EFOMP

The European Federation of Organisations for Medical Physics Bulletin

European Medical Physics News

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Cover page photographs: May 1979 - London meeting of medical physics representatives from 15 countries, when it was decided to establish EFOMP; photograph courtesy of Prof. John Clifton. October 2019 - Attendees at the EFOMP Council meeting held in Warsaw.

Editorial

I am writing this editorial during the second half of August, towards the end of the summer. I hope that you have had a chance to have a break, most likely in your own country, or perhaps some of you have been brave enough to venture further afield.

The main theme of this issue of the newsletter is one of celebration, to acknowledge the fact that 2020 marks the 40th anniversary of the foundation of EFOMP! The cover page features a photograph taken at the Medical Society of London in May 1979, showing the participants of a meeting called by the UK's Hospital Physicists' Association (IPEM's precursor), to discuss the formation of a European Medical Physics organisation. During the meeting, representatives of the medical physics organisations from fifteen countries unanimously agreed to establish a Federation; this resulted in the formation of EFOMP, which held its first meeting, again in London, in May 1980 – thus, EFOMP was born!

While planning this issue, I contacted past-Presidents of EFOMP to ask if they would be willing to write about their time in office. The response was immediate and overwhelmingly positive, with the result that this newsletter contains articles written by eight past-Presidents, starting with our very first President, John Clifton, and covering the complete span of EFOMP's 40-year existence. To conclude the set of presidential articles, Marco Brambilla writes about his three years as EFOMP's current President, while Vice-President Paddy Gilligan tells us what he has in mind for his upcoming presidency. I am sure you will agree that all of the articles are highly informative, interesting and entertaining! Continuing the celebratory theme, EFOMP delegates from OeGMP have contributed an article about the very positive impact that EFOMP has had on the Austrian National Member Organisation over the years. Unfortunately there is also a sad note, since EFOMP's second President, Professor Jean Chavaudra, passed away in April; you can read his obituary in this issue.

The Autumn newsletter contains a number of regular features, including a medical physics book review, and an overview of recent papers published in Physica Medica by the journal's Editor-in-Chief, Paolo Russo. There is another excellent cartoon strip by AURORA Young minds from the Czech Republic, demystifying medical technology for the general public. We are lucky that our colleagues around Europe are always willing to share their diverse interests and hobbies – in this issue we have articles about medical physicists' voluntary work and volleyball team support!

Returning to the practice of medical physics, you can find an article about IPEM's Master's level accreditation scheme, as well as two fascinating articles by early-career medical physicists, describing their research into different aspects of breast imaging. Contributions from our Company Members are always welcome and you can find several articles in this issue, updating readers on companies' products and activities. An interesting development this year has been the publication of a Wikipedia page about EFOMP; you can find an article in the newsletter about how this came about and what was involved.

Finally, returning to the "EFOMP@40" celebrations, the newsletter includes a call for readers to contribute Haiku verses around the themes of medical physics, EFOMP and our 40th birthday. I encourage you to enter the EFOMP Haiku Contest – winning verses will be published in our next EMP News issue.

I hope you will enjoy reading this issue of European Medical Physics News!

David Lurie and the Editorial Team
(pubcommittee@efomp.org)
August 2020

David Lurie holds a Chair in Biomedical Physics at the University of Aberdeen, UK, where he has researched and taught MRI Physics since 1983. In 2017 he was awarded the Academic Gold Medal of IPEM. David Lurie is Chair of the Communications and Publications Committee of EFOMP and Vice Chair of the Course Accreditation Committee of IPEM.

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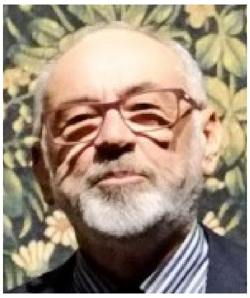

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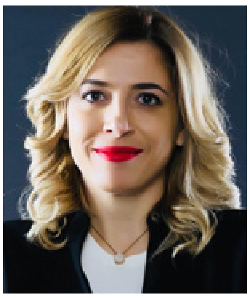

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40
YEARS
1980 - 2020
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EFOMP 40th BIRTHDAY ARTICLE

EFOMP's 40th Anniversary – Recollections of the first President

Prof. John Clifton was EFOMP's first President, serving in that role from 1980 to 1983. In this article he recalls the foundation and early years of EFOMP, along with subsequent developments.

Prof. John Clifton receiving the Bronze Medal of the Medical Society of Slovakia from Dr. Ivan Manka in Smolenice in September 1986.

