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"We must believe that we are gifted for something, and that this thing, at whatever cost, must be attained."

Marie Skłodowska Curie
1867–1934

Medical Physics World

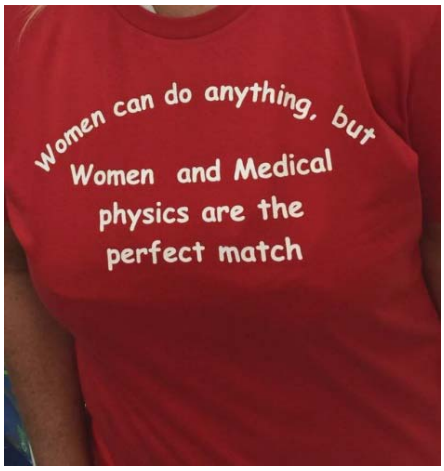
TOPICAL EDITORS: M. STOEVA, V. TSAPAKI

SPECIAL ISSUE ON WOMEN IN MEDICAL PHYSICS

Message from the Editor

Magdalena Stoeva, PhD, Chair MPW Board

Dear friends and colleagues,
We are at the beginning of an exceptional year!
2017 marks the 150th Anniversary of the remarkable Marie Curie and to celebrate this IOMP has dedicated IDMP 2017 to women.
Medical Physics World strongly supports IOMP's initiative and has produced this special issue to celebrate year 2017, to present women in our profession and related disciplines, and to mark another milestone in the IOMP's development.
It is my pleasure and honour to be the editor of this special issue of Medical Physics World.
This special issue of MPW is guided by one of Marie Curie's most famous citations: "We must believe that we are gifted for something, and that this thing, at whatever cost, must be attained". Read Medical Physics World and you will find out that it is full of examples of women's devotion and achievements. Being a woman and a professional is not always easy, as we have to balance between the family live and our professional duties, but women have proven they can manage.
Medical Physics World is now dedicated to women. Made by an entirely female team this issue has several major highlights:
- The historical role of women in science – MPW presents 2 excellent articles, dedicated to Marie Curie (edited by Dr. Martín), and to women in science (a reprint of a National Geographic article authored by Jane Lee)
- Women and leadership – IOMP Women Subcom's chair Dr. Tsapaki is opening this new topic for discussion. Further reading is also available at the ICTP's article presenting their support for women in science.
- The International Day of Medical Physics (IDMP) 2017 is dedicated to women. IOMP Women Subcom's secretary Dr. Kodlulovich Renha is presenting this initiative.
- MPW Interviews – Medical Physics World presents 8 interviews of women succeeded in their profession as medical physicists or in similar disciplines, interviewed by 8 young women starting their career in the field. Read this section and you will find out what Medical Physics means in our lives, and what are the different aspects of being a woman and a professional.
I would also like to express my sincere gratitude to my co-editor Dr. Tsapaki, to all women members of the IOMP Women subcommittee for their active participation in the production of this special issue of Medical Physics World, to Drs. Martín and Jornet for their hard work on developing the interview questionnaire, and to all women who took part in our interviews. Special thanks to the international organisations WHO and IAEA, as well as IOMP's regional and national organisations who supported our interviews; to the ICTP Women group who provided MPW with valuable information and statistics on education at the ICTP and particularly on women participants; and finally to the National Geographic magazine who also supported the special issue of Medical Physics World by providing a reprint permission on one of National Geographic's articles related to women in science.
Historically women have made a huge progress. For women in Medical Physics all this started with Mme. Curie's discovery, but women's role in science can be traced back to the ancient times. What about us, the contemporary women in science - we are at the beginning of an exceptional year… and I am sure there will be more to come. We have all the time ahead of us to continue proving that we are the better part of the world, that we are gifted and talented, emotional and practical, strong and gentle, mothers and teachers, wives and scientists, that Women can do anything but Women and Medical physics are the perfect match.



Medical Physics World

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IOMP
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Editorial Board

Strengthen the Confidence of Women

Virginia Tsapaki, Chair IOMP Women Subcom

Women have made significant contributions to science despite the barriers faced, the limitations of resources and the long traditional prevalence of men endeavoring this field. Despite the immense steps for women so far, there are still socio-economic factors that limit the effective participation of women in higher education and professional levels. If one focuses specially at the field of medical physics, this is still a male-dominated field in many regions of the world.

The first ever study on women in medical physics was performed a few years ago by the International Organization for Medical Physics and published in 2015. Sixty-six countries answered the survey, with only half of responses provided by women. The total number of medical physicists cited was 17024, representing more than three quarters of the worldwide medical physics workforce. This included 4807 women – just 28% of the total. The variation between continents and between individual countries was enormous with Africa having the lowest level of medical physics services in general, mirrored by a low number of women working in the field. There are countries with no women medical physicists at all. Even in Europe, a continent with strong legislation as far as women are concerned and the European Commission pushing for a 40 % representation of women, there were several European countries far from this goal. In contrast, in some Middle Eastern and Asian countries, female medical physicists outnumbered males. Furthermore, USA one of the most developed countries around the world, if not the most developed one, reported a lower percentage of women than actually expected (21%).

The latest study on women in medical physics, was performed in Australia/New Zealand and published in 2016. The main conclusions of this study were that women in medical physics have increased in numbers over the years and that there are passionate about their work. However, this is not translated in leadership roles.

For all the above reasons, the Women SubCommittee of IOMP and the editorial team of the electronic Medical Physics World Newsletter of IOMP have recently decided to celebrate the International Women's Day with a special issue. All women in this issue are in leadership positions and can act as an inspiration for young professionals in the field of science. As this year, the International Day of Medical Physics is devoted to women, this eMPW issue will be the start of a number of initiatives to strengthen the confidence of women colleagues and encourage them to take leadership roles. They can!

IOMP Women

www.iomp.org/IOMP-W

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The IOMP Women Group and the IDMP 2017

Simone Kodlulovich Renha, Secretasry IOMP Women Subcom

Madame Curie certainly is an inspiration for all women scientists. She was the first woman to achieve many goals, among them we can highlight: to earn a Physics degree at the Sorbona University (1893), to earn a science doctorate degree in Europe (1903), to win the Nobel Prize in Physics (1903) and to be the first person to win two Nobel prices (1911), to teach, to be lab head and professor at the Sorbonne University (1906), to become member of the French Academy of Medicine (1922) and the first woman buried in the Panthéon of Paris on her own merits (transferred from cemetery in Sceaux in 1995).

It is important to consider that until the 20th century, the social structures have deprived women to access the higher education. Even the few who had private tutors were denied to engage in laboratory work and to participate in discoveries process. The scientific societies were also closed for women. Only after three centuries of the foundation of the Academie des Sciences of Paris and the Royal Society (London) female members were elected.

However, even in this dark stage of history, we had many women who had surpassed the barriers, restrictions and social opprobrium and became notable scientist, especially in the 19th century. Unfortunately, despite their exceptional discoveries, most of them are unknown. Finally in the 20th century, the scientific world was opened to women and their undeniable talent. However, we still have a long way to go through. According to latest UNESCO Science Report (UNESCO 2015), women are actively pursuing bachelor's and master's degrees and even outnumber men at these levels, since they represent 53% of graduates, but their numbers drop off abruptly at PhD level. Suddenly, male graduates (57%) overtake women. The discrepancy widens at the researcher level, with men now representing 72% of the global pool. The high proportion of women in tertiary education is, thus, not necessarily translating into a greater presence in research. Therefore, IOMP Women Group invites you all to promote and to incentive a participation of more women in medical physics and in a more effective way.

In recognition of the memorable contribution of Madame Curie, IOMP decided to prepare for the international Day of Medical Physicist 2017, a special commemoration to celebrate her 150 Birth anniversary. For this occasion, IOMP decided to honour all women medical physicist that overcome all barriers to dedicate their professional lives to contribute to the health care of patients. In addition, devotes special care to the safety of women patient submitted to diagnostic and treatment applying ionizing radiation. Prof. John Damilakis, chairman of the IDMP Task Group Medical Physics of IOMP, already started to prepare the activities to IDMP. The theme chosen for this year is: **Providing a holistic approach to women patients and women staff safety in radiation Medicine.**

Marie Sklodowska-Curie: a Woman Ahead of Her Time

Guadalupe Martín Martín, IOMP Women Group

Guadalupe Martín was born in Madrid and graduated in Physics at the Autonomous University of Madrid (UAM), Spain. In 2000 Dr. Martín got a grant from the UAM to follow doctoral studies in Biophysics at the Florida International University, FL (USA). She received her Diploma of Advanced Studies (DEA) in Medical Physics from the Complutense University of Madrid. In 2005 Dr. Martín was accredited as medical physicist by the Spanish regulatory board and has been working in the Radiation Therapy field for more than 10 years. Since 2010 she works in the Medical Physics and Radiation Protection Service of the University Hospital of Fuenlabrada in Madrid. Dr. Martín is associate editor of "Física Médica", the Spanish journal of Medical Physics. She was delegate of the Spanish Society of Medical Physics in EFOMP for 3 years and she is actually member of different committees in EFOMP (Education and training, Projects and Professional Matters). Dr. Martín is also member of the IOMP women subcommittee and is active in activities to push women participation in the Medical Physics field.

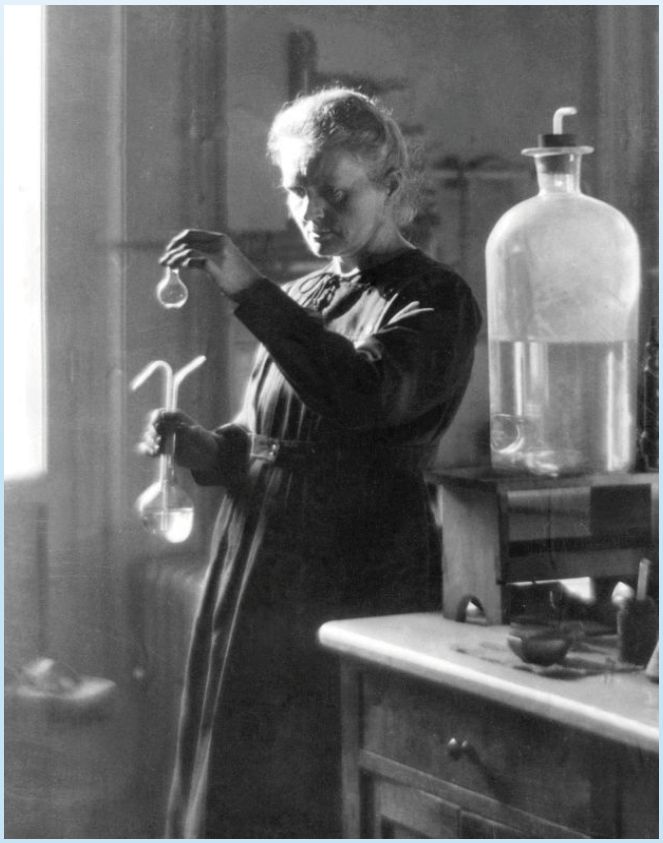
Marie Curie belongs to that exclusive group of women whose worldwide fame and recognition have lasted for more than a century. Her discoveries have led a major step for humanity. Her scientific achievements were more than just the result of outstanding work, they showed that a woman could succeed in the field of science, an intellectual activity traditionally forbidden to women of her time.

