L'ORÉAL-UNESCO FOR WOMEN IN SCIENCE 2008

2008 AWARDS and FELLOWSHIPS

CONTENTS

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THE L'ORÉAL-UNESCO AWARDS FOR WOMEN IN SCIENCE

Scientific excellence and balancing the five continents:
assuring that the Laureates are models for future generations

Christian de Duve, Nobel Prize in Medicine 1974 and Founding President of the L'ORÉAL-UNESCO Awards, and Gunter Blobel, Nobel Prize in Medicine 1999 and President of the Life Sciences Jury, talk in an interview about the stringent selection process, their vision of the Laureates as role models, and discuss the success of the program that started ten years ago...

Professor Christian de Duve
Nobel Prize in Medicine 1974 and Founding President of the L'ORÉAL-UNESCO Awards For Women in Science.

"From the start of the program, we made scientific excellence the main criterion for the awards."

Professor Gunter BLOBEL
Nobel Prize in Medicine 1999 and President of the Life Sciences Jury.

"The greatest achievement is surely to have given such recognition to the contribution of women in sciences. But it's particularly important to have extended it to the five continents."

Professor Christian de Duve
Nobel Prize in Medicine 1974 and Founding President of the L'ORÉAL-UNESCO Awards For Women in Science.

What do you consider as the major achievement of the For women in Science program?

When I look at the list of Laureates, I'm impressed by the quality of their work. It is a great achievement to have contributed to the recognition of so many talented scientists in so many fields and in all types of research – whether applied or fundamental. Even in parts of the world such as Africa, where structures are less developed and where science is more oriented to applied fields, we have Laureates using the latest technologies and doing fundamental research. For example, we have two Laureates from Nigeria. This is a central issue for the program, as it is for science itself. All the Laureates value the importance of basic scientific research and share the tremendous desire for understanding and for exploration of unknown territories that leads to major discoveries. It is important to put faces to this passion for research and it's a privilege for me to meet the new Laureates each year.

As the first president of the Jury, where did you place scientific excellence among the values of the award?

From the start of the program, we made scientific excellence the main criterion for the awards. We excluded consideration of political or media aspects connected to the candidates. It was quite a challenge at the time because there were no similar awards and the subject of woman scientists was still unusual. But L'ORÉAL and UNESCO wanted the awards to reflect the best international scientific standards – and that surely contributed to its success. When we did the first editions, no one could have said that they were launching such an important operation as it is today, but each of us was deeply committed to the success of this project.

How do you view the "role model" dimension of the Laureates?

This is a major issue, and it is deeply connected to the scientific excellence we so highly value. If the Laureates have the great impact as role models today, it is because they are women *and* great scientists, with a real desire for research that drove them to impressive work and careers. I wouldn't be surprised if some of them appear on the Nobel Prize list in the coming years. Their exemplarity derives directly from their passion for science, and that's the best role model for the next generation.

Do you see the creation of the L'Oréal Corporate Foundation as a new asset for the program?

It surely is. And I'm happy to see that these awards, which were created in a pioneer step, can continue its action now within such a durable framework.

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Professor Gunter BLOBEL
Nobel Prize in Medicine 1999 and President of the Life Sciences Jury.

What do you consider to be the main achievement of the "For Women in science" program?

The greatest achievement is surely to have given such recognition to the contribution of women in sciences. But it's particularly important to have extended it to the five continents. This is a major issue, as we have tremendous talents in science in the developing countries and most of these brilliant women face great difficulties regarding the lack of structures for research, the cultural resistances to emancipation or the scarcity of local role models. A lot of this potential is lost. On the awards jury, we maintain a strong belief in the need to support these scientists from developing countries. Not only with money, but also by highlighting these new faces and news ideas from Africa, Asia or Latin America.

How do you consider the scientific value of this program?

It's at a high, a very high point. As Nobel Prize winners, individually we receive a lot of solicitations coming from all over the world. But this Jury is in a unique position. I didn't hesitate long when I was asked to take the presidency for the life sciences awards. From the very beginning, Christian de Duve and Pierre-Gilles de Gennes, the late president of the Physical Sciences Jury, insisted that the scientific works of the candidates be the central standard of the awards.

They always placed the scientific requirement at the highest level of demand and we have to thank them for that. As a result, "For Women in Science" is not just recognized as a prize for women, but also as an opportunity to promote news visions and news achievements in the sciences. I try to focus on this goal in our Jury deliberations. We view hundreds of candidate files each year, and spend hours analyzing each of them. It's a big task, but it's the one guarantee of the quality of the Laureates.

Are you also sensitive to the dimension of "role models" of the winners?

Role models are a very crucial point. It's important for all the other women engaged in scientific careers and who might feel isolated. It's even more important for the youngest girls who might choose science studies and need examples to follow. We have among our laureates many impressive role models. I'm still surprised by the involvement and the strength some of them put into changing the situation in their country and helping new generations. Look at Shirley Tilghman who became the first president of Princeton University, in the US or Indira Nath fighting leprosy in India, just to name two. They are great examples for women, but also for all the scientists who may hesitate to engage themselves actively wherever they are.

L'ORÉAL-UNESCO FOR WOMEN AND SCIENCE 2008:
THE LAUREATES

L'ORÉAL-UNESCO For Women in Science 2008
Laureate 2008 for AFRICA & ARAB STATES

"For her contributions to the characterization of inherited disorders"

Professor Lihadh AL-GAZALI
United Arab Emirates

Professor in Clinical Genetics and Pediatrics
Senior Consultant in Clinical Genetics
Department of Pediatrics
United Arab Emirates University, Al-Ain

Clinical genetics is a medical specialty concerned with the diagnosis and prevention of inherited conditions. It examines the relationship between genes and health among individuals and their families. With growing advances in science and technology, as well as increasing public and professional awareness of genetic issues, this field is rapidly gaining importance.

The diagnosis of a genetic state or condition is based on clinical techniques such as cytogenetics (examining chromosomes under a microscope), molecular genetics or 'genomics' (the analysis of genetic material at the DNA level), and biochemical genetics, which looks at the activity of certain enzymes and other chemicals created by the metabolic processes of cells.

CLINICAL GENETICS: Professor Lihadh Al-Gazali is a leading clinical geneticist and a pioneer of genetics research in the Arab region. For over 17 years she has worked to educate Middle Eastern populations about clinical genetics. She has defined several new syndromes and contributed to the clinical and molecular characterization of many disorders. She established a registry for monitoring birth defects for the United Arab Emirates (UAE),

the first registry from an Arab country to gain membership in the International Clearinghouse of Birth Defects based in Rome.

The UAE population has a high level of consanguineous marriages (in which spouses share a common ancestor), leading to a higher incidence of recessive genetic disorders and, in particular, rare dysmorphic syndromes and bone dysplasias. Professor Al-Gazali has greatly contributed to building awareness of the importance of genetic counseling for the prevention of genetic disorders.

THE U.A.E.'S FIRST FACILITY TO DIAGNOSE GENETIC DISORDERS

When she joined the UAE University in 1990, there were no facilities for the diagnosis of genetic disorders or research facilities available anywhere in the country. She established a Clinical Genetics Service supported by cytogenetic and DNA laboratories. Today this service covers the entire UAE population, offering counseling, education and support for families affected by genetic diseases.

Professor Al-Gazali has focused her research primarily on the identification and delineation of genetic disorders and syndromes that are prevalent in the UAE and Arab populations at the clinical and molecular level. Through international collaborations, she and her group have contributed to the identification of 15 recessive genes and to the mapping of 7 genes. She has provided important data on the clinical appearance and natural history of many genetic syndromes, as well as describing new syndromes, two of which were named after her.

