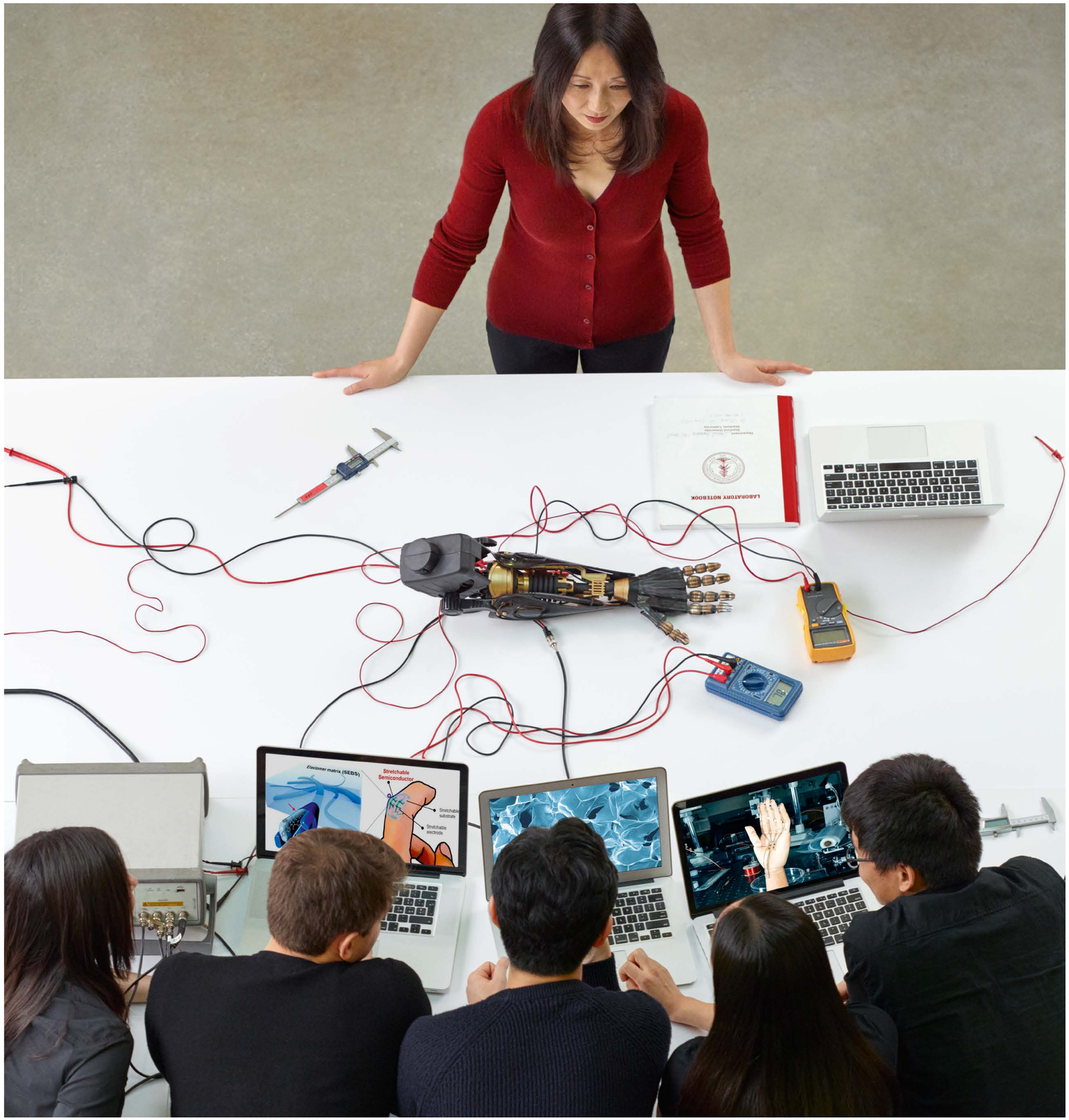
Ensuring a better life for all and the sustainable use of our planet's resources is increasingly challenging as the global population continues to grow and a greater number of people are exposed to conflict, poverty, hunger, illness and the impacts of climate change. In this context, we will rely on science and researchers to achieve the goals of the 2030 Agenda for Sustainable Development, adopted by the United Nations on 25 September 2015, as well as the Paris Climate Agreement. The critical mass of scientists working on these issues of common concern must be consolidated and reinforced.