In February 1978, near the end of my term of office as President of the UK's Hospital Physicists' Association (HPA), I suggested to the HPA Executive Council there was a need to establish a body that would be recognised by the European Union as representing the unified opinion of European Medical Physics, "A voice for Medical Physics in Europe". To achieve this objective, I proposed that the HPA should undertake the task of forming an association that embraced all the existing European national medical physics organisations. The HPA Executive Council endorsed this proposal, and the HPA began the task of forming what would ultimately become EFOMP. Support was provided to the HPA by the British Institute of Radiology (BIR) and the International Organisation for Medical Physics (IOMP), the latter providing a list of medical organisations in Europe known to the IOMP. Letters were sent to these organisations and other contacts seeking their support and inviting them to a meeting in London to discuss the proposal.

A meeting with medical physics representatives from fifteen European countries was held in London over 10th-11th May 1979 at which it was enthusiastically agreed to establish a European-wide Medical Physics organisation. At a second meeting on 7th-9th May 1980 in London, representatives of 14 countries approved the draft constitution and EFOMP was formally established. I had the unique honour to be elected the first President of the Federation.

The constitution of the Federation required that each country was represented by a single national organisation. In several countries there were several organisations that claimed to represent medical physics. The advent of EFOMP forced them to establish a single national organisation. Italy was a typical example. The merger of several bodies resulted in the formation of the Associazione Italiana Fisica Biomedica (AFIB) and I was invited to speak at the inaugural symposium of the Associazone, held in Florence in March 1981.

In other countries Medical Physics was frequently a subsection of the national Radiological Society. This was the situation in the German Democratic Republic. In June 1981 Professor Stewart Orr and I visited East Berlin, to meet with Dr. Manfred Tautz, to help him form a separate GDR Medical Physics organisation, independent of the GDR Society of Radiology. The new organisation, once formed, had to be approved by the GDR State before it was allowed to join EFOMP. We entered East Berlin through the infamous "Checkpoint Charlie"; I suspect we were listed by the KGB as potential spies!

It was important to seek to overcome the difficulties of communication with member organisations in countries that were behind the "Iron Curtain" that existed in 1981. So I visited Prague to meet Dr. Novotny of the Czechoslovakia Society of Radiological Physicists and attended the Symposium of Radiological Physicists held in Bratislava in October 1981. Attendance at the Symposium provided a unique opportunity to meet with many colleagues from those countries.

In my President's Letter, published regularly in EMP News, I tried to keep the membership fully informed of the many activities I performed to promote the Federation. There were also some significant activities that happened after I ceased to be President.

In September 1986, I took part in a second Symposium of Radiological Physicists, now with EFOMP participation, held in Smolenice. There, to my surprise, at the end of the conference I was presented with the Bronze Medal of the Medical Society of Slovakia, the citation reading "in recognition of EFOMP's achievements in promoting Medical Physics throughout Europe."

In September 1991, EAR established the European Congress of Radiology, permanently located in Vienna. A discounted registration fee was available for medical physicists. At a meeting of the EAR/EFOMP Liaison Group in May 1998, examination of the registration records of the 1997 Congress revealed that many individuals who were not medical physicists had made use of this discount. Professor Nüsslin, then President of EFOMP, and I agreed that medical physicists would in future pay the full registration fee. In return, to continue their support of European medical physics, EAR would pay the total equivalent registration discount fee to EFOMP, thus substantially increasing the finance available to the Federation. It was also agreed that EFOMP should be represented on the ECR Congress Planning Committee. As Chairman of the EFOMP Scientific Committee at the time, I was appointed to that post.

If you look back at the inaugural meeting of the Federation with 14 member organisations representing some 3000 medical physicists and compare it to the size of the Federation today, EFOMP can truly claim to be "the voice of Medical Physics in Europe"!

John Clifton

Prof. John Clifton is Professor Emeritus in Physics Applied to Medicine at the University of London. Before his retirement in 1993, he was Professor of Medical Physics in University College London (1987) and Joel Professor of Physics as Applied to Medicine in University of London (1990).

Following Technical College training in engineering, he graduated with an Honours degree in Physics from Southampton University in 1955, then with an MSc in Radiation Physics at London University in 1961. He joined the Medical Physics Department of the Royal Southampton Hospital as a Basic Grade Physicist, then moved to the University College Hospital and Medical School (UCHMS), Medical Physics Department in 1957. He was appointed Head of Department in 1962 and Director of Medical Physics and Bioengineering for the Bloomsbury Area Health Authority. In 1966-67, by invitation, he was Assistant Professor of Applied Mathematics and Computer Science, Washington University, St. Louis USA.