After obtaining her medical degree from Baghdad University, Professor Al-Gazali trained in medical and clinical genetics at Edinburgh and Leeds Universities in the UK. She played a key role in founding the Center for Arab Genomic Studies in Dubai and establishing other regional genetics-related institutions. Lihadh Al-Gazali received the Distinguished Performance Award in Research and Clinical Services of UAE University in 2003 and was profiled in the *The Lancet* in 2006 for her contribution to Clinical Genetics and Research in the Middle East.

IN HER OWN WORDS

The choice of clinical genetics

A good education was of the utmost importance in Lihadh Al-Gazali's family. *"My father was a judge in the army and my mother was an educator, very much ahead of her time. As one of the first women to go to university in Iraq in the 1930s, she was highly respected in her field and supported and guided me throughout my career. She always told me that with hard work and perseverance I could achieve anything I want – something I passed on to my two daughters and son, who are now all successful in their own right."*

Since she excelled in math and science at school, studying medicine was a natural choice. After obtaining a medical degree, Lihadh Al-Gazali trained in the UK in pediatrics and human genetics. At the time, there were no clinical geneticists in Iraq. *"My interest in clinical genetics and dysmorphology stemmed from a desire to understand the scientific basis for clinical differences between children with strikingly different phenotypes, who were all regarded as 'children with multiple congenital anomalies', with no attention given to their individual medical problems and disabilities. I was eager to discover how I could develop ways to help them and their families."*

The fast pace of this field has provided a constant source of motivation throughout her career. *"Every day is different! I enjoy remaining close to the 'cutting edge' of new discoveries in genetic diseases and being able to use my knowledge and skills to provide innovative and effective medical services to those that require them. Naturally it is also very important to me to feel I am contributing to the community I serve."*

Will advances in medical genetics allow us to one day cure or prevent disease?
"To date there are very few effective therapies for genetically linked conditions. It is likely that for some time there will be many more genetic diseases diagnosed than can be treated. The capacity to fix genes with perfect precision and without side effects is proving remarkably difficult. Already, there have been some high-profile examples of gene-therapy trials going terribly wrong, and the field now is proceeding with perhaps more caution. Over time, there is little doubt that our genetic knowledge will improve modern medicine and thus prove a great advantage to us all. But the new genetics will probably not be the therapeutic panacea that many once hoped."

Women everywhere face the same difficulties
Lihadh Al-Gazali has seen that women face the same obstacles the world over, the primary one being the difficulty of juggling family and professional life. *"I think the biggest hurdle for women is the challenge of combining raising a family with a professional career."* She also thinks women in scientific fields encounter similar problems, regardless of their backgrounds. *"In my personal experience, I did not find any difference between my culture (Iraqi) and western culture regarding working as a woman in Science."*

Although the number of women scientists has increased since she began her career, there are still too few female role models for young women to identify with. *"Women remain under-represented and only a handful actually reaches positions of responsibility. In addition, women aspiring to be scientists are generally excluded from the male-dominated 'networking' that is ever-prevalent in scientific circles."*

Learn from setbacks
She advises aspiring young scientists to be focused, perseverant and immune to discouragement. *"My advice to young women scientists is to be confident, to work hard, set your goals and strive towards them. Do not be put off by obstacles or a few failures; learn from them instead. One or two setbacks are good for the soul."*

L'ORÉAL-UNESCO For Women in Science 2008
Laureate for ASIA-PACIFIC

"For elucidating several key steps in the formation of a new class of gene regulating RNA molecules"

Assistant Professor V. Narry KIM
Republic of Korea

School of Biological Sciences
Seoul National University

MicroRNAs are small, single-stranded RNA molecules that are naturally expressed by the cells of plants and animals. They regulate gene expression, usually by causing a developmental process to "turn off" at a necessary time point, by either inhibiting the translation or inducing the destruction of protein-coding messenger RNAs. Scientists predict there may be 1000 unique microRNAs in the genetic material of higher mammals, including several hundred in humans.

MOLECULAR BIOLOGY: Professor V. Narry Kim specializes in the biology of microRNAs, which play an important role in gene regulation. She has made major contributions to the understanding of microRNA biogenesis, and her pioneering studies have laid the groundwork for the development of RNA interference technologies, with promising potential biotechnology and medical adaptations.

The importance of microRNA
MicroRNAs are very small pieces of RNA that function as an on/off switch for gene expression; gene expression is itself an on/off switch for cell activity. These tiny RNA molecules in cells can turn off the production of proteins required for a particular process, thus stopping that process (such as cell division) at just the right time for the correct development of an organ. As a result, they control several developmental pathways that are critical to life, including the earliest formation of blood and organs, cell proliferation, and eventually cell death.

Much about the influence of microRNA and the extent of its effects remains undiscovered, but V. Narry Kim has shown that microRNAs have important regulatory roles to play in fundamental cellular processes. Her research has elucidated how the expression of microRNA genes is controlled. In particular, she provided evidence that microRNA genes are transcribed by RNA polymerase II ("Pol II"), an important enzyme in the genetic transcription process.

To study the molecular mechanisms of the microRNA pathway, V. Narry Kim and her group combined approaches from a range of cell biological, biochemical, and computational techniques. By identifying key processing factors for microRNA biogenesis, Professor Kim has greatly added to the current understanding of how microRNAs are created and processed in cells.

Fundamental microRNA discoveries

Professor Kim and her colleagues determined that microRNAs are generated by a specific "stepwise processing" method, consisting of two sequential processing steps. This major study, published in 2002, provided the basis for microRNA research; the model she described was confirmed later by many labs and soon became dogma in the field.

In another important breakthrough, she identified Drosha, a nuclear enzyme that is a key processing factor for microRNA biogenesis. Maturation of the microRNA requires a series of biochemical cleavages to the RNA chain at specific locations. Professor Kim was able to define the rules by which Drosha recognizes cleavage sites, which are widely used today for the identification of microRNA and the design of RNA interference vectors.

The activity of Drosha was later found by others to be associated with certain tumors, making it a target for drug discovery efforts. Today her laboratory continues to make progress in unraveling the function and regulation of microRNAs in cancer cells.

V. Narry Kim and her colleagues also work extensively on embryonic stem cells and the microRNAs that are specifically expressed in these cells. She is the author of one of the most cited papers in the field of human embryonic stem cell biology in recent years.

Professor Kim did her postdoctoral work at the Howard Hughes Medical Institute, University of Pennsylvania, and is currently an assistant professor at Seoul National University. She has received a number of awards, including the Young Scientist Award from the Korean Ministry of Science and Engineering and the Thomson Scientific Citation Laureate Awards.