The considerable potential of women's contribution to these efforts is currently underexploited. Gender equality is a global priority for UNESCO because it is critical to the very future of society, as a building block for social justice and sustainable development.

Girls and women must be empowered at every level, beginning with access to education, in order to combat the stereotypes that are preventing them from contributing to the highest levels of science. We must promote equal participation of women in learning and research, from administration to teaching, across all scientific fields. UNESCO is committed to supporting all initiatives that promote these goals. Women's contribution to science continues to be overlooked. This is why the L'Oréal-UNESCO *For Women in Science* programme, developed with the L'Oréal Corporate Foundation, promotes the scientific excellence of exceptional female researchers. Through this recognition, the programme aims to foster a cultural shift and show a new generation of young girls that they have a place in science and can participate fully in finding the solutions we need to create a sustainable future.

The programme also raises women's awareness of science, at the national and regional level, and encourages local authorities to support women in science. This year's Laureates and Rising Talents, and the excellent scientists who preceded them, are proof that our concerted efforts are bearing fruit.

Flavia Schlegel
Assistant Director-General for Natural Sciences, UNESCO


LABORATORY NOTEBOOK
Elastomer matrix (SEBS)
Stretchable Semiconductor
Stretchable substrate
Stretchable electrode

L'ORÉAL-UNESCO
FOR WOMEN IN SCIENCE
2017

THE 2017 LAUREATES:
Women scientists at the cutting-edge

A RIGOROUS SELECTION PROCESS

156 NOMINATIONS FROM HIGH LEVEL SCIENTISTS
FROM 47 COUNTRIES

EACH NOMINATION IS REVIEWED BY 2 OR 3 SCIENTIFIC EXPERTS IN THE CANDIDATES' FIELD OF RESEARCH

▼

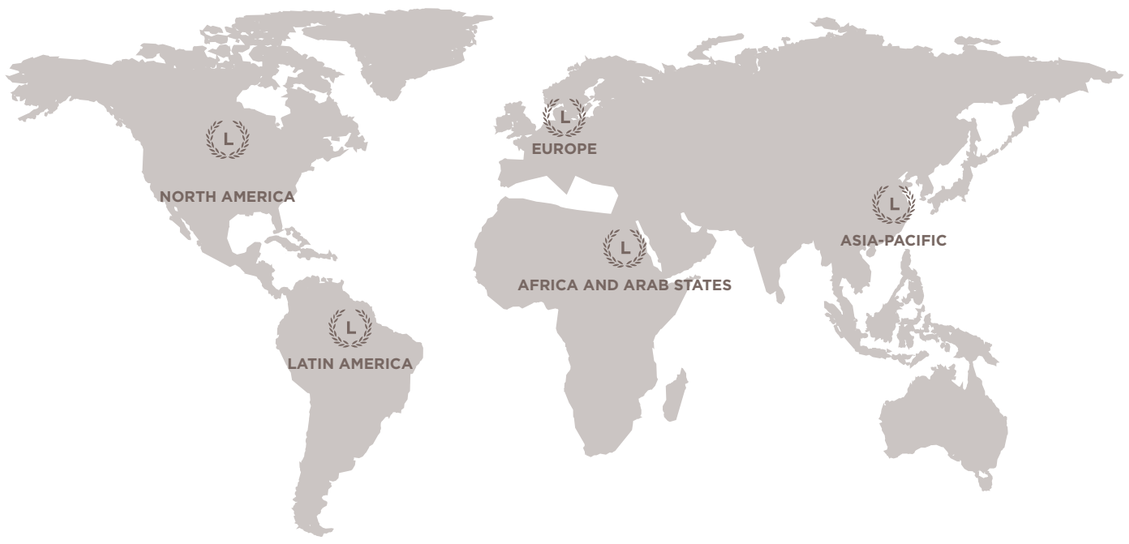
53 SHORT-LISTED CANDIDATURES
FROM 28 COUNTRIES

EVALUATED BY A JURY OF 12 EMINENT SCIENTISTS

▼

SELECTION OF THE 5 LAUREATES
1 FROM EACH OF THE WORLD'S REGIONS

▼



THE 2017 LAUREATES : *A rigorous selection process*

To choose the five award winners, recognized by the international scientific community, each candidate had to be nominated by their peers: presidents of universities, Academies of Sciences, Nobel Prize winners, or laureates of a previous edition of the L'Oréal-UNESCO *For Women in Science* Award.