Marie Curie's personality

Marie Curie, born in Poland in 1867, was the first woman to achieve many goals - the first woman in France to earn a PhD in physics; the first woman to teach and to head a laboratory of science at the Sorbonne; the first woman to be buried in the Pantheon of Paris on her own merits; the first woman to win a Nobel Prize and the first person in the world to win two Nobel prizes.

It should be noted that a century ago, it would have been exceptionally difficult for a woman to be recognized for scientific achievement. It is worthwhile to point out the importance for Curie's scientific future of the seemingly simple act of placing only her signature on the scientific note submitted to the French Academy of Sciences. Clearly, it was important for her career to sign it alone[2], braking many rules, some of which still exist today.

Some details of her personal life are helpful in understanding the courage and determination of Marie Curie during and after a series of personally discouraging events which she overcame[3]. In 1910, after obtaining her first Nobel Prize, Marie Curie was encouraged to apply for election to the French Academy of Science, a prestigious organization that had never admitted a woman since it was created in 1666. Her application was turned down and after that, Marie Curie never ever re-applied for admission. Later the Academy of Medicine granted her to be the first woman member of this institution.



Marie Curie at her lab

After the death of her husband Pierre, Marie Curie and Paul Langevin, a distinguished physicist, became involved in an emerging love affair in 1910. It was in the Paris press three days before the announcement of Marie Curie's second Nobel Prize. Svante Arrhenius, an also Nobel Prize awardee who had enthusiastically supported Marie Curie's candidature for this Nobel prize, wrote her a letter suggesting she not accept the Prize, to which Marie Curie replied:

"The action which you advise would appear to be a grave error on my part. In fact the prize has been awarded for the discovery of Radium and Polonium. I believe that there is no connection between my scientific work and the facts of private life".[4]

Accompanied by her sister Bronia and her elder daughter Irène, Marie Curie journeyed to Stockholm to receive the Prize in person[3].

The discovery of Radium

In 1896, three months after the discovery of X-rays by Wilhelm Röntgen, a strange phenomenon was observed by chance by the French physicist Henry Becquerel: uranium salt emitted invisible rays in the absence of any luminous excitation. In 1897 Marie Curie choose the "uranic rays" of Becquerel as main subject for her PhD thesis[5]. However, whereas Becquerel's study was limited to the rays emitted by the uranium, Marie Curie went a step further- she began studying different compounds and minerals in an attempt to discover other elements that emitted the same radiation that Becquerel had discovered[1].

With samples of pitchblende, a mineral-enriched uranium, Marie Curie obtained a measure of the intensity of radioactivity produced by this ore. In just 2.5 months she discovered several much more active compounds and concluded that there was a highly radioactive unknown substance inside the pitchblende. Pierre Curie, convinced of the interest of his wife research, left his own research in the field of crystallography to join Marie Curie research. In July 1898, the Curies announced that they had isolated a new element - "polonium", named after Marie Curie's homeland of Poland. In December, they discovered a more active radioactive element - "radium"[1,5]. In 1903, Marie and Pierre Curie along with Becquerel were awarded their first Nobel Prize in Physics for the discovery of natural radioactivity. In 1911, Marie Curie was awarded her solo Nobel Prize, this time in chemistry for the discovery of radium and polonium.

Marie Curie and the radium industry

From the start of the medical applications of radium in 1901[6], there was a growing interest and strong demand from worldwide medical and scientific community. Marie and Pierre Curie shared their knowledge about radium extraction with scientists from all over the world refusing to protect it with a patent and also established a semi-industrial process to obtain radium from pitchblende ore, fully financed with the money from their Nobel Prize.

In 1904, the Curies began a close collaboration with an industrial chemist called Armet de Lisle, who provided Marie Curie an area in his factory for her research on radium. This position enabled Marie Curie to treat several tons of pitchblende and make a precise measurement of the atomic mass of radium. In 1907, she determined it to be 226.2±0.5, a very close value to today's accepted one of 226.0.

After the death of Pierre Curie in 1906, Marie Curie remained in close collaboration with industry and put her research program into action. Soon she had some of the largest supplies of radioactive material in the world. By contrast, it was very difficult for other scientists to obtain radioactive material, e.g. for Ernest Rutherford, who studied only the physical aspects of radioactivity[7].

Marie Curie and metrology

During the years 1910-1914 there was a huge expansion of radium industry and a high demand for the growing number of professionals who used radioelements. This created a need for a standard measurement of radium, in which Marie Curie played a key role.

In 1910, according to the advice of Marie Curie, the "curie" was adopted as international unit of measure of radioactivity. In 1912 Marie Curie prepared the international primary standard of radium. Her laboratory became the primary standard laboratory for radioactivity. In addition, she created an accredited commercial service for radium calibration. It soon became the national body for the metrology of radioactivity and played a key role in the international certification network.

The Institute of Radium

In 1914, just before the outbreak of the First World War, the Curie laboratory moved to the newly built Radium Institute. The Curie Institute was devised by Marie Curie as a multidisciplinary centre to house research in physics, chemistry, applied sciences, metrology and medicine.

During the war, there was a break in the Radium Institute, but Marie Curie did not interrupt her work. She managed to raise funds to create a fleet of 18 mobile X-ray units for which she devised a way to equip military vehicles with X-ray equipment to offer radiological service close to the battle fields (the so-called "petites Curies").

Marie Curie headed the physics Laboratory of the Institute of Radium between 1914 and 1934. In 1920 the Curie Foundation was established as a result of the notoriety and perseverance of Marie Curie, and shortly after the first clinic dedicated to radiumtherapy was created[8]. Between 1920 and 1930 the Curie Foundation became one of the most important organizations

worldwide for treating cancer.

Marie Curie's legacy to science

Shortly before she died, Curie was present at the Radium Institute when her daughter Irène Curie and her son-in-law Frédéric Joliot-Curie discovered artificial radioactivity. Later, Frédéric Joliot-Curie recounts that moment:

"I will never forget the expression of intense joy which overtook her when Irène and I showed her the first (artificially produced) radioactive element in a little glass tube. I can see her still taking this little tube of the radioelement, already quite weak, in her radium-damaged fingers. To verify what we were telling her, she brought the Geiger-Muller counter up close to it and she could hear the numerous clicks…This was without a doubt the last great satisfaction of her life[4]."

After her death from leukaemia in 1934, Irene and Frédéric continued her work. Marie Curie left a huge legacy to science – founded a new scientific discipline and trained many nuclear physicists and radiochemists. She always insisted that "Therapy should be permanently backed up by scientific research without which no progress is possible".

Marie Curie's legacy to medicine

Marie Curie also left a great legacy to medicine, as she wrote in 1923 of the implications of her discovery of radium[9]:

"The first experiments on the biological properties of radium were successfully made in France with samples from our laboratory, while my husband was still living. The results were, at once, encouraging, so that the new branch of medical science, called radiumtherapy (in France, Curietherapy), developed rapidly, first in France and later in other countries… The radiumtherapy and the radium production developed conjointly, and the results were more and more important, for the treatment of several diseases, and particularly of cancer.

It may be easily understood how I appreciated the privilege of realizing that our discovery had become a benefit for mankind, not only through its great scientific importance, but also by its power of efficient actions against human suffering and terrible disease. This was indeed a splendid reward for our years of hard toil."

Marie Curie's legacy to women

"It is a woman who is now in charge of research and of numerous applications relating to radioactivity…helping her and sharing the same work, is a whole staff of women doctors and university graduates."

This is how a female French journalist described Marie Curie's lab in 1927, underlining the large number of women to be found working in a single scientific research laboratory that was also run by a woman[10].

Marie Curie opened the doors of her lab to many women for which she was an icon and represented an example to follow[12]. On average, the proportion of women researchers in her lab was around 30%, which is the proportion of female women nowadays in the Spanish Society of Medical Physics. The work done by these women in her lab was a reflection of all the activities carried out there, whereas in labs in other countries, these activities were carried out exclusively by men.

Acknowledgements

This paper has been mainly inspired by two articles: "Marie Curie: scientific entrepreneur" from Soraya Boudia [1] and "Marie Curie's contribution to Medical Physics" from Jean Claude Rosenwald et al. [5]. The assistance from Magdalena Stoeva for her carefully review of the manuscript is highly appreciated.

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Marie Curie and four of her students - sometime between 1910 and 1914

ICTP: Supporting Women in Science

Mary Ann Williams, Public Information Officer, ICTP

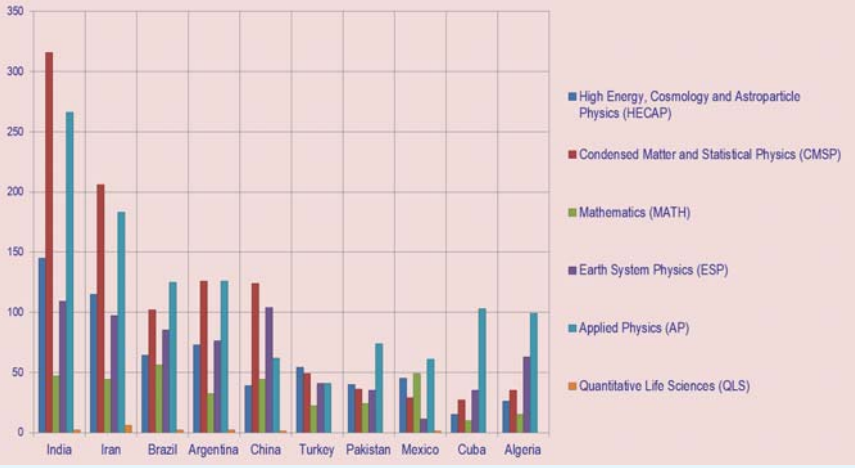
Why are there still fewer women than men in science? In a world where just 30% of researchers are women, the reasons are many, ranging from the challenge of balancing family life and career to a lack of childcare support and role models.

