International Organization for Medical Physics

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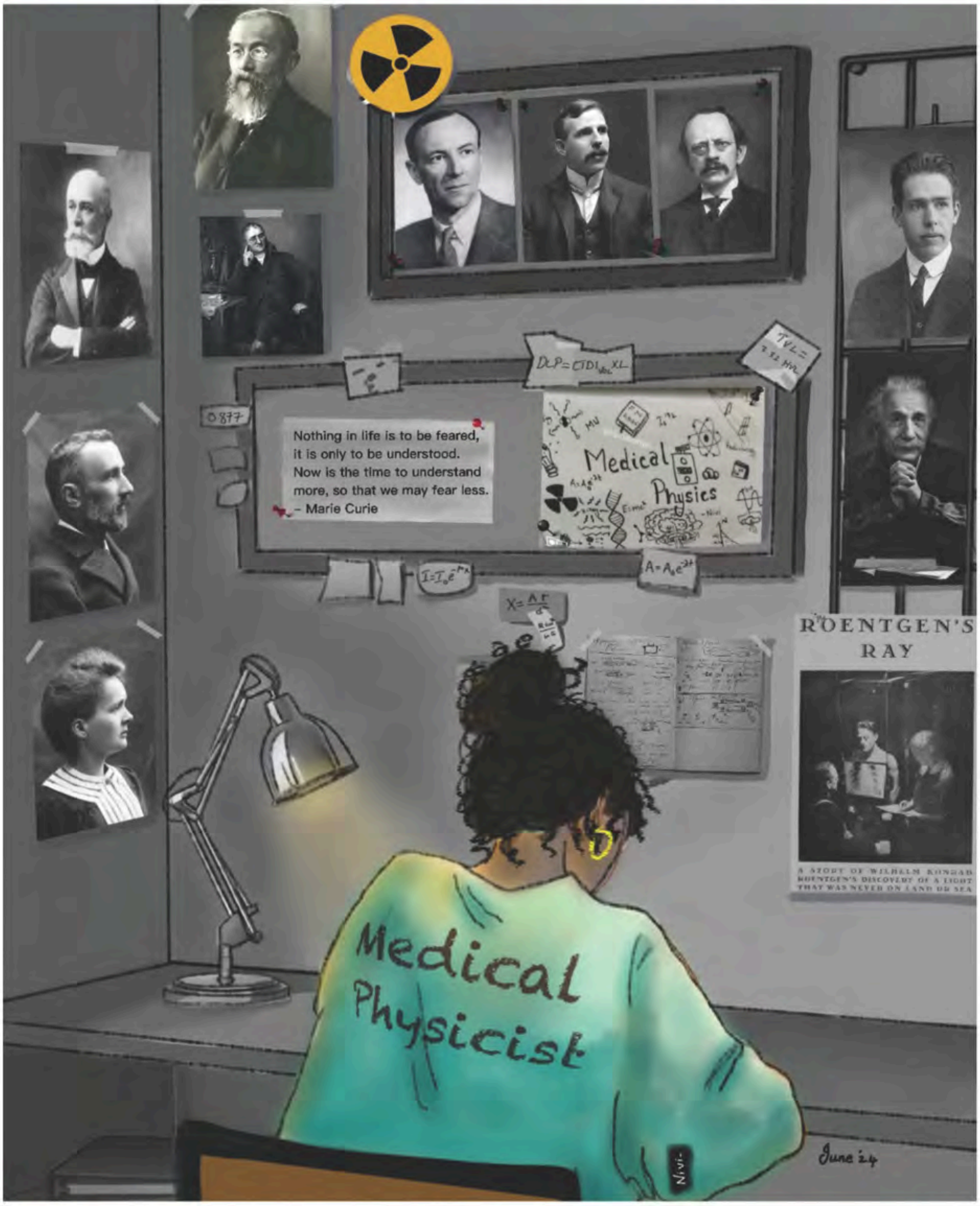
INTERNATIONAL DAY OF MEDICAL PHYSICS (IDMP) 2024



Inspiring the next generation of Medical Physicists

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Editorial

Chai Hong Yeong, PhD

Editor-in-Chief of IOMP e-Medical Physics World (eMPW)

CHAI HONG YEONG

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"As we reflect on the year, we are reminded of the continued progress we are making as a global medical physics community, driven by innovation, collaboration, and a shared commitment to improving patient care."

Dear Colleagues,

It is with great pleasure that we present to you **Volume 40, Issue 2 of e-Medical Physics World (eMPW)**, our final issue for 2024. As we reflect on the year, we are reminded of the continued progress we are making as a global medical physics community, driven by innovation, collaboration, and a shared commitment to improving patient care.

This issue brings together a wealth of content that highlights the vibrant and evolving field of medical physics. Among the key features of this edition are the **IOMP ExCom Reports** for the period from July to December 2024, offering comprehensive updates from our leadership on the progress of IOMP activities and initiatives.

We are also proud to share the **International Day of Medical Physics (IDMP) 2024 reports**, centered on the theme "Inspiring the Next Generations of Medical Physicists." The report, prepared by Ibrahim Duhaini, offers valuable insights into the global celebrations that brought together IOMP members from around the world to mark this special day. A highlight of the celebrations was the first-ever **"24-hour Global Webinar on Inspiring the Next Generations of Medical Physicists"**, hosted by IOMP under the technical coordination of Magdalena Stoeva, IOMP Secretary General. This global event achieved great success by attracting participation from over 97 countries, with a total attendance of 2,516 manhours, demonstrating the widespread enthusiasm and engagement in this historic initiative.

The Conference and Event Reports section highlights several meetings that took place this year. These include the **Conference on Radiation Applications in Medicine**, held on 30 November 2024 by the Departments of Radiation Oncology and Radio Diagnosis at the Christian Medical College & Hospital, Ludhiana; the **24th Asia-Oceania Congress on Medical Physics (AOCMP) and the 22nd Southeast Asia Congress on Medical Physics (SEACOMP)**, which were held from 10-13 October 2024 in Penang, Malaysia; as well as the **Chula Summer School on Advanced Medical Physics in the AI Era**, held at the Chulalongkorn University, Thailand, from 19-21 July 2024.

Editorial

Chai Hong Yeong, PhD

Editor-in-Chief of IOMP e-Medical Physics World (eMPW)

This issue also includes several invited articles that explore emerging areas in medical physics, such as **Medical Physics Education, Anomaly Detection using AI**, and the transformative role of **Artificial Intelligence in Proton Therapy**. These articles not only highlight current trends but also offer a glimpse into the future of our field. A particularly notable contribution is the article **"Doing Science in Cuba: Dr. Marlen Pérez-Díaz,"** which provides a unique perspective on the challenges and opportunities within medical physics in Cuba, offering inspiration for future global collaboration.

As we approach the close of 2024, this issue serves as a reminder of the power of global collaboration in overcoming the challenges faced by the medical physics community. The contributions in this edition reflect the ongoing evolution of our profession, underscoring the importance of education, outreach, and innovation in advancing the field.

I would like to take this opportunity to express my deepest gratitude to all our contributors, the MPWB committee, Editorial Board members, and our readers. Your continued support and dedication to the field of medical physics are what drive our progress and success.

Looking ahead to 2025, I encourage each of you to engage with the wealth of knowledge shared in this issue. Let us continue to inspire, learn from, and support one another as we move forward, building a brighter future for medical physics and patient care.

Thank you for your continued support. We look forward to the new year and the exciting journey ahead!

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President's Message

John Damilakis, PhD

President of IOMP

JOHN DAMILAKIS

President, IOMP
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"From global events and educational workshops to innovative projects and outreach activities, 2024 has been a year of growth and meaningful contributions from colleagues and partners worldwide"

Dear Colleagues,

This year has been marked by significant progress, impactful collaborations, and inspiring initiatives that continue to advance our profession and strengthen our shared commitment to improving patient care through medical physics. From global events and educational workshops to innovative projects and outreach activities, 2024 has been a year of growth and meaningful contributions from colleagues and partners worldwide. In this message, I would like to highlight a few of the most important events and initiatives that have defined our collective journey.

The **International Day of Medical Physics (IDMP)**, celebrated annually on November 7th, honors the birthday of Marie Curie. The theme for 2024 was ***"Inspiring the Next Generation of Medical Physicists"*** emphasizing the need to attract young talent in the field. The overarching message of IDMP 2024 reflected a shared commitment to inspiring future generations. A global poster competition was held in preparation for IDMP 2024, and **Dr. Lavanya Murugan** was selected as the winner for her design, which captured the theme's essence. A very successful 24-hour global event titled ***"Around the World in 24 Hours: Celebrating Medical Physics"*** was held on November 7th, bringing together regional and national organizations to share presentations, strategies, and plans.

The **International Medical Physics Week (IMPW)** is an annual global event organized by the IOMP to highlight the critical role of medical physicists in healthcare. IMPW serves as a platform for knowledge sharing, collaboration, and promoting awareness of the contributions medical physics makes to improving patient care and advancing healthcare technologies. In 2024, IMPW was celebrated from **April 22 to April 26**, with a series of online webinars organized by IOMP's regional organizations. This global initiative underscores the importance of collaboration and continuous learning in addressing current challenges and advancing the field of medical physics.

President's Message

John Damilakis, PhD

President of IOMP

Medical Physics International (MPI) is a freely accessible journal dedicated to medical physics education, professional development, and global collaboration. It serves as a platform for sharing knowledge, insights, and innovative approaches in medical physics, with a strong emphasis on educational methods, professional growth, and the dissemination of best practices. The journal focuses on publishing general review articles, reports on specific educational strategies, and resources that support the professional development of medical physicists worldwide. In addition to regular issues, MPI introduced this year a designated "Proceedings Series" for the publication of congress abstracts, making it easier for researchers and practitioners to access information from specific scientific events. This initiative enhances the visibility of academic contributions and facilitates the dissemination of key findings from global conferences. Authors interested in contributing to MPI are encouraged to follow the journal's submission guidelines, which outline the requirements for preparing and submitting manuscripts.

IOMP actively supports the global medical physics community through the **sponsorship and endorsement of events**. IOMP supported many events during 2024 and relevant information was included in my IOMP newsletter messages. By providing official recognition and support, IOMP helps ensure that medical physics events, including conferences, workshops, webinars, and training programs, achieve broader visibility, attract greater participation, and maintain high standards of scientific and educational quality. Endorsed events often provide opportunities for early-career professionals and students to engage with experts, participate in hands-on training, and gain insights into cutting-edge research and technologies. Organizers seeking IOMP sponsorship or endorsement are encouraged to align their events with the organization's mission and objectives. Clear educational goals, relevance to the field of medical physics, and potential for long-term impact are key criteria for consideration.

The IOMP recognizes the importance of **hands-on training and targeted education** in advancing the expertise and skills of medical physicists worldwide. IOMP organized a **significant workshop** held in Malaysia a few days before the **Asia-Oceania Congress of Medical Physics (AOCMP) and the South-East Asia Congress of Medical Physics (SEACOMP)**. The event included expert-led sessions, interactive discussions, and opportunities for hands-on training, offering participants a well-rounded learning experience. The workshop also served as a platform for knowledge exchange and collaboration among professionals from various countries in the Asia-Oceania region.

Looking ahead to February 2025, IOMP, in collaboration with the Middle East Federation of Organizations of Medical Physics (MEFOMP), will organize another key workshop in Kuwait. This event, titled ***"Advances in CT Dosimetry and Machine Learning: Optimizing Patient Safety and Dose Estimation,"*** will take place alongside the **MEFOMP Medical Physics Conference**. The workshop will span four days and focus on both theoretical foundations and hands-on practical training in CT dosimetry, radiomics, and machine learning workflows. Participants will gain exposure to the latest methodologies, tools, and practices aimed at enhancing diagnostic precision, patient safety, and treatment optimization. To ensure effective engagement, practical sessions will be limited to a pre-selected group of participants, allowing for personalized guidance and in-depth training.

President's Message

John Damilakis, PhD

President of IOMP

The **IOMP Accreditation Board** plays a key role in maintaining and promoting high standards in medical physics education, training programs, and professional development activities worldwide. Throughout 2024, the Accreditation Board has been actively involved in evaluating and accrediting numerous events, including conferences, workshops, residency programs and training courses. This accreditation process ensures that events meet globally recognized standards, provide valuable educational content, and contribute meaningfully to the professional growth of medical physicists. Accreditation by IOMP signifies that an event adheres to rigorous quality benchmarks, including clear educational objectives, scientifically sound content, and relevance to contemporary challenges in medical physics. The IOMP Accreditation Board's activities in 2024 have contributed significantly to strengthening global collaboration in medical physics.

The **e-Medical Physics World (eMPW)** is the biannual newsletter of the IOMP, serving as a vital communication platform for the global medical physics community. Together with our **Newsletter**, **IOMP's website and social media**, MPWB delivers updates on the latest advancements, challenges, and achievements in the field, highlighting key initiatives, events, and collaborations led by IOMP and its member organizations. The newsletter features insightful articles from experts, reports on major conferences, updates on ongoing projects, and announcements of upcoming educational opportunities.

The upcoming **World Congress on Medical Physics and Biomedical Engineering** will take place in **Adelaide, Australia, from September 7 to 12, 2025**. This prestigious event, held every three years, is jointly organized by the IOMP, the International Federation for Medical and Biological Engineering, and the International Union for Physical and Engineering Sciences in Medicine. The congress serves as the largest international gathering of medical physicists, biomedical engineers, healthcare professionals, researchers, and industry leaders. Under the overarching theme "Innovating Healthcare through Medical Physics and Biomedical Engineering" the congress will feature a diverse scientific program, including keynote lectures, plenary sessions, parallel tracks, workshops, and poster presentations. Attendees will have the opportunity to explore the latest advancements in areas such as artificial intelligence in medical imaging and therapy, precision medicine, radiation therapy, diagnostic radiology, healthcare technologies, and patient safety initiatives.

I would like to extend my gratitude to all members of the Executive Committee and colleagues around the world for their dedication, support, and commitment. I am deeply appreciative of the time, expertise, and passion you bring to every initiative, meeting, and project. Together, we have created a strong foundation for future growth, inspiring the next generation of medical physicists and improving patient care worldwide. Thank you for your continued collaboration, professionalism, and dedication to our shared mission.

Happy 2025!

Vice President's Message

Eva Bezak, PhD

Vice President of IOMP

EVA BEZAK

Vice President, IOMP
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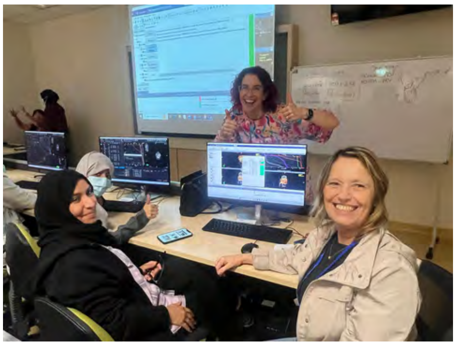
“Your continued support and active participation in IOMP events and activities are essential for the growth of the profession and improving the standards of education and training around the world"

Dear Colleagues and Friends,

As the year 2024 comes to a close, I reflect on the positive and active year of continued IOMP service to the medical physics profession and our global communities.

One of the highlights for me was the **IOMP School on Intensity Modulated Radiation Therapy (IMRT), held from October 5-8, 2024, at the National Cancer Institute (NCI) in Putrajaya, Malaysia**, this program hosted ~30 attendees from Malaysia, the Philippines, Indonesia, Bangladesh, Saudi Arabia, Iran, and even Mexico. Thanks to our excellent local NCI hosts, participants had access to clinical facilities, lecture rooms, and excellent hospitality. Partnering with Varian, the program offered hands-on training using treatment planning software, generating treatment plans for prostate, breast and head and neck IMRT. The planning sessions were accompanied by a QA session on a linear accelerator at the NCI. The immediate feedback was overwhelmingly positive and currently we conduct follow up zoom sessions to see how the participants are implementing the acquired knowledge in their clinical practice.



Vice President's Message

Eva Bezak, PhD

Vice President of IOMP

The **last 2024 meeting of the IOMP ExCom** was conducted face-to-face in Penang, Malaysia, as many of the ExCom members were fortunate enough to attend the AOCMP/SEACOMP 2024 congress in person. **AOCMP/SEACOMP 2024** received 380 abstracts and over 500 participants attended – with local hosts led by Prof Jeannie Wong and Prof Chai-Hong Yeong, delivering a perfect professional meeting with exceptional hospitality.

I was honoured to deliver an opening talk of AOCMP 2024 on **diversity, equity, and inclusion** which are essential to fostering an innovative environment in all areas of science, including medical physics. Diversity represents a spectrum of identities—social, ethnic, gender, religious, cultural, and more—each offering unique perspectives that enrich our field. Inclusion, meanwhile, ensures that this diversity is not only welcomed but actively embraced, allowing each individual to contribute fully and authentically to our scientific community. Equity is crucial, as it addresses the systemic barriers that may limit opportunities for some, ultimately fostering fair outcomes for all.

Research and industry data repeatedly demonstrate that diverse teams are more creative, resilient, and adept at problem-solving than homogeneous groups. While teams of similar backgrounds and perspectives might feel easier to manage, they may not yield the best results. In science, and particularly in medical physics, where innovation can translate into life-saving technologies, embracing diversity is not just beneficial—it is essential. The varied viewpoints and experiences, that diverse teams bring, lead to faster advancements, novel insights, and more comprehensive approaches to research and patient care.

Vice President's Message

Eva Bezak, PhD

Vice President of IOMP

Inclusive practices strengthen team dynamics and are linked to organizational success and market growth. A **diverse and inclusive team** also fosters happiness and fulfillment, as it allows individuals to express their unique identities while finding common purpose in the values that unite us. In medical physics, these values encompass a commitment to our communities, our patients, and their families.

Next year will be equally exciting, with **IUPESM World Congress on Medical Physics and Biomedical Engineering 2025** preparations well underway. This tri-annual event will be held in Adelaide, Australia from 29/9 to 4/10 2025. Please visit https://wc2025.org/ for details. The exhibition and sponsorship packages have been launched (https://wc2025.org/sponsor-exhibitor/). Abstract submissions opened in September, with 27 determined tracks (https://wc2025.org/abstract-submissions/). Efforts are being made to provide student-friendly accommodations and secure travel grants for participants. The Local Organizing Committee aims for 30% of participants to be from low- to middle-income countries and 25% to be students.

Our confirmed plenary speakers include **Prof Simon Cherry** (UC Davis, the whole-body PET CT co-inventor), **Dr Marian Sowa**, Deputy Director of the Science Directorate, NASA, and **Jitendra Sharma**, Managing Director and CEO of the Andhra Pradesh MedTech Zone (AMTZ), one of world's largest medical technology manufacturers.

Lastly, none of the IOMP activities and successes would happen without you – our members, wherever you are around the globe. Your continued support and active participation in IOMP events and activities are essential for the growth of the profession and improving the standards of education and training around the world.

Wishing you all the best in 2025!

Treasurer's Report

Ibrahim Duhaini, PhD

Treasurer of IOMP

IBRAHIM DUHAINI

Treasurer, IOMP
duhaini@yahoo.com

""The proposed goals for 2025 aim to enhance financial management practices, diversify revenue, and support IOMP's mission of advancing medical physics globally"

A. Here are the Finance Subcommittee members:

1. Ibrahim Duhaini, Chair
2. Shigekazu Fukuda, Asia
3. Sanchez Palmer, Africa
4. Ana Maria Marques da Silva, Latin America
   Ex-Officio:
5. John Damilakis, President, Europe
6. Eva Bezak, Vice President, Australia

B. Activities Performed (June–December 2024):

1. Financial Oversight and Expense Management:

- Reviewed and approved Executive Committee (ExCom) expenses, vendor invoices, and operational bills, ensuring all transactions adhered to IOMP's financial policies.
- Regularly monitored the IOMP Company Account, reconciling statements and resolving discrepancies in a timely manner.

2. Membership Dues Collection:

- Sent out reminders and follow-ups to National Member Organizations (NMOs) for membership fee payments.
- Successfully processed membership payments, improving compliance with deadlines.

3. Budgeting and Financial Planning:

- Finalized the mid-year financial review to assess the organization's performance against the 2024 budget.
- Assisted in reallocating funds to high-priority projects, including education and outreach activities, to maximize their impact.

4. Collaboration with Key Stakeholders:

- Worked closely with ExCom, the IOMP Accountant, and the Administration Office to streamline workflows and ensure efficient fund management.
- Supported regional and global initiatives, including webinars, workshops, and collaborative efforts with international organizations.

Treasurer's Report

Ibrahim Duhaini, PhD

Treasurer of IOMP

5. Risk Mitigation and Audit Preparation:

- Implemented stricter controls on fund disbursements and internal compliance measures to mitigate financial risks.
- Prepared documentation and coordinated with auditors for the 2024 annual audit, ensuring transparency and accountability.

6. Fundraising and Revenue Diversification:

- Explored potential sponsorship opportunities with industry partners.
- Initiated discussions on expanding revenue streams through educational programs and collaborative research grants.

C. Goals for 2025:

1. Strengthen Financial Oversight:

- Implement more robust financial management software to enhance reporting accuracy and transparency.
- Develop a detailed monthly reporting mechanism for ExCom and stakeholders.

2. Enhance Revenue Streams:

- Introduce sponsorship packages tailored for corporate partners to support IOMP initiatives.
- Launch a global campaign to attract philanthropic contributions toward scholarships and training programs.

3. Support Membership Growth:

- Improve communication with NMOs by establishing a digital payment portal and streamlining fee collection processes.
- Encourage NMOs to participate in IOMP's initiatives, highlighting the value of membership through reports and testimonials.

4. Educational and Research Funding:

- Allocate additional funds to promote educational webinars and research collaboration across regions.
- Establish a dedicated grant program to support early-career medical physicists and promote diversity in the field.