A team of high-level scientific experts evaluated the nominations over a period of several months to choose the best candidates. Finally, an international jury composed of 12 eminent scientists selected the award winners. The awards are presented to five women, one from each world region (Africa and the Arab States, Asia-Pacific, Europe, Latin America and North America) in recognition of their scientific accomplishments.

The five laureates will receive their prizes, worth 100 000 €, on March 23rd, 2017 at la Maison de la Mutualité in Paris. They will join the 92 laureates that have already been honored by the program since it began in 1998. Among these, professors Elizabeth H. Blackburn and Ada Yonath went on to win a Nobel Prize and her Excellency Dr. Ameenah Gurib-Fakim became President of the Republic of Mauritius.

THE 2017 LAUREATES: *Women scientists at the cutting-edge*

Laureate for North America
PROFESSOR
ZHENAN BAO

FOR INVENTING SKIN-INSPIRED ELECTRONIC MATERIALS

Her research on flexible, stretchable and conductive materials could improve the quality of life of patients with prostheses.

Laureate for Europe
PROFESSOR
NICOLA A. SPALDIN

FOR REINVENTING MAGNETIC MATERIALS FOR NEXT-GENERATION ELECTRONIC DEVICES

Her research on multiferroic materials could lead to a new generation of electronic equipment components.

Laureate for Asia-Pacific
PROFESSOR
MICHELLE SIMMONS

FOR PIONEERING ULTRA-FAST QUANTUM COMPUTERS

Her work on atomic-scale transistors could give birth to tomorrow's computers.

Laureate for Latin America
PROFESSOR
MARIA TERESA RUIZ

FOR DISCOVERING A NEW TYPE OF CELESTIAL BODY, HALFWAY BETWEEN A STAR AND A PLANET, HIDDEN IN THE DARKNESS OF THE UNIVERSE

Her observations on brown dwarfs could answer the universal question of whether there is life on other planets.

Laureate for Africa and the Arab States
PROFESSOR
NIVEEN M. KHASHAB

FOR DESIGNING NOVEL NANOPARTICLES THAT COULD IMPROVE EARLY DETECTION OF DISEASE

Her work in analytical chemistry could lead to more targeted and personalized medical treatment.

2017 LAUREATE

Africa and Arab States

Professor Niveen M. Khashab

ORGANIC CHEMISTRY

Associate Professor of Chemical Sciences at the King Abdullah University of Science and Technology (KAUST) in Thuwal, SAUDI ARABIA

For designing novel nanoparticles that could improve early detection of disease

Each day, millions of drugs are taken to cure diseases. When delivered, these drugs travel through the entire body without targeting the specific cells to be treated. This produces lots of side effects and is inefficient. The nanoparticles designed by Professor Niveen M. Khashab address this issue, since they deliver the drugs where they are needed, allowing for targeted diagnosis and improved treatments with fewer side effects.

Oxidative stress is at the heart of many disorders, like brain diseases or cancer. Being able to detect the phenomenon earlier would allow for much better patient outcomes. In 2014, Prof. Khashab published an article on an innovative technique for detecting oxidative stress in living cells. Already tested in vivo, the approach might help in the development of made-to-measure diagnostics in the future.

Another important discovery by Prof. Khashab is the design and synthesis of new kinds of particle assemblies called "colloidosomes". These particles, whose permeability and elasticity can be precisely controlled, can deliver the drugs on demand upon light irradiation and provide a revolutionary system for delivering large components, such as proteins and genetic materials, which are at present difficult to deliver with accuracy.

Prof. Khashab is aware of how important her research might be for society in the future but she also worries about the negative impact it might have on the environment. *"Although nanotechnology is a highly useful area, we must consider the potentially harmful effects of nanoparticles employed in medical therapies"* she says. To address this concern, she recently developed a new generation of nanoparticles that naturally degrade when exposed to light.