IN HER OWN WORDS

The beauty of logic and biology

As a teenager, V. Narry Kim developed a strong interest in natural science, which her family encouraged her to develop. "*I read a book on the history of science, about the birth of philosophy, mathematics, and physics in Greece. The beauty of logic fascinated me. My father and teachers wanted me to become a doctor, but when I decided to study biology, my parents were very supportive. In fact, my parents have always believed in me and respected my opinion, which I think was the critical element that helped me grow up as an independent individual and scientist."*

Describing herself as a thinker rather than an observer, she recalls how, during her university studies, she was struck by the elegance of biology. "*I realized that living organisms are not just a chaotic mixture of molecules; instead they are governed by very simple, elegant rules. I wanted to reveal the simplicity of the principles underlying the complexity of life.*"

Enjoying research and hard work
Through the years and despite moments of discouragement, the overriding factor that has sustained V. Narry Kim and enabled her to persevere in the world of research is her love for science. "*There were times when it seemed simply impossible to continue my career. But I stayed on because I knew that I love science. I truly enjoy the act of doing research itself.*"

In her experience, scientific breakthroughs are the product of deliberate and careful effort: "*Scientific illuminations haven't come all at once in my case. Instead, they've come step by step, after I've invested a great deal of time and thinking. Most often, good ideas come when I am relaxed, after I've been thinking hard.*"

Initially not a friendly laboratory environment
When she began doing research, women scientists in Korea were still a minority, even in biology. The environment was intimidating. Male students and even professors sometimes made remarks that, although they may have been intended as jokes, left women students feeling uncomfortable. "*We were often told that it might be difficult to get a decent permanent position as a woman, even when we excelled in terms of scientific capability. That was very discouraging. The working environment in the lab in Korea in the early 1990's was not very friendly to women students. But things have in many ways improved significantly over the last ten years. The difficulty still remains, however, especially with childcare—which needs changes not only in Korea but also worldwide.*"

Young women in science need to be courageous
Professor Kim is convinced that young women scientists must be brave and believe in themselves. "*There can be many obstacles in pursuing your career. If you are afraid and avoid them, nothing will happen. Just take a deep breath and tell yourself in the mirror 'You can do this!'."*

L'ORÉAL-UNESCO For Women in Science 2008
Laureate for EUROPE

"For her structural studies of the protein biosynthesis system and its disruption by antibiotics"

Professeur Ada YONATH
Israel

Professor of Structural Biology and Director,
Helen & Milton A. Kimmelman Center for Biomolecular Structure and Assembly

Weizmann Institute for Science, Rehovot

Ribosomes are responsible for the production of all proteins in living cells. Often referred to as the cell's protein factory, they translate the genetic code into functional molecules. They receive instructions in the form of messenger RNA from the cell DNA and use them to assemble amino acids and build proteins. If the work of the ribosome is impeded, the cell dies.

Ribosomes are present in all cells, of mammalians (e.g. human), plants and bacteria, including disease-causing pathogens. Performing a fundamental life process, the ribosomes represent a key target for antibiotics, which, by exploiting subtle details, can selectively attack the ribosomal activity of harmful bacteria, leaving human ribosomes untouched.

STRUCTURAL BIOLOGY: For her research spanning more than two decades in pursuit of revealing the intricate function of ribosomes based on their structure, Professor Ada Yonath is widely considered the pioneer of ribosome crystallography. She made many crucial insights and developed innovative techniques that led to determining the structure of ribosomes, the site of protein biosynthesis in living cells.

The importance of unlocking the ribosomal structure
Ribosomes are relatively giant, unstable nucleoprotein complexes whose structure challenged biologists for years. Being able to visualize the ribosomal structure was a key prerequisite to understanding of protein biosynthesis, with potential applications in biotechnology, medicine, and pharmacology—in particular, improvement of antibiotics that interact with bacterial ribosomes and the design of advanced antibacterial agents.

When Ada Yonath began her scientific career, many in the international scientific community did not believe that ribosomes could be crystallized, nor their structures determined, due to their enormous size, heterogeneity, flexibility and molecular instability. Yet, Yonath, who in 1970 initiated Israel's first laboratory for protein crystallography, decided, in 1979 to attempt ribosome crystallography, a subject that gained international attention for its innovative investigations. In the 1980s, she and her team succeeded for the first time in crystallizing and in year 2000 the first exact three-dimensional structure of ribosomes and their complexes were determined.

Innovative methods that are standard today
In her groundbreaking work to determine the structure of ribosomes, Professor Yonath introduced a number of innovations that have become routine structural biology techniques today. One in particular stands out: the method of cryo-crystallography, which runs at temperatures of minus 185 Centigrade and minimizes the problem of damage to the extremely sensitive ribosomal crystal that is caused by the technique’s required irradiation.

Ada Yonath also visualized key structural features necessary for the folding of proteins; it is this folding that creates each protein’s unique three-dimensional shape—and therefore determines its biological function— which can be gained only after the entire protein emerges out of the ribosome. Particularly, she showed how the newly born proteins are protected from misfolding as it exits the ribosome “factory.”

Solving the problem of antibiotic resistance
Resistance to antibiotics is a serious public health concern today because it severely compromises the effectiveness of antibiotics to treat infections caused by disease-causing bacteria. Professor Yonath's research has revealed the precise modes of action of over 20 different antibiotics that target bacterial ribosomes, and her findings have helped identify how bacteria become resistant to antibiotics. This knowledge can be applied to improving antibiotics' ability to target ribosomes of pathogens, helping to combat the problem of resistance.

In addition to her work at the Weizmann Institute of Science, Professor Yonath has led research groups at the Max Planck Institute in Hamburg, Germany. She is a member of the Israeli, American and European Academies of Science, and serves on national and international committees on particle super-accelerators (used in determining molecular structures, among other things). She has received numerous awards and honors in recognition of her research and techniques, which have had a tremendous impact on structural biology and biomedical research.

IN HER OWN WORDS

Still so much to discover
Since the age of five, Ada Yonath has been driven by a desire to understand Nature's secrets. At university, she studied biophysics and structural biology: "*I realized these are the most powerful techniques for understanding the function and modes of operation of biomolecules, the molecules produced by living cells. Today I'm still fascinated by science, and my stimulation for divulging the principles of life has not decreased. There are still so many fundamental questions to be answered, so many key processes to investigate!*"

Invaluable support
Her parents placed importance on learning, and Ada Yonath was encouraged to pursue her studies, even though at a young age she also needed to help support her family. "*My father died when I was 11 years old and left my mother with me and my sister but no income, so I was needed at home. Nevertheless, my mother realized my lust for science and provided me with massive emotional support. She did not object to my academic studies, although at the time this was not so common for females. When I became a scientist, my mother, sister, and later on my daughter and granddaughter always supported my scientific activities, in my presence as well as in my frequent absences.*"

Although many scientists expressed doubts about what she aimed to accomplish—unlocking the structure of the ribosome—she was able to count on the support of "*a few individuals, including several distinguished scientists and my own group of young and highly motivated students. They encouraged me even when my project met with rigorous skepticism from most prominent scientists all over the world, even when I was called 'a dreamer,' 'crazy' or the 'Village Fool'.*"

She was also sustained by her steadfast conviction that her project was too important to be abandoned. "*Once matured, I knew it would contribute an immense amount of knowledge concerning a profound process in life science, which also has significant clinical importance.*" Often she overcame one obstacle and immediately faced another: "*At times, I felt as if I reached the summit of Mount Everest, only to discover that right behind it was a steeper and even higher mountain. Throughout, I felt as if I was putting together a huge puzzle with numerous components, some of which had unpredictable complications.*"

Not a question of gender
Ada Yonath believes that gender should have little or no influence on a scientist's ambition to explore nature. "*For generations our society has been led to assume that there is a too big gap between having a career and raising kids. This unjustified impression is still the major reason that prevents young women from becoming scientists.*"

Her words of advice are directed at all young scientists. "*My main advice is to go along with their scientific dreams, to be determined and flexible, and to focus on profound scientific questions. A scientific career is highly demanding for women as well as for men. Yet both genders can find ways for accommodating their scientific work with their domestic duties.*"

L'ORÉAL-UNESCO For Women in Science 2008
Laureate for LATIN AMERICA

"For her contribution to the understanding of the molecular basis of hearing"

Professor Ana Belén ELGOYHEN
Argentina

Professor, Independent Investigator
Institute for Genetic Engineering and Molecular Biology (CONICET)
University of Buenos Aires, School of Medicine
Buenos Aires

The ear is divided into three parts: the outer, middle and inner ear. The eardrum separates the external ear from the middle ear. The **cochlea** of the inner ear is a small, coiled organ where the sounds detected by the ear are received and modulated, and then sent to the brain for further processing.