5. Ensure Financial Sustainability:

- Build a financial reserve equivalent to six months of operational expenses to safeguard against unforeseen challenges.
- Update financial policies to reflect evolving best practices in financial management.

Treasurer's Report

Ibrahim Duhaini, PhD

Treasurer of IOMP

6. Audit and Compliance:

- Ensure timely completion of the 2024 audit and address any recommendations for process improvements.
- Develop an internal audit schedule to preemptively identify and resolve discrepancies.

7. Long-Term Strategic Planning:

- Collaborate with the IOMP leadership to align financial strategies with the organization's long-term vision.
- Regularly evaluate financial policies and adapt to changing economic and organizational needs.

D. Conclusion:

The period from June to December 2024 was focused on financial stability, operational efficiency, and groundwork for future growth. The proposed goals for 2025 aim to enhance financial management practices, diversify revenue, and support IOMP's mission of advancing medical physics globally. These steps will ensure the organization remains financially sustainable and continues to expand its reach and impact.

Scientific Committee's Report

M Mahesh, PhD

Chair of IOMP Scientific Committee

M. MAHESH

IOMP Science Committee Chair

MMAHESH@jhmi.edu

"the Science Committee will be aiding the program committee in finalizing the scientific program for the upcoming World Congress on Medical Physics & Biomedical Engineering in Adelaide, Australia from Sept 29 – Oct 4, 2025"

The IOMP Science Committee is responsible for disseminating current information to medical physicists; assisting in the planning and conduct of regional meetings on medical physics; contributing to and reviewing scientific documents prepared by organizations such as the ICRP, the WHO, and the IAEA, and participating in various forums for the generation of scientific information in medical physics.

The second part of the year 2024 went very fast. The Science Committee was active in terms of reviewing and endorsing requests on programs hosted by member societies. In addition, the Science Committee reviewed documents/reports from external bodies that requested endorsement from the IOMP. One such document is from the International Atomic Energy Agency (IAEA) and is as follows: ***"DOSE MANAGEMENT SYSTEMS: FROM SETTING UP TO QUALITY ASSURANCE"***. The Science Committee provided constructive comments along with strongly supported IOMP to endorsing the document.

Having aided in finalizing the tracks and sessions for the upcoming **World Congress on Medical Physics & Biomedical Engineering in Adelaide, Australia from Sept 29 – Oct 4, 2025** (https://wc2025.org), the Science Committee will be aiding the program committee in finalizing the scientific program for WC 2025. The Science Committee Chair will serve on behalf of IOMP as one of the co-chairs of the scientific program committee and also as co-chair of international scientific committee for WC2025.

Science Committee Chair, Dr Mahesh organized and moderated the **IOMP webinar on AI on December 11, 2024.** The webinar was well attended (nearly 1300 attendees) and the recording can be found at https://www.iomp.org/iomp-school-webinars-recordings/

The chair is immensely grateful to the members of the Science Committee for their responsiveness and thoughtful reviews of the applications and documents received by the committee.

Scientific Committee's Report

M Mahesh, PhD

Chair of IOMP Scientific Committee

Education and Training Committee's Report

Arun Chougule, PhD, FIOMP, FAMS

Chair of IOMP Education and Training Committee

ARUN CHOUGULE

IOMP Education & Training Committee Chair

arunchougule11@gmail.com

"To date, the IOMP AB has granted IOMP CPD accreditation to 24 educational and training programs, 7 medical physics education programs and 4 medical physics residency programs."

The Education and Training Committee [ETC] of IOMP is entrusted with the development of programs related to the education and training of medical physics, to promote internationally sponsored education and training programs, consider applications from national and regional organisations for IOMP endorsement and funding, to harmonise and standardize medical physics education program, accreditation of educational, residency and CPD program. The members of ETC and Accreditation Board [AB] are working hard to fulfill the aims and objectives of ETC and contributing for betterment of medical physics education & training in IOMP member countries.

1. ETC IOMP has reviewed **4 applications from the conference organizers/scientific activity** for IOMP endorsement and/or funding and submitted a report to IOMP EXCOM.

2. The IOMP accreditation board [AB] undertook the evaluation of the IOMP accreditation application for accreditation of its postgraduate medical physics education program from the **National University of Colombia** and completed the site visit from 18-20 September 2024. The program is recommended for **accreditation for 5 years** w.e.f. 1 November 2024. IOMP has received US$ 3000 as accreditation fees.

3. The IOMP accreditation board has received an application from **Ghana**, the first application from the FAMPO region for **CPD accreditation of the educational training program**. 11 CPD points was appointed for the program. IOMP received US$ 300 from this activity.

4. The IOMP accreditation board has received an application from MEFOMP for IOMP **CPD accreditation of the MEFOMP2025 conference and workshop**. It is evaluated and recommended 20 CPD points MEFOMP2025 conference and 16 CPD points for the workshop. IOMP received US$ 300 for it.

Education and Training Committee's Report

Arun Chougule, PhD

Chair of IOMP Education and Training Committee

5. The IOMP accreditation board has received an application for IOMP **CPD Accreditation of ALFIM2025 Pre-congress Course *"UPDATE ON REFERENCE AND RELATIVE DOSIMETRY WITH APPLICATION IN E2E TESTING"*** being organised at Radioterapia Los Altos, Carretera Salcajá, Zona 0, Las Rosas, Salcajá, Quetzaltenango. Guatemala. during 7-8 March 2025. IOMP has received US$ 300 for it.

6. IOMP AB is providing guidance and support to establish a **residency program at Kalli, Colombia** and helping to improve and formalize the **residency program from Karbala, Iraq.**

7. ETC IOMP has encouraged medical physicists from Colombia to take the IMPCB certification examinations and **over 50 medical physicists from Colombia are taking IMPCB certification examinations.**

8. ETC IOMP has provided guidance and support to take initiatives in establishing the **National Certification Board in Colombia** and soon they will establish it.

9. The ETC Chair is in communication with another **University from Bogota, Colombia** for IOMP accreditation of their MPE program, and hope I will succeed soon. Communications are also in progress with a few more programmes.

10. IOMP ETC has actively participated in IOMP activities and supported **IMPW2024 and IOMP webinars**.

11. The ETC Chair, Prof Arun Chougule took part in the **first IOMP School on IMRT c**onducted at the National Cancer Institute, Putrajaya, Malaysia from 5 – 8 October 2024.

12. ETC submitted a proposal on Medical Education for **IOMP-AAPM session in AAPM2025** and it is accepted.

13. ETC is taking active participation in the preparation of the **scientific program for WC2025** in Adelaide, Australia.

14. ETC has evaluated the updated/revised IAEA draft document on **"IAEA Safety Report on Education and Training for Building and Maintaining Competence in Radiation Protection in Medicine"** and submitted a report to the IOMP Excom.

15. ETC has evaluated the **online radiation protection manual from Italy** for IOMP considerations and submitted a report to the IOMP Excom.

Education and Training Committee's Report

Arun Chougule, PhD

Chair of IOMP Education and Training Committee

To date, the IOMP AB has granted IOMP CPD accreditation to **24 educational and training programs**, **7 medical physics education programs** and **4 medical physics residency programs**.

For more information on the IOMP-accredited medical education programs, CPD-accredited activities, and accredited residency programs, please visit the IOMP website.

Detailed information regarding the accreditation board's activities, relevant manuals/forms, and the list of accredited programs is available at: https://www.iomp.org/accreditation/.

I encourage all of you to take advantage of the IOMP accreditation services for medical physics education programs, residency programs, CPD accreditation for conferences, workshops, training programs, and CME points.

For further details or any queries, please contact the Chair of ETC or the Chair of IOMP Accreditation Board at: arunchougule11@gmail.com.

Awards & Honours Committee's Report

Kwan Hoong Ng, PhD

Chair of IOMP Awards & Honours Committee

KWAN HOONG NG

IOMP Awards & Honours Committee Chair
kwanhoong.ng@gmail.com

"We are pleased to announce the winners of the IDMP 2024 Award and the 2024 IUPAP Early Career Scientist Prize in Medical Physics, Dr Oleksandra V. Ivashchenko"

The committee is composed of:

Name	Position	Country	email
Kwan Hoong Ng (Chair)	Emeritus Professor	Malaysia	ngkh@ummc.edu.my
Erato Stylianou Markidou (Vice Chair)	Medical Physics Expert – Radiotherapy	Cyprus	eratostylmark@gmail.com
Jeannie Wong (Secretary)	Associate Professor	Malaysia	jeannie.wong@ummc.edu.my
Meshari Al Nuaimi	Radiation Physicist	Kuwait	Mesh.Alnuaimi@gmail.com
Wayne Beckham	Provincial Medical Physics Leader & Adjunct Professor	Canada	WBeckham@bccancer.bc.ca
Cynthia McCollough	Professor of Medical Physics & BME	USA	McCollough.Cynthia@mayo.edu
C Barbara M'Ule	Radiation Therapy Physicist	Zambia	chandamule@gmail.com
Jose Luis Rodriguez	Medical Physicist	Chile	fmjlrp@yahoo.com

Awards & Honours Committee's Report

Kwan Hoong Ng, PhD

Chair of IOMP Awards & Honours Committee

We are pleased to announce the winners of the **IDMP Awards 2024** as following:

We would also like to congratulate Dr Oleksandra V. Ivashchenko from the Netherlands for the prestigious **2024 IUPAP Early Career Scientist Prize in Medical Physics!**

Awards & Honours Committee's Report

Kwan Hoong Ng, PhD

Chair of IOMP Awards & Honours Committee

The biography of Dr Oleksandra V. Ivashchenko is presented below:

Oleksandra V. Ivashchenko is a board-certified Medical Physics Expert (MPE) in Radiology and Nuclear Medicine at the University Medical Centre Groningen in the Netherlands.

In 2012, she graduated cum laude with an MSc in Applied Physics, with a minor in medical physics, from the Taras Shevchenko National University of Kyiv. Shortly after, she worked as a conversion engineer at Materialise NV in Kyiv, focusing on medical applications of rapid prototyping. She then pursued a PhD in medical physics, beginning an industrial PhD project in February 2013 between TU Delft and MILabs (the Netherlands), a preclinical imaging company, as a Marie Curie fellow. Under the guidance of Prof. F.J. Beekman, known for his 'out-of-the-box' solutions in preclinical imaging, she focused on developing task-oriented preclinical SPECT/PET/CT technologies. Her research resulted in several molecular imaging products that were successfully commercialized and are widely used in preclinical imaging centres worldwide. After completing her PhD in just three years, Oleksandra embarked on a postdoctoral project in image-guided surgery at the Netherlands Cancer Institute (NKI).

During her 2.5 years at NKI, Oleksandra contributed significantly to the development and clinical implementation of the first image-guidance system for mobile tumour targets during complex oncological surgeries. She also developed various surgical planning tools, which have since facilitated over 1,000 surgeries at the NKI. Following this, she pursued a clinical residency in medical physics at Leiden University Medical Centre (LUMC), where she focused on applying artificial intelligence (AI) for image processing and dosimetry optimization.

Over the next six years, Oleksandra's work centred on personalized dosimetry, including the development of ultra-low-dose imaging protocols for vulnerable patient groups, Monte Carlo code for independent dose evaluation of new breast imaging scanner designs, and improving the understanding of uncertainties in time-activity curve modelling for radionuclide therapy. Her contributions have significantly advanced internal dosimetry in this area.

Since completing her residency in early 2022, Oleksandra has been coordinating radiation safety and personalized dosimetry within nuclear medicine at the University Medical Centre Groningen, the oldest and one of the largest nuclear medicine department in the country. She is also developing her own research line in multi-parametric dosimetry models to enhance therapy personalization in radionuclide therapy.

In addition to her professional work, Oleksandra is actively involved in science communication and philanthropy. She holds a board seat at the European Federation of Organizations for Medical Physics (EFOMP) and coordinates #ScienceForUkraine, one of the largest international initiatives supporting scientists affected by the war in Ukraine.

Professional Relation Committee's Report

Simone K Renha, PhD

Chair of IOMP Professional Relation Committee

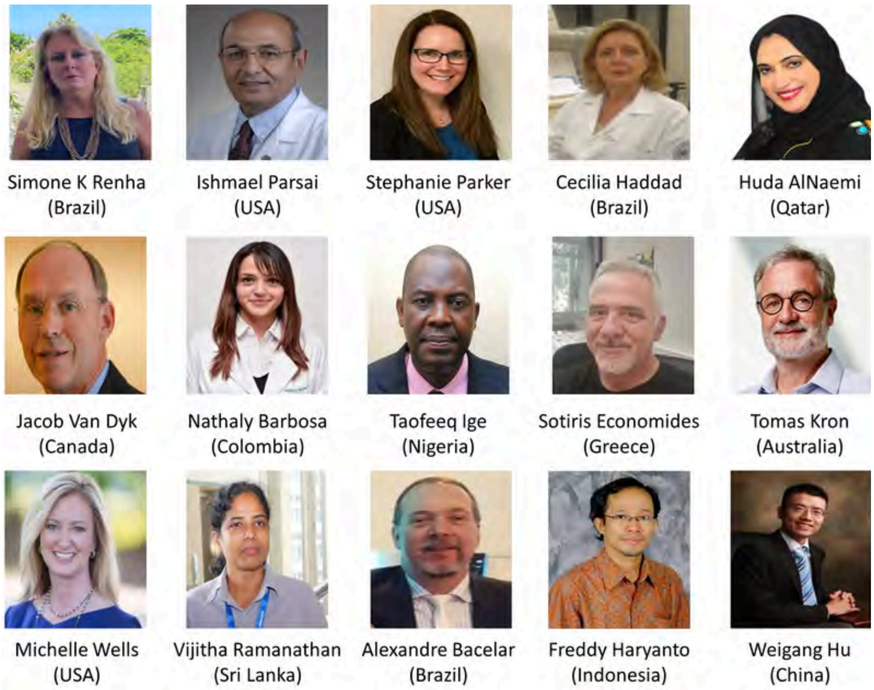
SIMONE K RENHA

IOMP Professional Relation Committee Chair

simonekodlulovich@gmail.com

"Let us prioritize reducing regional disparities and advancing medical physics on a global scale. Strengthening our profession and securing the recognition it deserves is a shared responsibility for all of us - Let's commit to making this goal a key focus for 2025. "

IOMP PRC MEMBERS (2022-25):



One of the main goals of the PRC is to significantly increase the number of medical physics associations. As the year comes to a close, it's time for reflection on the objectives we've achieved, an evaluation of those we didn't complete, and planning for 2025. While new associations were established, the total was much lower than we had hoped.

As of now, **only 26% of countries in Latin America and the Caribbean have established a medical physics association**, and this percentage is even lower in Africa. It is widely recognized that the number of medical physicists in these regions is insufficient to meet clinical demands. However, in many countries within these regions, there are enough medical physicists to form an association. So, what is the underlying issue?

To address this issue, PRC members have been contacting a group of medical physicists with whom we have close connections, including Costa Rica, Honduras, Guatemala and the President of FAMPO, Professor Christoph Trauernicht, and Professor Francis Hasford, Vice President

Professional Relation Committee's Report

Simone K Renha, PhD

Chair of IOMP Professional Relation Committee

of FAMPO to understand the key reasons for the lack of established medical physics associations. The PRC recognizes that in many smaller countries, there are very few, if any, experienced medical physicists, which presents a significant challenge. However, there are also countries with smaller but active groups that could work towards forming a medical physics association.

The primary challenges identified by medical physicists include a **lack of motivation, insufficient time, and an inadequate number of professionals in the field**. Let us delve deeper into these issues to better understand their impact and explore potential solutions. We want to convey that while these issues may complicate the process, development of a national physics association is still achievable, and IOMP is here to assist. Strengthening the profession in one country can lead to the creation of new positions in hospitals and encourage the development of new medical physics courses. As a result, the workload can be reduced as additional medical physicists are hired.

Finding the motivation to complete important tasks can often be the first challenge in effective time management. However, **joining a group of medical physicists dedicated to this goal** can make success easier. A group can help sustain the motivation needed to carry out the tasks required to establish the association. The number of medical physicists in this group may be small. This is not important at the moment. What is essential is to understand how these efforts will provide benefits soon after the association is in place.

An important aspect of local medical physics associations is that they can effectively connect to local medical physicists as they **share the same regulatory framework, are aware of the local status of medical physics and speak the same language.** In addition to this, local medical physics associations bring colleagues together and can play an important role in **improving the recognition of the profession** within a jurisdiction.

Effective time management is crucial for group members to complete their work while maintaining the energy needed to establish the medical physics association. This goal is attainable because tasks can be distributed among the group members, and activities can be planned and organized efficiently.

The **guidance document on establishing a medical physics association**, prepared by the PRC, outlines the steps necessary for its creation. It shows that the process of setting up the association can be simpler than one might expect. The PRC members are always ready to assist.

For the upcoming year, we are considering several additional strategies. Without a doubt, **strengthening communication with a larger number of medical physicists** and making the planning process **more participative** will be an important starting point. Here are a few goals listed below.

Professional Relation Committee's Report

Simone K Renha, PhD

Chair of IOMP Professional Relation Committee

1. To contact the **executives of the regional medical physics organizations** (e.g., ALFIM, FAMPO) to seek their advice on countries, contacts and/or advocates for the development of specific national medical physics associations.

2. To seek **individual medical physicists** who are linked in some way to these potential countries who could advise, support and/or advocate for a specific national medical physics organization.

3. To search for the **best channel of communication.** Communication is a major consideration in providing support for national medical physics associations. It behooves the PRC to determine what the best channels of communication are. Suggestions from other committees of the IOMP are welcome.

Let us prioritize **reducing regional disparities** and **advancing medical physics on a global scale**. Strengthening our profession and securing the recognition it deserves is a shared responsibility for all of us. As we look ahead, let's commit to making this goal a key focus for 2025.

During this special holiday season, the members of the Professional Relations Committee want to express their heartfelt wishes for peace, joy, health, and unity to all. We understand that this time can bring both warmth and challenges, and we hope you find comfort and connection with loved ones.

Medical Physics World Board (MPWB) Committee's Report

Chai Hong Yeong, PhD

Chair of IOMP Medical Physics World Board (MPWB)

CHAI HONG YEONG

IOMP MPWB Committee Chair

yeongchaihong@gmail.com

"The IOMP Newsletter now has over 55,000 subscribers from around the world. Between January and November 2024, IOMP website received approximately 623k views from around 109k visitors"

The Medical Physics World Board (MPWB) committee plays a crucial role in advancing medical physics on a global scale. Our key terms of reference are as follows:

- Contributing to the Advancement of Medical Physics: By producing the Medical Physics World Bulletin (eMPW), we keep our members informed about IOMP activities and other matters relevant to medical physicists worldwide.
- Promoting Communication and Information Sharing: We aim to disseminate valuable information, with a particular focus on reaching developing countries, ensuring that medical physicists across all regions have access to relevant news and updates.
- Gathering and Sharing Information: We actively seek out information of value to IOMP members from Officers, Committee Chairs, World Congress Presidents, Regional Meeting Organizers, and other IOMP representatives. This information is then communicated to the worldwide membership.
- Enhancing Communication: In collaboration with IOMP Officers, the committee works to improve communication within the organization by suggesting publication alternatives and preparing proposals to achieve the goals of the Medical Physics World (MPW).

Over the period from June to December 2024, the committee successfully released three issues of the **IOMP Newsletter:**

- IOMP Newsletter, Vol. 6, No. 4, August 2024
- IOMP Newsletter, Vol. 6, No. 5, October 2024
- IOMP Newsletter, Vol. 6, No. 6, December 2024

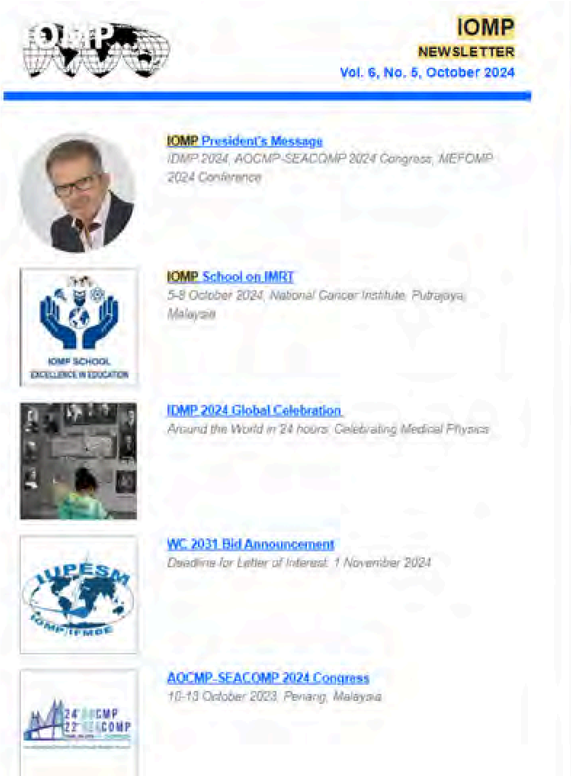
These issues continued to inform our global community on the latest IOMP activities, as well as share medical physics protocols, guidelines, and recommended articles.

Medical Physics World Board (MPWB) Committee's Report

Chai Hong Yeong, PhD

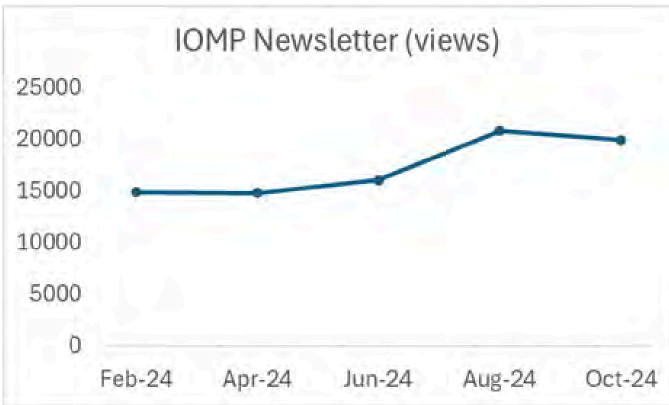
Chair of IOMP Medical Physics World Board (MPWB)

We are pleased to announce that the newsletter now has **over 55,000 subscribers** from around the world. The newsletter is distributed bi-monthly, providing our members with timely updates on key developments in the field. To join, please complete the subscription form on our website: https://www.iomp.org.