For Prof. Khashab, who is the mother of three children, another important part of her work is the impact it will have on future generations. *"Scientific discoveries are not just a matter of increasing personal knowledge, but most importantly for passing on this knowledge. In this context, women play a crucial role as natural passionate educators,"* says the scientist, whose already impressive track record holds her in good stead for becoming an important ambassador for the sciences in the Middle East. At just 35, she has more than 90 publications, and already supervised thirteen students and is supervising another eight at the moment (five women and three men). In 2010, she left the United States after a brilliant career there, to become part of an emerging scientific community in the Middle East - at the King Abdullah University of Science and Technology (KAUST) in Saudi Arabia. Today, her research is indeed a source of considerable inspiration for a new generation of scientists in this region of the world.

Professor Michelle Simmons

QUANTUM PHYSICS

Director, Centre of Excellence for Quantum Computation and Communication Technology – at the University of New South Wales, AUSTRALIA

For pioneering ultra-fast quantum computers

Predicting the weather and natural catastrophes, breaking complex cryptographic codes, optimizing the routes for millions of travelers… In the era of Big Data, traditional computers are reaching their limits in terms of size and power. Professor Michelle Simmons has been developing the computers of the future: quantum computers. These extremely small and powerful machines could solve certain problems in 10 seconds compared to many thousands of years for a traditional computer.

This breakthrough is possible thanks to the atomic transistor. A transistor is the main component of all computers and it is the interconnection between millions of transistors on chips that allow electronics devices to work. The classical transistor was invented in 1947 and has been decreasing in size ever since, but Prof. Simmons' work shows that it is now possible to create transistors all the way down to the atomic scale. In 2010, after perfecting the fabrication process for over a decade, her research team at the Centre of Excellence for Quantum Computation and Communication Technology in Sydney succeeded in creating the world's first atomic transistor from several atoms of phosphorus embedded in a silicon crystal. These transistors will be used to make tiny computers that exploit the principles of quantum mechanics to process information much faster than is possible with conventional computers.

In 2012, together with her team, she broke another world record by creating a transistor made from just one atom. The same year, they succeeded in fabricating the thinnest conducting doped wires in silicon. These wires are 10 000 times thinner than a human hair and are key components of an atomic-sized computer.

"Optimization and machine learning problems are amongst the first application areas," explains Prof. Simmons. *"For example, UPS have noted that if they can shorten the distance that their drivers travel in the US by one mile every day, they will save their company 50 million dollars a year."*

The researcher has six patents in this space to prepare for such potential applications in industry. She has also published more than 380 articles in some of the most prestigious scientific journals. She is also a natural leader, and one of the youngest scientist to have been elected to the Australian Academy of Sciences, when she was just 36 years old in 2006. An outstanding communicator, she now directs 180 researchers at the Center of Excellence which she helped to co-found in 2000. Not afraid of challenges, she chose the field of quantum physics for its complexity and her wish to *"push things to their limits"*. Her greatest achievement is having convinced the world that atomic-scale electronics is possible, paving the way forward for a quantum revolution in computing.

2017 LAUREATE
Asia-Pacific

2017 LAUREATE
Europe

Professor Nicola A. Spaldin

MATERIALS SCIENCE

Head of the Materials Theory Group at the Swiss Federal Technical University in Zürich (ETH), SWITZERLAND

For reinventing magnetic materials for next-generation electronic devices

Today's world is surrounded by electronic devices which makes everyone's life easier: cellphones, GPS, computers. These devices all contain two types of components, which either store or deliver information in the electronic circuits. A material that allows "two-in-one" components, able to both store and process information, would significantly reduce the size of electronic devices allowing for a new generation of technologies that are lighter, smaller and more energy-efficient.

Professor Nicola A. Spaldin's research conceived and developed a new class of two-in-one materials called "multiferroics", which are at the same time both ferromagnetic and ferroelectric. Multiferroics are rarely found in nature and must be developed in the laboratory. Prof. Spaldin begins by designing the physical and chemical structure of new materials using computer simulations and then uses the results of these simulations to guide real experiments with her team and with outside collaborators.

Since 2010, she has headed the Materials Theory Group at the Swiss Federal Technical University (ETH) in Zürich, where her work focuses on understanding and developing these materials, which as mentioned, are both ferroelectric and magnetic at the same time. While ferroelectricity was first hypothesized by Pierre Curie in the late 1800s, it took another hundred years before Spaldin's work allowed ferroelectricity to be combined with magnetism.