The Abdus Salam International Centre for Theoretical Physics (ICTP) hopes to address some of these challenges through a number of initiatives aimed at increasing the participation and representation of women in physics at the Centre. By including specific actions to this end in its new strategic plan for 2015 to 2019, ICTP has already taken some important steps. For example, ICTP will host its third Career Development Workshop for Women from 9 to 13 October 2017. This follows on workshops held in 2015 and 2013. More actions are planned, thanks to the appointment of a coordinator for ICTP's women in physics initiatives. Please check ICTP's dedicated web page frequently for new developments and opportunities: http://www.ictp.it/ictp-for-women.aspx

ICTP Success Stories about Women in Physics

ICTP alumna overcomes poverty, war to reach science goals: As a child in the war-stricken Republic of Congo, Maryse Nkoua could hardly have predicted that someday she would be attending physics conferences with Nobel Laureates. Yet those tough times at an early age taught her an enduring lesson in the strength of family and friendship that has guided her to where she is today: an ICTP Postgraduate Diploma Programme alumna and PhD graduate determined to discover a vaccine to alleviate the horrors of malaria. Now based at the University Marien Ngouabi in Brazzaville, Maryse is interested in studying a specific protein related to malaria and sickle cell diseases. "We are trying to characterize and inhibit the protein so that a vaccine could be developed, " she explains, adding, "We don't really know how to treat pregnant women who have malaria, what the proper drug is to give them, so my main project is to help in this direction." Read more at http://www.ictp.it/about-ictp/media-centre/news/2017/1/maryse.aspx

ICTP co-sponsors optics/photonics event for women in Pakistan: The United Nations' International Year of Light (IYL) may be officially over, but related scientific outreach activities continue. Recently, ICTP scientist Joe Niemela, who oversaw coordination of IYL activities as head of the IYL Secretariat, shared the magic of optics and photonics at a workshop in Pakistan co-sponsored by ICTP and Quaid-i-Azam University (QAU) in Islamabad. The goal of the workshop was to inspire women to consider a career in science. This is the third workshop in a series that involved ICTP assistance (the first ones were with female students from Islamabad Model Colleges) and in this case the participants were QAU undergraduates. All workshops featured lessons on lasers, color mixing, light polarization and light wave diffraction. "The participants were extremely curious and attentive and thoroughly engaged--many of them even came back early from lunch to have a chance to play more with the equipment while the instructors were still taking a break," says Niemela. Read more at http://www.ictp.it/about-ictp/media-centre/news/2016/7/light-pakistan.aspx



Female Course Participants from Top 10 Countries, Distribution by Field of Study

Women in Science at ICTP, 2002-2015

Fast facts:

- 14,277 visits since 2002
- 162 countries represented (including 20 LDCs)
- 21% of total visitors are women
  51% of these are from developing countries
- 24% of total visitors in 2015 were women

6 Women Scientists Who Were Snubbed Due to Sexism

Jane J. Lee, Reprint from National Geographic, May 2013

Over the centuries, female researchers have had to work as "volunteer" faculty members, seen credit for significant discoveries they've made assigned to male colleagues, and been written out of textbooks.

They typically had paltry resources and fought uphill battles to achieve what they did, only "to have the credit attributed to their husbands or male colleagues," said Anne Lincoln, a sociologist at Southern Methodist University in Texas, who studies biases against women in the sciences.

Today's women scientists believe that attitudes have changed, said Laura Hoopes at Pomona College in California, who has written extensively on women in the sciences—"until it hits them in the face." Bias against female scientists is less overt, but it has not gone away.

Here are six female researchers who did groundbreaking work—and whose names are likely unfamiliar for one reason: because they are women.

Jocelyn Bell Burnell

Born in Northern Ireland in 1943, Jocelyn Bell Burnell discovered pulsars in 1967 while still a graduate student in radio astronomy at Cambridge University in England.

Pulsars are the remnants of massive stars that went supernova. Their very existence demonstrates that these giants didn't blow themselves into oblivion—instead, they left behind small, incredibly dense, rotating stars.

Bell Burnell discovered the recurring signals given off by their rotation while analyzing data printed out on three miles of paper from a radio telescope she helped assemble.

The finding resulted in a Nobel Prize, but the 1974 award in physics went to Anthony Hewish—Bell Burnell's supervisor—and Martin Ryle, also a radio astronomer at Cambridge University.

The snub generated a "wave of sympathy" for Bell Burnell. But in an interview with National Geographic News this month, the astronomer was fairly matter-of-fact.

"The picture people had at the time of the way that science was done was that there was a senior man—and it was always a man—who had under him a whole load of minions, junior staff, who weren't expected to think, who were only expected to do as he said," explained Bell Burnell, now a visiting astronomy professor at the University of Oxford.

But despite the sympathy, and her groundbreaking work, Bell Burnell said she was still subject to the prevailing attitudes toward women in academia.

"I didn't always have research jobs," she said. Many of the positions the astrophysicist was offered in her career were focused on teaching or administrative and management duties.

"[And] it was extremely hard combining family and career," Bell Burnell said, partly because the university where she worked while pregnant had no provisions for maternity leave.

She has since become quite "protective" of women in academia. Some individual schools may give them support, but Bell Burnell wants a systemic approach to boost the numbers of female researchers.

She recently chaired a working group for the Royal Society of Edinburgh, tasked with finding a strategy to boost the number of women in the fields of science, technology, engineering, and math in Scotland.

Esther Lederberg

Born in 1922 in the Bronx, Esther Lederberg would grow up to lay the groundwork for future discoveries on genetic inheritance in bacteria, gene regulation, and genetic recombination.

A microbiologist, she is perhaps best known for discovering a virus that infects bacteria—called the lambda bacteriophage—in 1951, while at the University of Wisconsin.

Lederberg, along with her first husband Joshua Lederberg, also developed a way to easily transfer bacterial colonies from one petri dish to another, called replica plating, which enabled the study of antibiotic resistance. The Lederberg method is still in use today.

Joshua Lederberg's work on replica plating played a part in his 1958 Nobel Prize for physiology or medicine, which he shared with George Beadle and Edward Tatum.

"She deserved credit for the discovery of lambda phage, her work on the F fertility factor, and, especially, replica plating," wrote Stanley Falkow, a retired microbiologist at Stanford University, in an email.But she didn't receive it.

Lederberg also wasn't treated fairly in terms of her academic standing at Stanford, added Falkow, a colleague of Lederberg's who spoke at her memorial service in 2006. "She had to fight just to be appointed as a research associate professor, whereas she surely should have been afforded full professorial rank. She was not alone. Women were treated badly in academia in those days."

Chien-Shiung Wu

Born in Liu Ho, China, in 1912, Chien-Shiung Wu overturned a law of physics and participated in the development of the atom bomb.

Wu was recruited to Columbia University in the 1940s as part of the Manhattan Project and conducted research on radiation detection and uranium enrichment. She stayed in the United States after the war and became known as one of the best experimental physicists of her time, said Nina Byers, a retired physics professor at the University of California, Los Angeles.

In the mid-1950s, two theoretical physicists, Tsung-Dao Lee and Chen Ning Yang, approached Wu to help disprove the law of parity. The law holds that in quantum mechanics, two physical systems—like atoms—that were mirror images would behave in identical ways.

Wu's experiments using cobalt-60, a radioactive form of the cobalt metal, upended this law, which had been accepted for 30 years.

This milestone in physics led to a 1957 Nobel Prize for Yang and Lee—but not for Wu, who was left out despite her critical role. "People found [the Nobel decision] outrageous," said Byers. Pnina Abir-Am, a historian of science at

Brandeis University, agreed, adding that ethnicity also played a role.

Wu died of a stroke in 1997 in New York.

Lise Meitner

Born in Vienna, Austria, in 1878, Lise Meitner's work in nuclear physics led to the discovery of nuclear fission—the fact that atomic nuclei can split in two. That finding laid the groundwork for the atomic bomb.

Her story is a complicated tangle of sexism, politics, and ethnicity.

After finishing her doctoral degree in physics at the University of Vienna, Meitner moved to Berlin in 1907 and started collaborating with chemist Otto Hahn. They maintained their working relationship for more than 30 years.

After the Nazis annexed Austria in March 1938, Meitner, who was Jewish, made her way to Stockholm, Sweden. She continued to work with Hahn, corresponding and meeting secretly in Copenhagen in November of that year.

Although Hahn performed the experiments that produced the evidence supporting the idea of nuclear fission, he was unable to come up with an explanation. Meitner and her nephew, Otto Frisch, came up with the theory.

Hahn published their findings without including Meitner as a co-author, although several accounts say Meitner understood this omission, given the situation in Nazi Germany.

"That's the start of how Meitner got separated from the credit of discovering nuclear fission," said Lewin Sime, who wrote a biography of Meitner.

The other contributing factor to the neglect of Meitner's work was her gender. Meitner once wrote to a friend that it was almost a crime to be a woman in Sweden. A researcher on the Nobel physics committee actively tried to shut her out. So Hahn alone won the 1944 Nobel Prize in chemistry for his contributions to splitting the atom.

"Meitner's colleagues at the time, including physicist Niels Bohr, absolutely felt she was instrumental in the discovery of nuclear fission," Sime said. But since her name wasn't on that initial paper with Hahn—and she was left off the Nobel Prize recognizing the discovery-over the years, she has not been associated with the finding. The nuclear physicist died in 1968 in Cambridge, England.

Rosalind Franklin

Born in 1920 in London, Rosalind Franklin used x-rays to take a picture of DNA that would change biology.

Hers is perhaps one of the most well-known-and shameful—instances of a researcher being robbed of credit, said Lewin Sime.

Franklin graduated with a doctorate in physical chemistry from Cambridge University in 1945, then spent three years at an institute in Paris where she learned x-ray diffraction techniques, or the ability to determine the molecular structures of crystals. (Learn more about her education and qualifications.)

She returned to England in 1951 as a research associate in John Randall's laboratory at King's College in London and soon encountered Maurice Wilkins, who was leading his own research group studying the structure of DNA.

Franklin and Wilkins worked on separate DNA projects, but by some accounts, Wilkins mistook Franklin's role in Randall's lab as that of an assistant rather than head of her own project.

Meanwhile, James Watson and Francis Crick, both at Cambridge University, were also trying to determine the structure of DNA. They communicated with Wilkins, who at some point showed them Franklin's image of DNA—known as Photo 51—without her knowledge.

Photo 51 enabled Watson, Crick, and Wilkins to deduce the correct structure for DNA, which they published in a series of articles in the journal Nature in April 1953. Franklin also published in the same issue, providing further details on DNA's structure.

Franklin's image of the DNA molecule was key to deciphering its structure, but only Watson, Crick, and Wilkins received the 1962 Nobel Prize in physiology or medicine for their work.

Franklin died of ovarian cancer in 1958 in London, four years before Watson, Crick, and Wilkins received the Nobel. Since Nobel prizes aren't awarded posthumously, we'll never know whether Franklin would have received a share in the prize for her work.

Nettie Stevens

Born in 1861 in Vermont, Nettie Stevens performed studies crucial in determining that an organism's sex was dictated by its chromo-somes rather than environmental or other factors.

After receiving her doctorate from Bryn Mawr College in Pennsylvania, Stevens continued at the college as a researcher studying sex determination.

By working on mealworms, she was able to deduce that the males produced sperm with X and Y chromosomes—the sex chromosomes-and that females produced reproductive cells with only X chromosomes. This was evidence supporting the theory that sex determination is directed by an organism's genetics.