IOMP Newsletter

https://www.iomp.org/newsletter/



The **IOMP website** (www.iomp.org) remains a vital hub for connecting global medical physicists and disseminating essential information. Between January and November 2024, the website received **approximately 623k views from around 109k visitors**. This high level of engagement underscores the importance of the platform in supporting the global medical physics community.

The committee continues to manage and expand IOMP's presence on social media. Our aim is to engage with members and promote the activities of IOMP across various platforms. We encourage everyone to follow and subscribe to our **social media channels.** These platforms are used to share important updates, events, and educational content with the medical physics community.

- LinkedIn: linkedin.com/in/iomp-international-organization-for-medical-physics-a402b824b
- YouTube: https://www.youtube.com/@IOMPOfficial
- Twitter: https://twitter.com/IOMP_Official
- Facebook: https://www.facebook.com/InternationalOrganizationforMedicalPhysics
- Instagram: https://www.instagram.com/iomp.official/

Medical Physics World Board (MPWB) Committee's Report

Chai Hong Yeong, PhD

Chair of IOMP Medical Physics World Board (MPWB)

IOMP MPWB COMMITTEE MEMBERS (2022-25):

1. Chai Hong Yeong, Malaysia – Chair
2. Rosana Pirchio, Argentina - Secretary
3. Afua Yorke, United States
4. Cheryl Lian, Singapore
5. Habib Ashoor, Bahrain
6. Ismail Zergoug, Algeria
7. Joerg Lehmann, Australia
8. Milton Estuardo Ixquiac Cabrera, Guatemala
9. Niki Fitousi, Belgium
10. Safayet Zaman, Bangladesh

IOMP WEB SUB-COMMITTEE MEMBERS (2022-25):

1. Chai Hong Yeong, Malaysia – Chair
2. Cinthia Kotzian Pereira Benavides, Brazil
3. Eleftherios Tzanis, Greece
4. Leyla Moghaddasi, Australia
5. Li Kuo Tan, Malaysia
6. Mark Pokoo-Aikins, Ghana
7. Nabil Iqeilan, Qatar
8. Santiago Girola, Argentina
9. Yiwen Xu, Canada

www.iomp.org

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Publication Committee's Report

Francis Hasford, PhD

Chair of IOMP Publication Committee

FRANCIS HASFORD

IOMP Publication Committee Chair

haspee@yahoo.co.uk

"The Publications Committee has made commendable progress in its efforts to support the dissemination of knowledge and documentation of the organization's history"

The Publications Committee (PC) of the International Organization for Medical Physics (IOMP) has been actively engaged in various initiatives aimed at enhancing the dissemination of knowledge and fostering the growth of the medical physics community worldwide. The following are highlights of the committee's activities and achievements:

1. Establishment of a New Peer-Reviewed Journal

The Publications Committee continues to make significant progress toward the establishment of a new peer-reviewed journal (MPI-Experiences). This initiative aims to provide an additional platform for medical physicists to share research findings, innovations, and best practices, furthering the advancement of the profession globally. Efforts are on course, with detailed planning and discussions ongoing to ensure the journal meets the highest standards of academic publishing.

2. Distribution of Books to LMICs

In collaboration with CRC Press/Taylor & Francis, the Publications Committee facilitated the distribution of 300 print copies of books to medical physicists and students in low- and middle-income countries (LMICs). This initiative underscores IOMP's commitment to capacity building and education by making critical resources accessible to professionals and learners in regions where such materials may otherwise be scarce.

3. Publication of the June 2024 Issue of Medical Physics International (MPI)

The June 2024 issue of Medical Physics International (Vol. 12, No. 1), containing twelve high quality papers, was successfully published and received wide readership across the globe. This reflects the growing interest and engagement of the international medical physics community with the journal, which serves as a key platform for sharing knowledge and advancing the field. December 2024 edition of the journal is under preparation and expected to be released in January 2025.

Publication Committee's Report

Francis Hasford, PhD

Chair of IOMP Publication Committee

4. Publication of the MPI-History Edition

The MPI-History Edition was published in June, marking a significant milestone in documenting the legacy and evolution of the medical physics profession. This publication highlights the rich history of IOMP and the contributions of its members over the years.

5. History Sub-Committee Activities

The History Sub-Committee has outlined plans to conduct video interviews with past IOMP officers over the internet. These interviews will be compiled for inclusion in future history editions, enriching the historical archives of the organization. The initiative builds on earlier efforts that began during WC2009, with a planned continuation during WC2021 that was interrupted by the COVID-19 pandemic. The sub-committee now aims to resume and expand these interviews, with the goal of documenting the experiences of several colleagues by WC 2025.

Conclusion

The Publications Committee of IOMP has made commendable progress in its efforts to support the dissemination of knowledge and documentation of the organization's history. These activities not only enhance the visibility and impact of IOMP's work but also contribute significantly to the global medical physics community.

Med Phys Int (MPI), 2024 Vol.12 No.1

Publication Committee's Report

Francis Hasford, PhD

Chair of IOMP Publication Committee

IOMP PUBLICATIONS COMMITTEE 2022-2025:

- Francis Hasford, Ghana – Chair
- Hassan Kharita, Syria – Vice Chair
- Marina Sala, USA – Secretary
- Lorenzo Brualla, Germany
- Mohamed Metwaly, UK
- Michael Lee, Hong Kong
- Gustavo Daniel Sanchez, Argentina
- Hafiz Mohd Zin, Malaysia
- Bamidele Awojoyogbe, Nigeria
- Magdalena Stoeva, Bulgaria
- John Damilakis (IOMP President) - Ex-Officio
- Eva Bezak (IOMP Vice President) - Ex-Officio
- Slavik Tabakov (MPI History Edition) - Ex-Officio
- Perry Sprawls (MPI History Edition) - Ex-Officio
- Sameer Tipnis (Medical Physics International) - Ex-Officio
- Chai Hong Yeong (e-Medical Physics World) - Ex-Officio
- Iuliana Toma-Dasu (Physica Medica) - Ex-Officio
- Kang-Ping Lin (Health and Technology) - Ex-Officio
- Jamie Trapp (Physical and Engineering Sciences in Medicine) - Ex-Officio
- Jong Min Park (Progress in Medical Physics) - Ex-Officio
- Ambika Pradhan (Journal of Medical Physics) - Ex-Officio
- Ishmael Parsai (e-Medical Physics World) - Ex-Officio
- John M. Boone (Medical Physics) - Ex-Officio
- Katia Parodi (Physics in Medicine and Biology) - Ex-Officio
- Michael David Mills (Journal of Applied Clinical Medical Physics) - Ex-Officio
- Simone Renha (Revista Latinoamericana de Física Médica) - Ex-Officio
- Nobuyuki Kanematsu (Radiological Physics and Technology) - Ex-Officio

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Medical Physics International (MPI) Journal Report

Francis Hasford and Sameer Tipnis

co-Editors-in-Chief

FRANCIS HASFORD

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SAMEER TIPNIS

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Medical Physics International (MPI) continues to advance its mission as a platform for the global dissemination of knowledge in medical physics, contributing significantly to the development of the profession. The journal's success is built on the dedication and engagement of its authors and readers, whose invaluable support we deeply appreciate.

1. Publication of High-Quality Articles

Over the past year, MPI has upheld its commitment to publishing high-quality articles that address critical areas in medical physics. In June 2024, the journal published 12 articles under thematic areas including educational topics, professional issues, invited papers, and research articles. These contributions reflect the journal's rigorous standards and its role in advancing the science and practice of medical physics globally.

2. Commitment to Quality

Ensuring the publication of articles that meet the highest quality standards remains a core priority for MPI. This dedication not only reinforces the journal's reputation but also serves to inspire confidence among its readers and contributors.

3. Upcoming Edition Preparation

The next edition of MPI, the December 2024 issue (Vol. 12, No. 2), is currently under preparation and is scheduled for release in January 2025. This upcoming issue promises to continue the tradition of excellence, featuring a diverse range of articles that address key topics in the field.

4. Call to Action

Readers are encouraged to stay updated with MPI's latest publications by visiting our website at www.mpijournal.org/index.aspx. The site provides access to the journal's archives and the latest articles, ensuring the global medical physics community remains informed and connected.

MPI remains steadfast in its mission to serve as a premier platform for the dissemination of knowledge and the exchange of ideas within the medical physics community. We extend our gratitude to all contributors and readers who make this possible and look forward to their continued support.

History Sub-Committee's Report

Slavik Tabakov, PhD

Chair of IOMP History Sub-Committee, IOMP Past President

SLAVIK TABAKOV

IOMP History Sub-Committee Chair

slavik.tabakov@emerald2.co.uk

"During June 2024 MPI-HE included two large Annexes: with the abstracts from the First International Conference on Medical Physics (ICMP 1, 1965, Harrogate, UK); with the materials from the First International Conference on Medical Physics Education (1994, Budapest, Hungary). "

History Sub-Committee (HSC) has been created as part of the IOMP Publication Committee. The HSC does not take part in the ExCom (it reports to PC). Its charges include: To recognize the IOMP members who have made major contribution(s) to the IOMP; To acknowledge the contributions of EXCOM Committees and other activities, etc – activities aiming to keep the history of IOMP.

HSC was established in **2008** and started its activities in the following year with a number of interviews of active IOMP members. Currently HSC has identified a number of colleagues from IOMP ExCom for a new sequence of video interviews.

The current members of the HSC are:

- Slavik Tabakov, (UK)
- Azam Niroomand-Rad, USA
- Geoffrey Ibbott, USA
- KY Cheung, Hong Kong
- Perry Sprawls, USA
- John Damilakis, Greece (Ex-Officio)
- Eva Bezak, Australia (Ex-Officio)
- Francis Hasford, Ghana (Ex-Officio)

During the past period the History Sub-Committee has regularly updated the **IOMP History Tables** - https://www.iomp.org/history-sub-committee-activities/. HSC also reminded of important anniversaries of activities and developments in the profession.

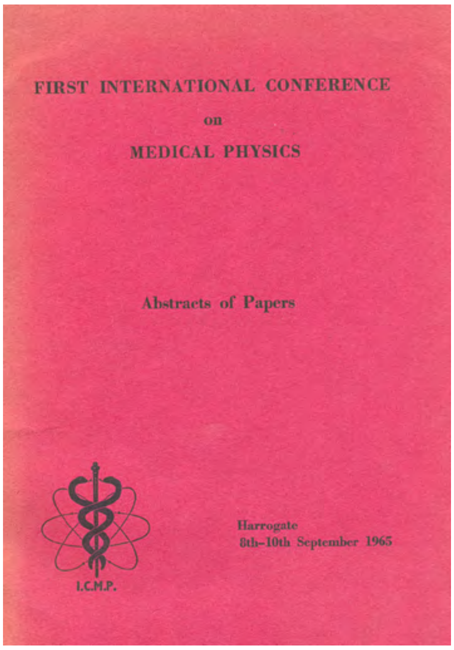
The large project History of Medical Physics (History of Medical Physics – A Brief Project Description, Journal Medical Physics International, 2017, v.5, p 68-70) further expanded the activities of HSC. The project became a catalyst of a specially formed sub-Journal of MPI Journal: **"Medical Physics International – History Edition" (MPI-HE**). Its Founding Co-edited are S Tabakov, P Sprawls and G Ibbott. During the past several years MPI-HE included many historical articles, such as about: Pioneer-Women in Medical Physics; History of Ultrasound Imaging; History of International Day of Medical Physics; History of various methods in Medical Imaging and Radiotherapy; History of the initial days of X-ray use in medicine, etc.

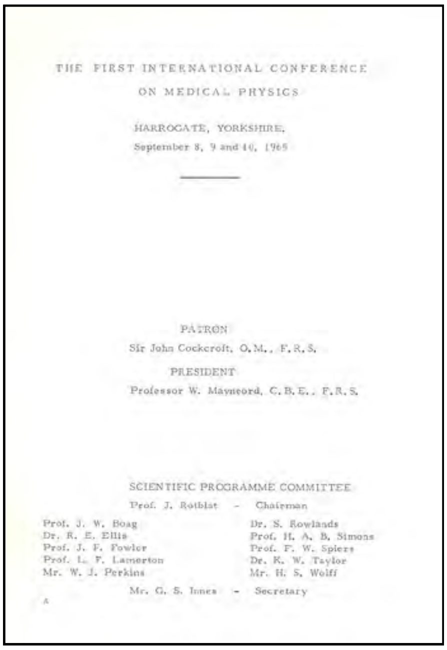
History Sub-Committee's Report

Slavik Tabakov, PhD

Chair of IOMP History Sub-Committee, IOMP Past President

During June 2024 MPI-HE included two large Annexes: with the abstracts from the **First International Conference on Medical Physics (ICMP 1, 1965, Harrogate, UK);** with the materials from the **First International Conference on Medical Physics Education (1994, Budapest, Hungary).** These Annexes complement the MPI-HE from June 2022, when the whole MPI-HE issue of 236 pages was dedicated to the History of IOMP – from its creation and initial activities, through all colleagues who have voluntarily contributed to IOMP over its 60 years history, to the current status of the Organisation.





THE FIRST INTERNATIONAL CONFERENCE
ON MEDICAL PHYSICS

HARROGATE, YORKSHIRE,
September 8, 9 and 10, 1965

PATRON
Sir John Cockcroft, O.M., F.R.S.

PRESIDENT
Professor W. Mayneord, C.B.E., F.R.S.

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Prof. F. W. Spiers
Dr. K. W. Taylor
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Mr. G. S. Innes - Secretary

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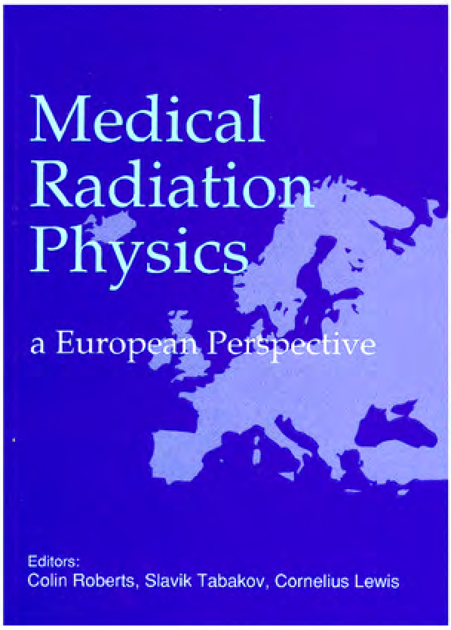
Abstracts from the First International Conference on Medical Physics (ICMP 1, 1965, Harrogate, UK)

Materials from the First International Conference on Medical Physics Education (1994, Budapest, Hungary)



1995

rticipants to the European Conference on Post-Graduate Education in Medical Radiation Physics, Budapest 12-14 November 1994

IOMP Women Sub-Committee's Report

Loredana Marcu, PhD

Chair of IOMP Women Sub-Committee

LOREDANA MARCU

IOMP Women Sub-Committee Chair

loredana@marcunet.com

"the IOMP Women Subcommittee is focused on a number of activities aimed to attract more women to medical physics and to assist women MPs with their continuous professional development."

IOMP Women Subcommittee 2022-2025 members:

- Loredana Marcu, Romania – Chair
- Huda Al-Naemi, Qatar
- Zakiya Al-Rahbi, Oman
- Hanan Aldousari, Kuwait
- Hasin Anupama Azhari, Bangladesh
- Laurentcia Arlany, Singapore
- Eva Bezak, Australia
- Kathleen Hintenlang, USA
- Simone Kodlulovich, Brazil
- Anchali Krisanachinda, Thailand
- Savanna Nyarko, Ghana
- Nadia Octave, Canada
- Elina Samara, Switzerland
- Magdalena Stoeva, Bulgaria
- Rajni Verma, India
- Rafidah Zainon, Malaysia
- Iyobosa B. Uwadiae, Nigeria

The objective of the IOMP Women Subcommittee is aligned with the key IOMP mission, namely, to advance medical physics practice worldwide by disseminating scientific and technical information, fostering the educational and professional development of medical physicists, and promoting the highest quality medical services for patients.

In view of the above, the IOMP Women Subcommittee is focused on a number of activities aimed to attract more women to medical physics and to assist women MPs with their continuous professional development.

To fulfill the aforementioned goals, the IOMP Women subcommittee has set a number of action plans:

- To develop, implement and coordinate activities and projects related to the role of females in the scientific and professional advancement of medical physics.
- To promote the role of the women in medical physics and encourage female medical physicist to advance in the profession.

IOMP Women Sub-Committee's Report

Loredana Marcu, PhD

Chair of IOMP Women Sub-Committee

- To support the contribution of female medical physicists at major scientific conferences and congresses.
- To disseminate the work undertaken by the subcommittee through scientific publications and conference presentations.
- To provide regular status/progress updates to the IOMP on all tasks and projects related to the IOMP Women subcommittee.

IOMP Women subcommittee main activities / events during 2024:

During 2024 the IOMP Women Subcommittee was involved in a number of tasks/ activities:

(1) Our subcommittee has received a nomination for a **new membership** (nominee **Dr. Iyobosa B. Uwadiae**, Secretary General of Nigerian Association of Medical Physics (NAMP)), that was approved by the executive committee of IOMP. Thus, as of this year, our committee has 17 active members. Dr. Uwadiae is a welcome addition to the Women Subcommittee, given the underrepresentation of the African continent in the medical physics profession, particularly female physicists.

(2) This year's **International Women's Day (8th March 2024)**, was marked by a special webinar organized by IOMP Women Subcommittee dedicated to early career female medical physicists with the theme Celebrating International Women's Day with early career medical physicists. The three invited speakers presented their journeys through research in medical physics as well as their involvement in various professional matters and they were:

- Ashleigh Hull (Allied Health and Human Performance Academic Unit, University of South Australia, Adelaide, SA, Australia) presenting on the topic of In vitro development of MUC1-CE targeted alpha therapy for pancreatic ductal adenocarcinoma
- Ashley Cetnar (Department of Radiation Oncology at The Ohio State University) presenting on two aspects of medical physics– scientific and professional through her talk on Exploring Ultra-high Dose Rate Radiation and Growing as an Educator in Medical Physicist
- Leticia Irazola (Medical Physics at Centro de Investigaciones Biomédicas de la Rioja, Spain) presenting her experience as the chair of the Early Career Medical Physicists - Special Interest Group within EFOMP, with the topic Making progress only needs to get started.

The webinar was very well received and well attended.

(3) **Collaboration with IUPESM WiMPBME group**: a new paper was written reporting the quantitative data resulting from the international survey developed by the group with the title: A gender breakdown of unexpected benefits generated by work from home in STEM fields - a qualitative analysis of the WiMPBME Task Group survey. Currently the paper is under review in the journal Physica Medica.

IOMP Women Sub-Committee's Report

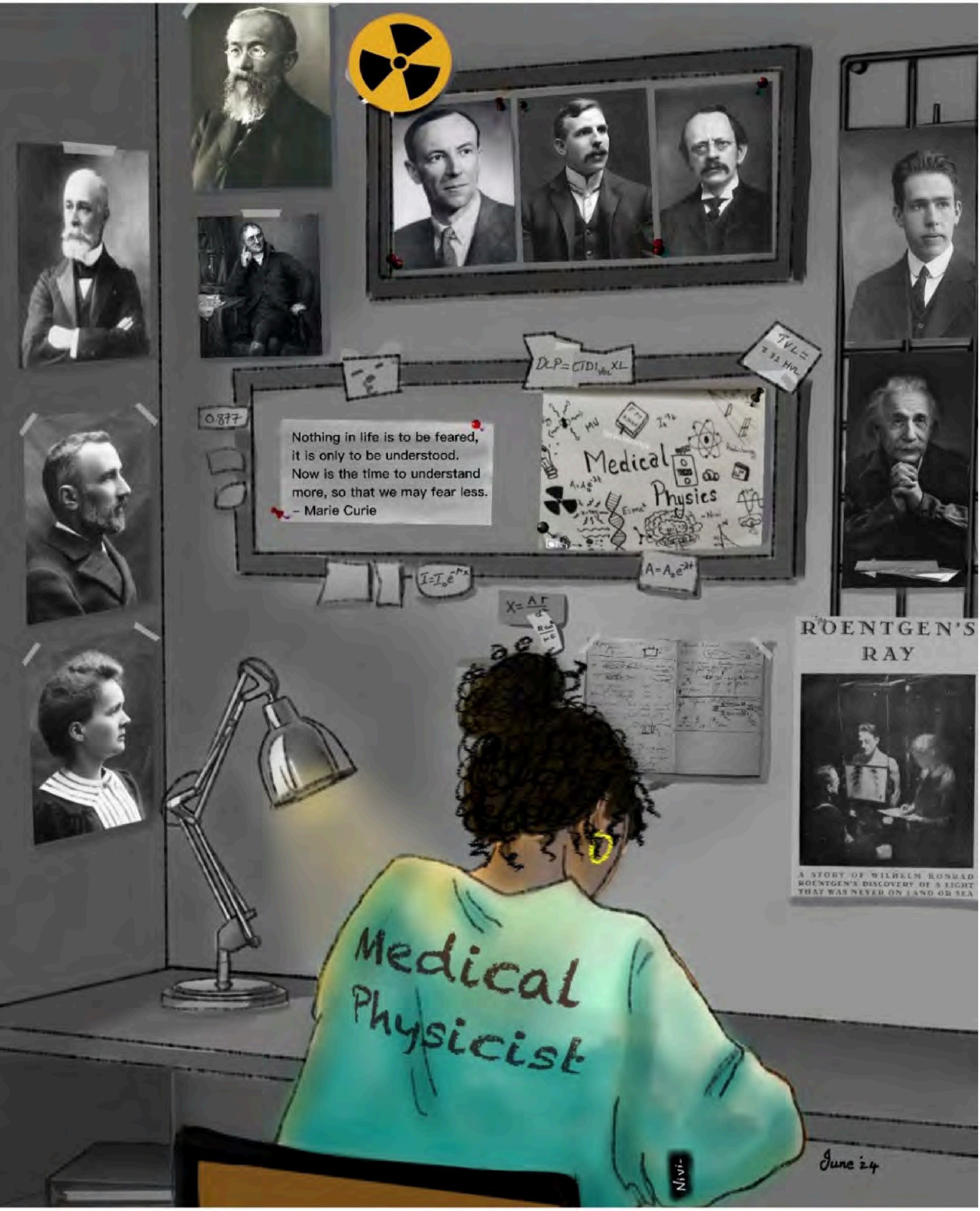
Loredana Marcu, PhD

Chair of IOMP Women Sub-Committee

(4) Our committee member, **Zakiya Al Rahbi** has been awarded the International Organization of Medical Physics **(IOMP) International Day of Medical Physics (IDMP) Award for 2024**, representing the MEFOMP region. She is also representing the IOMP-W committee at the “1st Kuwait Conference of Medical Physics and Radiation Safety” in Jan 2025 with a talk on “Building a Robust Radiation Safety Culture: Quality Management Initiatives in Radiation Oncology.”