Prof. Clifton was elected President of the Hospital Physicists' Association in 1976, first President of EFOMP in 1980, and Honorary Editor of "Physics in Medicine and Biology" 1979.

Other appointments included: Membership of Parliamentary & Scientific Committee, Council member Foundation of Science and Technology, Chairman Science Council Health Care Advisory Committee, Advisor to Secretary of State for DHSS on Top Grade Scientist Appointments, Advisor to WHO on Health Technology Assessment and Chairman Physics of Medical Imaging Sub-Committee of the European Congress of Radiology.

EFOMP 40th BIRTHDAY ARTICLE

EFOMP's 40th Anniversary – Recollections of the fourth President

Dr. Pieter Inia was EFOMP President from 1990 to 1992. In this article he writes about developments that took place during the 10 years that he was involved with the organisation.

Congratulations to EFOMP!
It is a pleasure and an honour to be invited to reflect on the development of EFOMP in these 40 years since the start. I cherish my memories of the time I was involved in the activities of EFOMP in the 10 years starting from 1984, including my service as President in the years 1990-92.

At the time I became active, EFOMP still evolved in a rather informal way. Any physicist interested in the development of professional skills in the application of physical sciences in healthcare was welcome to contribute within the still-developing framework of EFOMP. I remember John Stewart Orr and John Clifton as initiating and stimulating medical physicists from all over Europe to join the club.

EFOMP gradually developed from a bunch of interested and enthusiastic medical physicists to a more formal organisation of national societies of medical physics of medical physicists. Policy was prepared by officers and committees and policy was accepted and affirmed at the annual council meeting by the delegates of national societies. Meanwhile, a main concern was the speed and integrity of the internal communications of EFOMP and its membership.

Policy documents were developed and accepted on Education and Professional Affairs. These policy documents served as a guideline for national societies, but apart from that, they were particularly useful in the growing contacts with national and international bodies. EFOMP could make clear the importance of the correct application of sciences in healthcare by qualified medical physicists by means of these policy documents; these documents got appropriate attention, internally as well as externally.

EFOMP was actively consulted by the European Community in the development of a general system for the recognition of higher education diplomas. EFOMP presented guidelines for the training of medical physicists as a qualified expert in the application of radiation in health care, which were accepted as input to the directive of the European Community on the protection of the patient.

Relationship with international bodies like IAEA in Vienna and ICTP in Trieste were developed. EFOMP gave active input at IAEA advisory meetings in the development of manuals for radiation protection in hospitals and general practices as well as on the handling of radioactive waste from hospitals. Together with ICTP in Trieste, EFOMP organised summer schools for medical physicists from developing countries.

Medical physics related to radiotherapy initially made up the majority of the background of medical physicists related to EFOMP. Involvement of medical physicists working in other medical disciplines, such as imaging in radiodiagnostics and nuclear medicine or the application of science in non-radiation related medicine was only slowly developing for whatever reason, be it that there was and is a spread in that respect over the European countries.

A natural relationship like AAPM and RSNA in North America was non-existent with respect to imaging. Medical physicists here were not officially involved in the programme of the European Congress of Radiology until EFOMP was accepted as a partner in the programme committee of ECR in Vienna in 1993 and 1995. I always hoped that this would result in a lasting relationship, which indeed has been the case.

My time with EFOMP has been very stimulating and rewarding due to personal interactions with colleagues. Effectivity and efficiency in communication was not what it is or can be now with email and videoconferencing. At that time we met personally, mostly during weekends in some desolated medical physics department or on the margins of a congress; it was necessary to travel to meet!

I remember well my last Council meeting, which concluded with an informal dinner with officers and delegates at a fish restaurant at Scheveningen Harbour! Great Colleagues!

Pieter Inia
Pieter Inia was managing director of medical and paramedical diagnostic departments at the Medical Center Leeuwarden (MCL), NL, until his retirement in 2004. He obtained his PhD in experimental physics from the University of Groningen in 1971 and the following year began setting up a clinical medical physics department at MCL. During his career he held various advisory and board-member positions in national and international organisations, including being President of EFOMP from 1990-92. Since his retirement he has taken up a second career (unpaid) in the redevelopment of historic housing for charity and heritage.

EFOMP's 40th Anniversary – Recollections of the fifth President

Dr. Karl Arne Jessen served as EFOMP President from 1993 to 1995. Here he recalls some of the key events that took place during his time in office.