A fellow researcher, named Edmund Wilson, is said to have done similar work, but came to the same conclusion later than Stevens did.

Stevens fell victim to a phenomenon known as the Matilda Effect—the repression or denial of the contributions of female researchers to science.

Thomas Hunt Morgan, a prominent geneticist at the time, is often credited with discovering the genetic basis for sex determination, said Pomona College's Hoopes. He was the first to write a genetics textbook, she noted, and he wanted to magnify his contributions.

"Textbooks have this terrible tendency to choose the same evidence as other textbooks," she added. And so Stevens' name was not associated with the discovery of sex determination.

Hoopes has no doubt that Morgan was indebted to Stevens. "He corresponded with other scientists at the time about his theories," she said. "[But] his letters back and forth with Nettie Stevens were not like that. He was asking her for details of her experiments."

"When she died [of breast cancer in 1912], he wrote about her in Science, [and] he wrote that he thought she didn't have a broad view of science," said Hoopes. "But that's because he didn't ask her."

And now we'd like to ask: Who would you add to this list of female researchers who did not get the credit they deserved for their work?

The Medical Physics Future is Very Promising

TSAPAKI VIRGINIA

Virginia is head of the medical physics Dpt at Konstantopoulio General Hospital of Athens, Greece. She has 25 years of experience in Diagnostic Radiology and Nuclear Medicine. She is an IAEA expert and has been sent in several missions for the last 13 years. She has participated in multiple European projects. She is IOMP Secretary General for the term 2015-2018, EFOMP Chair of Projects Committee for the term 2016-2017 and has been President of Hellenic Association of Medical Physicists since 2012. She has been member of Organizing, Scientific, International Advisory Committee or Chair of various international conferences: World Congress 2015, European Conference of Medical Physics 2012, 2014, 2016, International Conference of Medical Physics 2013, etc. She has more than 100 publications in SCI journals, national, international journals and conference proceedings, 150 presentations and posters in national and international conferences.

TRIANTOPOULOU SOTIRIA

Sotiria is a medical physicist in Greece. She graduated from the School of Applied Mathematical and Physical Sciences of the National Technical University of Athens (NTUA). She obtained her MSc degree in Medical Physics in the University of Athens. She practiced medical physics in "Aretaieio", "Attikon" "Alexandra", "Laiko" and "Konstantopoulio" Hospitals. During her practice, the main topics of research and publications in which she participated are cancer treatment with Hyperthermia and radioprotection of pediatric patients. For two years she participated in radiobiology research to the National Center for Scientific Research "Demokritos". She also participated in the establishment of the Quality Assurance Protocol of Hyperthermia systems in Greece.

TS: How did you enter the medical physics world?

VT: My father was a physician in Creta. I was always fascinated, especially during my childhood, by the love and warmth he received by his patients. Creta is not a very big island and people know each other. They used to stop him while walking and greeting him cordially. Once or twice, he took me with him inside the surgery room (I had to wear the special clothing and this was very fascinating for me) to experience his work (simple day eye surgery). This was a disaster as both times I almost fainted. Although my initial intension was to follow his steps, I realized that I could not overcome these unpleasant feelings. A similar profession, that could bring me close to patients and clinical environment that I liked very much, could be the solution. As I really liked also physics it seemed that medical physics could be the best choice.

TS: Is there any person(s) that have had a special impact in your professional life?

VT: There are a number of people that made a special impact to my life, but 2 of them made me what I am today professionally. The first one is Dr Vasiliki Neofotistou, a Greek medical physicist, who participated in a number of European projects back in the 90's and opened the fascinating door of European research for me. The second one is Prof Madan Rehani, who was the first person with whom I worked within the International Atomic Energy Agency and who opened the wonderful world of International medical physics through the IAEA training courses.

TS: What has been from your point of view your best contribution to the medical physics world?

VT: Going back to my professional steps, I think that the contribution to the training of medical physicists through the IAEA courses is my most important achievement so far. The continuous communication with colleagues around the world, the on site quality control training in various hospitals (some in very bad condition and others simply amazing and very high level) and the smile at their faces when they performed real measurements in a CT scanner or an angiography machine is something that I will always cherish and remember. In some cases, the experience was not good as the hospitals were in a really bad condition but the willingness of the participants trying to work in this situation helped me see the world from a different point of view. And I have to say

that there was not a single country that I went and sensed a different attitude because of my gender.

TS: How do you see the future of medical physicists?

VT: In my opinion, the medical physics future is very promising. The evolution of medical technology, the complexity of clinical cases, the increasing trend to personalized treatment of patients, together with the growing needs due to European legislation and International guidelines, point the finger to more medical physicists and more expertise.

TS: Do you think that it is possible to balance professional, family and personal life?

VT: Well, this is not an easy question since my children are still young and family needs are very demanding. However, I can say that with good organization and of course, a husband that understands and wishes to help, everything is possible for a woman. Even having these two, however, it is not easy sometimes as each day has only 24 hours!

TS: What are the 3 most important advice you would give to young women medical physicists to encourage them in their professional development?

VT: I would say that they should not be afraid to attempt, to try, to risk. Life is never easy for anyone (man or woman). Some of the events may not be to your liking, and how you deal with these events will determine where you will be after this. So don't back down from challenges and don't be afraid of the ladder, just climb on it.

...If I Had Known About Medical Physicists, I Would Have Decided to Become One!

MARÍA DEL ROSARIO PÉREZ

Physician graduated at the School of Medicine of Buenos Aires University, Argentina (1980), specialized on Radiation Oncology, a post-graduate diploma on Radiation Protection and Nuclear Safety (1990). Radiation protection expert at the Atomic Energy Commission and Nuclear Regulatory Authority (1991-2006), scientist at the WHO Department of Public Health, Environmental and Social Determinants of Health (2007 up-to-now). Responsible for the technical coordination of the WHO Global Initiative on Radiation Safety in Health Care Settings, WHO representative at: Joint Secretariat for the revision of the International Radiation Basic Safety Standards (BSS), Inter-Agency Committee on Radiation Safety, United Nations Scientific Committee on the Effects of the Atomic Radiation, IAEA Radiation Safety Standards Committee, the EC Group of Scientific Experts referred to in Article 31 of the Euratom Treaty and the International Commission on Radiological Protection (ICRP).

SALLY HAWKING

Sally works at the Institute of Physics and Engineering in Medicine (UK) as International & External Services Manager where, among other responsibilities, she supports IOMP as their Administrative Secretary. Her role also includes support for IUPESM and EFOMP.
After graduating from Sheffield Hallam University with an Honours degree in Communications & Media Studies, Sally began her career at a newspaper before moving to the local council's Economic Development Unit where she was part of a team who launched the successful 'Science City York' initiative. Sally then moved to a life-assurance company where she progressed from computer programmer, through IT Project Management to running Programme Office for the large-scale re-branding of the company to 'Aviva' before joining IPEM in 2012.

For this issue of MPW I was delighted to be asked to interview Dr María del Rosario Pérez from the World Health Organization. When we spoke, I asked María some key questions about her career and experience of being a woman within the profession.

SH: How did you enter the medical physics world to begin with and what has your journey through the profession looked like?

MP: I am not a medical physicist, I am a radiation oncologist so I will answer from the perspective of a woman who has been working in the medical physics world since the very beginning of her profession, but without being a medical physicist. I entered this world soon after finishing medical school at the Buenos Aires University, while I was starting my post-graduate formation in radiation oncology. It was in the 80's, a period when the medical physicists - at least in my home country of Argentina - were not yet seen as health professionals and key members of the cancer treatment team. In fact in my hospital we had only one medical physicist working part-time for the Radiotherapy Department. During my medical career I had been educated under the vision that medical doctors were at the centre of health care. My journey through the medical profession was for me a discovery because I learned that patients were the ones who must be at the centre of health care and I also realized that the individual approach under which I had been educated was wrong. After working at the hospital I understood that team work was essential in radiotherapy and that medical physicists had a key role as the health professionals who implement QA and promote safety and quality in radiation oncology.

Do you think this kind of 'doctor-centric' education still exists in parts of the world?

The patient-centred approach started in the late 70's, when multiple social and political changes occurred in different parts of the world, paving the way for an increasing engagement of stakeholders in the decision making process. It was later adopted by health policy makers as a strategy to improve quality of health care. WHO is currently developing a framework on integrated people-centred health services to change the way health services are funded, managed and delivered. Integrated people-centred health services means putting the needs of people and

communities at the centre of health systems and empowering people to take charge of their own health. But this change is far from complete and the required cultural shift in medical education is yet to take place worldwide.

SH: Is there anybody who has had a special and lasting impact in your professional life?

MP: Yes, there is one person who definitely impacted my professional life: that person was a woman, and a medical physicist. Her name is Elisa Singer and she still continues to be an example for me. When I finished at medical school I wanted to become a clinical oncologist, but I could not get a position in the oncology fellowship program. I continued exploring other options and a friend suggested I talk to her mother, a medical physicist who was working in radiotherapy. I wondered whether a medical physicist could really advise me about my future career as a medical professional, but I tried. And that first interview with Elisa changed my life; she opened a door to an area of work that I had never even considered. After that, I got a position as a fellow at a Radiotherapy Department where I had the privilege of working with Elisa and learned from her. Even without having all the necessary resources, Elisa showed me that it is possible to continuously improve service quality and safety. Elisa is a great woman who always tried to create an environment that fosters excellence in health care.

SH: From your point of view, what has been your best contribution to the medical physics world?

MP: My contribution has evolved over the decades. In the early 80's, while working in Argentina as a radiation oncologist, I continuously fostered the dialogue, effective collaboration and mutual respect between radiation oncologists and medical physicists. In the early 90's, after obtaining a diploma on radiation protection and nuclear safety, my professional life substantially changed. I moved from the hospital to the Atomic Energy Commission, and later on at the Nuclear Regulatory Authority. During this period, I worked in cooperation with relevant professional societies for scaling-up the role of the medical physicists as promoters of safety and quality in the medical use of radiation. Since joining WHO in 2007 I work in close cooperation with the IAEA and the ILO to advocate for the recognition of the medical physicists as health professionals and to ensure that the medical physicists' role in the optimization of protection and safety in medical exposures is properly reflected in the norms and standards.

SH: Do you think it has been harder for you than for your fellow men to reach your current position?

MP: Yes, I think it was harder for me as well as for my medical physicist female colleagues. Many years ago radiotherapy used to be a traditionally male-dominated speciality, and women were underrepresented in senior positions. This situation has substantially changed, discrimination and harassment have decreased, but still some behavioural patterns persist and represent obstacles to women's professional success. In addition, there may be specific challenges in terms of radiation protection for women working in the field of radiology, nuclear medicine and radiotherapy (e.g. pregnancy, breast feeding). In general, it is more difficult for women than for men to combine the responsibilities of the daily work and the aspirations for continuing professional development with the personal life and the aspirations to build a family.