Hearing starts with the outer ear. Sound waves coming into the ear make the eardrum vibrate, and these vibrations are transmitted to the **hair cells** in the cochlea, which convert them into an electrical signal. This signal is sent to the brain, where it produces the sensation we know as hearing. Importantly, in mammals, the hair cells do not regenerate if they are damaged, which may lead to tinnitus (a constant ringing in the ears) and hearing defects.

AUDITORY PHYSIOLOGY: Ana Belén Elgoyhen studies the neurochemical mechanisms that regulate hearing. She is best known for having identified and characterized the specialized nerve receptors in the inner ear that modulate, or "remix," the sounds heard by the ear in a way that makes them understandable.

The importance of muffling out sounds
Being able to read undisturbed by background noise or to hear one's dinner companion in a noisy restaurant is something most of us take for granted. The specialized cochlear (inner ear) nerve receptors that Professor Elgoyhen identified allow nerve signals coming from the brain to adjust the sounds received by the ear. These receptors diminish the intensity of

some sounds (or “muffle them out”) by inhibiting amplification, which has the effect of clarifying and enhancing other sounds above the level of background noise.

Diminishing the incoming sound intensity at the level of the cochlea also protects the cochlear hair cells, which are the specialized sensory cells that amplify sound waves into auditory information that is transmitted to the brain. Being able to diminish the intensity offers protection from noise-induced trauma—caused for instance by loud traffic, rock concerts, or portable listening devices at high volumes. Injury to the inner ear sensory receptor cells may result in hearing defects and tinnitus (ringing in the ears).

Solving the mystery of an elusive receptor
Professor Elgoyhen discovered these specialized nerve receptors that are stimulated by the neurotransmitter acetylcholine, a chemical messenger. Her pioneering studies cleared up a long-standing mystery in auditory physiology regarding the molecular nature of these specialized nerve receptors, which researchers had been trying to identify for decades. In addition, and contrary to expectations, she proved that the acetylcholine-sensitive receptors are related to the nicotinic-class receptors of nerve and muscle tissue located elsewhere in the body.

Her discovery opened new avenues for the identification of potential therapeutic approaches for disorders of the inner ear. It also greatly expanded scientists' understanding of this family of neurochemical signaling proteins involved in hearing.

In Argentina, Professor Elgoyhen contributed to establishing genetic diagnostics criteria for hearing impairment and is a member of the Tinnitus Research Initiative, based at the University of Regensburg, Germany. She has received numerous awards, including a fellowship from the PEW Charitable Trusts Latin American Fellows program. Most notably, her scientific accomplishments led to her appointment as a Howard Hughes Medical Institute International Scholar. She is the only Latin American woman to have achieved this distinction in three consecutive competitions.

IN HER OWN WORDS

Choosing science
Ana Belén Elgoyhen has never been able to leave a puzzle unsolved. "*In high school I really enjoyed mathematics and biology, especially human physiology. I was always eager to go beyond what was already known, looking for new things to learn and understand.*" She and her two sisters were encouraged to pursue a university education: "*My parents always fostered us to have our own identity in this evolving world, and they considered that, for us to be able to have the tools to succeed in life, we needed a university degree.*"

Although she felt this set her apart, she did not mind. "*My generation of women was raised to marry young and have children. While most of my friends were going out and having fun as teenagers, I was always studying. I was seen as different, but at one point I just did not care.*"

A fundamental love for her work and a combative spirit have helped her remain motivated: "*I've stayed in this career because I love what I do, there cannot be another explanation. Although I have been successful, it has been difficult, obscure and not always straightforward. I think that I am a fighter in life, and that has been key to succeeding in science.*"

Applying basic research to solving real problems
At one point, she wanted to find an application for the basic research she enjoyed so much. "*I love investigating for the sake of finding answers to biological problems, but I got to the point where I felt that I owed something to society. Since I was working with genes that are expressed in the inner ear, I decided to look for genes that are responsible for hearing*

defects. Nobody was doing that in Argentina, and we established the genetic diagnostics of hearing impairment in my country. I also joined the Tinnitus Research Initiative. If we can find a cure, we will have made a huge difference for people who suffer from this condition."

The Eureka moment

"As often happens in science, I came to the auditory field by chance. I was working at the Molecular Neurobiology Lab at the Salk Institute, studying nicotinic receptors of the central nervous system, which are involved in pathologies such as Alzheimer's disease and tobacco addiction. I revealed a new receptor in the same family, but it had a strange structure and properties. I realized this molecule's properties matched those of a receptor of unknown function that researchers in the auditory field had been seeking for 30 years! Without intending to, I had solved a mystery in auditory physiology."

What has changed for women scientists?

Ana Belén Elgoyhen feels the traditional path taken by women has changed dramatically, in all working environments: "*Women no longer follow their husbands, but seek their own professional success. This is true for women in science too.*

“I think that the opportunities are equal for men and women. However, in general women go slower in this frantic race because we have extra work compared to men; we are scientists, we have to help support our family, we give birth to our children and raise them, and we have to run the house and family."

Her advice to young women scientists is to work hard and collaborate with other researchers. "*The key to success is hard work, intelligence, a huge cup of luck and being in the right place at the right time, surrounded by the right, good people. Nothing grandiose can be achieved in isolation.*"

L'ORÉAL-UNESCO For Women in Science 2008
Laureate for NORTH AMERICA

"For the discovery of the nature and maintenance of chromosome ends and their roles in cancer and aging"

Professor Elizabeth BLACKBURN
USA

Morris Herzstein Professeur of Biology & Physiology
Department of Biochemistry & Biophysics
University of California, San Francisco

"**Telomeres** are the protective caps at the ends of chromosomes in cells. Chromosomes carry the genetic information; telomeres are the buffers. They are like the tips of shoelaces. If you lose the tips, the ends start fraying.
"**Telomerase** is an enzyme. In cells, it restores the length of the telomeres when they get worn. As the ends of the chromosomes wear down, the telomerase comes in and builds them back up. In humans, as we mature, our telomeres slowly wear down."
- from *A Conversation with Elizabeth H. Blackburn,* **The New York Times**. July 3, 2007

MOLECULAR BIOLOGY: With the population aging in all regions of the globe and life expectancy rising from year to year, the multi-faceted process of aging is a rich and important area of scientific inquiry. Elizabeth Blackburn has devoted her scientific career to the study of telomerase and telomeres, which are essential to protecting genetic information in the chromosomes and play a key role in aging and disease. Through her pioneering work in the field of telomere biology, she has greatly contributed to advancing the understanding of aging and cancer at the level of our chromosomes.

In 1985, Elizabeth Blackburn and her graduate student, Carol Greider, reported the discovery of telomerase, the enzyme that restores the ends of chromosomes by replenishing telomeres, which are the protective caps that seal off these chromosome ends. Her findings gave rise to an entirely new view of how the lifespan of normal cells is regulated and how that regulation goes awry in cancer cells.

Telomerase and cell renewal
The telomerase enzyme is found in almost all cells of higher animals and is crucial to normal cell growth. Chromosomes that lose their protective caps (telomeres) lose the ability to replenish themselves and no longer divide normally to give rise to healthy new cells. As we grow older, telomerase is not always active, and telomeres shorten. This loss of the ability to regenerate cells is behind one popular theory about why we age.

Yet telomeres also play a role in uncontrolled cancer growth and metastasis. Telomerase levels are high in 80 to 90% of malignant tumors, where the enzyme's activity causes the cancer cells to grow and divide rapidly. Unregulated cell division is the hallmark of cancer.