She works closely with colleagues at companies such as IBM and at large-scale facilities like the Swiss Light Source, as well as universities worldwide to make her materials and measure their properties.

A theoretical chemist by training, Prof. Spaldin's expertise lies in making detailed quantum-mechanical calculations to understand the properties of complex materials. She is passionate about teaching her subject, in venues ranging from world-leading universities to remote mountain valleys in Nepal. Outside the laboratory, she loves hiking in the mountains thanks to a childhood spent in the beautiful and hilly Lake District in the north of England; it was there that the surrounding geology first sparked her interest in science, which developed through studies in mineralogy and chemistry to her current specialty of materials physics (which are not so far removed from each other as one might think, she says). Today, at 47, she likes to climb and backcountry ski in the Swiss Alps when she has some free time. And that is not all: she is also an active performing orchestral and chamber musician, which allows her to meet people from different backgrounds and walks of life, something that is important to her. Dialogue is another essential fuel, she adds. "*Discussions with my research group are always very stimulating and the diversity of our team allows new ideas to emerge.*"

From the mountains to materials and music, the multiferroics pioneer is indeed a creative soul – and science is a creative endeavor after all, as she points out.

2017 LAUREATE
Latin America

Professor Maria Teresa Ruiz

ASTROPHYSICS

Professor at the Department of Astronomy at the University of Chile, CHILE

For discovering a new type of celestial body, halfway between a star and a planet, hidden in the darkness of the universe

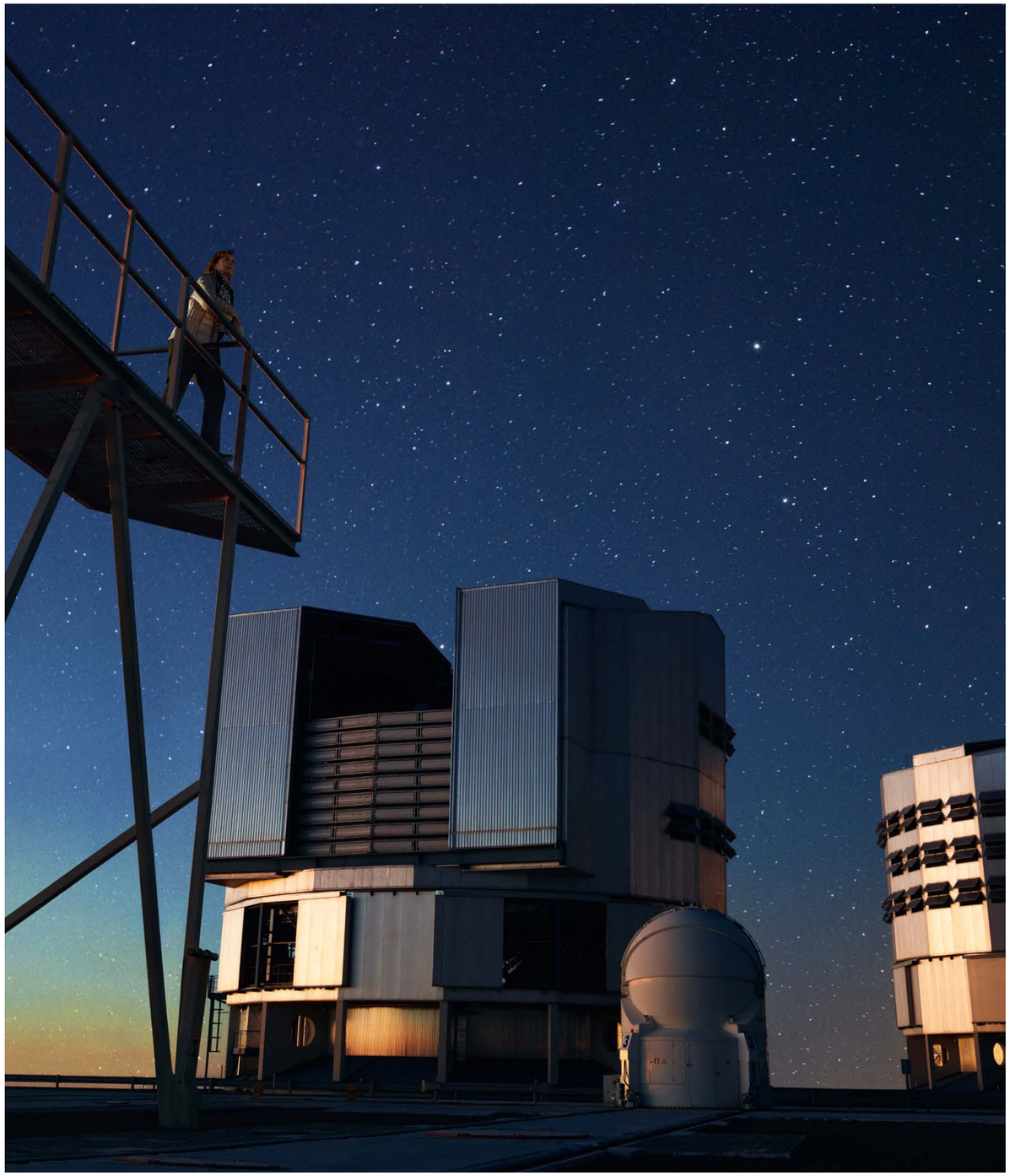
Our solar system has 8 planets, but there are nearly 2000 exoplanets (so called because they are outside our solar system). These exoplanets help provide answers to scientists working on a wide range of issues, including whether life exists on other planets. However, they are difficult to study because, since they orbit very close to their star, they are generally masked by the star's light. In 1997, Professor Maria Teresa Ruiz discovered an unusual celestial body, previously theorized but never observed: the first free-floating brown dwarf.