SH: How do you think women can contribute to the field of Medical Physics differently from men?

MP: From a scientific point of view, I do not think that women's contribution to the field of Medical Physics would be different from men's contribution. However, there are subtle behavioural differences (e.g. trend to bring a broader perspective, integrative analysis, intuitive thinking) that can be advantageous if women and men work together as an effective team. Women can help empower other women to become successful medical physicists.

SH: What are the three most important pieces of advice you would give to young women medical physicists to encourage them in their professional development?

MP: I would advise young female medical physicists to have i) confidence - to identify and potentiate their strengths and manage their vulnerabilities; ii) persistence - to achieve their goal by continuously improving their knowledge, competence and skills and iii) courage - to stay standing when faced with life's inevitable challenges

SH: And finally María, could you see yourself doing any other job?

No, I love medicine in all its components – clinical practice, research, education. I wished to become a medical doctor since I was very little, however, perhaps if I had known about medical physicists, I would have decided to become one!

Medical Physics is a Very Promising Career

SIMONE KODLULOVICH RENHA

Graduated in Physics, master degree and PhD in Nuclear Technology with specialization in medical physics in Brazil and trained in hospitals of UK, Spain, USA and Canada. Since 1999, is a researcher of the National Commission of Nuclear Energy (CNEN). For more than 10 years was head of Diagnostic Radiology Division of the "Instituto de Radioproteção e Dosimetria". Currently works at the Section of Standards of the Radiation Protection and Safety Division of CNEN. Since 2001 is lecturer of the MP master program and supervisor of master and PhD students and also works as a proof-reader of scientific journals. For more than 15 years, has been acting as expert of IAEA and Pan American Health Organization, especially in diagnostic radiology. Currently is member of the Quality Certification in Computed Tomography of the Brazilian College of Radiology. Recently was elected for the deliberative council of Brazilian Association of Medical Physics. President of "Asociación Latinoamericana de Física Médica " (2010-2013 and 2013-2016). She is Chair of Awards and honours committee for the term 2015-2018

TAINÁ OLIVIERI CHAVES

Dr Olivieri is a Nuclear Medicine Medical Physicists in the Rede D'Or São Luiz, Rio de Janeiro. She has graduated Medical Physics in the Federal University of Rio de Janeiro in 2009. In 2012 she received her MSc degree in Radionuclide Metrology with a dissertation on "Metrologic Quality Assurance of I-131 Capsules Used in Nuclear Medicine" . Dr. Olivieri's most recent work is dedicated on the Pediatric CT Scan Usage Pattern, Effective Dose and Clinical Indication in a Private Hospital in Rio de Janeiro, in Medical Physics by the Instituto de Radioproteção e Dosimetria – IRD/CNEN. She also has experience as a Nuclear Medicine Medical Physics (Fleury), Coordinator and Radiology Medical Physics(Rede D'Or São Luiz).

TOC: How did you enter the medical physics world?

SCR: Although initially I had chosen the medical career, when entering in the high school I became enthusiastic with the mysteries of the physics that appeared each day and, also counting on the influence of an excellent teacher of this subject I ended up opting for the University of Physics. At that time, my family did not approve my decision due to the limited job opportunities in this field in my country. During my Master Degree course, I had my first contact with medical physics. I realized that it was exactly what I wanted to do, because I could integrate the two professions I liked which was Physics and Medicine. In this way, as a medical physicsist, I could contribute to health care as I always wanted to do.

TOC: What has been from your point of view your best contribution to the medical physics world?

SKR: I consider that I have been contributing especially to: education and training of MP in all Latin America countries, strengthening the Latin America Association of Medical Physics (ALFIM) and providing support to the medical physics associations of the region during the six years which I was president and also contributing to raise awareness of the role of the medical physics specially in diagnostic radiology and finally participating in IAEA missions to improve the safety of the medical exposures.

TOC: How do you see the future of medical physicists?

SKR: There are several evidences that medical physics is a very promising career, among which I might cite: increased awareness of the importance of the medical physicist, increased demand for highly trained medical physicists due to the complexity of procedures and new technologies, inclusion of regulatory requirements regarding to the presence of the medical physicist in the services, including their responsibilities and duties, and finally the definition of medical physicists as a health profession by the ILO.

TOC: Do you think it has been harder for you than for your fellow men to reach your actual position, normally occupied by men?

SKR: In my career I did not felt directly any kind of discrimination. Competence, skills and also some politics issues were in general considered by the managers. It does not mean that it isn't exists. Maybe, there were many opportunities and offers I have not even taken notice. However, I

consider that gradually this mentality is changing and that our professional space has opened up due to our competence and effort. However, some actions should be done to stimulate the girls to study physics; even now in many countries it is not considered a profession for women.

TOC: What are the 3 most important advices you would give to young women medical physicists to encourage them in their professional development?

SKR: a) Focus and dedication: Seek the knowledge: MSc, PhD, clinical training. Keep up to date: research, participation in congress and in continuous training programs is essential to deepen your knowledge and keep you up to date. b) Perseverance: difficulties will appear all the time. Economic problems, family concerns, temporary lack of job and many other factors could induce you to give up. In this situation you shall be strong and fight against the problems that are deviation you from your objective. c) Striving for excellence: if you do not be stagnated, you will be able to make the difference in a larger scale.

TOC: Do you think that it is possible to balance professional, family and personal life?

SKR: Yes. It is important that you could make your family understand the importance of your profession for you, your goals and expectative it will be easier to have their support. Even when you have children, although it is not easy, they can understand you and accept that you will not be present all the time. They will be proud of you and you will be an example for them.

Be Trustworthy, Be Reliable, Be Competent!

MELISSA MARTIN

Melissa Martin is President of Therapy Physics Inc., a consulting medical physics group in Southern California. She received her M.S. in Medical Physics from UCLA and is certified in Radiological Physics by the American Board of Radiology. Melissa is a recognized expert in radiation therapy vault shielding design, and has completed evaluations for over 400 vaults throughout the world. She has been a key contributor to development of International standards in shielding design and national standards for mammography quality control. She has been very active within the AAPM both regionally and at the national level serving as AAPM Board Member, Treasurer, Administrative Council Chair and currently as President, continuing to build strong working relationships between the AAPM and the regulatory community. Melissa is a Fellow of the AAPM, the ACR, and the ACMP and has worked with the ABR for the past ten years on both the written and oral exams in Diagnostic Imaging Physics.

NICOLE RANGER

Nicole Ranger is a Diagnostic Imaging Physicist at Aspirus Inc. a non-profit regional healthcare system with headquarters in Wausau, WI (USA). Nicole received her MSc in Medical Radiation Physics from McGill University in Montreal, Canada and has worked in academic, industry, consulting and hospital-based settings as both a clinical and research medical physicist with specific expertise in nuclear medicine instrumentation, radiation dosimetry, and image quality metrics in digital radiography. Nicole serves on the Women's Committee of the IOMP, is past Chair of the AAPM Women Professionals Sub-Committee, and currently as Co-Chair of AAPM TG150 which is defining Quality Control guidelines for evaluation of digital radiography imaging systems.

NR: How did you enter the field of Medical Physics?

MM: After completing a B.S. in Engineering Technology (Radiation and Nuclear) from Oklahoma State University, I spent a year working in a Biochemistry Department while exploring options for graduate school. Upon discovering the option of majoring in Medical Physics at UCLA, I applied to and was accepted into the graduate program. My interest was in applying engineering and physics principles to the field of medicine. The UCLA graduate program in Medical Physics trained the students in all three areas of medical physics: diagnostic imaging, radiation therapy and nuclear medicine. My M.S. thesis was on the use of the Air Gap Technique for Chest Radiography. Upon completion of the M.S. program, I accepted my first job in Medical Physics at Good Samaritan Hospital in Los Angeles under the supervision of Robert Pugh, M.S., DABR (the second ABR Certified Physicist in the State of CA). After one year, Mr. Pugh retired and I worked under the supervision of Richard Garver, M.S., DABR to complete my years of experience required to enter the process of ABR Certification in Radiological Physics. Four years after graduating from UCLA, I completed my ABR certification in Radiological Physics (Diagnostic Imaging, Radiation Therapy and Nuclear Medical Physics) by completing three separate exams sequentially (written and oral). I then worked at hospitals in the Los Angeles area for eighteen years before joining a consulting physics group full time in 1992. I became President of Therapy Physics Inc. in 1995 and have remained in that role since then.

NR: Is there any person(s) that have had a special impact on you professionally?

MM: There are three medical physicists who primarily influenced my career path. The first significant medical physicist in my career was my thesis chairman and Chairman of the Medical Physics Graduate Program at UCLA: Moses A. Greenfield, Ph.D., DABR. Dr. Greenfield emphasized two major areas that impacted my life in Medical Physics: # 1 - Join and become active in the local chapter of the AAPM and # 2 - Complete ABR Certification as soon as possible. The second physicist with a major influence in my professional career was David Neblett, M.S., DABR, the physicist who along with Nisar Syed, M.D., FACR, developed many of the interstitial brachytherapy techniques still in use today. David Neblett developed the brachytherapy templates used for prostate, rectal and gynecological treatments along with the treatment planning software that

allowed multi-dimensional dose distributions for interstitial techniques. I worked for Mr. Neblett's company (ROCS) as a treatment planning computer installer and on-site trainer for seven years giving me the opportunity to see how dosimetry and treatment planning was performed in multiple sites throughout the US.

NR: From your point of view, what has been your contribution to medical physics that has made the largest impact or you are the most proud of?

MM: I feel that my most important contribution to the field of medical physics has been the development of an optimized radiation shielding program for radiation therapy equipment. This has been a multi-year development culminating in a flexible program allowing use of any available material whose density is known to be used for shielding purposes. To date, I have designed the shielding for over 400 vaults through the world for all types of equipment and, working with Jim Smathers, Ph.D., FACR, FAAPM, six proton facilities. The work on this program earned me the appointment by ANSI as the US representative to the ISO committee that just completed the publication of the new ISO standard on Radiation Shielding Design for Therapy Facilities. Receiving the referrals from many colleagues to design their vaults in new cancer centers and replacement linear accelerators has been rewarding for me.

NR: Do you think that it is possible to balance professional, family and personal life?

MM: I do believe that is is certainly possible to balance a professional career and your family and personal life. Of course, it is very helpful if you have a supportive spouse and you both approach your family life as a joint effort. I have been very fortunate to have been in a great marriage for over forty five years in which both of us have had very successful professional careers. We have a wonderful successful daughter who has now been married for over ten years in a dual career marriage while raising two fantastic granddaughters. One of the most important parameters to making this successful is the approach of all members of the family taking responsibility for performing whatever tasks need to be completed. One cannot take the attitude of entitlement in a dual career marriage. One of my best examples of a supportive husband occurred when our daughter broke out in chicken pox the night before I was to fly out for my oral ABR exams. There was no hesitation from my husband that I was to go to my board exam and he would care for our daughter.