(5) IOMP-W has started organizing the next year’s women day celebration with the initiation of a **joint IOMP-W & AHC webinar** to promote Women in Medical Physics. There are three speakers proposed representing Europe, North America and Asia, respectively.

INTERNATIONAL DAY OF MEDICAL PHYSICS (IDMP) 2024



Inspiring the next generation of Medical Physicists

IDMP 2024 Report: Celebration of the IDMP 2024

Theme: "Inspiring the Next Generation of Medical Physicists"

Ibrahim Duhaini, PhD

IDMP Coordinator

Introduction

The International Day of Medical Physics (IDMP) 2024 was celebrated worldwide on November 7th under the theme “Inspiring the Next Generation of Medical Physicists.” This annual event, organized by the International Organization for Medical Physics (IOMP), highlights the pivotal role of medical physics in healthcare and aims to attract new talent to the profession. As the global coordinator of IDMP 2024, I am honored to present this report summarizing the successful activities held across the world.

1. Poster:

We would like to congratulate and acknowledge **Dr. Lavanya Murugan** from Rajiv Gandhi Government General Hospital and Madras Medical College, Chennai, India, for winning the poster design contest for IDMP 2024. Her artwork beautifully captures the theme and spirit of this year’s IDMP and will continuously serve as an inspiration to others.

2. President’s Video:

The IOMP President, Prof. John Damilakis, addressed the International Day of Medical Physics (IDMP) 2024 with the theme: "Inspiring the Next Generations of Medical Physicists." Prof. Damilakis emphasized the importance of promoting medical physics to young professionals and students globally, particularly focusing on addressing shortages of medical physicists in underserved regions. A key highlight for this year's celebration is a 24-hour global event titled "Around the World in 24 Hours: Celebrating Medical Physics." The program includes webinars, discussions, and presentations from IOMP's regional and national organizations. A significant session, "Bridging the Gap: Inspiring Future Generations to Address the Global Shortage of Medical Physicists," aims to unite international organizations to discuss strategies for encouraging young talents to pursue careers in medical physics. This global initiative reflects IOMP’s commitment to advancing the profession and inspiring future leaders in the field.

IDMP 2024 Report:
Celebration of the IDMP 2024
Theme: "Inspiring the Next Generation of Medical Physicists"

Ibrahim Duhaini, PhD

IDMP Coordinator

3. Coordinator Message:

Dr. Ibrahim Duhaini's message for IDMP 2024 focused on the theme: "Inspiring the Next Generation of Medical Physicists." His key points highlighted the importance of ensuring the future of medical physics through collective efforts. The main takeaways included:

1. Mentorship: Encourage experienced medical physicists to guide and support young professionals and students by sharing knowledge and insights.
2. Education: Promote participation in educational programs, workshops, and conferences to foster continuous learning.
3. Research and Innovation: Support an environment where young physicists are encouraged to pursue research and innovative projects.
4. Community Building: Create a collaborative, inclusive network to help aspiring medical physicists connect and grow.
5. Recognition: Celebrate and acknowledge the achievements of young professionals to motivate them and inspire others.

Dr. Duhaini emphasized that through these efforts, medical physics will remain a dynamic and impactful field, ensuring positive contributions to healthcare and patient outcomes. The message concluded with a call to action for senior professionals to lead with purpose and inspire the next generation to continue advancing the field.

4. Central Celebration: 24-Hour Marathon Webinar

The centerpiece of this year's celebration was a groundbreaking 24-hour marathon webinar, hosted by IOMP in collaboration with regional organizations, national member bodies, related international entities, and distinguished partners. This innovative virtual event showcased the spirit of global unity and cooperation in the field of medical physics.

Under the meticulous coordination of Dr. Magdalena Stoeva, IOMP Secretary, the webinar operated seamlessly around the clock, delivering diverse presentations and discussions. The event emphasized inclusivity and engagement, offering a platform for sharing insights, advancing knowledge, and fostering connections across the international medical physics community.

IDMP 2024 Report: Celebration of the IDMP 2024

Theme: "Inspiring the Next Generation of Medical Physicists"

Ibrahim Duhaini, PhD

IDMP Coordinator

Key Features of the Marathon Webinar:

- Global Participation: Featured speakers and participants from every continent, spanning diverse time zones.
- Collaborative Approach: Organized in partnership with regional organizations (e.g., MEFOMP, AFOMP, EFOMP, ALFIM, SEAFOMP, FAMPO, and AAPM), national members, and related organizations like IAEA and WHO.
- Distinguished Speakers: Included ExCom members, prominent medical physicists, and representatives from partner organizations.
- Diverse Topics: Covered topics such as career pathways in medical physics, emerging technologies, education and training programs, and initiatives to engage young professionals.
- The webinar drew thousands of participants and provided a platform for knowledge exchange, mentorship, and inspiration.

5. Regional and National Activities

In addition to the central event, medical physics organizations worldwide organized a variety of activities to mark IDMP 2024:

1. Workshops and Seminars:
   - Educational sessions to introduce high school and undergraduate students to medical physics.
   - Specialized workshops focusing on advancements in medical imaging, radiation therapy, and AI in healthcare.
2. Public Outreach Programs:
   - Public talks aimed at raising awareness about the role of medical physics in patient care and safety.
   - Interactive exhibits in hospitals and universities showcasing medical physics applications.
3. Competitions and Awards:
   - Essay and poster contests for students and early-career professionals on the theme of inspiring future medical physicists.
   - Recognition of outstanding contributions by medical physicists at local and regional levels.
4. Social Media Campaigns:
   - Leveraged platforms like Twitter, LinkedIn, and Facebook to promote the IDMP theme.
   - Engaged audiences through hashtags like #IDMP2024, #InspiringPhysicists, and #MedicalPhysicsDay.

IDMP 2024 Report:
Celebration of the IDMP 2024
Theme: "Inspiring the Next Generation of Medical Physicists"

Ibrahim Duhaini, PhD

IDMP Coordinator

Achievements and Impact

1. Increased Awareness:
- The event significantly enhanced the visibility of medical physics among the general public and aspiring professionals.
- Outreach efforts reached thousands globally, inspiring interest in pursuing medical physics careers.

2. Strengthened Partnerships:
- Collaboration with organizations such as IAEA, WHO, and other professional bodies reinforced the role of medical physics in global healthcare.

3. Engagement of the Next Generation:
- Direct engagement with students and young professionals highlighted pathways to careers in medical physics.
- Mentorship initiatives launched during IDMP promise lasting impacts on career development.

Conclusion and Gratitude

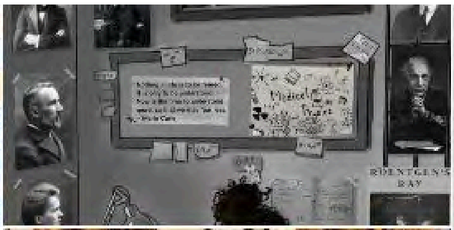
The International Day of Medical Physics 2024 was a resounding success, thanks to the collective efforts of medical physics organizations and professionals worldwide. The theme, “Inspiring the Next Generation of Medical Physicists,” resonated deeply with participants, ensuring the event's objectives were met.

I extend my heartfelt gratitude to all IOMP Officers, the IOMP Regional and National Organizations, our International partners, and all the dedicated individuals who contributed to this celebration. Together, we are shaping a brighter future for medical physics and healthcare.

IDMP 2024 Report: Celebration of the IDMP 2024

Theme: "Inspiring the Next Generation of Medical Physicists"

IDMP 2024 Report:
Celebration of the IDMP 2024
Theme: "Inspiring the Next Generation of Medical Physicists"



IDMP 2024 Report:
Celebration of the IDMP 2024
Theme: "Inspiring the Next Generation of Medical Physicists"

IDMP 2024 Report: 24-hour Global Webinar on Inspiring the Next Generations of Medical Physicists

Magdalena Stoeva, PhD

Secretary General of IOMP

Global collaboration in medical physics is a key to further developing our profession and contribute to healthcare. For over 10 years IOMP and medical physicists all over the world celebrate the International Day of Medical Physics on 7 November. Over the years this special day turned into a tribune to unite medical physicists, contribute to our professional development, raise awareness, inform and build networks.

IDMP 2024 turned into one of the most unique events of our profession - a 24-hour global webinar on ***'Inspiring the next generations of Medical Physicists'***.

With special focus on regions, national member organizations and international partnership IOMP organized several events with invited presenters from our six regional organizations and national member organizations. A central part of the celebration were the two webinars organized by the IOMP ExCom and the IOMP Partner organizations, as well as the IDMP awards announcement. The IDMP global webinar received inaugural support from some of the world's leading organizations - IAEA, ICRP, IRPA, ISR, IUPESM, WHO.

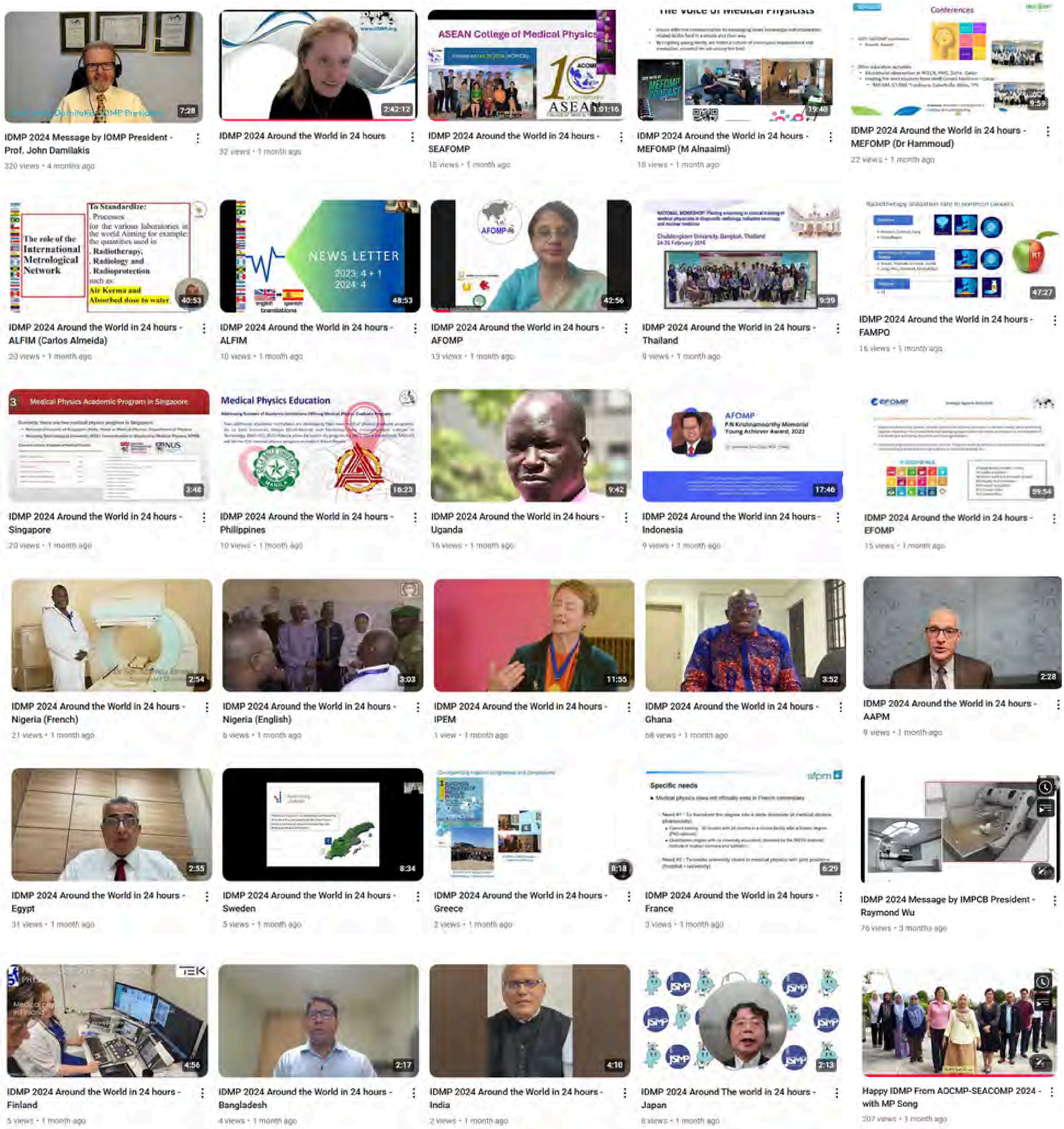
The global event was attended by colleagues from **97 countries** and scored a total attendance of **2516 manhours**. The recordings of the events are available at the IOMP Youtube channel: https://www.youtube.com/@IOMPOfficial/videos

Start Time, GMT	Event
1:00 AM	AFOMP - Regional Organization and NMOs
3:00 AM	SEAFOMP - Regional Organization and NMOs
8:00 AM	MEFOMP - Regional Organization and NMOs
10:00 AM	FAMPO - Regional Organization and NMOs
11:30 AM	**IOMP Panel**
1:00 PM	IOMP Partner Organizations Panel IUPESM, ICRP, IAEA, WHO, IRPA, ISR
3:00 PM	EFOMP - Regional Organization and NMOs
6:00 PM	ALFIM - Regional Organization and NMOs
8:00 PM	AAPM
9:00 PM	Summary of the day, IDMP awards and Closing Ceremony

IDMP 2024 Report: 24-hour Global Webinar on Inspiring the Next Generations of Medical Physicists

Magdalena Stoeva, PhD

Secretary General of IOMP



Conference on Radiation Applications in Medicine to commemorate International Day of Medical Physics (IDMP) & International Day of Radiology (IDOR)

Mary Joan

Christian Medical College and Hospital, Ludhiana, India

On 30th November 2024, a conference on Radiation Applications in Medicine with the theme ‘Inspiring the future generations of radiation professionals’ was organized by the Departments of Radiation Oncology and Radio Diagnosis Christian Medical College & Hospital, Ludhiana to commemorate the International Day of Medical Physics (IDMP) and the International Day of Radiology (IDoR) 2024. This conference was accredited with 4 credit hours by the Punjab Medical Council. The conference was held in the Lady Willingdon Assembly Hall, Christian Medical College and Hospital, Ludhiana.

The contribution of Medical Physics in healthcare is multi-dimensional and it has improved healthcare tremendously. The recent advancements in Medical Physics may it be in Radio diagnosis, Radiotherapy, Nuclear Medicine and various fields specially using ionizing radiation has made monumental sprints. To bring over it and recognize the contribution of Medical Physics to healthcare, International Organization for Medical Physics (IOMP) has started to celebrate 7th November, the birthday of Madam Marie Curie as International Day of Medical Physics (IDMP) since 2013. The main purpose of IDMP celebrations include motivating the organization of activities that result in the promotion of the subject of medical physics globally, increasing the visibility of the profession and outreach to fellow professionals and general public. Since the 7th day of November 2013, the very first International Day of Medical Physics, where various academic and teaching institutes showcased the contributions of medical physicists to healthcare globally and continues to be celebrated annually thereafter. Discovery of X-rays on 8 November 1895 by German physicist Prof Wilhelm Roentgen has revolutionized the medical diagnosis and treatment. The anniversary of this discovery is celebrated around the world as IDoR in recognition of the remarkable contributions made by radiological imaging and radiological treatment to health care, and the role of radiation professionals in providing quality care to patients.

Conference on Radiation Applications in Medicine to commemorate International Day of Medical Physics (IDMP) & International[1] Day of[2] Radiology (IDOR)

Mary Joan

Christian Medical College and Hospital, Ludhiana, India

Christian Medical College and Hospital Ludhiana has been always in the forefront to avail the best diagnostic and treatment facilities to treat patients since 1894. The teaching and training program for radiotherapy technologists in CMC Ludhiana dates to early 1960's and the MD Radiation Oncology program at the institute completed 30 years. The departments of Radiation Oncology and Radio Diagnosis collectively decided to commemorate the IDMP and IDoR 2024 and more than 450 healthcare professionals and trainees attended the conference.

Honourable Sub Divisional Magistrate, Moga, Ms Swati Tiwana inaugurated the conference and addressed the gathering of more than 300 delegates from across Punjab and neighboring states. She highlighted the importance of creating awareness among general public and emphasized the immense contribution of Madam Marie Curie to the health sector. Professor Dr MK Mahajan, guest of honour, a senior radiation oncologist from CMC Ludhiana illuminated the contributions of Sir Wilhelm Roentgen with the discovery of X-Rays. Professor Karamveer Goel Member Punjab Medical Council congratulated the organizing team and announce four credit hours. Prof Dr William Bhati, Director CMC Ludhiana congratulated the organizing team and said that more such conferences need to be conducted to create awareness. Prof Dinesh Badyal, Vice Principal encouraged the conduct of academic programs and conveyed the wishes of Dr Jeyaraj Pandian Principal CMCH. Prof Dr Pamela Jeyaraj, Head, Department of Radiation Oncology and Organizing Chairperson mentioned about the contributions made by the founder Dame Edith Mary Brown and the services rendered to cancer patients and Prof Dr Mary Joan, Organizing Secretary extended the vote of thanks to the entire invited faculty, delegates and the team of support persons.

The theme of this year's IDMP celebrations was ***'Inspiring the future generation of medical physicists'*** and it inspires us to continue our collective commitment to improving patient care, advancing medical technology, and enhancing the overall well-being of our communities. THE IDMP day is dedicated to raising awareness about the role of medical physicists in healthcare and their contributions to the well-being of patients. Medical physicists play a crucial role in areas such as radiation therapy, diagnostic imaging, and nuclear medicine, ensuring the safe and effective use of medical technology. The International Day of Medical Physics serves to highlight the importance of their work in improving the diagnosis and treatment of diseases and promoting the well-being of individuals worldwide. The rapidly evolving applications of physics in medicine demands new set of skills as well as outlooks to meet the challenges efficiently and successfully. This CME offered a forum for radiation professionals of various healthcare streams to come together and share invaluable experiences for improving the practice of applications of radiation in medicine. The scientific program included a key note talk by veteran radiation oncologist and former Professor and Head of Department of Radiation Oncology, CMC Ludhiana on the theme 'Inspiring the future generations of radiation professionals'. He has emphasized not only the contributions of scientists and clinical medical physicists to the field of radiation oncology, but

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also reiterated the importance of the role of medical physicists in routine clinical activities of radiation oncology, academic and research work. The session was moderated by Dr Sandhya Sood, Radiation Oncologist, Dayanand Medical College and Hospital Ludhiana and Dr Pranay Pawar, Vascular Surgeon, CMCH Ludhiana. Following the keynote address, Dr Rajeshwar Sahonta, Associate Professor of Neurology and Interventional Neurology spoke about the 'Mechanical Thrombectomy: CMC Experience, moderated by Dr Harpal Singh, Prof and Head, Dept of Gastroenterology, CMCH Dr Ishu Sharma, Radiation Oncologist, Mohan Dai Oswal Cancer Hospital Ludhiana.

A talk on Radiation accidents causes, consequences and preparedness by Dr Preety Negi, Radiation Oncologist, Capitol Hospital, Jalandhar was followed moderated by Dr Gurpreet Kaur, Senior Medical Physicist, Dept of Radiation Oncology, Baba Farid Government Medical College Faridkot and Mr Alok K Yadav, Dept of Nuclear Medicine, Baba Farid Government Medical College Faridkot.