Manipulating telomerase activity as a therapeutic tool
Professor Blackburn's research has opened up a new area of inquiry into potential cancer therapies that would block production of the telomerase enzyme and thus hinder the cells' ability to replicate. The opposite approach could be considered for the treatment of age-related and neurodegenerative diseases: reactivating the enzyme to prolong cell life. Both scientists and biotech companies are very interested in exploring these areas of research.

Professor Blackburn and her colleagues have recently reported that chronic psychological stress takes a toll on telomerase. Stress reduces the restorative effect of telomeres, decreasing the cell's capacity for self-renewal. This finding has implications for how stress may promote the earlier onset of age-related disease. Additionally, they have shown that low telomerase levels are a risk factor in human cardiovascular disease.

An outspoken advocate of human embryonic stem cell research and therapeutic cloning, Professor Blackburn made headlines in 2004 when her membership on the United States President's Council on Bioethics, which President George W. Bush invited her to join in 2001, was not renewed after she objected to the Council's written reports on stem cell research.

Born in Australia, Elizabeth Blackburn earned a PhD from Cambridge University and did her postdoctoral work at Yale University. She has received dozens of awards throughout her career, including the prestigious 2006 Albert Lasker Award for Basic Medical Research and the 2007 Vanderbilt Prize in Biomedical Science. In 2007, she was named one of *Time* magazine's “100 Most Influential People in the World.”

IN HER OWN WORDS

The appeal of science
As a child, Elizabeth Blackburn found science alluring. She was intrigued by animals and was naturally curious. "*I loved science because it was a secure and fair world, a place in which you know how things stand.*" In her family tree were several scientists. Hawaii’s largest native insect, the Blackburn’s sphinx moth, is named after one of her 19th century ancestors who collected butterflies. Her great-grandfather and her grandfather were geologists, and both her mother and father were family physicians.

As the second of seven children, "*The encouragement I got from my mother was important in leading me to have a career. I had the idea that women could and would do professional and important work.*" Elizabeth Blackburn admired Marie Curie, whose biography she read several times, and a beautifully illustrated book about science by Jacob Bronowski. Her high school chemistry and biology teachers also strengthened her penchant for science: "*They made the subjects interesting and fun, despite learning with very dry textbooks*."

One of the most exciting moments in her career was the first glimmer of the existence of telomerase. "*Various lines of evidence were pointing to the possibility of a new enzyme that added telomeric DNA to chromosome ends. I started experiments to see if I could work out conditions that might uncover such an activity, and found the first indications that it existed.”*

What has changed for women in science, and what has not
Young women are increasingly choosing to study science today, and women complete postdoctoral research in equal numbers as men. And yet their situation remains discouraging in some respects: "*What has not changed is that the applications by women for the best jobs in science are not proportionately high, and women are grossly underrepresented in such jobs, especially as one goes up the ranks.*"

Many women still encounter discrimination and are, in fact, surprisingly vulnerable. "*Even when women are accomplished scientists, discriminatory remarks can have a devastating effect. The vulnerable early stage of being a scientist is one where a young woman can be especially impacted. What does a young person who does not have a career of achievements and recognition to fall back on or do for reassurance?*"

Question your ideas and wander off the beaten track
In terms of their research, Elizabeth Blackburn advises young women scientists to ask themselves: "*'What can I do that others wouldn't do?' Do not be afraid to ask questions and take roads off the beaten track—but always back up your decisions and research with the highest standards of rigor*."

They should not do experiments that simply reinforce their ideas. "*The trick is to find an experiment that has the capacity to undermine them. You have to be totally willing to undercut yourself and live with the consequences of your original idea being wrong.*"

A strong base of support is also very important for a young woman to enjoy her life as a scientist and the challenges it brings. "*Find people who will support you psychologically. Do not underestimate the importance of the resilience you will need for a demanding career*."

L'ORÉAL-UNESCO FOR WOMEN IN SCIENCE 2008: THE FELLOWS

2008 UNESCO-L'ORÉAL FELLOWSHIPS

Encouraging talent

Fifteen UNESCO-L'ORÉAL International Fellowships are allocated each year to young women researchers in the Life Sciences, at the doctoral or post-doctoral level, whose promising projects have been accepted by a reputable institution outside their home country. Each Fellowship is worth a maximum of US $40,000 over two years.

The Fellowship beneficiaries are geographically spread, three Fellows being selected from each of these five regions: Africa, Arab States, Asia & the Pacific, Europe & North America, and Latin America & the Caribbean. Since their creation, Fellowships have been awarded to 120 women from 67 countries.

Following a pre-selection process by the National Commissions for UNESCO, four candidatures from each country are forwarded to the Fellowship Section at UNESCO in Paris. The final selection of 15 beneficiaries is made by a UNESCO-L'ORÉAL Fellowship Selection Committee.

The 2008 Committee was made up of Maciej Nalecz, Director, Division of Basic and Engineering Sciences, Natural Sciences Sector, UNESCO; Julia Hasler, Program Specialist, Division of Basic and Engineering Sciences, Natural Sciences Sector, UNESCO; Patricia Pineau, Director of Research Communication, L'Oréal; Bruno Bernard, Head of the Hair Biology Group, L'Oréal; Catherine Gerst, Scientific Communication Manager, L'Oréal; and Ali Saib, Professor, University of Paris-Diderot and group leader, National Center for Scientific Research (CNRS).

The program aspires to support the scientific vocations of young women, to give them the opportunity to build international networks in the scientific community, and to gain crucial experience that they can bring back and share with others in their home countries.

AFRICA

Gabon — Agronomy

Yonelle Dea MOUKOUMBI, 34, is a PhD student at the University of Abomey-Calavi in Benin, where she is studying the genetic diversity of new varieties of lowland rice in Africa.

Rice is a primary source of protein for many African people. However, the amount of rice grown in Africa is very low in comparison to Asia and insufficient to respond to the needs of the ever-growing urban populations. Many African states are obliged to import rice at high cost. **Improving rice production is therefore a high priority for ensuring food security in Africa**.

During her fellowship, Yonelle Dea Moukoumbi **will analyze the genetic characteristics of different varieties of Nerica** (NEw RIce for Africa) **rice growing in lowland areas of Benin**. Nerica varieties are a hybrid of African and Asian rice varieties. African rice is a rugged plant well-adapted to African environmental conditions but it has a poor yield. **The Asian species has a much higher yield but its cultivation requires abundant water** and it is more susceptible to African pests and disease.

The new Nerica varieties have transformed African rice culture because they combine the high yields of the Asian rice with the ruggedness of the African species. To ensure that only those Nerica varieties best adapted to the heterogeneous lowland areas are adopted by African farmers, Yonelle Dea Moukoumbi **will identify which gene sequences are associated with high productivity and resistance to plant pathogens and drought**. Her work will make an important contribution to the improvement and sustainability of lowland rice production in Africa and to the quality of life of the population.

On return to Gabon, she will continue her work improving Nerica rice varieties. She plans to develop training for the local farmers and to create new production zones for rice growing.

Host institution: Africa Rice Centre, Cotonou, Benin

Mozambique — Marine Biology

Maria Joao Rego RODRIGUES, 34, is in the final stage of completing her PhD in marine biology at James Cook University in Australia looking at the impacts of macroalgal blooms on coral recovery from bleaching.

During her postdoctoral fellowship, she **will examine the impact of diseases on coral communities of the Western Indian Ocean,** as part of the Global Environmental Facility - Coral Disease Working Group. Coral reefs play an important role in maintaining ocean biodiversity and acting as a protective barrier from wave damage. However, many reefs in the world are losing their coral cover and ecological function due to climate change and human activity, becoming more susceptible to coral bleaching and disease.