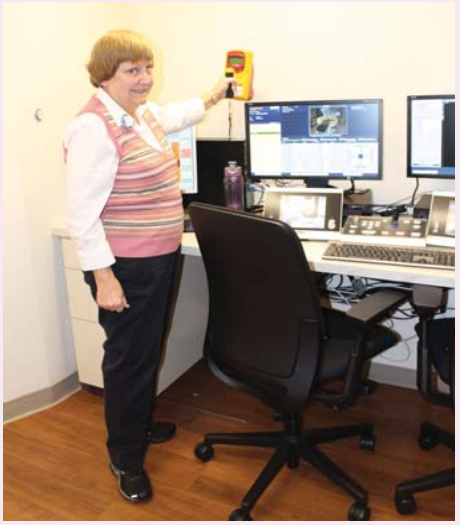
NR: Do you think it has been harder for you as a woman to attain success and advance to positions normally occupied by men?

MM: I have been very fortunate in my career in that I have never felt that I received anything except equal consideration for any position or job that I have applied for. Being the only female in my engineering undergraduate program and in the Medical Physics class at UCLA provided me the opportunity to learn to work with men in a professional role. I was treated equally in all classes and training situations. I never asked for special consideration and as far as I am aware, did not receive any special consideration. Neither was I treated any differently. This was also true within my professional career within the AAPM and American College of Medical Physics and American College of Radiology. I have served in nearly every office within my local AAPM Chaper and within the national AAPM including Treasurer, Council Chair, Government Relations Chair, Liaison to the CRCPD (Regulatory Community) and AHRA (Administrators), and now in the role of President of the AAPM. The observation that I have made over the years is that if I treat my colleagues with respect and courtesy, I receive the same treatment in return.

NR: What guidance would you give to yound women medical physicists to encourage them in their professional development; list three of your most important recommendations?

MM: My three most important recommendations to young women and men in this field are as follows: # 1 - Be Trustworthy; # 2 - Be Reliable; # 3 - Be Competent

We all tend to concentrate so much on competence that we miss the fact that until one has established their reputation as being trustworthy and reliable, one's competence will not be evaluated or appreciated. Once you have lost the trust of your physicians or administrators in a department, one should start looking for a new job. If you are not viewed as being dependable to arrive in a timely manner and perform required tasks, you will never advance to the opportunity to show how competent you are in your job. Setting up a reliable routine and back-up system for child care is mandatory to be viewed as a professional in the performance of your job. In today's environment, the medical physicist is required to be onsite for many procedures or the patient cannot be treated. Ensuring that one can meet your responsibilities is critical to success in this field. This is one of the most important criteria used when considering promotion of staff. If one wants to be treated equally by your colleagues, you must perform your job on an equal basis and accept equal responsibilities.



Contribute to Your Community, Nation, Region

ANCHALI KRISANACHINDA

Dr. Anchali Krisanachinda is an Associate Professor at the Department of Radiology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand. She has BSc (Hons.) in Physics by the Chulalongkorn University; MSc in Radiation Physics by the University of London, UK and PhD in Medical Radiation Physics by the University of Health Sciences, Chicago Medical School, IL, USA. Currently Dr. Krisanachinda is a chair of the MSc program in Medical Imaging, Chulalongkorn University; chair of the PhD program in Medical Physics, Chulalongkorn University, President of the Thai Medical Physicist Society (TMPS), founder and past president of the South East Asian Federation of Organizations for Medical Physicist (SEAFOMP); founder of the Asia-Oceania Federation of Organizations for Medical Physics (AFOMP) and IOMP officer. Dr. Krisanachinda has been acknowledged as one of the 50 outstanding medical physicist over the last 50 years from ICMP 2013, Brighton UK and was recently awarded the IDMP award.

HATAIPAT JANTAWONG

Jantawong is a medical physicist in the Imaging Department, Bumrungrad International Hospital, Bangkok, Thailand. She has received her BSc degree in Radiological Technology by the Mahidol University (2004); MSc in Medical Imaging, Chulalongkorn University (2009) and PhD Candidate in Medical Physics, Chulalongkorn University (2016). Since 2012 Dr. Jantawong is a DRMP Resident, Clinical Training of Medical Physicists Specializing in Diagnostic Radiology, IAEA in cooperate with Thai Medical Physicist Society (TMPS). Work Experience: 2011-2016: Diagnostic Medical Physicist, Radiology department, Bumrungrad International Hospital; 2005-2011: Radiological Technologist, CT/MRI Department, Piyavate Hospital; 2004-2005: Radiological Technologist, Cardiac Imaging, Bangkok General Hospital

HJ: How did you enter the medical physics world?

AK: Initially, there was the need for hospital physicist position to serve in the newly established university hospital in Bangkok, Thailand at that time. The job description for this position was posted at Physics Department for senior students to apply for. It was challenging to enter into this profession as the pioneer in the field. The radiologist who made the interview explained clearly how the physicist could contribute to the patient healthcare by using radiation for the investigation and treatment of cancer. He also informed about the well-supported organizations for this new profession from WHO and IAEA for further education. During the probation period, the expert from WHO showed how important the physicist serving the department in clinical work and the radiation safety was. The training supporting the profession standard, without any doubts, encouraged me to sacrifice for the medical physics work since then. The opportunity for the continued education and clinical training were also achievable. The radiologist who was also radiation oncologist, nuclear medicine physician, and WHO Expert in medical physics were the best example of multidisciplinary work in the initial period of the department.

HJ: Is there any person(s) that have had a special impact in your professional life?

AK: There are many persons affected my professional life in medical physics. Firstly, my parents: Both gave me the excellent incentive in studying physics from high school to university. My father always explained to me patiently the difficult part of physics and mathematics during my study. He taught me how to be a scientist from the nature and the simple environment. Secondly, my friends: My undergraduate friends who chose different subjects in physics such as solid state, electronics, astronomy, etc. we exchanged the knowledge until we graduated from the university. Those people made me fall in love with physics. My friends in radiology and non-radiology departments inspired me to work happily and non-tiredly with care and supports in field of medical physics. Thirdly, International Experts in medical physics: The most important part in my life is the opportunity to learn, practice and exchange knowledge with the international experts from IAEA, WHO, AAPM, JSRT, etc., at the institution and the international conferences. The updated technology, new standards, innovation and the clinical implementation are introduced by them. Finally, Global medical physicists: As I had opportunities to study abroad, be able to

develop medical physics profession and work internationally while my neighbor counties just started developing the career of medical physics. They need the supports at different scales- the lack of medical physicist, no education and clinical training programs, lack of facilities in the patient healthcare, lack of the rules and regulations in the use of radiation safety. These are the problems that made me set my objectives to volunteer supporting them to improve the situation of medical physics and to be more uniform in the region.

HJ: What has been from your point of view your best contribution to the medical physics world?

AK: Education and Clinical Training in Medical Physics is the most important factor in the establishment of medical physicist. IAEA had established the structured clinical training program for medical physicist on-line while the education program can be developed nationally according to the country development and the available facilities. We offer the opportunity to ASEAN students for the education with scholarship of the two-year program at the government university. The competency clinical training program needs the suitable facilities and clinical supervisors at the department of medical physics resident in the particular fields. Several countries lack of clinical supervisors, the on-line clinical training offers the opportunity to share supervisor in the program. The self-assessment for each Module, the progress report, the portfolio and the final assessment have been arranged by IAEA for the clinical training to establish the clinically qualified medical physicist. I have started this two-year program on clinical training for radiation oncology medical physics (ROMP), diagnostic radiology medical physics (DRMP) and nuclear medicine medical physics (NMMP) in Thailand since 2008 and have two classes completed. Now we have on-line clinical training for residents from Vietnam, Nepal and Myanmar which they share clinical supervisors with Thai residents. We could support the countries in need of clinical supervisors in radiation oncology and nuclear medicine.

HJ: How do you see the future of medical physicists?

AK: As the radiological technology in the investigation of the disease and the treatment of cancer are going on rapidly, the future of medical physicists in Thailand should be growing consequently. The number of cancer centers in Thailand with full facilities is 25, but the number of medical physicists filled in the requested position is still not enough. The number of medical physics graduates each year is still not adequate to fill in the position vacancy. Furthermore, there are needs for medical physicists in neighboring countries where education program is not yet established. The recognition in medical physics profession is improved among related field especially radiologist, radiation oncologist and nuclear medicine physician. The need of medical physicist graduated in the Ph.D. level is increasing in the university hospital all over the country, so the recruitment of medical physicist in Thailand is very important and the opportunity to get the job after completes the clinical training is high.

HJ: Do you think it has been harder for you than for your fellow men to reach your actual position, normally occupied by men?

AK: No, I don't think so.
In Thailand, we have equal rights among males and females in reaching to the medical physics position, more females are found in the field as well as other profession in the department of radiology since the beginning until now. Both males and females have the equal opportunity to be the leader in the field. Therefore, it was not hard for me to become a leader in medical physics in Thailand. My leadership has been accepted since I graduated medical physics from University of London, UK, and set up the first graduated program in Medical Physics in Thailand after return to Thailand. Furthermore, I had devoted in studying in USA and graduated as the first Ph.D.in Medical Physics in Thailand. I had set up medical physics society since a small community until become well accepted society internationally.

HJ: What are the 3 most important advices you would give to young women medical physicists to encourage them in their professional development?

AK: Firstly, understand clearly what you are doing. Understand people around you about what they think. Profession development is very important for the future progress in medical physics.
Secondly, be consistence and patience.
Thirdly, contribute to your community, nation, region and the international community whenever you have the opportunity.

Life is a Sequence of Opportunities

JENIA VASSILEVA

Jenia Vassileva holds a PhD and a clinical qualification in Medical Physics. Since 2014 she has been working as a radiation protection specialist at the Radiation Protection of Patient Unit of the IAEA, developing guidance, organizing trainings and contributing to national and regional projects on radiation protection in medicine. Previously, Jenia was a Professor of Medical Physics and Head of the Radiation protection of patients department at the NCRRP in Sofia, Bulgaria. She was involved in the university education of medical physicists in Bulgaria since its establishment and since 2004 she is the coordinator of the residency program for medical physicists, chair of the State examination board and lecturer in courses for health professionals. She has participated in numerous research projects; supervised around 40 MSc and PhD students, as well as co-authored more than 200 publications and conference contributions. During the period 2012-2014 she was the President of the Bulgarian Society of Biomedical Physics and Engineering.