The next talk was 'Liver SBRT by Exac Trac Gating' by Mr Rakesh Kaul, Senior Radiotherapy Technologist, Max Hospital, New Delhi moderated by Dr Preeti Paul, Prof and Head, Dept of Pathology, CMC Ludhiana and Dr Tapasya Dhar, Prof., Dept of Genecology and Obstetrics, CMC Ludhiana. The next talk was on 'Theragnostics: Present and Future', by Dr Dhananjay Kumar, Medical Physicist, Dept of Nuclear Medicine, Yashoda Hospital, New Delhi moderated by Dr Parvez Haque, Prof and Head, Department of Surgery, CMCH Ludhiana and Mr Joy Anzer, Senior Radiology Technologist, CMCH Ludhiana. Following that the 'Safe Practice in Radiotherapy' was discussed by Dr Kamlesh Passi, Senior Consultant Medical Physicist, Dept of Radiation Oncology, Mohan Dai Oswal Cancer Hospital Ludhiana. This session was moderated by Dr Romikant Grover, Radiation Oncologist, Baba Farid Govt Medical College, Faridkot and Dr Vivek Kumar, Chairperson, Centre for Medical Physics, Punjab University, Chandigarh. A thriving discussion followed including various practical situations and challenges considering patient safety and patient doses. Next Talk was 'Advancing Imaging and Diagnostics with ultra-sound' by Dr Dr Chithra Krishnamoorthy, Medical Physicist, AMITY University, Noida moderated By Dr Shekhar Kapoor, Head, Oral Medicine and Radiology and Dr Neha Chitkara, Assistant Professor, Christian Dental College Ludhiana. Dr Parneet Singh, Radiation Oncologist, Panchkula deliberated on 'Building a culture of Radiation Safety' moderated by Dr Navneet Kumar, Prof and Head, Dept of ENT AND Dr Mary John, Prof and Head, Dept of Internal Medicine CMC Ludhiana. Dr Reena Sharma, Senior Medical Physicist, Dept of Radiation Oncology, PGI Chandigarh spoke on 'Small Field Dosimetry' moderated by Dr Narjeet Kaur, Prof and Head, Dept of Anesthesia and Dr Gurpreet Thiara, Head, Dept of Transfusion Medicine, CMC Ludhiana. Dr Gourav Goyal, Radiation Oncologist, Advanced Cancer Institute, Bhatinda spoke about 'Radiation Protection in a Changing World' moderated by

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Mr Shashank Shukla, Medical Physicist, Kamla Nehru Medical College, Allahabad and Mr Devaraju S, Senior Medical Physicist, Homi Bhabha Cancer Hospital, Sangrur. Following that Mr Ramesh Chandra Sharma, Senior Technologist, SMS Medical College, Jaipur presented 'Transportation of Radioactive Material' moderated by Dr Jaspinder Kaur, Radiation Oncologist, Satguru Pratap Singh Hospital Ludhiana and Dr John Livingston, Dept of Cardiology CMC Ludhiana. The morning session concluded with a talk on 'MR Linac- Early clinical experience in India' by Dr Vivek Immanuel Radiation Oncologist, Fortis Hospital New Delhi moderated by Dr Abhishek Samuel, Dept of Orthopedics, CMC Ludhiana and Ms Satinder Kaur, Senior Medical Physicist, Department of Radiation Oncology, PGI Chandigarh.

e-Poster presentations were followed after lunch on the theme 'Radiation Applications in Medicine' for the graduate and post graduate students to promote awareness and to nurture all round development.42 e-posters were presented by medical physicists, radiology MD residents and BSc technology trainees, radiation oncology MD residents and BSc radiotherapy technology trainees from various medical colleges and teaching institutions across Punjab. A major attraction was the 5 models prepared and presented by graduate students upholding the spirit of the IDMP celebrations. Ms Nidhi Goswami, Mr Abhishek Sehrawat, Mr Vikram Singh, Ms Shivani Bhakal, Ms Gunjann Sharma, Mr Narender Sharma, Mr Munish Sanhotra, Ms Urvashi, Ms Kushpinder Kaur, Mr Randhir Singh Doad, Mr Mirza Burhan, Ms Eswari Vigneshwaran, Ms Ripanpreet Kaur, Dr Kewal Aaditya, Ms Rama Bhawani, Mr Gurpreet Singh, Mr Devaraju S; a panel of Medical physicists, radiologists, radiation oncologists and technologists from various institutions across Punjab moderated and judged the e-poster presentations and models.

Ms Nimmi Mathew, Homi Bhabha Cancer Hospital Sangrur won the 1st Prize from medical Physicists. Dr Harshit Chouhan, MD RT, Dr Guntas, MD RD and Dr Benhur Jojan MD RD won the 1st, 2nd and 3rd prizes respectively from PG residents. Ms Sejal Sharma, Ms Kiran and Mr Bhupendra Kothotiya won the 1st, 2nd and 3rd prizes respectively from radiotherapy technology students. From Radiology technology students Ms Tanvi, Ms Anumeetand Ms Rukhsah won the 1st, 2nd and 3rd prizes. In the model session, Mr Sahil (RD), Ms Harshpreet (RD) and Ms Vaishnavi (RT) won the 1st, 2nd and 3rd prizes. Dr Maria Thomas, Associate Director, CMCH Ludhiana presented the awards (certificate, trophy and momento) to the winners during the valedictory function. Following the prize distribution, the conference came to an end with a vote of thanks and the ethos of IDMP and IDoR strongly reverberating in all participants.

Conference on Radiation Applications in Medicine to commemorate International Day of Medical Physics (IDMP) & International Day of Radiology (IDOR)

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Conference on Radiation Applications in Medicine to commemorate International Day of Medical Physics (IDMP) & Internat[1]ional Day of[2] Radiology (IDOR)

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Christian Medical College and Hospital, Ludhiana, India






Congress Report of the 24th AOCMP and 22nd SEACOMP (AOCMP-SEACOMP 2024)

Jeannie Hsiu Ding Wong[1], Chai Hong Yeong[2]

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2 School of Medicine, Faculty of Health and Medical Sciences, Taylor's University, Subang Jaya, Malaysia

The 24th Asia-Oceania Congress of Medical Physics (AOCMP), in conjunction with the 22nd Southeast Asia Congress of Medical Physics (SEACOMP), was successfully held at The Wembley - A St Giles Hotel, Penang, Malaysia from 10th to 13th October 2024.

AOCMP and SEACOMP are important annual events for medical physics in the region, aiming at gathering medical physics and allied health professionals to share knowledge, expertise, and updates on medical technology while fostering cultural exchange. This marks the third time Malaysia has had the honour of hosting this event, previously held in 2004 and 2018. This year, the congress is jointly organised by three medical physics societies in Malaysia: the Malaysia Institute of Physics, Malaysian Association of Medical Physics (MAMP) and Persatuan Pegawai Sains Fizik KKM (PERFEKS).

The theme of this year's congress, "Revolutionising Patient Care Through Medical Physics", reflects the vital role that medical physicists and allied health professionals play in modern healthcare. We stand at the forefront of innovation, continuously advancing patient care through cutting-edge research and clinical practice across various fields, including diagnostic and interventional radiology, radiotherapy, nuclear medicine, and emerging fields like artificial intelligence (AI) and radiobiology. The rapid advancement of AI in healthcare underscores the importance of medical physicists possessing the required knowledge and skills.

The congress attracted 523 participants from 33 countries (Figure 1), including clinical medical physicists (36%), academics (24%), students (24%) and industry representatives (12%) (Figure 2).

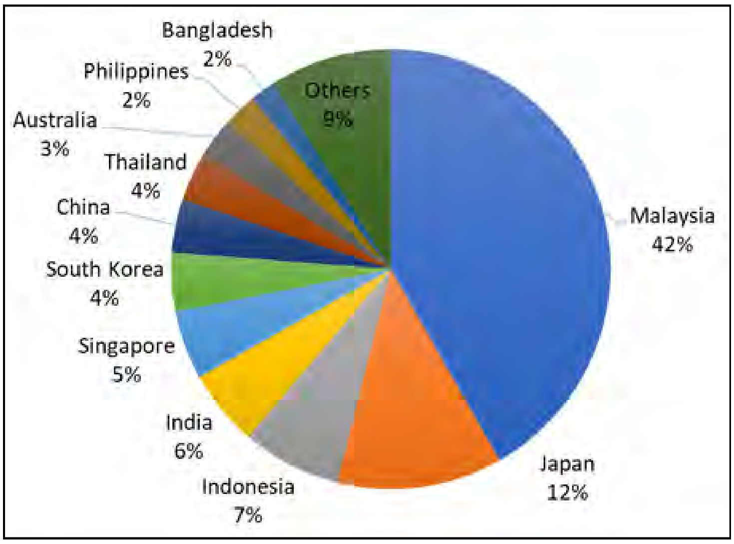

Figure 1: Country distribution of the participants.

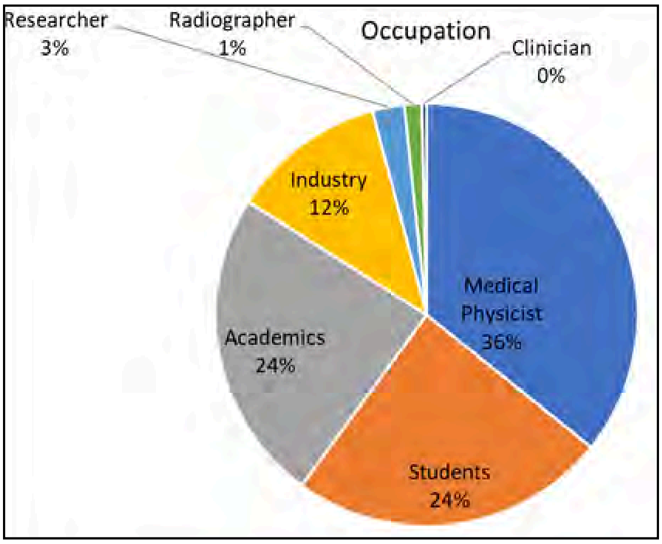

Figure 2: Distribution of participants by profession.

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A whopping 62 renowned speakers from 20 countries spoke at the congress. The scientific programme comprises of 5 pre-congress workshops, 1 public lecture, 1 keynote lecture, 9 plenary sessions, 15 invited lectures, 15 proffered paper sessions, 4 sponsored tech talks, 2 special sessions, 1 John Cameron Memorial Lecture, 1 Kiyonari Inamura Memorial Oration, and 1 SEAFOMP Anchali Krisanachinda Quiz.

The Congress received 430 abstract submissions with the final listing of 151 posters and 144 oral presentations. A total of 38 travel awards were offered to support researchers and students to attend the congress (Table 1).

The congress is also enriched by the many organisations that have cooperated and supported this congress:

- International Atomic Energy Agency (IAEA)
- International Organization for Medical Physics (IOMP)
- International Union of Pure and Applied Physics (IUPAP)
- International Medical Physics Certification Board (IMPCB)
- Institute of Physics and Engineering in Medicine (IPEM), UK
- The American Association of Physicists in Medicine (AAPM)
- Malaysia Convention & Exhibition Bureau (MyCEB)
- Penang Convention & Exhibition Bureau (PCEB)

We are also privileged to have 17 industry partners and four non-government organisations (NGOs), including the Penan Borneo Bag, a charity that sells beautiful hand-weaved bags by the indigenous Penan women from Sarawak. 100% of the income will go back to support the livelihood of Penan families in Sarawak. The congress also supported the United Nation Sustainable and Development Goals (UNSDG) initiatives by providing a free booth for SK Chew Enterprise, a home-based industry selling recyclable handicrafts.

The Congress is CME-approved and accredited for the following CPD points:

MyCPD	Pre-congress: 6 points
	Congress: 20 points
BKRP	Pre-congress: Radiotherapy 7 h, Nuclear Medicine 6 h, Diagnostic 4 h
	Congress: Radiotherapy 12 h, Nuclear Medicine 6 h, Diagnostic 4 h
MBOT	Congress – 18 CPD points

The first day of the Congress (10th October 2024) was designated for Pre-Congress workshops. A total of 5 workshops were conducted (Table 2).

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Table 1: Winners of various Travel Awards.

Travel awards	Recipients
IUPAP Travel Awards for Developing Countries	1. Shriram Rajurkar (India) 2. Ariij Naufal (Indonesia) 3. Tanny Bepari (Bangladesh) 4. Hamza Arjah (Jordan) 5. Waritsara Kriangkraiwat (Thailand)
AFOMP Travel Awards for AFOMP Members	1. Md. Mokhlesur Rahman (Bangladesh) 2. Sadia Afrin Sarah (Bangladesh) 3. Yiling Wang (China) 4. Sheeba Gunasekaran (India) 5. Rajalakshmi K A (India) 6. Yanurita Dwihapsari (Indonesia) 7. Hanifa Fithraturrahma (Malaysia) 8. Muhammad Hafiz Hanafi (Malaysia) 9. Loja, Christine (Philippines) 10. Magdaong, Nikkitita (Philippines) 11. Samuel Meng-En Lian (Singapore) 12. Urshella Hishaam (Sri Lanka) 13. Wiroon Monkongsubsin (Thailand)
SEAFOMP Travel Awards for SEAFOMP Members	1. Stevania Fadhilah Adhillaksa (Indonesia) 2. Zheng Hwee Koh (Malaysia) 3. Jimnoel Quijano (The Philippines) 4. Khanh Luan Mai (Vietnam) 5. Lyda Pav (Cambodia)
IFM AOCMP-SEACOMP 2024 Travel Awards for Malaysian Physicists	1. Nishta Letchumanan 2. Nashrulhaq Tagling 3. Hui Chin Leow 4. Norhayati Abdullah 5. Jia Ding Wong 6. Qing Le Keng 7. Muhammad Hanif bin Mohd Omar 8. Nik Mohd Amiruddeen Nik Pakheruddin 9. Wan Nur Ain Wan Ghazali 10. Muhammad Khalis Abdul Karim
MyCEB Travel Awards	1. Hnin Nitar (Myanmar) 2. Christoph Trauernicht (South Africa) 3. Md. Rustam Ali (Bangladesh)

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Table 2: Pre-congress workshops

Workshop	Theme
GE Healthcare Nuclear Medicine Workshop	Internal Dosimetry in Nuclear Medicine
Monte Carlo Workshop	Monte Carlo Calculation for Radiation Safety
Siemens Healthineers Workshop	Embracing Innovation, Enhancing Outcomes
ACOMP Workshop on Women in Medical Physics	Radiance in Resilience: Inspirational stories of successful women in medical physics
ACOMP Workshop on Diagnostic Reference Levels	ASEAN Diagnostic Reference Levels

The opening ceremony was held on 11th October 2024. It was preceded by a Public Lecture titled "*We all belong*", by Prof Dr Eva Bezak and a keynote lecture by Prof Dato' Dr Adeeba Kamarulzaman on *"Technology and the future of healthcare"*.

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The opening ceremony started with a welcome speech by the co-chair of the congress, Prof Dr Jeannie Wong, followed by the welcome remarks by the IOMP president, Prof Dr John Damilakis, AFOMP president, Prof Dr Eva Bezak and SEAFOMP president, Prof Dr Chai Hong Yeong. Prof Yeong also launched the SEAFOMP Coffee Table Book titled “20 Years of SEAFOMP”.

The honourable YB Gooi Zi Sen, Member of the Penang State Executive Council (Youth, Sports & Health), officiated the opening ceremony by launching the gimmick (Figure 3). A video montage depicting the journey of a cancer patient through her treatment, elucidating the critical role of medical physicists in every step of patient care, was played. Then, there were the Malay, Indian and Chinese cultural dance performances, showcasing the diverse and multicultural background of Malaysia (Figure 4). A group photo was taken to commemorate the momentous event (Figure 5).

Figure 3: YB Gooi Zi Sen, member of the Penang State Executive Council (Youth, Sports & Health), officiated the opening ceremony by launching the gimmick

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Figure 4: Multicultural dance at the Opening Ceremony.

Figure 5: Group photo of the participants at the AOCMP-SEACOMP 2024 Opening Ceremony

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On the 2nd day (12 October 2024), the congress commenced early with the Presidents' Symposium. The presidents of the IOMP, AFOMP, SEAFOMP, AAPM and Medical Physics for World Benefit (MPWB) discussed various trends and issues related to medical physics education, training and accreditation. The panel emphasized the importance of standardization of medical physics education and training, while adapting to the local sensitivities and situations. They also highlighted the significance of communication as a crucial soft skill for medical physicists and the critical role of advocacy for medical physicists at both national and international levels.

The John Cameron Memorial Lecture was delivered by Emeritus Prof. Larry DeWerd, the 5th PhD student of Prof. John Cameron, titled "The Importance of Medical Physics in Preclinical Research." Additionally, the Kiyonari Inamura Orator, Prof. Youngyih Han from Korea, shared her journey as a medical physicist in a talk titled "Finding Purpose in Physics: My Story as a Medical Physicist."

On the social front, all invited faculty members were treated to a special appreciation dinner on the evening of 11th October 2024, at Nyonya Chiak Restaurant, showcasing the exquisite culinary traditions, clothing and culture of the Baba Nyonya Peranakan heritage of Penang. A Gala Dinner was held at the Jen's Hotel on 12th October 2024, where delegates from various countries presented multicultural performances. The highlight of the night was "The MP song", presented by the Malaysian team. This parody, set to the tune of "Country Road, Take Me Home", resonates with the experiences of many delegates.

On the third day of the congress, the SEAFOMP Anchali Krisanachinda Quiz took place. This annual competition focuses on medical physics and SEAFOMP-related knowledge, opens to young medical physics representatives from Southeast Asian nations. A total of eight teams, comprising representatives aged 35 or younger, participated in the Quiz. Assoc Prof Dr Kitiwat Khamwan, Prof Dr Jeannie Wong, and Dr Wei Loong Jong served as the Quiz masters. The first prize went to the team from the Philippines, followed by the teams from Indonesia and Vietnam, with cash prizes of USD 150, USD100 and USD 50, respectively.

The closing ceremony was held on 13th October 2024, during which 18 best oral and poster presentation awards were presented. The lists of Best Oral and Best Poster presentations are listed in Table 3 and Table 4.

The prestigious SEAFOMP Young Leaders Awards were also presented to Mr Melvin Ming Long Chew (Singapore), Assoc Prof. Dr Rafidah Zainon (Malaysia), Mr M Roslan Abdul Ghani (Indonesia), Dr Sirinya Ruangchan (Thailand) and Ms Raquel Louise Munsayac Espiritu (Philippines) by the President of SEAFOMP, Prof Dr Chai Hong Yeong, and the Chair of the Awards and Honours Committee, Dr Aik Hao Ng, during the ceremony.

Congress Report of the 24th AOCMP and 22nd SEACOMP (AOCMP-SEACOMP 2024)

Jeannie Hsiu Ding Wong[1], Chai Hong Yeong[2]

1 Department of Biomedical Imaging, Faculty of Medicine, Universiti Malaya, Kuala Lumpur, Malaysia
2 School of Medicine, Faculty of Health and Medical Sciences, Taylor's University, Subang Jaya, Malaysia

In conclusion, the AOCMP-SEACOMP 2024 concluded on a high note, with participants returning to their home countries enriched by a memorable congress experience and the beauty of Penang.

Table 3: Winner of Best Oral Presentations.

	Diagnostic Radiology	**Presenter**	**Country**
1	Exploring Hidden Dangers: Brain and Eye Exposure in Neurointerventional Radiology	Mohamed Badawy	Australia
2	Development of a CT Dose Calculation Program Reflecting Angular and Longitudinal Tube Current Modulations	Kosuke Matsubara	Japan
3	CT Warriors - Enhanced Customisation of Weight-Based Contrast Media Protocol for CT Chest-Abdomen-Pelvis Scans in Universiti Malaya Medical Centre	Sue Anne Manushya Kaur Foo	Malaysia
	Radiotherapy		
1	Deep learning-based tumor tracking at Elekta Unity MR-Linac	Yiling Wang	China
2	Comparative dosimetric analysis between volumetric modulated arc therapy in TrueBeam and Halcyon for craniospinal irradiation plans	Nalinpun Buranavanitvong	Thailand
3`	Three-dimensional dose evaluation for proton therapy using a polymer-gel dosimeter	Atsuki Terakawa	Japan
	Nuclear Medicine, Biology, Education & Radiation Safety		
1	Validation of Particle and Heavy Ion Transport Code System (PHITS) in generating voxel S values for internal dosimetry calculations	Shalaine Tatu	Malaysia
2	Development of a biodegradable radioactive rod for targeted internal radiation therapy of liver tumours	Asseel Hisham	Malaysia
3`	Additive manufacturing technology towards radiological tissue equivalence for experimental radiotherapy: From dosimetry to radiobiology	John Paul Bustillo	Australia

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Table 4: Winners of Best Poster presentations.

	Diagnostic Radiology	**Presenter**	**Country**
1	Photon-counting detector CT techniques for the detection of acute ischemic stroke using virtual monoenergetic images	Hidetake Hara	Japan
2	QuIQCT: An Online Image Quality Analysis System for Computed Tomography Quality Assurance	Hafiz M Zin	Malaysia
3	Preliminary Study on IEC-based Exposure Index (EI) Estimation from Chest Radiographs Using Deep Learning	Jawon Jang	Korea, Republic of
	Radiotherapy		
1	Investigation of 2D Ionisation Chamber Detector Array Performance for VMAT Verification Using Linac Log Data	Kai Wei Chuah	Malaysia
2	Monte Carlo simulation study of dose distributions in intensity-modulated boron neutron capture therapy	Kengo Miyada	Japan
3`	Evaluation of the Raydose 2Dmap Detector Array for Intensity-Modulated Radiation Therapy (IMRT) Verification	Rosmawati Binti Remli	Malaysia
	Nuclear Medicine, Biology, Education & Radiation Safety		
1	Determination of Voxel S-value Maps for Internal Dosimetry of [68Ga]Ga-PSMA, A Monte Carlo Study	Mehrnoosh Karimipourfard	Iran, Islamic Republic of
2	Consideration of real-time visualization of scattered rays using a high- sensitivity CMOS camera	Hyojin Lee	Japan
3`	Radiosensitization Effects of Schiff Base Iron Complexes (Fe- L4) Irradiated with Cobalt-60 Brachytherapy	Nur Afiqah Moh Chipto	Malaysia

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Chula Summer School on Advanced Medical Physics in the AI Era

Anchali Krisanachinda

Department of Radiology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

The Chula Summer School (CSS) on Advanced Medical Physics in the AI Era took part at the Faculty of Medicine, Chulalongkorn University in Bangkok, Thailand from 19 to 21 July 2024 (CSS2024). The success of the School was facilitated by the close collaboration of the Medical Physics Management Committee, Faculty of Department of Radiology and the Dean, Faculty of Medicine, Chulalongkorn University. CSS2024 attracted 140 delegates and exhibitors and was supported by a strong team of the graduate students in medical physics program.