Maria Joao Rodrigues **will survey 22 coral reefs along the Mozambican coastline**. She will assess coral disease prevalence, monitor the rate of disease progression over time and identify the different types of pathogens. **This will be the first quantitative study of this type in the region and will provide an important baseline for future conservation projects**. She will coordinate her results with research teams working in other parts of the Indian Ocean and then analyze the data at the Australian Research Council Center of Excellence for Coral Reef Studies at James Cook University.

Her study will help to assess the impact of factors such as large coastal populations and reduced water quality near river discharges, in addition to climate change, on coral communities. It will also establish the potential role of Marine Protected Areas in mitigating the impact of coral disease.

After her fellowship, Maria Joao Rodrigues will continue to contribute to international collaborative coral reef research. She also hopes to take up a university teaching position in Mozambique and to promote awareness of the importance of coral reef conservation.

Host institutions: ARC Center of Excellence for Coral Reef Studies, James Cook University, Australia; Institute of Marine Science, Zanzibar, Tanzania; and Wildlife Conservation Society, Kenya.

South Africa **Comparative phylogeography**

Hanneline Adri SMIT, 27, has recently completed a PhD in zoology at Stellenbosch University in South Africa looking into the evolutionary relationships and differences in genetic profiles within African elephant-shrews.

During her fellowship, she will extend her interest in evolution **by exploring the historical factors which might have shaped the current biodiversity of a number of birds and mammals in two neighboring regions of South Africa**. By understanding the history of the animals and of the regions in which they live, she hopes to be able to predict future evolutionary pressures and use this information to help conserve species richness.

Members of the same species found in the two regions of the study often show genetic differences. This genetic “rupture” is thought to be due to biogeographic events which separated the regions geologically or climatically sometime in the distant past.

To find out more, Hanneline Adri Smit will build up a collection of DNA samples taken from small mammals and birds from the two regions. **She will study the genetic differences found in same-species individuals, map these with geographical data** and then see if geographical patterns begin to emerge when different species with similar life histories, similar habitat requirements and overlapping distributions are compared.

Using mathematical and geographical modelling, she **will use these patterns to identify which habitat features could have acted as barriers to gene flow.** This will allow predictions on the future impact of climate change and disrupters to gene flow, including habitat degradation caused by agriculture, for example, which may have significant implications on the future survival of species.

The results of her research will make a useful contribution to conservation strategies by identifying distinct geographical regions of importance for species protection.

After her fellowship, Hanneline Adri Smit will continue her research in this area of comparative phylogeography with the aim of contributing to future conservation management in South Africa and other world regions.

Host institution: University of California, Berkeley, USA

ARAB STATES

Kuwait **Structural Biology**

Jamillah ZAMOON, 34, has a PhD in biochemistry from the University of Minnesota, USA, and is currently working as an assistant professor at the University of Kuwait.

She is interested in studying the relationship between structure and function in proteins. In particular, during her fellowship project, she plans **to decipher the structure of proteins found in a naturally occurring substance that could have important implications for treatment of diabetic patients.**

The substance she wants to investigate is an **epidermal secretion produced by a Kuwaiti species of catfish** when under stress or threatened. **This secretion has been shown to have exceptional wound-healing properties in humans** and has great potential for the treatment of chronic ulcers in diabetic patients. Diabetes affects some 246 million people globally and is associated with chronic wounds in the lower limbs that often require amputation.

Jamillah Zamoon plans to use a variety of techniques to **determine the structures of the proteins present in the fish secretion and to study the interactions between them that contribute to wound healing**. She already has a strong research background in nuclear magnetic resonance (NMR), a technique which is well-adapted to solve the structures of the smaller, soluble proteins. However, the structures of the larger, insoluble membrane proteins found in the secretion are more difficult to resolve and require other complementary techniques: X-ray crystallography and cryo-electron microscopy. The host laboratory in Chicago is an ideal place for her to learn these techniques.

As well as perfecting these biophysical techniques, she will also learn the biochemical techniques necessary for purification and production of the proteins in insect, yeast and mammalian cell systems as a first step to drug development. After her fellowship, Jamillah Zamoon will return to Kuwait University to continue her teaching and research activities in structural biology.

Host institution: Rosalind Franklin University, Chicago, USA

Lebanon **Environmental sciences**

Magda BOU DAGHER KHARRAT, 33, has a PhD in biology from the Pierre and Marie Curie University in Paris. She is currently working as a biology lecturer and researcher at Saint Joseph University in Beirut, Lebanon.

Magda Bou Dagher Kharrat is planning to dedicate her fellowship period to **the creation of a web-based database describing the botanical, ecological and genetic richness of Lebanese flora**. Due to the wars that have ravaged Lebanon over the past decades, Lebanese plants have often been excluded from global studies of certain plant species because of the perceived difficulties of collecting plant material in this country.

The new database will include botanical identification sheets with photos or scans of each plant and a scientific description including information on pollen and seeds. **During her fellowship, Magda Bou Dagher Kharrat will concentrate on the genome size and chromosome number of each plant species**. Using equipment available in the host laboratory, she will use modern cytogenetic techniques to establish the number of chromosomes using seed or flower material and flow cytometry, using fresh plant material, to establish the genome size.

The database project is designed to bring together data collected by a variety of sources: students, local NGOs, amateur botanists, as well scientific researchers. She hopes that **the project will enable the establishment of a "red list" of Lebanese plant species at risk** as well as a "black list" of invasive species to enable an optimal management of fragile ecosystems in Lebanon.

On return to Lebanon, Magda Dr Bou Dagher Kharrat will continue to build up the database, enlarging it to include plants endemic to the wider Eastern Mediterranean region as well as plants of particular medical or economic interest. It will be made available to the general public and the scientific community.

Host institution: University of Paris-Sud XI, France

Morocco **Microbiology**

Hakima AMJRES, 26, is a PhD student in biotechnology at the Abdelmalek Essaâdi University in Tetouan, Morocco, where she is investigating the characteristics of bacteria adapted to extreme conditions.

The naturally occurring hot springs and areas of high salt concentration found in certain areas of Morocco are home to a wide variety of bacteria specifically adapted to thrive in such environments. Hakima Amjres is interested in studying the properties of certain surface sugars produced by these bacteria, thought to help them resist the high temperatures or salinity. These sugars, known as exopolysaccharides, are of great interest to industry because of their potential for bringing innovative properties to many products, including medical treatments, food and cosmetics. As each bacterial strain produces a unique type of exopolysaccharide with a particular structure adapted to its habitat, these bacteria provide a huge untapped resource for biotechnological exploitation.

During her fellowship, **she will collect samples of bacterial strains from different extreme habitats in Morocco and then identify those strains that produce exopolysaccharides**. Using molecular techniques available in her host laboratory, **she will analyze the genetic make-up of these bacteria** and then isolate and purify the exopolysaccharides. The next step will be to **study their biological activity and to identify those with the most industrial potential.** Any new strains, with particularly promising properties, can be used to genetically improve those already used in industry.

At the end of her fellowship period, Hakima Amjres will return to Morocco to finish her PhD. She hopes to raise awareness, through her work, of the importance of preserving the natural habitats of these unique bacteria in Morocco to ensure their sustainable exploitation in the future and thus contribute to the socio-economic development of her country.

Host institution: University of Agronomic Sciences, Gembloux, Belgium

ASIA & THE PACIFIC

Indonesia — Bioprocess Technology

Made Tri Ari Penia KRESNOWATI, 30, has a PhD in bioprocess technology from Delft University of Technology (TU Delft) in The Netherlands. She is currently teaching chemical engineering to graduate and undergraduate students at Bandung Institute of Technology (ITB) in Indonesia.