In recalling my time as EFOMP President 1993-95 I realized that many details had disappeared, but I also remember it as a very interesting period for our young Organization.

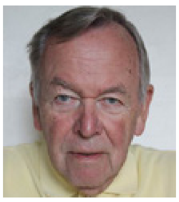
In 1993 we had a very successful meeting together with the Spanish Medical Physics Society in the furthest corner of Europe, namely Tenerife, with strong participation of young physicists which I found very promising. It was also succeeded with the European Communities to negotiate a Summer School of Medical Physics in Diagnostic Radiology in Nancy in June 1994. It was the third in a series of three Schools related to the Patient Directive Article 5 which set out the need for the "qualified expert in radiophysics". The school was well attended with 43 students from 15 countries indicating a strong need for such arrangements. EFOMP did not have the financial capacity at that time to run Summer Schools without seeking external support and therefore the help from the EC was very much appreciated.

Another important cooperation was consolidated with the European Congress of Radiology (ECR) and EFOMP was allocated sessions on the Physics of Medical Imaging. In October 1994 Committee and Council Meetings were held in Aarhus, my hometown, with participation from the EC in discussions of the important issue about our professional status, again related to the Patient Directive. In 1994, Policy Statement no. 6, "Recommended guidelines of National Registration Schemes for Medical Physicists" was published. This Policy Statement promotes standards of qualifications, competence and conduct of scientists practicing in healthcare and provides the basis for the proper recognition of the medical physics profession.

At the end of 1994 we were all busy preparing the activities to celebrate the centenary of the discovery of X-rays by Wilhelm Conrad Röntgen on November 8th 1895 in Würzburg, which made the direct involvement of physicists in healthcare a necessity. EFOMP celebrated the event in September 1994, together with the German National Society – only a few metres from the historical location in Würzburg – with a very successful Congress. A second Summer School in radiophysics related to Diagnostic Radiology was held at the European Centre for Theoretical Physics in Trieste with nearly 50 participants. Another important event was the meeting on Quality Assurance in Radiotherapy organized by IAEA and held in Vienna in May. Because up to 80% of the medical physicists in some of our member organizations are working in areas related to radiotherapy, QA in this field is of course of great concern to EFOMP. The ability of the medical physicist to quantify physical and technical parameters may persuade our clinical colleagues to strengthen their approach to the subject in their area of responsibility.

A joint working group with ESTRO was operating during 1995 in order to reach a general agreement on staffing levels for the physics support to radiotherapy and a consensus based on total staff was presented at the ESTRO meeting in Gardone. Many medical physicists are individual members of ESTRO. This agreement resulted later in Policy Statement no. 7, "Criteria for the Staffing Levels in a Medical Physics Department", published in 1997. The intense cooperation with the EC on the revised version of the Patient Directive resulted in the European guidelines on medical physics expert defined in Council Directive 97/43/Euratom from 1997 with a definition of the profession of the Medical Physicist and the degree of involvement in radiotherapy, nuclear medicine and diagnostic radiology. This formed the basis for the full recognition of our profession by our national health authorities and also facilitated the establishment of Registration Schemes, which had been proposed in Policy Statement no. 6.

In summary, I have the best memories from my period of service, not least because I was supported by a strong and cooperative group of Officers.



Karl Arne Jessen

Karl Arne Jessen was President of EFOMP from 1993-95. He was Chief Physicist at the Department of Medical Physics, Aarhus University Hospital, Denmark, from 1976 until his retirement in 2004. He was a founding member of the Danish Society of Medical Physics in 1981 and was that organisation's first President, from 1981-86. He sat on many national and EFOMP committees and was co-author of a number of reports and policy statements.

EFOMP 40th BIRTHDAY ARTICLE

EFOMP's 40th Anniversary – Recollections of the sixth President

Prof. Fridtjof Nüsslin was EFOMP's President from 1996 to 98. In this article he shares his memories of EFOMP's developments and achievements during that period.

Elected by the Council it was an honour and quite a challenge to follow my predecessor, Prof. Dr. Karl-Arne Jessen, as President of EFOMP. I am grateful to him and his crew who helped a lot for a smooth handover in navigating the EFOMP-steamer safely through the next period, 1996 to 1998. Looking back more than 20 years, it's not an easy task for me to remember all the actions and achievements worthy to be reported. Apologies to Officers and Council for some lost bits of my memory or wrong details in this review. However, what I am absolutely sure still today was the professional capacity combined with a spirit of friendship guiding us in the Officer's team in all debates, decisions and actions. Therefore, I want to acknowledge specifically the Officers during my term: Karl Arne Jessen (Immediate Past President), John Haywood (Secretary General), Peter Smith (Treasurer), Alberto Del Guerra (Chair Scientific Committee), Inger-Lena Lamm (Chair Education, Training, Professional Committee and Vice President), Geoffrey Cusick (Chair Communication Committee), Herman van Kleffens (EC Liaison), Philip Dendy (ETP Registrar). The following activities further followed-up or initiated in the period 1996-1998 appear worthy of being mentioned.