Bigger than giant planets but fainter than stars, brown dwarfs are thought of as being failed stars or expanded planets. They are quite similar to exoplanets, and easier to observe. By studying brown dwarfs, astrophysicists can thus better understand the characteristics of exoplanets, how they evolve over time and the conditions necessary for the development of life on planets other than Earth. In other words, brown dwarfs are excellent exoplanet laboratories.

Head of the Department of Astronomy at the University of Chile in Santiago, Prof. Ruiz named her discovery Kelu 1. Kelu means "red" in the language of the Chilean Mapuche Indians and Kelu-1 is said to be free-floating because it wanders through space without being attached to any stellar system.

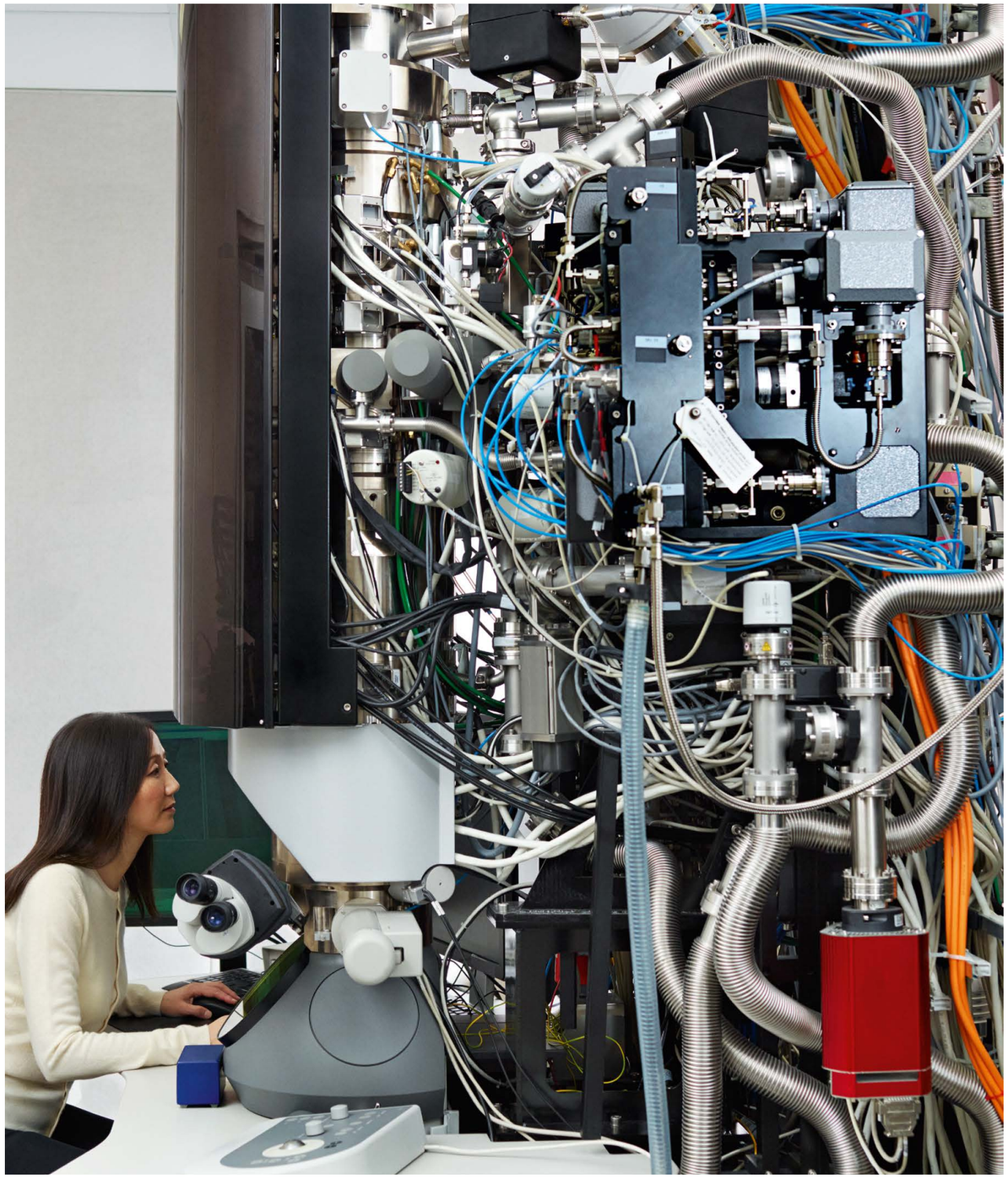
Prof. Ruiz also studies another type of faint star, the white dwarfs, which are the solid remains of dead stars. More than 97% of the stars in our galaxy become white dwarfs at the end of their lives. By studying the coldest ones, Prof. Ruiz and her colleagues have succeeded in calculating that the age of the Milky Way's Disk is about 8 billion years old. This result did not come easy: the researchers spent hundreds of long, cold nights on a remote desert observatory and two decades consulting their best data. This goldmine of information has been published in dozens of scientific articles and represents the most up-to-date research on white dwarfs.

Prof. Ruiz's career reads as a series of 40-year firsts: She is first woman to have taken a degree in astronomy at the University of Chile; she was the first female scientist to receive a PhD in astrophysics at Princeton University; and the first woman to receive her country's National Award for Exact Sciences. Now 70, she has also just been named the first woman president