Naturally, most of the participants at the CSS2024 were from Thailand, but it also attracted delegates from other countries, thus having participants, Invited Speakers and exhibitors from 13 countries. The delegations were from People's Republic of China, France, Germany, Italy, Japan, South Korea, Malaysia, Myanmar, The Philippines, Switzerland, Thailand, USA and Vietnam. CSS2024 included 17 lectures for on-site and on line, most of these being in the fields of AI in Radiation Therapy, Diagnostic Radiology, Nuclear Medicine, and Radiation Safety. One Lunch talk and three vendors talk were included in the School program.

Four companies had Exhibition tables at CSS2024, thus allowing the participants to see the latest developments in the medical-physics-related industry. The sponsors and exhibitors at CSS2024 (as per their boot number) were Saint-Med, JF Advanced Med, BA, IBA, Bayer, Siemens Healthineers, Varian. We express sincere gratitude to all sponsors and exhibitors!

It is the first Chula Summer School organised by the Graduate Program in Medical Physics at Chulalongkorn University in 2024, 22 years of its establishment. The total number of medical physicists graduated from the M.Sc. and Doctoral programs is 121 while the approximate number of medical physicists nationally was around 400. Our goal is to further double this number of Chula Graduates in the next decade.

The increase of the number of medical physicists is directly related to the education and clinical training in medical physics and the establishment of the school that has made sound steps in this direction. One of these steps is the establishment of the "Chula Summer School" – a sequence of educational presentations that was inaugurated at CSS2024. The support for this activity from the leaders of the profession was overwhelming. Thus, CSS2024 included 17 lectures covering various topics of importance for the profession. We want to offer special thanks to all colleagues who contributed to the Chula Summer School.

Finally, we want to thank all Organisers and CSS2024 Committee members, as well as all colleagues who contributed and participated at the CSS2024. The truly international friendly spirit at the School in Bangkok was one of the main pivots of the success of CSS2024.

Chula Summer School on Advanced Medical Physics in the AI Era

Anchali Krisanachinda

Department of Radiology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

Anchali Krisanachinda, Course Director of CSS2024

Course Leaders: Georges El Fakhri, Franco Milano, Jan Unkelbach, Hidetaka Arimura, Kosuke Matsubara, Se Young Chun, Yothin Rakvongthai, Sararas Khongwirotphan, Mintra Kaewsamur.

ANNEX:
List of the "CHULA SUMMER SCHOOL with their Organiser(s)/Contributor(s) at CSS2024:

Fundamentals of Quantitation in Medical Imaging: Georges El Fakhri
Nuclear Medicine Imaging in the AI Era: Georges El Fakhri
Foundations of IMRT Planning: Jan Unkelbach
Easily Understandable Machine Learning and related Theories with Examples [Online]: Hidetake Arimura
Automatic Exposure Control in CT: Kosuke Matsubara
Advanced Topics in PET Instrumentation: Georges El Fakhri
Deep Learning Reconstruction for CT: Kosuke Matsubara
Deep Learning for Medical Image Enhancement [Online]: Se Young Chun
Advanced Topics in IMRT Planning: Jan Unkelbach
Transition 7.0 the Sustainable Future of Radiological Imaging. Utopia or Reality? : Franco Milano
Fundamentals of Radiomics: Yothin Rakvongthai
Radiomics Applications: Sararas Khongwirotphan
Proton Therapy Planning Jan Unkelbach
Application of Effective Dose to Medical Procedures: Kosuke Matsubara
X-ray Multi contrast Imaging: Franco Milano
Support Target Volume Definition through AI: Jan Unkelbach
Particle Beam Therapy: Mintra Keawsamur
Course Evaluation: Anchali Krisanachinda, Picha Chunhavanich

Chula Summer School on Advanced Medical Physics in the AI Era

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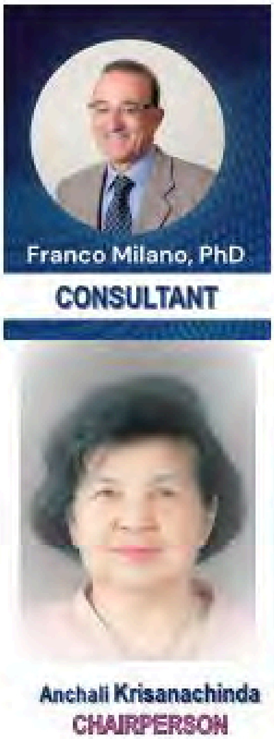


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Medical Physics Education- Time to Revise and Adapt

Arun Chougule

Chair, IOMP Education and Training Committee
Chairman, IOMP Accreditation Board
Member, IMPCB Board of Directors

"Education is not the learning of facts, but the training of the mind to think"
- Albert Einstein

Medical physicists are health professionals concerned with the safe and appropriate use of ionising radiation for diagnosis and treatment. Therefore clinically qualified competent medical physicists with proper education and training are needed to take up responsibilities. Furthermore, medical physics is a rapidly evolving field at the intersection of healthcare, science, and technology with advancements in medical imaging, radiation therapy, and diagnostic tools is experiencing a paradigm shift due to the increasing use of artificial intelligence (AI), machine learning (ML), and radiogenomics in precision medicine, mandating tuning of medical physics education to keep pace with these technological changes, creating a pressing need for curriculum revision and adaptation to educate students to become medical physicists of service to various areas of medicine, technology, industry and environment.

The status of clinical medical physicists and the medical physics service varies throughout the world depending upon socioeconomic and educational standards. This depends on several factors but normally is related to the existence and standard of education and training in medical physics and the standard of service provided. Countries at an early stage of development of medical physics that are currently developing medical radiation physics service, need a careful structuring of the medical physics programme with strong involvement from related disciplines. Only through interdisciplinary education of science can one achieve high standards and broader visions upon the emerging research areas.

Though the demands on clinically qualified medical physicists have grown significantly, medical physics education often struggles to keep pace with these technological changes, creating a pressing need for curriculum revision and adaptation. In addition, adaption to the dual process of learning new concepts and technologies and unlearning outdated or less relevant practices will enhance the effectiveness and innovation of education. Unlearning requires identifying and letting go of outdated knowledge, which can be challenging amidst information saturation.

A medical physicist must have a multidisciplinary vision of physics, otherwise the goals of this developing area are not met. Clinics, hospitals, as well as industry expect to hire 'appropriately educated trained medical physicists, with a comprehensive background knowledge meant to cover all the major aspects of radiobiology, health physics, radiotherapy, protection against radiation.

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This thoroughness can only be achieved through careful planning of the curriculum and well-trained educators with broad visions and knowledge. Recent Lancet Oncology Commission [www.thelancet.com/oncology Vol 25 November 2024] estimated the requirement of manpower in radiotherapy by 2050 and reported based on global projections indicating a substantial increase in new cancer cases reflecting a more than 60% surge in the radiotherapy workforce demand, including 84 646 radiation oncologists, 47 026 medical physicists, and 141 077 radiotherapy technologists globally. In addition, in the International Organization for Medical Physics (IOMP) 2023 survey about the availability of qualified medical physicists, 73·4% of responding IOMP NMO's reported a shortage of medical physicists. This article explores the challenges, opportunities, and strategies for modernizing medical physics education to meet contemporary demands.

More than 390 Medical Physics Undergraduates/Postgraduates and Research programme are available around the world. Detailed information is available at https://www.iomp.org/education-training-resources/

The Medical physics education programs in various regions are:

- AFOMP ~ 119 (0.03 programs/million population)
- USA ~ 42 (0.127 programs/million population)
- ALFIM ~ 46 (0.076 programs/million population)
- EFOMP ~ 105 (0.141 programs/million population)
- MEFOMP ~ 21 (0.08 programs/million population)
- FAMPO ~ 37 (0.026 programs/million population)
- CANADA ~ 18 (0.49 programs/million population)

The Current Landscape of Medical Physics Education

Traditional Curriculum Structure

Medical physics education typically includes:

- **Foundational Physics:** Covering radiation physics, dosimetry, and radiobiology.
- **Clinical Applications:** Focusing on imaging techniques like MRI, CT, and ultrasound, as well as radiation therapy modalities.
- **Research Methodology:** Introducing students to research principles and applications in medical physics.
- **Clinical Training**: Practical exposure through residencies or internships in hospitals or research centers.

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While these components are essential, many curricula lag in integrating emerging technologies and interdisciplinary approaches.

Challenges in the Existing System

1. Technological Lag: Outdated modules on imaging and therapy technologies.
2. Limited Interdisciplinary Exposure: Lack of integration with fields, like data science, AI, and bioinformatics.
3. Inadequate Practical Training: Insufficient focus on clinical scenarios, regulatory standards, and ethical issues.
4. Resource Constraints: Many institutions lack advanced equipment and qualified faculty.
5. Global Disparities: Education standards vary widely, creating a skills gap across regions.

The IOMP policy statement 2 and IAEA HHS25 mandate that to be a clinically qualified medical physicist the education requirements are:

1. The minimum educational qualification for an MP is a university degree or equivalent (level corresponding to a master's degree) majoring in medical physics or an appropriate science subject.
2. Educational qualification could be accomplished in two phases. The first phase of the education program is the completion of a bachelor's degree in physics or an equivalent degree in a relevant physical or engineering science subject. The second phase of the program is the completion of a postgraduate program at a master's degree level in medical physics or an equivalent degree in an appropriate physical science subject
3. The suitability of a certain education program to provide the necessary academic knowledge for the following professional training could be established through a suitable national or international validation/accreditation body.

Professional Training Requirements

Minimum duration of training - The duration of clinical competency training should not be less than 2 years full-time equivalent. The training should be carried out under the direct supervision of a Certified Medical Physicist (CMP) specialized in the same sub-field or a qualified professional with a level of professional experience and expertise equivalent to that of the CMP.

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The number of medical physicists in various regions of the world are as follows:

No	Regional Organization / Region	Population (million)	Number of Medical Physicists (MP) (approx.)	MP/million Population
1	USA & Canada	330 + 38 = 368	9000	24.50
2	EFOMP	750	9000	12.00
3	FAMPO	1300	1000	0.77
4	ALFIM	700	1400	2.00
5	MEFOMP	400	1100	2.75
6	AFOMP	4200	11000	2.67

The Need for Revision

Medical physics is experiencing a paradigm shift due to advancements such as artificial intelligence (AI), machine learning (ML), radiobiology, molecular imaging, Radiogenomics and precision medicine. These advancements necessitate changes in both the scope and delivery of education.

1. Emerging Technologies:
    - AI and ML in medical imaging and therapy planning.
    - Innovations in proton therapy, adaptive radiotherapy, and theranostics.
    - 3D printing and augmented reality for patient-specific solutions.

2. Interdisciplinary Training:
   Collaboration with fields like:
    - Data Science: For analysing patient data and optimizing treatment plans.
    - Biology: For understanding molecular mechanisms and radiobiological effects.
    - Engineering: For developing and maintaining medical devices.

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3. Regulatory and Ethical Competence:
   Students must understand international and local regulations, as well as ethical considerations in patient care and data management.
4. Global Standardization:
   The need for standardized education frameworks, ensuring uniform competencies worldwide.

Strategies for Modernizing Medical Physics Education

Curriculum Enhancements

1. **Incorporate Emerging Topics:**
   - AI applications in diagnostics and treatment.
   - Big data analytics and predictive modelling.
   - Advances in imaging modalities like PET-MRI and spectral CT.
2. **Expand Clinical Training:**
   - Hands-on experience with cutting-edge technologies.
   - Simulated learning environments using virtual reality (VR).
   - Problem-based learning focused on real-world clinical scenarios.
3. **Foster Research Skills:**
   - Encouraging participation in multidisciplinary research projects.
   - Training in scientific communication and grant writing.
4. **Interdisciplinary Modules:**
   - Joint courses with engineering, biology, and data science departments.
   - Dual-degree programs integrating medical physics with other fields.

Learning and Unlearning in Medical Physics

Medical physics is a dynamic field where education must continuously evolve to meet advancements in technology, clinical practices, and research methodologies. The dual process of learning new concepts and technologies and unlearning outdated or less relevant practices is crucial for professionals to remain effective and innovative. The concept of learning and unlearning within medical physics education is about focusing on the balance between acquiring knowledge and letting go of practices no longer beneficial in contemporary settings.

Examples of Unlearning in Medical Physics

1. Outdated Imaging Techniques:
   - Transition from analog to digital radiography.
   - Replacement of film-based dosimetry with electronic dosimeters.

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2. Conventional Radiation Therapy:
    - Gradual phasing out of 2D and basic 3D conformal techniques in favour of IMRT and volumetric-modulated arc therapy (VMAT).
3. Manual Calculations:
    - Dependence on manual dose calculations has been replaced by sophisticated treatment planning systems.
4. Traditional Educational Approaches:
    - Moving from lecture-heavy curricula to interactive, technology-driven, and student-centred learning models.

Challenges in Unlearning

1. Resistance to Change:
    - Professionals accustomed to traditional methods may find it difficult to adapt.
2. Knowledge Overload:
    - Unlearning requires identifying and letting go of outdated knowledge, which can be challenging amidst information saturation.
3. Cultural and Systemic Barriers:
    - Institutional resistance to curriculum changes or new technologies.

Strategies for Effective Learning and Unlearning

Building a Culture of Lifelong Learning

1. Continuous Professional Development (CPD):
    - Mandating regular workshops, certifications, and refresher courses.
2. Self-Directed Learning:
    - Encouraging professionals to explore online courses, webinars, and journals.
3. Learning from Peer Networks:
    - Creating forums and communities for knowledge exchange and mentorship.

Facilitating Unlearning

1. Embracing Evidence-Based Practice:
    - Regularly reviewing research and clinical guidelines to identify obsolete practices.
2. Flexible Curriculum Design:
    - Designing modular curricula that allow for periodic updates.
3. Critical Thinking Exercises:
    - Encouraging students to challenge traditional methods through case studies and problem-solving.

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Leveraging Technology in Education

1. Simulated Learning Environments:
   - Virtual reality (VR) and augmented reality (AR) for practical training.
2. AI-Driven Tools:
   - Personalized learning pathways based on individual progress.
3. Interactive Platforms:
   - Gamification and interactive software for active engagement.

Leaning of Soft Skills and Ethics

1. Development of communication, teamwork, and ethical decision-making skills.
2. Awareness of patient-centred care principles.

Innovative Teaching Methods

1. E-Learning Platforms:
   - Online lectures, simulations, and virtual labs.
   - Interactive assessments to gauge student understanding.
2. Blended Learning:
3. Combining online and on-site learning for flexibility and deeper engagement.
4. Mentorship Programs:
5. Partnerships with industry professionals and clinical experts.
6. Hackathons and Competitions:
7. Encouraging innovation and practical problem-solving.

Strengthening Global Collaboration

1. Standardized Certifications:
   - Establishing global benchmarks for medical physics education.
   - Accreditation of medical physics education and residency programmes
   - Encouraging certifications of individual medical physicist.
2. International Exchange Programs:
   - Facilitating student and faculty mobility.
   - Sharing resources and expertise across institutions.
3. Developing Regions:
   - Providing support for under-resourced areas through online courses and remote training.

Medical Physics Education- Time to Revise and Adapt

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The Role of Professional Bodies

Organizations such as the International Atomic Energy Agency (IAEA), International Organisation of Medical Physics (IOMP), American Association of Physicists in Medicine (AAPM), Regional Organisations of IOMP and the IOMP NMO's are pivotal in driving educational reform. Their contributions include:

- Setting global standards and guidelines.
- Offering training programs and workshops.
- Funding research and development initiatives.

Conclusion

Medical physics education must evolve to keep pace with technological advancements and the growing complexity of healthcare. Learning and unlearning are two sides of the same coin, essential for keeping medical physics relevant and effective in modern healthcare. By fostering a culture of continuous improvement, educators and professionals can ensure that the field not only adapts to change but thrives amidst it. This dual process is not merely an educational strategy; it is a fundamental necessity for progress in medical physics.

By revising curricula, adopting innovative teaching methods, and fostering global collaboration, we can ensure that future medical physicists are equipped to meet the challenges of modern medicine. The time to act is now, adaptation is not just an option but a necessity for the continued relevance and excellence of the field.

"Education is the passport to the future, for tomorrow belongs to those who prepare for it today."

Anomaly Detection Using Digital Medical Image Processing and Artificial Intelligence

Marlen Pérez Díaz, José Daniel López Cabrera, Jorge Armando Portal, Rubén Orozco Morales, Alejandro Quiñones Espín, Hanlert Cruz Corzo, Noel Victor Amador Legón, Melisa Llody Fajardo, Yusely Ruiz González, Rachel Abreu Llanes, Deborah Galpert Cañizares

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Conflict of Interest Statement: The authors declare no conflict of interest related to this article.

Statement on the Use of Medical Data: Most of the images used in the presented research are public and anonymized on the Internet. However, a set of images is proprietary. These were anonymized and subsequently donated by the participating hospitals, with written approval from the local hospital ethics committees. Informed consent was not required due to the retrospective nature of the study.

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Abstract:

Automated diagnosis support systems (CAD) are a valuable second opinion tool for radiologists and specialists in various pathologies that are difficult to appreciate visually. The Objectives of this research have been to develop basic research for the generation of new knowledge and implement models based on artificial intelligence (AI) and digital image processing (DIP) to detect Covid 19 / pneumonia, masses and microcalcifications in breasts and lung nodules, as well as classify in benign-malignant lesions, all from x-ray images. Methods: In the first case, the work consist on forming an architecture based on the ResNet34 pre-trained model, in the other two cases the work consist in various ways, such as deep neural networks (CNN) based on the Inceptionv3, YOLOv5 and SquizNet, as well as with machine learning (ML) methods such as support vector machines (SVM), random forest (RF), fractal analysis and radiomics, the latter two for malignant – benign classification and with DIP. In all cases, national and international databases were used for training, validation and external testing of the systems. Results: After comparing results between various AI and PDI approaches, the machine learning (ML) methods that best solved the problems posed were chosen, which were Res-Net34 for Covid 19/Pneumonia detection (87.5% accuracy), YOLO v5 for breast (80% accuracy) and lung (90% accuracy), and RF-radiomics (92% accuracy) for malignant-benign classification in lung nodules. Conclusion. Several DL and ML-based CAD systems were obtained that were able to detect and classify injuries with accuracy values above human performance.

Keywords: *Anomaly detection; X-ray images; machine learning; digital image processing*

Anomaly Detection Using Digital Medical Image Processing and Artificial Intelligence

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Introduction

Computer-aided diagnosis (CAD) systems have emerged as a valuable support tool (second opinion) for radiologists in the early detection of various diseases. The recent increase in computational power has enabled the development of CAD systems based on machine learning (ML) techniques. Studies indicate, for instance, that the sensitivity of the human eye for detecting lung nodules ranges from 49% to 65% without CAD assistance, rising to between 68% and 93% with CAD. Similar findings have been reported for detecting breast masses, microcalcifications, and COVID-19. In recent years, these systems have also been applied to classify lesions as malignant or benign based on imaging.

CAD systems are typically categorized into three main types: rule-based and digital image processing (DIP) systems, machine learning-based systems, and deep learning (DL)-based systems. The increase in computing capabilities, data availability, and storage has facilitated the development of ML-based CAD systems. Like rule-based systems, ML-based systems involve preprocessing, segmentation, and using equations to describe lesions. The primary difference lies in the use of classifiers, which effectively learn classification rules from feature vectors previously extracted from images.

DL algorithms utilize convolutional neural networks (CNNs), which, to achieve effective model training and generalization, require a very large volume of data—a resource not always available in the medical field. CNNs emulate the behavior of the human visual cortex. Two main approaches for lesion detection are frequently seen in the literature: object localization architectures such as Faster R-CNN, YOLO, and SSD, and image classification models like MobileNet, SqueezeNet, GoogLeNet, ResNet, and DenseNet.

Despite considerable advancements in imaging technologies in recent years, human experts still do not detect all lesions. Low contrast, small lesion size, anatomical complexity, image quality, observer expertise, and visual fatigue often make detection challenging. Some of these challenges also affect automated CAD systems, though to a lesser degree, as these systems rely on mathematical pattern recognition for learning and classification. However, CAD systems sometimes capture structures irrelevant to the target area, potentially introducing bias into classification. This issue arises when the features learned by ML algorithms lack relevance in real-world scenarios, limiting model generalization to new cases. This phenomenon, known as “shortcut learning,” is one of the primary obstacles to achieving more reliable systems.

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In addition, within ML, random forests (RF) and support vector machines (SVM) have been among the most successful algorithms over the past 20 years due to their strong generalization and model convergence properties. Unlike traditional statistical methods and neural networks, SVMs retain only a small number of features without attempting to approximate the complexity of the control model.

Many models have also been developed for detecting malignancy in lesions, with the most successful drawing from 20th-century fractal theory and a newer approach in the past five years: radiomics. These methods are linked to the concept of personalized or precision medicine.

As part of the project Development of Automated Systems to Support Medical Diagnosis Using Artificial Intelligence for Radiological Images, funded by the NUOLU Program of AENTA at UCLV, CAD systems were developed for COVID-19, lung nodules, and breast masses, as these lesions are particularly challenging to detect at an early stage on X-rays due to anatomical and physiological factors. This article synthesizes the extensive scientific work undertaken to develop models and architectures with and without artificial intelligence (AI), which formed the basis of version 1.0 of these software systems, summarizing six years of work.