Since the early days of our profession it was always a primary goal of EFOMP to develop and translate throughout Europe a science-based, harmonised concept of education, training and qualification of the medical physicist. Fortunately, in the mid-nineties the EC task group working on the later EC Directive 97/43 EU challenged the EFOMP to cooperate and to develop a comprehensive ETP-concept. In this frame, two Policy Statements were published, "Criteria for staffing levels in a medical physics department" (Policy Statement 7, 1997) and "Continuing professional development for the medical physicist" (PS 8, 1998). Additionally, working groups were initiated to work on the two subsequent policy statements: "Radiation protection of the patient in Europe: Training of the Medical Physics Expert in radiation physics or radiation technology" (PS 9, 1999) and "Recommended guidelines on national schemes for continuing professional development of Medical Physicists" (PS 10, 2000).

In order to improve the education and training opportunities for medical physicists a significant step forward was achieved when EFOMP and the European Scientific Institute (ESI) jointly founded the European School of Medical Physics (ESMP). It is particularly the merit of its highly motivated director Yves Lemoigne, that the ESMP became one of the most successful achievements of EFOMP. Once a year, a 4-week training programme joined by students from Europe and Overseas countries and well-known international teachers took place at Archamps near Geneva and provided a high-level training facility.

The growing role of medical physics, both in science and as a health profession, motivated the adaption of the internal structure of the EFOMP and its international networking. Therefore, some modifications of the EFOMP constitution were performed, like the introduction of the new post of Vice-President, created to alternate with that of Immediate Past President. Furthermore, two additional committees were established: the Committee on European Union Affairs (Herman van Kleffens) and the Committee on Registration Matters (Philip Dendy). With respect to EFOMP's external relations, liaisons were further developed to the European bodies EAR/ECR, ESTRO, EANM, ESI, EU and to extra- or pan-European bodies like IOMP, IAEA, IEEE-NSS, AAPM, SAMPS. An important step to strengthen the science face of medical physics in Europe was the conversion of the medical physics journal Physica Medica, created by Alberto Del Guerra and the Italian medical physics association (AIFM), to be the European Journal of Medical Physics as the EFOMP official journal. Finally, it may be mentioned that the increasing visibility in the public gave reason to create a new EFOMP-logo.

Let me conclude, also on behalf of the entire Officers Board, with deep-hearted thanks for that wonderful time when we could serve our organisation, congratulations on EFOMP's birthday and best wishes for a flourishing future!

Prof. Fridtjof Nüsslin was a Full Professor and Chair of Biomedical Physics at the University of Tübingen (DE). He was born in Berlin and studied physics and medicine in Tübingen and Heidelberg, followed by a PhD in physics and physiology. He was a postdoc at the Max-Planck-Institute for Nuclear Physics in Heidelberg and held appointments in Hannover and Frankfurt. His research areas included: RT-treatment optimization (IMRT, IGRT), Biological Modelling, Molecular Imaging & Imaging technology, particle RT; Radiation Protection; Non-Ionizing Radiation Effects. He was not only President of EFOMP, but also of President DGMP and IOMP. He was a member of the IAEA steering committee on Radiological & Nuclear Emergencies. Prof. Nüsslin is an Honorary Member of EFOMP.

EFOMP COMPANY MEMBER ARTICLE

Elekta: Radiotherapy evolves in the cloud

Cloud-based computing has liberated many radiotherapy professionals from the necessity to be physically present in the department to do their work. While that's a key benefit in the COVID-19 era, the cloud's capacity to store and manage countless terabytes of radiotherapy data – from thousands of patient cases – is the crucial gateway to allow clinicians to harness these aggregated data to help patients.

Solutions like ProKnow, a web browser-based cloud solution, demonstrate how mining and analysing big data mining can drive out variation, identify trends, analyse predictive value, and assess plan quality metrics across cohorts of patients – all with the goal of continuously improving radiotherapy outcomes. In this sense, data has evolved from an accumulation of information in an on-site archive to be referenced periodically, to a living trove of patient case information that physicians and physicists can manage, interact with, and analyse.