of the Chilean Academy of Sciences and was recognized by the American Astronomical Society (AAS) in 2004, when she became an honorary member. Outside the Americas, she is well known for her role in setting up the much-coveted international giant radiotelescope ALMA (Atacama Large Millimeter/submillimeter Array). The telescope, built in partnership with ESO (European Southern Observatory), is installed in the Atacama Desert in the north of Chile in a high-up (5000 meters above sea-level) region where there is little light pollution. The atmosphere there is also very dry, making it ideal for sub-millimeter astronomy, since radiation at these wavelengths is absorbed by water vapor in the atmosphere.



2017 LAUREATE

North America



Professor Zhenan Bao

MATERIAL CHEMISTRY

Professor in the Department of Chemical Engineering at Stanford University, UNITED STATES.

For inventing skin inspired electronic materials

Thanks to the unique polymer skin she has made, Professor Zhenan Bao could help prosthesis users regain the sense of touch. Her work focuses on transforming these polymers into an electronic skin that is as sensitive to touch as our skin, by turning them into conducting materials.

Potential applications for such a skin could see the light of day pretty soon, says Prof. Bao who arrived in the United States in 1990 when she was still in her junior year study at the Nanjing University in China. This university is where her mother was a chemistry professor and her father was a physics professor. She obtained her PhD in organic chemistry five years later and began work at the prestigious Bell Labs, specialized in telecoms and computing. Since then, she has co-published around 400 scientific papers and has received more than 40 awards and distinctions. She also has more than 60 patents to her name.