Methods

COVID-19 - Pneumonia

Three non-overlapping datasets were used. Dataset 1 consisted of 1633 chest X-ray images of various origins (international and Cuban), collected from different equipment and countries. These images were annotated by 3 expert radiologists, who followed the criteria of the Cuban Society of Radiology to classify them as COVID-19, pneumonia from other causes, and normal, by dividing each image into 6 regions. This generated 3 folders, which served as the initial labeling for training a deep learning convolutional neural network (CNN). Dataset 2 included 2040 chest X-rays from a single source (one X-ray machine), which were augmented by generating 10 variations of each original image. The augmentations included left-right rotations of up to 10 degrees, a 1.05% zoom, and brightness variations of up to 0.8%. This dataset was used to retrain the network automatically, by transferring learning from the initial training on Dataset 1 (updating the weights of the layers). Dataset 3, consisting of 339 images, was used only for external testing.

Each image was first segmented to isolate the lung region using the U-Net network. Then, the convex hull of each segmentation was extracted. This step removes irrelevant parts of the image, reducing potential biases during subsequent training. The training involved dividing each convex hull into 1, 2, 4, and 6 patches, representing 4 different models.

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Pytorch was used to implement the models, based on the pre-trained ResNet34 CNN. With 90% of Dataset 1, the network was trained for 400 epochs to adjust the layer weights, and validated with the remaining 10%. This learning was then transferred to retrain the network with 90% of both Datasets 1 and 2 (including the augmented images from Dataset 2) for another 300 epochs until model convergence was achieved, validated with the remaining 10%. The classification criterion was that if features of COVID-19 or pneumonia were found in any patch, the whole image would be classified as such. To test the generalization power of the 4 models, they were run on Dataset 3, and metrics such as accuracy, precision, and F1 score were calculated. The same metrics were used during validation. The hardware used was the UCLV HPC cluster with two K40 GPUs running in parallel. More details can be found in (3).

Lung Nodules

Three completely different approaches were used: one based on image processing and ML, and two based on deep CNNs—one with SqueezeNet 1.1 and the other with YOLO v5.

PDI-ML

In the first approach, two annotated chest X-ray datasets were used. The first dataset, used for training and validating the ML models, was the JSRT database, consisting of 247 images—93 normal and 154 with at least one lung nodule. Of this dataset, 80% was used for training and 20% for validation. For external testing, 20 digital chest X-rays were randomly selected from a combined dataset of ChestX-ray14, PadChest, and Openi. The desktop computer used had the following specifications: Processor (CPU): Intel® Core™ i7-8700 3.2 GHz, Graphics card: NVIDIA GeForce® RTX 3070 8 GB GDDR6, RAM: 32 GB (2 x 16 GB) DDR4 3200 MHz.

Image enhancement techniques were applied to reduce noise or unwanted artifacts, highlight relevant features, and prepare the data for further analysis. A normal localization filter (LN) (4) was used to achieve global contrast equalization across the image. Finally, edge enhancement was performed using homomorphic filtering. The image intensity values were adjusted to emphasize the lung region using the MATLAB function Imadjust.

The lung region was segmented using a multi-level thresholding method combined with morphological operations (4), (5). To locate and segment potential lung nodules, a local convergence sliding band filter (4) was applied. Accurate segmentation of the true nodule was then carried out using an adaptive distance thresholding algorithm (4), designed to find the center of the candidate nodule with the smallest distance to the center of the true lung nodule (reference point provided by the database).

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Seventeen features were calculated for each true nodule (5), (6), as well as for other random regions of the image without nodules. Principal Component Analysis (PCA) was used to reduce the dimensionality of the problem (6). The resulting reduced feature matrix was used to train ML classification models for lung nodule detection. Classification was performed using Random Forest (RF) classifiers (6). A summary of the procedures is shown in Figure 1.

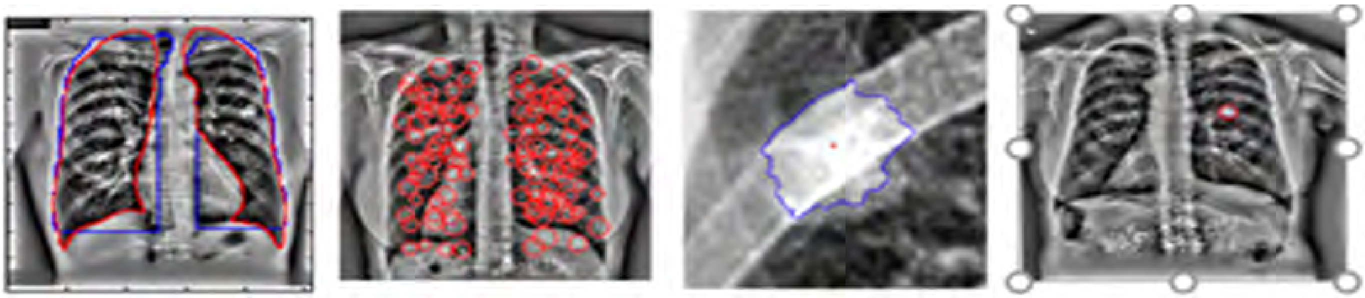

Figure 1: CAD Based on Image Processing and Machine Learning (ML)

SqueezeNet 1.1

For the second approach, the SqueezeNet CNN architecture was trained using two annotated chest X-ray datasets—one for model training and another from a different source to evaluate generalization. The training dataset combined frontal chest X-rays from ChestX-ray14, PadChest, and Openi, while the JSRT database was used for external testing. In total, 3935 normal and 1138 abnormal images were used for training/validation, without balancing techniques. All images included annotations, and data augmentation was applied by rotating each image up to 15 degrees left and right, scaling up to 110% and down to 80%, reducing brightness to 80%, and performing horizontal flips.

Three training strategies were used: training with the full image, training with U-Net segmented lung regions, and training with patches of varying sizes around normal and pathological regions.
The Grad-CAM method with a fixed threshold was used to visualize the regions the network relied on for predictions. More details can be found in (7). This part of the project was developed on a desktop computer with an Intel® Core™ i7-8700 3.2 GHz processor, an NVIDIA GeForce® RTX 3070 graphics card with 8 GB GDDR6, and 32 GB (2 x 16 GB) DDR4 RAM at 3200 MHz.

YOLO v5

For the third approach, YOLO was trained using Python and machine learning frameworks TensorFlow and PyTorch. The same datasets as in the previous experiment were used. Images were

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pre-processed and segmented with the U-Net network, and then a reconstruction network (ResNet18) was used to rebuild the original segmentation masks, isolating the lung region. Various data augmentation techniques were applied as mentioned. The nodule annotations were reformatted to YOLO's format, and three training strategies were conducted: segmented and normalized images, segmented images only, and segmented images including the mediastinum area.

For each case, the training set was split, with 80% used for training and 20% for validation. Pre-training involved 300 epochs with YOLOv5's original weights, using stochastic gradient descent for optimization. An external test was conducted using datasets of different origins.
The Grad-CAM method was also used to visualize the image regions where the models focused on detecting lung nodules. The model was validated after each epoch. Performance metrics included precision, sensitivity, F1 score, and area under the precision-recall curve. More details can be found in (8). The hardware used was a desktop computer with an Intel® Core™ i7-8700 3.2 GHz processor, an NVIDIA GeForce® RTX 3070 8 GB GDDR6 graphics card, and 32 GB (2 x 16 GB) DDR4 RAM at 3200 MHz.

Masses and Microcalcifications in Mammograms

Image Processing

In this work, edge enhancement and artifact removal were performed on the entire mammographic image using a convolution filter. Various kernels were applied to each image. For artifact removal, the image was segmented into multiple objects: dark background, breast tissue, labels, white stripes, and text. Overlapping objects were separated, and irrelevant ones were discarded. A morphological opening procedure was applied to isolate objects using a structured element (strel). For labels overlapping the breast region, a binarization technique based on the Laplacian threshold was chosen after testing several methods. Binary area opening was used on connected components to identify and separate the labels. The object of interest, the breast, was identified as the largest pixel area.

The glandular tissue was segmented using single-level thresholding based on entropy, assuming the normalized histogram represents the probability distribution of intensities. Fine adjustments were then applied, with the threshold modified by a factor kkk (ranging from 0.95 to 1.05) to ensure that the segmented gland appeared anatomically accurate, as per medical criteria. Grayscale morphological filtering was used to enhance microcalcifications. Geometric features in the image matching the shape and size of the selected strel were highlighted, while others were preserved.

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To increase contrast between identified objects, grayscale morphological transformations (white and black top-hat) were applied. Mass enhancement required determining the shape and size of the strel, which in this study was a flat-topped disk. Contrast in the detected mass was iteratively increased after separation from the pectoral muscle using active contours.

To test the CAD system, the Mammographic Image Analysis Society (MIAS) database was used, comprising 30 images with calcifications: 9 glandular, 15 dense glandular, and 6 predominantly adipose. Performance metrics calculated included sensitivity, accuracy, specificity, and precision. Further details can be found in (9).

Masses with Inceptionv3

From the MIAS DB, a program was designed in Matlab that as a result extracts an ROI that contains the anomalous region. Each chosen patch was augmented by means of geometric transformations consisting of random translations between -15 to 15 pixels in both axes, random rotations between 0° and 360°.

Two CNNs were generated based on the Inception v3 architecture, one for binary classification and the other in 3 classes, receiving as input data the patches received in the previous step. In the process of fine-tuning the network, the learning rate in the early stages remained small, while in the later layers the learning rate value was set high. In this way, the filter coefficients do not change too much in the early stages, in which low-level characteristics are learned, but not in the last stage, where the network learns to differentiate what is a mass from what is not, or to classify these as malignant and benign. To improve results and avoid overfitting, L2 regularization, batch normalization, and abandonment are used. A 6GB NVIDIA GeForce® GTX1060 graphics card was used. The architectures were trained on 80% of the data and validated on 20%. Sensitivity, specificity and area under the ROC curve were calculated as performance indicators. A greater number of details can be reviewed in (10).

Masses with YOLOv5

Two sets of annotated mammograms with the same origin, partitioned into 80% and 20% respectively, were used to train the model and for the internal validation process. To make parameter adjustments, 100 images were taken from two radiologists, with more than 10 years of experience, from the "Celestino Hernández Robau" University Hospital Clinical Surgical Teaching.This step served to adjust and monitor the performance of the pre-trained network in the face of the biomedical problem of nodule detection. To do the external test, BD MIAS was used. In total there were 18434 normal images and 1888 with masses for training/validation. No rocking

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techniques were applied. Data augmentation was carried out by rotations of 20º, fractions of the image size of 0.1 for translation and 0.5 for scaling. The values of the HSV model (brightness, hue and saturation) were modified.

The Python programming language and the YOLOv5 Ultralytics architecture were used in two models, one denser v5x trained in google collab and a less dense v5s, trained on a desktop computer with the following features: Processor (CPU): Intel® Core™ i7-8700 3.2 GHz and Graphics Card: NVIDIA GeForce® RTX 3070 8 GB GDDR6. RAM: 32 GB (2 x 16 GB) DDR4 3200MHz.

The effectiveness of the nodule detection system was measured by five factors: accuracy, sensitivity, F1 score. The area under the curve of Precision vs Sensitivity was also analyzed. These measures were calculated in validation and external testing. More details of the implementation can be found in (11).

Benign-malignant classification

Fractals

To separate the CD-LIDC-IDRI DB into 2 benign-malignant classes (Figure 2 left), they are subjected to a segmentation stage on the Pylidic platform, to separate the nodule from the rest of the image. At this stage, each pixel was filtered, according to its luminance level, to differentiate the node from the background of the image. To do this, the Yanni-Horne thresholding method is used. Then the operator Sobel worked with 3x3 pixel masks. The masks were designed to detect maximum at the edges. This result can be seen in Figure 8 (right). The fractal dimension of these edges was calculated using the Box Counting method and the power spectrum. More details can be found in (12).

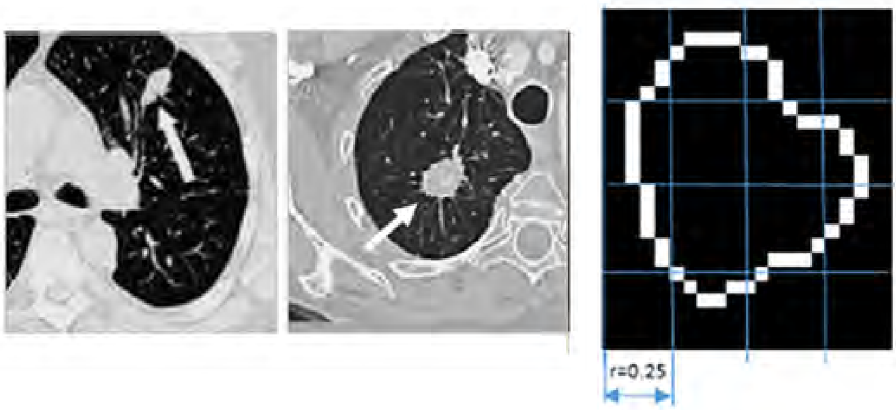

Figure 2: Classes to be separated (benign-malignant) on the left and contour delimited by Yanni-Horne and Sobel on the right.

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Radiomics

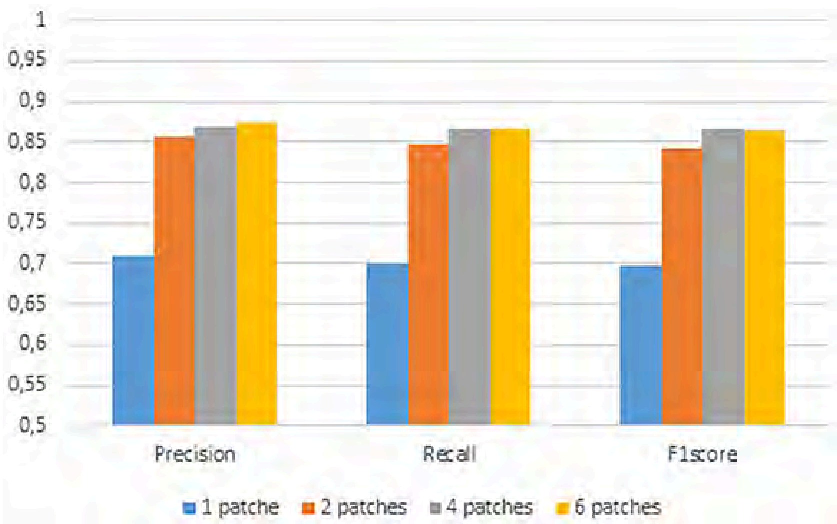
The nodules were segmented by Kuritas methods and by minimum error threshold, on the Pylic Platform. A 3D voxel was then constructed by reconstructing all the 2D slices where the nodule is visible in the form of a CSV file. 1165 cuts were used where 275 nodules are present. The CSV is introduced to the Pyradiomic platform where 102 characteristics are calculated, of shape, texture and 1st and 2nd order dististics. Pearson's correlation coefficient calculation between the database annotation and each radiomic feature extracted in the entire image set was then used to reduce the size of the problem. With the characteristics capable of determining the 2 classes (benign-malignant), 4 models of SVM and 4 RF models were trained in binary classification and in classification in 5 degrees of malignancy. Data were divided 80% for training and 20% for validation. Performance was assessed using sensitivity, specificity, accuracy, and precision. More details can be found in (13). To execute the programs and calculations, a computer with the following features was used: Processor (CPU): Intel® Core™ i5-4310M 2.70 GHz, RAM: 8 GB DDR4, Storage: HDD 500GB.

Results

For reasons of space, only the most successful strategy of each model is presented. All the results can be consulted at (1)-(13).

Covid 19-Pneumonias-Normal with ResNet34

The results of the validation from the training carried out agree with the sum of dates 1 and 2 (90%), demonstrating the generalization power of the 4 models. The best model was the 6-patch model (Figure 3). A detailed description of results can be found in (3).



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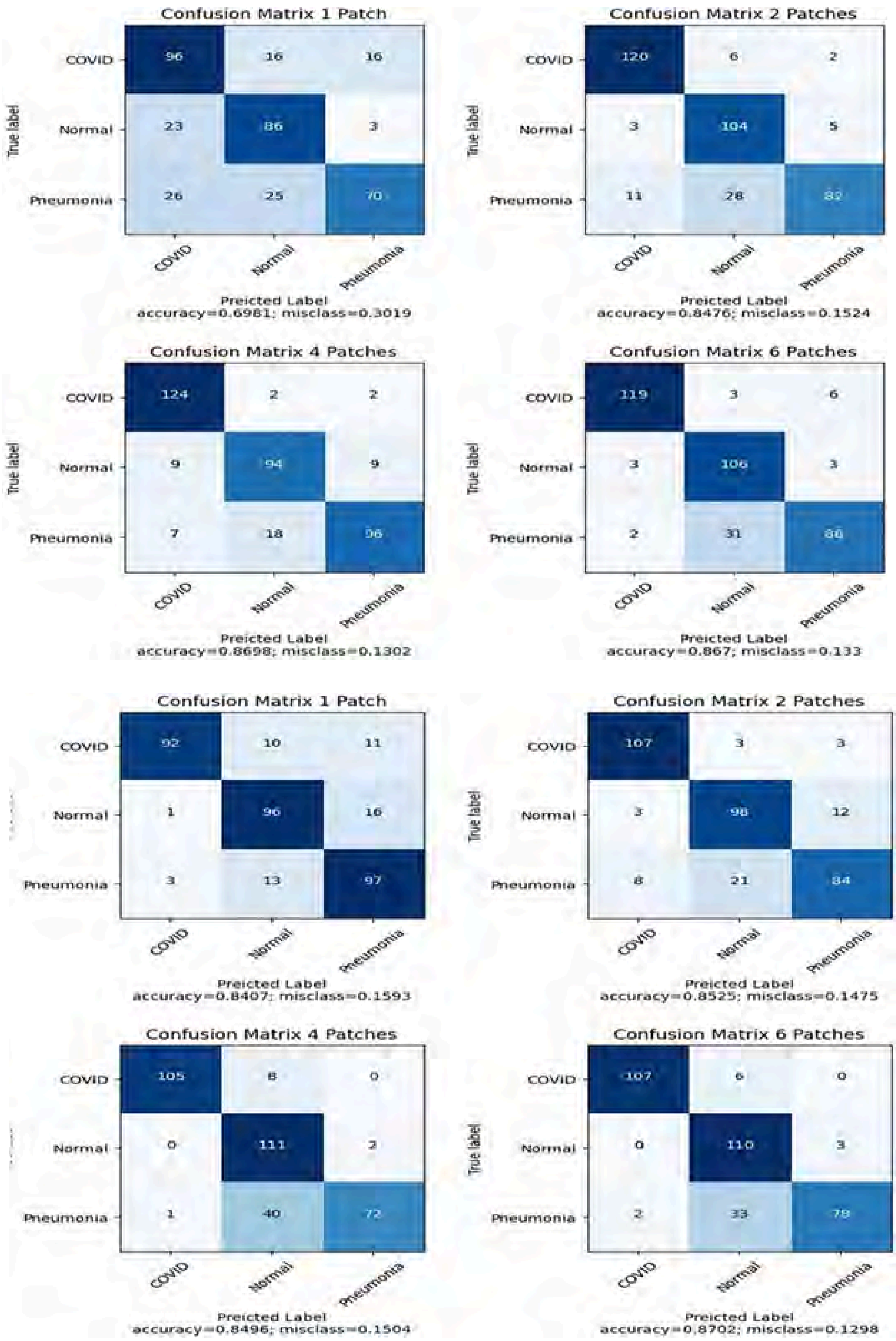

Figure 3: Results in validation and external testing.

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PDI-ML Lung Nodules

Table 1 shows the confusion matrix of the 4 RF models during validation. The main diagonal shows the well-classified hits or cases, while the other diagonal shows the errors (false positives (FP) and false negatives (FN)). The bottom shows the performance of the best model during the external test. The classification was made based on 9 main components (6) of the original 17 characteristics (5), which contain 96.26 % of the variability of the data and were therefore chosen as attributes to execute the classification.

Table 1: Confusion matrix of the 4 RF models during validation.

	Model 1		**Model 2**		**Model 3**		**Model 4**	
	Nodule	Non-Nodule	Nodule	Non-Nodule	Nodule	Non-Nodule	Nodule	Non-Nodule
Nodule	**129**	20	**130**	19	**138**	11	**119**	30
Non-Nodule	39	**108**	45	**101**	84	**63**	26	**121**

Model 1	**Sensitivity (%)**	**Specificity (%)**	**Precision (%)**	**Accuracy (%)**	**Balanced accuracy (%)**	**F1 score (%)**
External test	100	80.00	83.33	90.00	90.00	90.91

Lung Nodules with SqueezeNet 1.1

The strategy of training with small patches around lesions and healthy areas allowed for the best results. The sensitivity was (88.77%), precision (94.05%), accuracy (94.40%), balanced accuracy (92.99%), and the F1-score value (91.34%).

However, during the external test the model did not show generalization power. Sensitivity (40.94%), precision (91.04%), accuracy (78.97%), balanced accuracy (69.46%) and F1 value (56.48%) did not show good results. That is why it was not implemented in software. However, CNN SqueezeNet has shown potential for the proposed task, but it needs adjustments in terms of the greater number of eras to consider in training and the use of a much larger training dataset. Another solution may be the use of a deeper network or the use of object detection algorithms such as YOLO, More results can be seen in (7).

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Lung Nodules with YOLOv5

The strategy of training with segmentation that includes the mediastinal area provided the best results. The best result was achieved at epoch 169 and after its final validation it reaches a maximum sensitivity of 87%. The Grad Cam map in Figure 4 visually shows the performance of the model.