By enabling remote, collaborative 24/7 access, ProKnow not only makes daily tasks simpler and faster (e.g., plan review, chart rounds, contouring), it turns each centre's data stream into a cloud-based "knowledge centre" that clinicians can mine for insight.

"For example, against a backdrop of entire patient populations at a given centre or network – prostate cancer patients, for instance – a single patient case can be evaluated against hundreds or thousands of previous cases," says ProKnow Co-founder, Ben Nelms, PhD. "The centre selects the metrics to extract from the cohort, such as dose coverage, side effects, DVH, planning times and outcomes. Armed with this information, clinicians can rate the current patient's plan quality or determine if and why it seems to be an outlier. Radiotherapy professionals can then make data-driven actions based on the best results of the cohort, thus driving out variation and facilitating best practices."

Essentially, this means individual sites and healthcare networks will be empowered to conduct their own site-specific clinical trials using the data they're generating day to day, he adds. Moreover, clinical trials could be expanded through research collaborations across multiple different clinical sites by allowing centres to upload anonymized data to a shared ProKnow database.

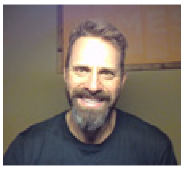
Aggregated data in ProKnow can also be used to validate new technology, such as auto-segmentation and auto-planning. For instance, physicists could simply select a number of manually created plans from their ProKnow database and compare them against automated plans via analysis of variance (ANOVA) across the two sub-populations. Is auto-planning different? If so, how much? And importantly: is it better? This kind of due diligence will answer these questions.

"As traditionally time-consuming tasks, such as anatomy segmentation and treatment planning, become more automated over time, radiation oncologists, physicists, and treatment planners will have more bandwidth to be 'data analysts' of pertinent clinical data," Dr. Nelms says. "Radiotherapy professionals can resume this crucial role: being scientists. They can formulate hypotheses and 'ask ProKnow' for data-driven answers to figure out, with scientific rigor, which methods work best and most efficiently for their practice and their patients.

"These are not changes that will take decades," he adds. "This isn't a manned mission to Mars. Rather, I envision this transformation happening starting now by those who are willing and ready to look, ask, and discover."

ProKnow offers unique capabilities to manage data for all radiotherapy modalities and vendors, including:

- The ability to store, navigate and retrieve radiation therapy data in a scalable cloud-based framework that works across all imaging, planning and treatment modalities and is available 24x7 regardless of staff location.
- Making it easy for a multi-disciplinary team, or distributed staff in cancer networks, to review contours, treatment design and plan quality from any location.
- Standardization of care quality by allowing users to analyse the results of their work against a backdrop of their patient population, leveraging large amounts of data currently in their procession.



Ben Nelms, Ph.D., has been an inventor, scientist, and entrepreneur in the radiation therapy industry for over two decades. In 2016, Ben co-founded a company called ProKnow with the aim to bring big data analytics and next-generation cloud-based treatment planning and peer review tools to the field of radiation oncology.

EFOMP 40th BIRTHDAY ARTICLE

EFOMP's 40th Anniversary – Recollections of the seventh President

Dr. Inger-Lena Lamm was President of EFOMP during the years 2000-02. She has the distinction of being the only female Past-President of EFOMP. In this article she writes about the events leading up to her time in office and the achievements and changes in EFOMP in the early years of the new Century.

Friday evening: Congress dinner at the Parliament Building. The Minister, centre, is flanked to her right by Dr. Stephen Smye, IPEM President, and to her left by Prof. Peter Smith, local organiser, all sombrely dressed. My luggage had finally arrived, I had chosen a striking colour for the occasion when packing… and my hat

My EFOMP involvement began in 1987, when I was elected President of the Swedish Hospital Physicists Association, SHPA, following Per-Erik Åsard both as President and as EFOMP long-term delegate. SHPA was one of the founder members of EFOMP, with Per-Erik being a highly active delegate in the preliminary meetings. My first EFOMP commitment as a Swedish delegate was in 1989, when I attended a most interesting meeting organised by the European Commission in Luxembourg "On the Qualified Expert in Radiophysics…". Non-EC EFOMP Member Organisations were invited as observers (Sweden joined in 1995). This brought me directly into the more procedural realm of education and training in medical radiation physics; I used to be "just teaching" before. In 1990 I also became the contact person of the then PET committee, and EFOMP was ten years of age.