DESISLAVA KOSTOVA-LEFTEROVA

Desislava Kostova-Lefterova is a young Bulgarian medical physicist holding a MSc, PhD and a clinical qualification in Medical Physics. Her professional carrier started at the Radiation protection of patient laboratory at the NCRRP in Sofia where she was involved in patient dosimetry, QC and radiation protection training. Her PhD research was focused on optimisation of paediatric CT and X-rays. Since 2009 she has been working in two university hospitals in Sofia, with responsibilities including radiation protection, QA&QC; optimization of imaging protocols and practice, training of medical staff. She has been involved in the first in Bulgaria Intra-operative radiotherapy. Desislava is a lecturer on two university courses for radiographers on QA in medical imaging and Radiation protection.

DKL: How did you enter the medical physics world?

JV: My journey in medical physics started in the 1990s, when the University of Shumen, where I worked at that time as an Assistant Professor in Nuclear Physics, introduced the first university programme in Medical Physics in Bulgaria. I was involved in developing the syllabus for the course, organising lectures from leading medical physicists and establishing clinical training in a close cooperation with the regional hospital in Shumen. All this gave me the unique opportunity to also qualify myself as a medical physicist through a number of international courses and close clinical involvement. The next opportunity came with receiving a three months fellowship from the IAEA in the Royal Marsden Hospital in London, where I joined the daily work of the Diagnostic Physics group. On my return to Shumen I was eager to implement the acquired new knowledge, and holding a long "to do" list on patient dose and image quality optimization in diagnostic radiology. Few years later these ideas were put into practice thanks to the enthusiasm of a team of students working with me on designing phantoms, performing measurements and thanks to the cooperation of the radiographers and radiologists. The defence of my PhD thesis came quite late compared to the standards, but appeared to be very timely with regard to the emerging need in the country for implementation of the new EU directive on radiation protection of patients. What followed was yet another step in my career – I took the leading position at the newly established laboratory on Radiation protection of patients at the National Centre of Radiobiology and Radiation Protection in Sofia.

DKL: Is there any person(s) that have had a special impact in your professional life?

JV: I consider myself very fortunate to have learned from many outstanding professionals. I would like to mention few people who have had a great impact on my professional development. First of all, these are three of the founders of the medical physics profession in Bulgaria, brilliant professionals and my first teachers: Michael Gantchew, Robert Popitz and Ventseslav Todorov. During my fellowship in London, I had the opportunity to learn from David Dance with whose work I was well familiar from his publications. The three months of daily communication with David and his team brought me new knowledge and new

research ideas. Later in my professional career, I had the chance to meet Madan Rehani, whose mentorship and unique work style have been a great inspiration. Generosity is the common characteristic of all these exceptional individuals who inspired me to follow the path of my dreams when changing careers.

DKL: What has been from your point of view your best contribution to the medical physics world?

JV: I would like to see as my contribution the education of a new generation of young medical physicists in my country, the establishment of the legal framework for medical physics involvement in hospitals, and the increasing recognition of the need of such professionals, particularly in diagnostic imaging, by our clinical colleagues. My pride and my love forever is the team of enthusiastic young professionals who started their successful carrier in medical physics from my group in Sofia. Like in a good family, we have been keeping a close relationship and supporting each other years after leaving the group and moving forward to another place of work in Bulgaria or abroad. My current position at the IAEA allows me to further spread this experience and continue contributing to improving the safety and quality in medical use of radiation in many other countries.

DKL: Do you think that it is possible to balance professional, family and personal life?

JV: I entered the medical physics profession relatively late, after already having a family and two children. What I achieved would have never been possible without the love and understanding of my husband and my children or the support of my parents. There is no universal rule for success, but the key word for me is love – love to the family and love to the profession. You need to be also a little bit selfish and leave some time for yourself that has been always my weakness. Of course, you need to be very well organized. The success is in your hands, and you are, Dessi, also a good example of a woman, successfully balancing professional development, family and hobbies.

DKL: Do you think it has been harder for you than for your fellow male collegues to reach your actual position, normally occupied by men?

JV: I have been lucky enough not to have experienced any discrimination during the pursuit of my dreams. I received the best education I could dream of in my time, I was supported by my senior colleagues to advance in my academic career, I was given the freedom to choose the topic of my research in medical physics and to apply for a fellowship abroad and was later invited to establish a new laboratory in Sofia. I was the first woman elected the President of the Bulgarian Society of Biomedical Physics and Engineering. Finally, I am honoured to have been selected among many highly qualified candidates for my current position at the IAEA. I wish more women were given the opportunities that I've had in my life.

DKL: How do you see the future of medical physics?

JV: Medical physics is much more than contribution to the scientific progress and technological developments in medicine. It is a clinical profession, and the biggest challenge for medical physicists is to prove themselves as important members of the clinical teams. From the global perspective, we need to find solutions for bridging the gap between developed and developing countries in the access to good healthcare, and in particular in the level of involvement and qualification of medical physicists.

DKL: What are the 3 most important advices you would give to young women medical physicists to encourage them in their professional development?

JV: Life is a sequence of opportunities we sometimes attribute to chance and even destiny. How we use these opportunities, the choices we make, is in our control. Every decision requires a certain extent of compromise. If you are brave enough to chase your dreams, you will succeed. However, never forget the most important components – love and devotion. Medical physics is a profession that helps save lives and improve the quality of life. It requires dedication, constant learning and development. If you love your profession as you love your family, there will be no need to make difficult choices, you will find the way to balance both. Just be yourself, work hard and believe in yourself!

Never Stop Learning and Asking Questions

AGNETTE DE PERIO PERALTA

Ms. Agnette de Perio Peralta graduated from the University of the Philippines (UP), Diliman, with a Bachelor of Science, major in Physics and M.Sc in Medical Physics from the University of Wisconsin-Madison, USA. She became the Director in 1990 in the Center for Device Regulation, Radiation Health and Research of the Food and Drug Administration of the DOH. In August 2016, she was appointed Assistant Secretary for Health Regulation, DOH. She had served for twelve years as a member of the International Commission on Non-ionizing Radiation Protection. Since 1983, she is a part-time professorial lecturer in the M.Sc in Applied Physics of the University of Santo Tomas Graduate School. She is the founder president of the POMP which is now the Philippine Society of Medical Physicists of the Republic of the Philippines (SMPRP), founding member of both the AFOMP and SEAFOMP (two years as president). Ms. Peralta has represented her country in many international meetings.

HASIN ANUPAMA AZHARI

Dr. Hasin Anupama Azhari is the Professor and the Chairman of the Dept of Medical Physics and Biomedical Engineering and Dean, Physical and Mathematical Sciences, Gono Bishwabidyalay, has been awarded PhD in Medical Physics from National University through a sandwich program of OWSD under ICTP fellowship. Her research stations were China and Germany. About 50 research works were published in journals and books. She is the founder President and Vice president of BMPS; Vice President, BAWS; Regular Associate member, ICTP; member, BPS; ESTRO, AMPI, member of scientific committee: AFOMP, executive member for Asia and Pacific Region of OWSDW, Italy. She is one of the pioneer Medical Physicist in Bangladesh, working with government to create position and recruitment rules for MP.

HAA: Inspiration to Enter Medical Physics World

I was in my second year of teaching undergraduate physics subjects in my Alma Mater, the University of the Philippines (UP), when Dr. Celia T. Anatalio, the first Director of the newly-created Radiation Health Office (RHO) of the Department of Health , came to our Physics Department looking for physicists to employ. Filipino medical physicists recognize Dr. Anatalio as the Mother of Medical Physics in the Philippines.

She talked about the field of medical physics, which at that time nobody in the Department had ever heard of UP, a government institution, is the first university in the Philippines that offered undergraduate and graduate degrees in physics and the UP System with its 15 campuses employs the largest number of pure and applied physicists in the country. Two of my batch mates who were then full time graduate students in physics were appointed health physicists in the RHO that year, while I was only able to transfer to the DOH the next year 1975 because I still had to complete my teaching duties for the academic schoolyear.

The RHO which was later renamed Radiation Health Service had been mandated to regulate devices and radiation facilities using these devices but it also provided radiation dosimetry, radiation protection and selected medical physics services. Our first mentors were Mr. Luciano Niguidula, the first Filipino.

HAA: Contribution to the Medical Physics World

I am one of the pioneers in the field of medical physics in the Philippines. After being promoted to a division chief position and later to a director position, I became more visible not just in our small medical physics community and the Department of Health, but also throughout the country. I was able to promote medical physics and I was able to convince many decision makers about the important role of medical physicists especially in the health care system. One major outcome is the creation of positions for medical/health physicists in many government medical centers. I was also able to ensure that medical physicists are employed in a full time capacity in private and government radiation oncology facilities through regulation.

As a part-time professorial lecturer since 1983 in the University of Santo Tomas Graduate School (USTGS) masteral program in medical physics, I have taught all medical physicists in the Philippines,

except for four colleagues who did medical physics graduate studies abroad. {The USTGS program was established as a joint project of the DOH, the then Philippine Atomic Energy Commission, and the USTGS with technical assistance from the International Atomic Energy Agency.}

HAA: Women contribution to the field of Medical Physics differently from Men

Most women are more empathetic than men. Looking at our field from the patient's point of view gives one a new perspective which could help bring about innovations.

HAA: Advices to young medical physicist

- Never stop learning and asking questions.
- Be active in professional activities of national and international organizations of medical physics and of health physics and if given the opportunity, those of related professions such as the society of radiologists, radiation oncologists, nuclear medicine specialists and radiologic technologists.
- Develop your written and oral communication skills.

...If It Is YOUR Decision, It Will Be Right

NÚRIA JORNET

Núria Jornet was born in Barcelona (1968) and graduated in Physics at the University Autònoma de Barcelona (1991). Dr Jornet got a grant from the Catalan Government to follow a Diplome d'etudes Aproffondies (DEA) in Medical Physics at University Paul Sabatier (Toulouse) and Paris IV. Since 1993 she works as Medical Physicist in the Department of Medical Physics and Radiation Protection of Sant Pau Hospital in Barcelona. Núria Jornet started working as a clinical physicist in the Medical Physics Department and got her PhD about in vivo dosimetry with diodes for high energy x-ray beams. In 2016 Dr. Jornet was accredited as university lecturer by the The Catalan University Quality Assurance Agency. Her relation with ESTRO started in 2001 with an involvement in booklet number 5 on in vivo dosimetry with diodes (2001). She is currently the chair of the Physics Committee and member of the Scientific and Education Council, a faculty member in ESTRO school and director of the Quality management: Quality monitoring and Quality Improvement course.

IRENE HERNÁNDEZ GIRÓN

Irene Hernández Girón was born in Madrid (1982) and got a Physics degree and Biomedical Sciences master (Universidad Complutense de Madrid). Technician for ASIGMA: X-ray devices quality control in hospitals. Researcher and teaching assistant (Rovira i Virgili University, Unitat de Física Mèdica, Reus, 2010-2015). PhD: Model observers applied to low contrast detectability in Computed Tomography; supervisors: A. Calzado (UCM) and W. Veldkamp (Leiden University Medical Center). Since 2015 Irene works at the LUMC Radiology Department (CLUES project: Clinical Image Quality Assessment: bridging the gap between physical measurements and clinical performance in medical imaging). Irene Hernández Girón is a teacher at EFOMP ESMPE 2016 winter school: Computed Tomography Imaging. Co-author of Quality control in cone-beam computed tomography (CBCT) EFOMP-ESTRO-IAEA protocol.