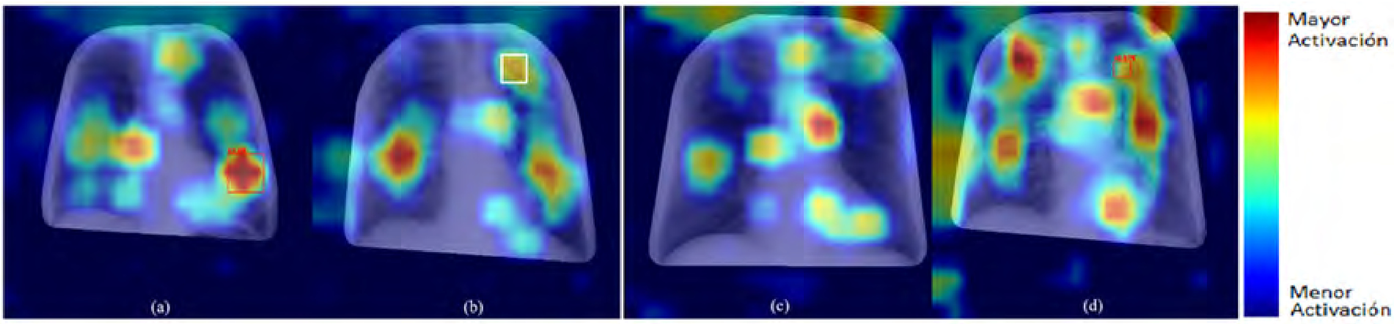

Figure 4: GradCam for pulmonary nodules

The results during the external test reproduce the above, so this model achieves generalization power and is implemented on a software solution for clinical routine. More results can be seen in (8).

Masses and microcalcifications in breasts with IDPs

Table 2 shows the performance of the designed CAD. These results are internationally competitive, therefore, it is decided to add a DL stage to the System to improve its classification even more. The rest of the results can be seen in (9).

Table 2: Performance of CAD to detect microcalcifications and PDI-based masses

Index	Numerical value The percentage
True positives	69
True negatives	35
False positives	6
False negatives	5
Exactness	90.4 %
Precision	92.0%
Sensitivity	93.2%
Specificity	85.3%
Area under the ROC curve	89.2%

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Breast masses with Inceptionv3

The models showed good results in validation. They had an accuracy of 91.3%, sensitivity of 93.33% and specificity of 90.32% in classification in 2 classes, while for classification in 3 classes the results were between 85% and 88% in all indicators, which corresponds to the international standard.

The training and validation results are good. Very few FP and FN were obtained with both models for various types of breast composition, which proves the potential of the implemented models (Table 3).

Table 3: Classification errors with InceptionV3 in binary classification and in three classes.

Binary classification	Adipose	Glandular	Glandular denso	Classification into 3 classes	Adipose	Glandular	Glandular dense
False Positives	1	1	0	False Positives	1	0	2
False negatives	1	1	2	False negatives	1	0	0

In this experiment, no external test was carried out, since there is data from very few samples, which guarantees that there is no overfitting, so the level of generalization of the models has not been tested. The rest of the results can be seen in (10).

Masses with YOLOv5

The results of both the denser v5x and the less dense v5s model are similar (Table 4). The model not only detects the mass but also gives the probability value that it really is. However, it must be said that small modifications of the IoU conf-thes parameter can substantially modify the results, so the requests of specialists should always be heeded. During the external test, these results were reproduced, demonstrating the generalization power of the model. More results can be seen in (11) with this model. Once trained, he himself has been put in a routine clinical service of a Cuban hospital, in trial mode.

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Table 4: Model Performance

Model	Sensitivity	Time of entry	Validation time	Detection time	GPU consumption
YOLOv5s	80%	10 a.m.	7.5 s	32.2 ms	6.4 GB
YOLOv5x	78%	6 p.m.	49.4 s	197.2 ms	14.6 GB

Benign-malignant classification in lung nodules with fractals

The designed CAD successfully separates into 5 degrees of malignancy from the Fractal Dimension (FD) calculated by both Box Counting and power spectrum. Table 5 shows their performance.

Table 5: Performance of the classification CAD by both methods.

Method	Accuracy (%)	Sensitivity (%)	Specificity (%)
Box Counting	91	85	92.5
Power Spectrum	92	85	93.7

More results can be seen in (12)

Benign-malignant classification in pulmonary nodules with radiomics

Of the 102 radiomic characteristics calculated, 5 managed to separate the benign malignant classes and 3 managed to separate into 5 degrees of malignancy. These were used in 4 models of SVM and 4 RF. The best SVM model was achieved in binary classification and achieved 100% accuracy, 92% sensitivity, 100% specificity, and 98% accuracy. The best RF model was achieved in non-binary classification and achieved 90% accuracy, 95% sensitivity, 94% specificity and 95% accuracy, so this approach presents superior results to those obtained with fractal dimension-based methods. More results can be seen in (13).

Discussion

By way of general discussion, it should be noted that all the classification models included in the proposed CADs have allowed the quantitative characterization of the various lesions with computational effectiveness and efficiency. The different approaches, whether they are PDI, machine learning based on attribute vectors or deep learning with convolutional neural networks, have shown that, although the approaches to the solutions of the problems are very different,

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results have been achieved in different ways that are at the level of the current international standard in professional systems. It has been shown that CNNs are capable of obtaining excellent results given the potential they have shown to have for different tasks, however, the achievement of generalization power is very much determined by the amount of training data used to avoid over-adjustments of them. However, in Medicine, there is not always the amount of data required to avoid biases and overfits in the models. Data augmentation methods play an important role in this regard. However, in the future, generative AI must fill this gap. So far in x-rays none of them can generate images that are indistinguishable from the real ones, therefore achieving classification noives between 80% and 95% is considered very good and so far the most successful systems with generalization power classify in this order (1), (2).

In the case of ML methods that do not perform deep learning, and that require the construction of an input attribute vector, to date it has been proven that models based on SVM and RF, among others, continue to be the most accepted by the scientific community (6), (12), (13). They manage to have acceptable correct classification percentages (above 90%) with a relatively lower amount of data than CNNs. Its success lies in the quality of the vector of input traits chosen and in how the dimension of the problem to be solved is reduced so that it is computationally efficient and suitable for clinical routine. In this sense, methods such as PCA (6) and radiomics (13) are proving to be very competitive worldwide.

Conclusion

Three systems were developed from various AI models and architectures developed during this project, which detect injuries above human performance. The 6-patch model to detect Covid 19-Pneumonia has a sensitivity of 100% for Covid 19 and 87% for pneumonias of various causes. The YOLO v5 model based on image segmentation including the mediastinum area, detects lung nodules with 90% sensitivity and generalization power. The YOLOv5 model for breast from a complete mammography image detects small, low-contrast masses with 80% sensitivity and generalizability. The radiomics approach has shown great potential for the malignant-benign classification of pulmonary nodules with indicators above 90%.

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Harnessing the Power of Artificial Intelligence to Revolutionise Proton Therapy: Enhancing Precision, Efficiency, and Patient Outcomes

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Krishnan and Ranjith

Introduction

Proton therapy is a sophisticated form of radiotherapy that utilises protons to deliver highly precise radiation to tumours, offering a superior dose distribution profile compared to traditional photon-based therapies. This precision allows for the sparing of surrounding healthy tissues, making it particularly advantageous for tumours located near critical structures. Despite these benefits, proton therapy is still susceptible to patient-specific variations, anatomical changes, and daily setup inconsistencies, which present significant challenges to consistently delivering accurate doses.

Artificial Intelligence (AI) integration into proton therapy workflows offers promising potential to address these complexities. AI-powered technologies enable the creation of adaptive treatment protocols that leverage data-driven decision-making to improve treatment precision and efficiency [1]. This article explores how AI advancements help manage uncertainties in proton therapy, focusing on real-time adaptations to anatomical variations. Conventional workflows often struggle to accommodate these variations effectively, which can lead to suboptimal outcomes. In contrast, AI-based techniques offer automated solutions for online adaptive proton therapy, integrating synthetic CT (sCT) generation, automated planning, and advanced quality assurance (QA) protocols.

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AI-Based Solutions for Auto Contouring

Contouring of target volumes and surrounding tissues is a critical step in radiotherapy treatment planning. Accurate delineation is essential for achieving optimal therapeutic outcomes while sparing healthy tissues. However, variations in contouring practices can introduce uncertainties, particularly in proton therapy, where precision is crucial to maximise dose conformity and minimise the impact on critical structures. Differences in clinician practices, institutional protocols, and contouring tools contribute to these inconsistencies [2].

AI-based contouring solutions are addressing these challenges by standardising structure delineation and reducing inter- and intra-observer variability. Advanced AI and machine learning (ML) algorithms, such as deep learning (DL) models, utilise neural networks to identify complex patterns in medical images, enabling automated and precise segmentation. This is especially relevant in proton therapy, where steep dose gradients demand high precision.

Several commercially available AI-based contouring systems, such as Mirada RTx and Limbus AI, employ ML and DL models for the automated contouring of organs at risk (OAR) [3]. Solutions like MD.ai and DeepMedic enhance segmentation precision using convolutional neural networks (CNNs), while RayStation and Elekta's ADMIRE integrate DL techniques for automated contouring tasks. Varian Ethos utilises adaptive AI models to adjust contours based on daily anatomical changes, while Velocity combines AI with deformable image registration (DIR) for accurate tumour tracking. Cloud-based platforms like MVision AI provide DL-based OAR contouring, and Radformation's ClearCheck optimises workflows with AI-driven delineation.

These AI-based tools reduce contouring time, ensure uniformity and accuracy, and enhance the reproducibility of contours in clinical settings. In proton therapy, where small deviations can impact dose delivery due to the sensitivity of proton beams to anatomical changes, consistent and accurate contouring is crucial for achieving the best patient outcomes.

Synthetic CT - Application of AI

The incorporation of sCT and ML models in proton therapy addresses critical challenges related to adaptive planning and patient-specific dosimetry. Synthetic CT generation involves creating high-quality CT-like images from other imaging modalities like MRI, providing a solution to improve dose calculation accuracy without additional CT scans. MRI's superior soft tissue contrast is particularly beneficial in proton therapy, where precise tissue density information is vital.

ML models, such as CNNs and generative adversarial networks (GANs), are instrumental in generating sCTs by learning complex mappings between MRI and CT images [4]. These AI-generated sCTs maintain high spatial accuracy, reducing the need for ionising radiation and

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streamlining the workflow. Moreover, reliable sCTs enhance treatment planning precision, essential for proton therapy's steep dose gradients.

In addition to sCT generation, ML models support treatment plan optimisation, dose prediction, and online adaptive therapy. AI-based systems can predict anatomical changes and adapt plans automatically, ensuring accurate dose delivery. For example, AI algorithms can identify anatomical deviations, generate updated sCTs, and adjust the dose distribution in real time, improving treatment precision and effectiveness.

Adaptive Treatment Workflow

Adaptive treatment workflows are essential for managing daily anatomical changes, variations in patient setup, and organ motion, all of which can impact dose distribution. AI-powered solutions are integral to these adaptive workflows, enabling dynamic adjustments to treatment plans [5]. AI models facilitate the generation of sCT images from non-ionising modalities like MRI, reducing the need for additional CT scans and minimising radiation exposure. These high-quality sCTs are used for daily dose recalculations, enhancing workflow efficiency. AI-based tools also automate the segmentation of updated images, detect anatomical deviations, and re-optimise treatment plans in real time. Systems such as Varian Ethos and Elekta's Unity use DL models to modify contours based on daily image guidance, ensuring precise dose delivery.

Furthermore, AI-driven workflows streamline the QA process by automating the analysis of treatment parameters. AI algorithms analyse log file data, detect deviations in spot size, position, and monitor units (MU) values, and compare them with planned values. This automated approach improves the accuracy and reliability of beam delivery while significantly reducing manual QA effort [6].

Conclusion

The integration of AI into proton therapy workflows marks a significant advancement in treatment precision and efficiency. By addressing challenges such as anatomical variations and daily uncertainties, AI-driven solutions—ranging from automated contouring and synthetic CT generation to adaptive planning—have enhanced dose accuracy and patient outcomes. These innovations streamline workflows, reduce variability, and facilitate responsive treatment adjustments, representing a transformative step towards more personalised and effective cancer care. As AI technologies continue to evolve, proton therapy is poised to deliver even greater clinical benefits in the future.

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About the Authors

Ranjith C P is a Senior Medical Physicist at the Proton Therapy Centre, Department of Radiation Oncology, Advanced Centre for Treatment, Research and Education in Cancer (ACTREC), Tata Memorial Centre, Mumbai, India. He is currently pursuing a PhD in Physics, focusing on the "Implementation of Machine Learning Models in Proton Therapy Quality Assurance" under Dr. **Mayakannan Krishnan** at D. Y. Patil Education Society (Deemed to be University), Kolhapur. Ranjith holds certification from the Clinical Medical Physics Association (CMPI), India, and was honoured with the Kingston Medical Physics Award in 2018. He has published eight papers in international journals, with four as the first author, and has presented his research on machine learning applications at various national and international conferences. His active engagement in proton therapy QA research and education reflects his dedication to advancing this field.

Doing Science in Cuba: Dr. Marlen Pérez-Díaz

Pirchio Rosana

Secretary, IOMP Medical Physics World Board (MPWB) Committee

It is a tremendous joy to highlight the work of an exceptional professional who, against all odds, has made her unique mark on her research.

Dr. Marlen Pérez, Doctor in Physical Sciences and Senior Professor at the Universidad Central "Marta Abreu" de Las Villas (UCLV), works within the Faculty of Electrical Engineering (FIE), specifically in the Department of Automation in Cuba.

With over eight years as a Senior Professor in the Department of Automation at UCLV, Dr. Pérez previously served as an Associate Professor at the Laboratory for Studies on Electronics and Information Technologies within UCLV's and Department of Physics. She has authored more than 60 publications in medical physics, won multiple awards, and held several international fellowships in countries such as Germany, Belgium, Spain and Italy.

Dr. Pérez is a nominee for the 2024 National Prize of the Cuban Academy of Sciences. Her project, titled Development of Automated Diagnostic Support Systems Based on Radiological Images Using Artificial Intelligence and Digital Image Processing, involves over 20 collaborators, including physicians, physicists, engineers, and technicians from Manuel Piti Fajardo Hospital, Arnaldo Milián Castro University Hospital and Celestino Hernández Robau Oncology Hospital.

An interview session with Dr. Perez is recorded as follows:

First, thanks a lot for your time, so Marlen, will start about your life, How was your childhood and adolescence in Cuba?

My childhood was very beautiful. I was born in a country town, with a rather humble origin. I am the only child and granddaughter of Spanish emigrants. The people who surrounded me as a child, in my eyes were very good. I could visit the whole neighborhood. I had a lot of friends and we did a lot of extracurricular activities of all kinds. The school was excellent, with very good teachers and I enjoyed it very much. I became a voracious reader from the age of 10.

Adolescence was also great. I went to a very good school, specializing in exact sciences. Already in 8th grade I was a Physics instructor and I began to participate in competitions. I had an excellent teacher who inspired me during high school, almost like a second father, Professor Wilfredo Rivero, one of the most intelligent and methodical people I know. It was the golden age of education in Cuba.

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What did you want to be when you grew up?

I was always thin and wanted to dance ballet as a child, but dad said he was sure he would have a scientific daughter. And then, when I was older, I immediately fell in love with Physics and Mathematics, although I also liked literature and the arts a lot, but when I was 17 years old I knew that I would choose a career in Physics. I started Nuclear Physics Engineering in 1988 in Havana.

Did your family and friends feel proud of the position you reached?

My parents always supported me, even when I was only 12 year-old and went to boarding school. And they were always very proud of me. I come from a family where each generation took a step forward. They were very hard-working people who never had anything easy. They taught me to fight for dreams. Apart from the fact that they were exemplary fathers, I say that they were all-terrain. Especially my father was my soul mate, a very intelligent man who told me that nothing was impossible. In the face of my doubts and fears he told me: "when you don't know a place, you are never lost". The values that both instilled in me I try to transmit to my own son, a wonderful young man who today studies Computer Science at the University. For me, family has always been and is today a source of constant inspiration and support. I love and value them very highly. I also have friends that I consider like family, whom I admire and love and I think the feeling is reciprocal.

About your work, what inspired you to pursue this line of research? Have you always chosen topics related to imaging? why?

Imaging reveals the inner workings of the human body—things that are not visible on the surface. Since I am passionate about physics and mathematics, imaging allows me to apply both fields in a way that can help people, sometimes even save lives.

How would you define yourself and the work you've done so far?

I am a persistent person. My results are the product of discipline and focus. The work I've done represents the best that could be achieved at each stage, but even when I feel satisfied, a new challenge or a new idea always arises for improvement. It's a continuous pursuit of bettering what has been achieved.

What aspects of your work do you enjoy the most?

I am passionate about the process. Generate a good project, find the resources to do it and carry it out, see the finished result and if it is in use even better. The more difficult and challenging the more exciting it is.

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What are the obstacles you face in your work?

My biggest challenge is managing the sheer number of simultaneous responsibilities, both professional and personal. Balancing time across so many tasks is tough. Research requires patience; achieving results is something that can't be rushed, as each stage needs time to mature. Teaching is also a passion, but it requires time to prepare classes, grade exams, submit reports, attend meetings, and respond to online activities. In short, time is a relentless factor.

Do you have a supportive team at work?

Yes, I work with a great team. The group is crucial, particularly because it includes talented young people who bring fresh ideas and a strong desire to learn. I enjoy sharing what I know with them and learning from all of them, as scientific discussions are always an exchange. However, the young team members often move on after a year or two to continue their studies or careers elsewhere, and new students arrive to start fresh, which is part of the process. My more experienced colleagues are equally very important, each specializing in their area and contributing their unique perspectives, which is essential for multidisciplinary research. Today, it's almost impossible to achieve much entirely on one's own. Our group is small, but we work well together, almost like a family, with a lot of mutual respect and support.

Have you ever considered working abroad? You must have had offers.

Everyone's decisions are shaped by their own lives, motivations, conflicts, and personal goals. Opportunities do come up, but it's important to stay consistent with what you believe in and love.

What was your biggest challenge?

Learning a completely new area of knowledge from scratch in a short time. AI has advanced rapidly and provides practical tools for tasks traditionally approached differently.

What was the project that brought you the greatest satisfaction?

I have a deep appreciation for all my projects. However, I remember with particular fondness—and even a bit of pain—the work we did to detect COVID-19 using AI and chest X-rays. We quickly implemented the algorithm in a clinical setting on a trial basis, which helped many people in my country during the 2021 pandemic when access to testing was limited.

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What future goals or achievements do you have in mind?

The most important goal is to keep learning every day. We are now focusing on neuroimaging projects and hope to achieve useful results in that field as well.

Are there any groups or individuals you still hope to collaborate with? Why?

I have a strong connection with the University of Trieste, the ELETTRA Synchrotron, and the ICTP—an institution that nurtures physicists from the developing world. I learn a lot from them, and each time I visit, I feel at home.

What do you see yourself doing when you retire? with a hobby or job that you were putting off?

I still don't see myself retired. My natural environment is the University, contact with young people, the classroom, the laboratory, scientific discussions. Apart from that, I really like to travel and learn about other cultures. I have great friends who I love very much in different places in the world, who make me not feel like a foreigner when I am away from home, which I am very grateful for. The truth is that I have met good and supportive people wherever I want, with whom I have lived tremendously enriching experiences. They are also part of my present and I hope my future.

What legacy do you hope to leave, or what advice would you give to someone interested in a research career?

My advice would be to study, prepare well, and above all, be persistent and maintain scientific integrity.

Calendar of Events (Jan - Jun 2025)

SEAAPM 2005 Symposium & Annual Meeting
When: Jan 29 – Feb 1, 2025
Where: Hotel Crowne Plaza in Knoxville, Tennessee, USA
Website: https://seaapm.regfox.com/seaapm-2025-annual-meeting

2025 SWAAPM Annual Meeting
When: Feb 13 – 15, 2025
Where: Hilton Hotel in Baton Rouge, Louisiana
Website: https://site.pheedloop.com/event/SWAAPM2025/home/

Biophysical Society Annual Meeting 2025
When: Feb 15 – 19, 2025
Where: Los Angeles, California, USA
Website: https://www.biophysics.org/2025meeting#/

20th European Molecular Imaging Meeting
When: Mar 11 – 14, 2025
Where: Bilbao, Spain
Website: https://e-smi.eu/meetings/emim/2025-bilbao/

2025 RSS Scientific Meeting
When: Mar 20 – 22, 2025
Where: The Westin La Paloma, Tucson, Arizona, USA
Website: https://therss.org/events/2025-rss-scientific-meeting

AIMBE 2025 Annual Event
When: Mar 29 – 31, 2025
Where: Renaissance Arlington, Virginia, USA
Website: https:/annualevent.aimbe.org/

2025 SBI Breast Imaging Symposium
When: Apr 24 – 27, 2025
Where: Colorado Springs, Colorado, USA
Website: https://www.sbi-online.org/events/2025-sbi-breast-imaging-symposium

ESTRO 2025
When: May 2 – 6, 2024
Where: Vienna, Austria
Website: https://www.estro.org/Congresses/ESTRO-2025

ACR 2025
When: May 3 – 7, 2025
Where: Washington, DC, USA
Website: https://www.acr.org/Lifelong-Learning-and-CME/Meetings-and-Course-Calendar/ACR-Annual-Meeting

ISMRM & ISMRT Annual Meeting & Exhibition
When: May 10 – 15, 2025
Where: Honolulu, Hawaii, USA
Website: https://www.ismrm.org/25m/

57th National Conference on Radiation Control
When: May 19 – 22, 2025
Where Tucson, Arizona, USA
Website: https://crcpdannualconference.org/

COMP 2025 Annual Scientific Meeting
When: Jun 4 – 7, 2025
Where: London, Ontario, Canada
Website: https://comp-ocpm.ca/2025-asm

SIIM 2025 Annual Meeting
When: May 21 – 23, 2025
Where Oregon Convention Centre, USA
Website: https://siim.org/event/siim25-annual-meeting-informaticstech-expo/

AAMD 50th Annual Meeting
When: Jun 15 – 18, 2025
Where: Caesars Palace, Las Vegas, USA
Website: https://www.medicaldosimetry.org/meetings/aamd-50th-annual-meeting/

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