EFOMP activities kept growing, becoming more complex, more sophisticated. It is essential that Member Organisations are fully and democratically involved in the running of the Federation. The Federation belongs to the Member Organisations, not to the Officers, "Council decides, Officers execute". At the 1999 EFOMP Council meeting in Patras, two "clarifying" amendments to the EFOMP Constitution were made. And I was elected President!

In the year 2000 EFOMP had left the teenage stage, celebrating its twentieth anniversary in connection with the Council meeting in Archamps in November. The EFOMP dinner, held in Annecy, was sponsored by the department of Haute-Savoi. (Ladies got a nice scarf, there were not too many of us…) EFOMP delegates and Officers also had the opportunity to get acquainted with ESMP, the European School of Medical Physics. ESMP, a partnership between EFOMP and ESI (European Scientific Institute), organised a series of consecutive one-week education and training courses in Archamps in the late autumn. ESMP had started in 1998 with a three-week programme, and a brachytherapy week was added in 2000, with me as supervisor.

Education, training, and professional matters were among my main priorities, closely followed by the development of the democratic structure of the EFOMP Federation. How appropriate, then, to be elected president in Greece! There was, and is, no definition of democracy on which everyone in the world would agree, and I certainly did not want to try to define democracy in "EFOMP speak". We had the Constitution laying down the basic structure of the Federation. The way individual medical physicists could contribute, through their National Member Organisation, was presented in Patras in the document "the EFOMP Operational Platform". The EFOMP Platform and the accompanying document on the EFOMP Structure were standing items on the agenda during my years as President, both for Council and Officers' meetings, including "transparency, democratic procedures, open nominations for Federation Officers, involvement of Member Organisations". To support and promote EFOMP activities, EFOMP needed, and still needs, a proper structure of tasks and responsibilities for Officers, and a proper structure of documentation and of communication between all actors. Have a look at the EFOMP Manual of today, 2020, a 124-page document!

Wednesday morning: Opening of the Congress with the Minister, everyone is dressed up except me. But I did have my hat!

The chairman of the ESTRO Physics Committee, Alan McKenzie, was invited to the Council meeting in Archamps; EFOMP and ESTRO needed a means of communication. Reciprocally, I was invited as EFOMP observer on the ESTRO Physics Committee, being a radiotherapy person. A working party within the EDRO/ESQUIRE project "Curriculum for Radiotherapy Physicists" was set up in 2001, and as EFOMP observer I was directly included in the group. A draft version of the curriculum was circulated for comments and discussed and presented at the EFOMP Congress in Eindhoven in 2003. After approval by ESTRO and EFOMP, the paper "Guidelines for education and training of medical physicists in radiotherapy, Recommendations from an ESTRO/EFOMP working group" was finally published in 2004 in the journal Radiotherapy & Oncology.

Continuing the subject of education and training, EFOMP had earlier been supportive to the EMERALD projects I and II (European Medical Radiation Learning Development), funded under the EU Leonardo da Vinci Programme. The projects were managed by King's College with Lund University and Lund University Hospital, my home bases, among the partners. EFOMP was one of the seven partners in the successor project EMIT (European Medical Imaging Technology Training) which started in late 2001. EMIT was given the Leonardo da Vinci award in 2004.

My home base was, and still is, Lund in southern Sweden; I can see the aircraft going into Copenhagen Airport from where we live. One of the main objectives of EFOMP is to harmonise and promote the best practice of Medical Physics within Europe. "The federal structure allows EFOMP to represent the medical physics profession, without constraining the diversity of national opinions, which constitutes the essence of Europe." It is one thing to discuss EFOMP objectives theoretically in the EFOMP setting, quite another matter to implement EFOMP proposals at home, no matter how well-founded they may be. The Swedish term for our medical physics profession is "sjukhusfysiker", hospital physicist. SHPA was one of the stakeholders advocating state recognition, a licence to practice, for the clinical medical physicist. EFOMP Policy Statements were used to our advantage in the preliminary deliberations with the authorities, and from 1st January 1999 "sjukhusfysiker" is a regulated profession by law. You apply to The National Board of Health and Welfare to get your licence to practise, the requirement being "sjukhusfysikerexamen", at that time four and a half years of academic education "including some training". In 2007 "sjukhusfysikerexamen" was officially extended to a five-year Master's programme, Master of Science in Medical Physics, in accordance with the Bologna process. (This extension required intensive use of contacts in the parliament, one of whom had personal knowledge and understanding of Medical Physics requirements via a daughter, who had studied in Lund and worked as "sjukhusfysiker" together with me. But that is a another story!)