IH: How did you enter the medical physics world?

NJ: When I was at my fourth year at the university, my thermodynamics teacher offered me the opportunity to go to Sant Pau Hospital to visit one of his friends that was a Medical Physicist, Teresa Eudaldo. At that moment I was specialising in high energy physics and I could clearly see that Medical Physics could offer me the possibility to apply my knowledge to improve both therapy and diagnosis of different illnesses and in particular cancer. I spent that summer at the hospital and during my fifth and last year I applied for a grant to go to France to study Medical Physics as at that time there was not formal education in Spain. I won the grant and I went to Univeristy Paul Sabatier (Toulouse) and Hospital Gustave Roussi in Paris, to get a Diplome d'etudes approfondies en Physique radiologique and medicale. I must say that the first month was really hard as my French was extremely basic, I had only studied English at school… But after Christmas my French was much better and I have good memories from the months I spent in Paris, learning from great teachers; Mr Bridier, Chavaudra, Ginette Marinello just to mention some. After that year I started working at Hospital Sant Pau, where I have been since.

IH: Is there any person(s) that have had a special impact in your professional life?

NJ: Several, first Montserrat Ribas, my head of department, who has always encouraged me. Then Hakan Nyström who was one of the first European Medical Physicists that I met and introduced me to ESTRO world and has been key in my development. Then, Tommy Knöös that trusted me and asked me to join the ESTRO education Committee and some years later the Physics Committee. I must say that I have been very lucky and during my professional life I have met incredible physicists and people. I still remember how impressed I was the first time I was in a lecture by Alan Nahum about the cavity theory or when I first met Pedro Andreo. Some women have also been role models for me, such as Madame Dutreix, Ginnette Marinello and Joanna Cygler to mention some. Ginnette was one of my teachers and, some years later, we were sitting together for an International Atomic Energy Agency project on in vivo dosimetry, and that was amazing.

IH: What has been from your point of view your best contribution to the medical physics world?

NJ: Probably my work on in vivo dosimetry using point detectors which was the topic of my PhD. I have also been very interested in changing the approach to Quality and Risk management in Radiotherapy departments. I have participated in some projects and started a project on auditing in the Catalan Medical Physics Society. I think that I am good at promoting networking and I am happy to see that, after this audit, the Catalan Medical Physics society is starting projects to join efforts between medical physicists from different hospitals and departments. Within ESTRO and together with Philip Maignon we have started a multidisciplinary course on Quality Monitoring and Improvement in Radiation Oncology which I hope will rationalize the quality controls we make and raise the standards. I love teaching and I feel proud of the students I've had when they succeed in their career.

IH: How do you see the future of medical physicists?

NJ: Medical Physicists' future depends on how open we will be to leave our comfort area and to move forward to new fields in which our knowledge as physicists can make a change in the natural history of different illnesses. In other words we have to move forward as it is possible that the fields in which we have been traditionally involved will need less medical physicists with the advent of automation and the take over by technologists. Some interesting fields are photo-dynamics, functional imaging, modelling…

IH: Do you think that it is possible to balance professional, family and personal life?

NJ: It is not only possible, for me is a must to be happy. I do not understand life if it is not a balance between the different spheres that is your professional duties, your family and also personal, individual. I have two kids, Anna and Enric, and when they were still babies and while I was working, I managed to write my PhD. At that time, the support of my head of department, my colleagues at the hospital and my family, together with long days, working on my PhD when the kids went to bed, were key elements.

When I think about how I have managed, I used to think that I had been lucky to have a partner, who is also doing research, and has never complained about the time I spent working at home or travelling to meetings… However, now I think that we are well together because we understand each other and respect this personal sphere… So probably not luck but a good choice.

IH: Do you think it has been harder for you than for your fellow men to reach your actual position, normally occupied by men?

NJ: Not in my case. I was lucky to have a head of department that was a woman and that has always pushed me to be involved in research and also to be active in European associations such as EFOMP and ESTRO. Both in EFOMP and ESTRO I have never felt that I was treated differently because I was a woman. However, it is true that some males tend to be condescending with women. I think that as women we should never accept this attitude, as we are, at least, as capable as them.

IH: How do you think women can contribute to the field of Medical Physics differently from men?

NJ: Women usually have a high workload capacity and a different approach to teamwork. I would say that most of the women with whom I have worked with were good team players; I cannot say the same of most of the men. Obviously, there are exceptions… It is not good to make general statements…

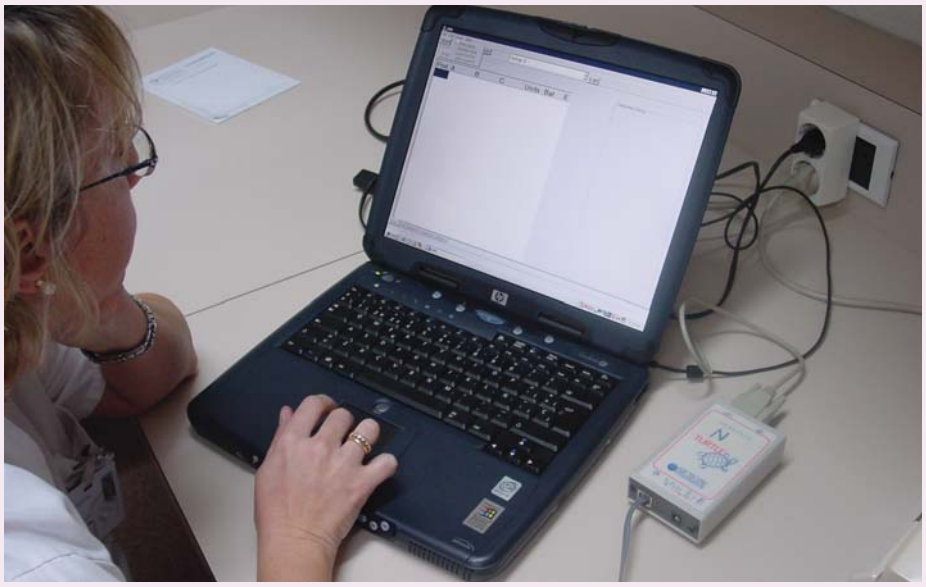
Also women usually think more critically before taking new challenges. We have to be sure that we will succeed, this is probably different from a typical male approach that take the challenge more impulsively.

IH: What are the 3 most important advices you would give to young women medical physicists to encourage them in their professional development?

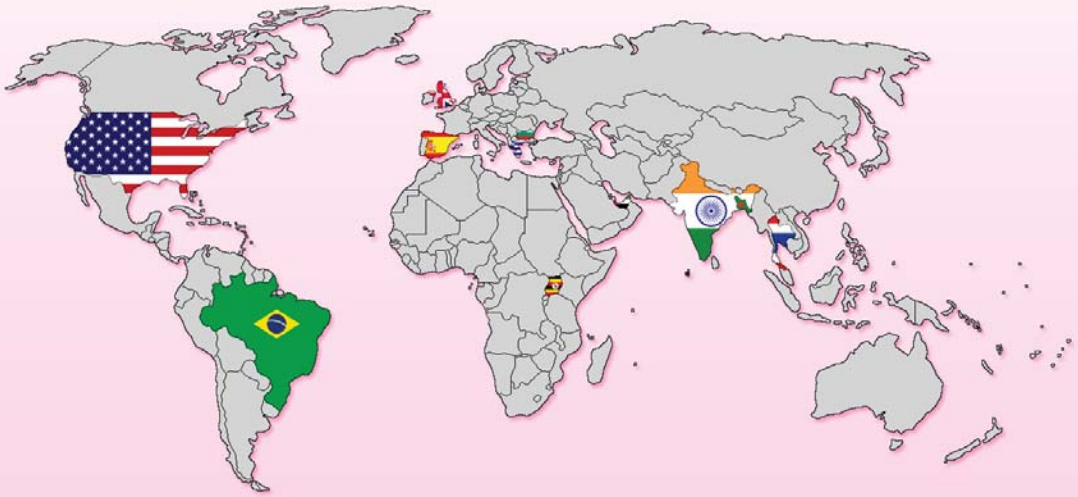
NJ: The first is that it is important to be competent in your job, to read, to be proactive, and think big!

Don't allow condescending attitudes… It is the worse enemy of women.

It is possible to balance family and work but to do this, you need to choose wisely your partner. Obviously how to get balance depends on your choices, but whatever you decide if it is YOUR decision, it will be right.



IOMP WOMEN SUBGROUP www.iomp.org/IOMP-W



Virginia Tsapaki (Greece)
Simone Kodlulovich (Brazil)
Magdalena Stoeva (Bulgaria)
Jamila Al Suwaidi (UAE)
Teh Lin (USA)
Nicole Ranger (USA)
Anchali Krisanachinda (Thailand)
Rebecca Nakatudde (Uganda)
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Francesca McGowan (UK)
Hasin Anupama Azhari (Bangladesh)
Rajni Verma (India)
Doris Dimitriadis (Lebanon)

"Women account for only 28 % of researchers across the world, with the gap deepening at the higher levels of decision-making. Women have less access to funding, to networks, to senior positions, which puts them at a further disadvantage in high-impact science publishing".

All these are reported at the latest UNESCO Science Report. It seems that despite the immense steps for women so far, there are still socio-economic factors that limit the effective participation of women in higher education and professional levels.
Seeing the latest figures in the international literature, the field of medical physics, one of the forefronts of current physics research and application, is still a male-dominated field in many regions of the world.

For these reasons, IOMP is taking action in order to increase women participation in the field of Medical Physics.
Rather recently, the "IOMP Women Subcommittee" (IOMP-W) was established (http://www.iomp.org/IOMP-W/) in order to deal with all matters relating to the role of women in medical physics scientific, educational and practical aspects.
The committee was small when created, but slowly developed to a large and hard working team as shown at the map.
We hope that it becomes even bigger in the near future.

IOMP Women Main Functions

Develop, implement and coordinate tasks and projects related to the role of females in medical physics scientific, educational and practical aspects.
To disseminate the experiences, good practice and learning within IOMP NMOs and other relevant accessible areas/across the globe.
Popularize the role of the women in medical physics and encourage female medical physicist to advance in the profession.
Organize international cooperation in medical physics and related specialities.
Provide regular status/progress updates to the IOMP on all tasks and projects related to the IOMP Women Group.

INTERNATIONAL DAY OF MEDICAL PHYSICS (IDMP) 7 November 2017

Medical Physics:
Providing a holistic approach to women patients and women staff safety in radiation medicine

www.iomp.org/IDMP