In 2015, the journal Nature named her as one of the top ten people who have had an important impact on science that year. In the same year, she published a remarkable paper about an electronic skin that was sensitive to touch. The electronic skin, made from a special polymer film, was developed in her chemical engineering laboratory at Stanford University. It is made up of a printed electronic circuit and a pressure sensor. When pressure signals were applied, the electronic skin produced electric pulses that were used to successfully stimulate the brain. Such signals can be sent to a computer or, if properly interfaced, to the human brain. If coated onto prostheses, the electronic skin could, for example, help amputee patients recover their sense of touch.

Eager to develop real-world applications for her research, Prof. Bao co-founded a start-up in 2010. Her aim is not only to create innovative materials but also to develop prototype devices that exploit these materials. Her love of chemistry no doubt comes thanks to her parents, she says, who were both science professors at Nanjing University– where she grew up. *"My father was a physicist and my mother a chemist. I remember playing with distilled water squeezy bottles as a child, and being fascinated by the color change of pH papers and the beautiful patterns of microprocessors on a silicon wafer."*

Today, mother of two children herself, the researcher cites two other important role models in her life - Edwin Chandross, previously a manager of Bell Labs, and Elsa Reichmanis, also previously a manager at Bell Labs and now a professor at the Georgia Institute of Technology in Atlanta, Georgia, USA. At 45, she admits that her biggest challenge was to understand who she was, and what she was best at – a must for having confidence in yourself, she says, and for overcoming the challenges that come with a career in science.

PROF. CHRISTIAN AMATORE
President of the L'Oréal-UNESCO International Jury
Chemistry Department, Ecole Normale Supérieure de Paris, Member of the French Académie des sciences, France.

INTERNATIONAL JURY
2017 EDITION
L'ORÉAL- UNESCO
For Women in Science awards

PROF. BEATRIZ BARBUY
Institute of Astronomy, Geophysics and Atmospheric Sciences, University of São Paulo, BRAZIL
L'Oréal-UNESCO Award Laureate 2009

PROF. MARGARET BRIMBLE
Chair of Organic and Medicinal Chemistry, University of Auckland, NEW ZEALAND
L'Oréal-UNESCO Award Laureate 2007

PROF. SYLVIO CANUTO
Institute of Physics, University of São Paulo, BRAZIL

PROF. LASZLO SZARKA
Director General, Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences, HUNGARY

PROF. SILVIA TORRES-PEIMBERT
Professor at Instituto de Astronomía, Universidad Nacional Autonoma de MEXICO
L'Oréal-UNESCO Award Laureate 2011

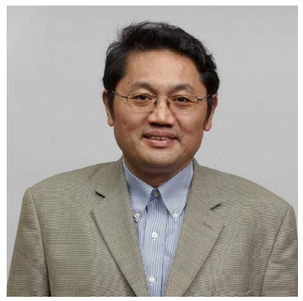
DOCTOR FRÉDÉRIC LEROY
Director, Strategic Foresight, L'Oréal Research and Innovation, FRANCE

PROF. TEBELLO NYOKONG
Director of DST/Mintek Nanotechnology Innovation Centre, Department of Chemistry, Rhodes University, SOUTH AFRICA
L'Oréal-UNESCO Award Laureate 2009

PROF. JEHANE RAGAI
Department of Chemistry, School of Sciences and Engineering, The American University in Cairo, EGYPT

PROF. MITCHELL WINNIK
University Professor and Chemistry Department, Faculty of Arts and Science, University of Toronto, CANADA

PROF. VIVIAN WING-WAH YAM
Philip Wong Wilson Wong Professor of Chemistry and Energy, Department of Chemistry, University of HONG KONG
L'Oréal-UNESCO Award Laureate 2011



PROF. DONGPING ZHONG
Robert Smith Professor, Ohio State University, USA

FOR WOMEN IN SCIENCE PROGRAM

Key figures in 2017

Over the last 19 years

2,820

Women scientists recognized
in 115 countries

97

Awards Laureates honored for excellence in science, including two who went on to win the Nobel Prize

2,723

Talented young women granted Fellowships to pursue promising research projects

275

Fellowships given worldwide this year
Over 9,000 applications

43

High level scientific institutions involved worldwide

353

Scientists involved in the selection process of the national and regional programs including 31 L'Oréal-UNESCO *For Women in Science* Laureates

All media resources for the
2017 L'Oréal-UNESCO *For Women in Science* program are available on:
WWW.FONDATIONLOREAL.COM/MEDIACENTER

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