During her fellowship, M.T.A.P. (Penia) Kresnowati will be turning her attention to **the production of stem cells for therapeutic treatment**. Stem cells are undifferentiated cells which retain the ability to multiply, and which, under the right conditions, can differentiate into a diverse range of specialized cell types. They have the potential to be extremely valuable in medical treatment, producing blood cells for transfusion, for example. However, if their potential is to be fulfilled, a number of technical difficulties need to be overcome.

Penia Kresnowati will **design a model prototype bioreactor to grow and multiply stem cells for the production of different types of blood cell for use in transfusion**. She will carry out her research at Monash University in Australia, and in collaboration with the experts at the Australian Stem Cell Centre.

The bioreactor needs to provide optimal conditions for producing large numbers of red blood cells of constant quality. Using a range of bioreactor configurations, she will assess which physical characteristics and operating parameters enhance stem cell growth and differentiation. **Her research will focus on how best to feed the cells and remove their waste products during the differentiation process from stem cell to red blood cell**. Her model could later be adapted to the creation of other types of cells with therapeutic potential.

After the fellowship, Penia Kresnowati will return to a position as lecturer at ITB, giving her the opportunity to pass on her expertise to the next generation. The knowledge gained during this collaboration will also help her to support the development of biotechnology in Indonesia.

Host institution: Department of Chemical Engineering, Monash University, Melbourne, Australia

Mongolia — Neuroscience

Naranjargal DASHDORJ, 27, qualified as a medical doctor in China before enrolling as a PhD student at the University of Nottingham in the UK, where she is studying brain function in people suffering from depression.

Depression is a widespread and serious problem with a high socio-economic burden. However, **only 30% of patients receive appropriate diagnosis and treatment**. The condition is thought to result from an imbalance in the brain circuitry which underlies our mental representations of mood and emotion.

Naranjargal Dashdorj plans **to study the neurological interaction between different areas of the brain d**uring the processing of emotional information in both healthy and depressed patients. This interaction, known as functional connectivity, **can be visualized using the technique of functional magnetic resonance imaging (fMRI)** which measures the amount of fresh blood flowing into an area of the brain when it is stimulated. A complementary technique - the electroencephalogram – can measure the electrical activity in the neurons during the same period of brain activity.

Using both techniques, **she will compare functional connectivity in the brains of healthy and depressed patients** when they are shown a series of sad, happy or neutral faces. She will also compare the effects of drugs on the processing of emotions.

By gaining a deeper insight into the neurological imbalance underlying this condition, **she hopes to contribute to the improvement of clinical diagnosis and treatment of depression** and more efficient drug development.

Naranjargal Dashdorj's work will have a particular impact in Mongolia where the study of mental health is in its infancy. On return to her home country, she will assist in setting up a new neuro-imaging research department in Mongolia's first-ever MRI center and ensure more appropriate care is given to depressive patients.

Host institution: School of Medical and Surgical Sciences, University of Nottingham, United Kingdom

Nepal **Écophysiology**

Susanna PHOBOO, 29, is a PhD student at Tribhuvan University in Kathmandu, where she is studying the ecophysiology of a Himalayan plant used in traditional medicine.

More than 80% of the Nepalese population relies on traditional medicine for basic healthcare. Over 1600 medicinal plants have been documented in Nepal, including the chiraito plant which is used in a wide range of treatments. Over 50% of the chiraito on the world market comes from Nepal and there is now **a significant risk of the plant declining from its natural habitat because of over-exploitation**.

Susanna Phoboo is highly committed to conservation issues in Nepal. During her fellowship, she will **study both the ecology and physiology of chiraito to enable successful cultivation as an effective means of providing an alternate source of income for the Nepalese villagers while reducing the pressure on the wild plant population.**

After collecting wild plants from different altitudes and environmental conditions across Nepal, she will study properties such as seed germination, growth rate and phytochemical concentration under varying experimental conditions, as well as the genetic diversity of the wild population. The resulting data will help to identify which plants should be cultivated and the optimal conditions necessary for producing the best quality plants with the highest concentrations of the medicinally active phytochemicals.

She will also **do experiments to see whether climate change is likely to affect the plant's physiology, and hence its medical efficacy**, by growing plants under conditions of increased temperature and CO2. This will provide critical understanding of how medicinal plants might be affected by future climate change and help in planning effective conservation strategies to minimize its effect.

On return to Nepal, Susanna Phoboo plans to continue her research and teaching relating to rare and endemic medicinal plants.

Host institution: Department of Plant, Soil and Insect Sciences, University of Massachusetts, Amherst, USA

EUROPE & NORTH AMERICA

Italy — Biophysics

Federica MIGLIARDO, 32, PhD in Physics, is a postdoctoral researcher at the University of Messina, where she is investigating the survival strategies of organisms living in extreme environments.

Organisms capable of surviving in extremely harsh conditions – extreme temperatures, high levels of salinity or intense UV exposure, for example – are of great interest both from a biological point of view but also because of the promise they hold for biotechnological applications.

Federica Migliardo has **focused her research on the interesting biophysical properties of a sugar called trehalose,** which is synthesized by some of these "extremophiles". **It can,** for example, **prevent the disruption of internal cell structures during dehydration of desert-living microorganisms** by forming a glass which holds biological structures in place until rehydration occurs when rain finally falls.

She now plans to **study the structure of membranes, proteins and enzymes in a number of extremophiles** in their different biological states – active, transition or inactive – in the presence of different bioprotectant compounds in order to gain insight into the connection between the protective mechanisms and the survival strategies. She is particularly **interested in understanding how protein stability and enzyme activity are preserved under extreme conditions.**

In her host laboratory, Federica Migliardo will have access to a range of complementary techniques, such as light and neutron scattering, X-ray and NMR spectroscopy, particularly well suited to studying the structural and dynamic properties of biological systems. She will use the results obtained to identify the optimal conditions for exploiting the unique biotechnological potential of the extremophiles in the pharmaceutical, food and chemical industries.

At the end of her fellowship, she will return to Italy to continue her research in the area of bioprotection.

Host institutions: Laboratory of dynamics and structure of molecular materials, University of Lille I, France

The Netherlands — Biomedical Science

Alma TOSTMANN, 27, is studying for a PhD in Biomedical Sciences at the Radboud University Nijmegen in The Netherlands, looking into side effects of tuberculosis treatment and the interaction between diabetes and tuberculosis drugs in Tanzanian patients.

Tuberculosis (TB) is a major poverty-related infectious disease, responsible for almost 2 million deaths every year, mainly in developing countries. The classic treatment for TB is a six-month course of combined drugs. However, **a recent study in Indonesia has shown that TB patients suffering from type 2 diabetes do not respond well to this classic treatment** as blood levels of one of the antibiotics, rifampicin, are reduced. Patients with diabetes are at greater risk of developing TB, and diabetes incidence is increasing rapidly, especially in countries where TB is also rife.

During her fellowship, Alma Tostmann **will investigate whether other TB drugs are affected by type 2 diabetes in the same way as rifampicin**. She will compare blood levels of TB drugs in two groups of Tanzanian TB patients, with or without type 2 diabetes. The importance of undertaking this work on the African continent is two-fold. It is here that the global incidence and mortality of TB are highest and it is also necessary **to see if the results from the Indonesian study are also found in an African population.**

Any reduction in the efficacy of classic TB treatment in the Tanzanian patients with diabetes could contribute to the evolution of drug-resistant forms of TB, a phenomenon which presents a serious global health risk. **Her work will therefore make an important contribution to improving the treatment of diabetic TB patients in sub-Saharan Africa**.

At the end of her fellowship, Alma Tostmann will return to The Netherlands to complete her PhD and continue researching and teaching in the area of poverty-related disease.

Host institution: Kilimanjaro Christian Medical Centre, Moshi, Tanzania

Slovenia **Conservation Biology**

Maja ZAGMAJSTER, 30, has a PhD in Biological Sciences from the University of Ljubljana in Slovenia, where she has been studying the subterranean biodiversity of the Western Balkans.

The underground cave ecosystems of the Dinaric Alps in the Balkans are one of the global hotspots of subterranean biodiversity. **They are home to some unique animal species** which are highly adapted to the unusual environmental conditions, including absence of light and scarce food. Over 900 such species (named troglobionts) have been recorded there. **This subterranean habitat is a fragile and limited resource at great risk** from the effects of human activity. The importance of preserving such biodiversity across the planet is now recognized as an urgent global priority.

Maja Zagmajster first became interested in this special underground fauna while studying bats in Slovenian caves. She is now dedicating her research to understanding the patterns of subterranean species richness in the Dinaric Alps, as an important prerequisite for planning long-term conservation to ensure that the unique biodiversity is not lost forever.

During her fellowship in the United States, she will learn to use the latest techniques in spatial statistics and Geographical Information Systems (GIS) **to analyze the species distribution and rarity, by focusing on terrestrial troglobionts.** She will **test various approaches for predicting and understanding biodiversity patterns and for selecting conservation areas.**

She hopes that her work will contribute to the implementation of strategies to protect the subterranean fauna in the Balkans and, more generally, a fuller understanding of the biodiversity of other unusual ecosystems where a large number of species are found in limited locations.

At the end of her fellowship, Maja Zagmajster plans to continue her research at her home university in Ljubljana.

Host institutions: University of Florida, Gainesville, and the American University, Washington, DC, USA

LATIN AMERICA & THE CARIBBEAN

Argentina — Écology

Carolina TROCHINE, 30, has a PhD in Biology and is currently a postdoctoral researcher for the Argentinean Council of Science and Technology investigating different aspects of the ecology of freshwater shallow lakes in Patagonia.

The fragile ecosystems of shallow lakes are at risk from human activities such as waste disposal (sewage) and agriculture. Excess nitrogen and phosphorous from fertilizer run-off, for example, results in the water becoming highly concentrated in nutrients - a process called eutrophication. As a result, the lakes suffer a rapid growth of microscopic algae in the water while the plants and animals living on the lake substrata are deprived of sunlight and oxygen and may eventually die off.

To test the effect of nitrogen and phosphorous on lake ecosystems, Carolina Trochine will distribute enclosures with blocks of agar jelly saturated with different amounts of these nutrients in 30 different lakes. She will regularly harvest the blocks and analyze the plant matter that has accumulated on them.

Lake eutrophication is expected to increase in many freshwater lakes due to global warming. To assess whether this hypothesis is valid, she will also undertake experiments in the world-class experimental pond systems available in Denmark, some at present-day temperature and some at temperatures predicted by climate change models for 2100. Over twelve months, she will regularly add nutrients into the pond systems and then observe changes in fauna and flora at different levels of nitrogen, phosphorous and oxygen. **The results of her work will help to establish the critical levels of nitrogen and phosphorous for good ecological state in lakes in different climate zones.**

After the fellowship, Carolina Trochine will use her research results to contribute to shallow lake conservation projects in Argentina. She also hopes to run a training course on lake restoration with other Argentinean researchers.

Host institution: Natural Environmental Research Institute, University of Aarhus, Denmark

Brazil — Microbiology

Andrea VON GROLL, 33, is studying for a PhD in Microbiology at the Federal University Foundation of Rio Grande in Brazil and the Prince Leopold Institute of Tropical Medicine in Belgium.

Andrea von Groll, who originally trained in veterinary science, **is focusing her research on the serious problem of tuberculosis (TB) in Brazil**. She is interested in understanding why the city of Rio Grande in the extreme south has a particularly high incidence of the disease, some 20% higher than the average for the country.

The answer could be in the identification of certain strains of *Mycobacterium tuberculosis* whose genotypes are associated with virulence and an increased capacity to propagate, although why this happens is not clear.

Using modern molecular biology tools available at the host institution in Belgium, she **will assess the genetic profile of TB strains obtained from patients in Rio Grande**. She will then compare parameters such as the bacterial growth rate and their adaptation to different selective pressures to see if there is a relationship between their genetic makeup and the disease epidemiology. By comparing genotypes of strains isolated in 2007 with those isolated in 2008, she will also be able **to see which genotypes have evolved over time and which are responsible for spread of the disease.**

Andrea von Groll hopes her work will allow more effective control strategies to be put in place that could help to reduce the TB incidence in the city. The study also will contribute to current knowledge of the factors affecting the virulence of certain genotypes of *M. tuberculosis*.

After the fellowship, she will continue to work on TB in her home laboratory in Brazil, where she will share her knowledge and understanding of advanced molecular technologies with other Brazilian researchers.

Host institution: Prince Leopold Institute of Tropical Medicine, Antwerp, Belgium

Colombia **Conservation ecology**

Lina Maria SAAVEDRA DIAZ, 32, is studying for a PhD in Natural Resources and Earth Systems Science at the University of New Hampshire in the USA, looking into the development of sustainable management systems for small scale Colombian marine fisheries.

Colombia has the second highest biodiversity of any country in the world, but in fishery terms, high diversity also implies low abundance of individual species. This fact has important implications for Colombia's marine fisheries, **bordering both the Pacific and Atlantic coasts, which are at risk of over-exploitation** by inadequate fishing practices through local fishing communities and other factors.

Lina Maria Saavedra Diaz's research project aims to **find ways of conserving the marine environment and replenishing depleted fish populations** while still allowing for the sustainable use of some fish species. The local fishing communities, some of the poorest in Colombia, rely heavily on the fish as the only source of available income. By working hand in hand with these communities, developing a "bottom-up" perspective, **she will explore the alternative of community-based comanagement approach for these traditional fisheries**.

She will interview a sample of communities on each coast to gather information on past and present fishing activity, including location and depth of fishing, species caught, the type of boat used and where the catch is sold, as well as socio-demographic data. The communities on each coast will be directly engaged in the process of comanagement in implementing this process locally.

On returning to Colombia, Lina Maria Saavedra Diaz will take up a teaching and research position at the University of Magdalena. She also hopes to propose the results of her research to the national authorities as a tool to develop a national management plan for the country's marine artisanal fisheries.

Host institution: University of New Hampshire, Durham, USA

L'ORÉAL-UNESCO FOR WOMEN IN SCIENCE 2008:

THE PARTNERS

The **L'Oréal Corporate Foundation,** created in 2007, is committed to three areas of action: encouraging education, fostering scientific research, and creating bonds of solidarity for those in fragile circumstances. The Foundation, which presently regroups a number of major existing corporate philanthropy initiatives including the L'ORÉAL-UNESCO Awards For Women in Science, will strengthen these actions and ensure their continuity, as well as develop new programs in the coming years.

L'Oréal is a worldwide leader in the cosmetics industry, developing innovative products to meet the diverse needs of customers in 130 countries worldwide. Nearly 3,000 people work in the Group's 14 research centers, located in France, Asia and America. Their findings are responsible for the registration of hundreds of patents annually. Women represent 55% of the research workforce – a percentage unmatched anywhere else in the industry (www.loreal.com).

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Since its creation in 1945, **UNESCO** has pursued the mission of promoting science - the "S" in its acronym - for peace. Today, UNESCO reinforces international co-operation in the basic sciences among its 192 Member States and promotes ethical norms in science. The Organisation has been also dedicated to eliminating all forms of discrimination and promoting equality between men and women. As well as developing educational programs in science particularly designed for girls, UNESCO has established a network of academic chairs creating links between women in science around the world.
(www.unesco.org/science/women).