My second EFOMP Council Meeting as President was held in conjunction with the 2001 Congress in Belfast. I landed in Belfast on the afternoon of Tuesday 2001-09-11, well prepared for and looking forward to all official tasks. My attention was immediately caught by news monitors showing extraordinary, unbelievable images of burning towers. It did take some time for me to understand that this was indeed happening, "IRL"! I will not dwell on the vast consequences of the 9-11 terrorist attack, just to mention the inconsequential but nevertheless not unimportant direct result for me: "no luggage delivered". For safety reasons my well-packed suitcase had to stay in England, where I changed flights on my way over from Copenhagen. The schedule for Tuesday evening included the

Three Presidents welcoming reception and a dinner, and Wednesday morning started with the Congress Opening Ceremony. But clothes are just the outer shell, aren't they, it is the inner qualities that count… The Belfast Congress and the EFOMP Council were a great success!

It is evident that I enjoy having many balls in the air, family, physics, music, 3D-modelling (not just in radiotherapy, but also in the form of sewing and knitting), and more: "energy flows where your passion goes". I am just one of that kind who finds it difficult to say no to proposals that seem interesting and fun. "Having fun" the correct way is in fact productive! When I think back on all my EFOMP years, it is first and foremost the memory of all the people I have met and interacted with that makes me smile happily. We did meet with some obstacles, time was occasionally too short, frustration sometimes reigned, but together we did accomplish many of the tasks we were given. I have picked just a few of the balls that were in the air during the years 2000, '01 and '02, hoping that you would enjoy the tale. There is much more to tell, but that will be another story!

It has been a great honour and a privilege to serve as EFOMP President for the first three years of the 21st century.

Inger-Lena Lamm
Inger-Lena Lamm studied at Lund University, Faculty of Engineering, and graduated with a Master of Science in Engineering, Engineering Physics, in 1965. She was teacher and researcher at the department of mathematical physics 1964-74 and received her PhD in 1974, subject "Theoretical studies of some equilibrium properties of stably deformed nuclei". The same year she changed from mathematical physics to radiation physics, formally completing her MSc in Medial Physics in 1976. She was a medical physicist at Lund University/Hospital – clinical radiotherapy, education, training, and research – from 1974 until her official retirement in 2011. She was elected President of the Swedish Hospital Physicists Association in 1987, and President of EFOMP in 2000. She held various advisory and board-member positions in national and international organisations, participated in EU projects and in the organisation of national and international conferences and workshops. Since 1997 she has been involved in radiation therapy standardisation as an expert in WG 1 of IEC Sub Committee 62C (International Electrotechnical Commission), and she has been Chairman of the Swedish mirror committee SEK TK62BC since 2005 and continuing. Formal retirement has meant more time for family matters: three children, born 1967, 1971 and 1972, nine grandchildren, her husband, and dog.

EFOMP 40th BIRTHDAY ARTICLE

EFOMP's 40th Anniversary – Recollections of the eighth President

Prof. Alberto Del Guerra served as EFOMP President from 2003 to 2005. Here he reflects on his time in office, highlighting key developments that took place.

7th EFOMP President Dr. Inger-Lena Lamm and 8th President Prof. Del Guerra at an official dinner of the EFOMP committee (2004)

After having been chair of the Scientific Committee for three years, on the 1st January 2003 I took service as President of EFOMP. I was preceded by Dr. Inge-Lena Lamm from Sweden, who did a splendid job on the Education and Training Programme (ETP) of EFOMP, whereas I was going to concentrate more on the scientific issues. As you can see from the photograph, I was nicely introduced by Inge-Lena Lamm to the affairs of the Federation.

There were very hot topics that I put on the floor during my Presidency to be discussed. Some of these are now successfully solved, some are still under discussion:

1) Recognition of the Medical Physics Profession and free movement of Medical Physicists in Europe

This issue is the most delicate, although many steps forward have now been taken. Under the auspices of IUPEM, Medical Physics was finally recognised as a medical profession by ILO, but not completely peritectic to the other medical disciplines; thus Medical Physics is a Europe-wide part of the Health system, but the free movement among the various countries on the basis of a common specialty degree is not possible yet. EFOMP is still working hard on this item.

2) The EFOMP Association and its collaboration with the sister European Medical Societies (EAR/ECR, EANM,ESTRO).

There has always been a strong collaboration between Medical Physicists and ESTRO, but the other Medical Imaging societies were rather disjunct from EFOMP. It was Prof. Fridtjof Nüsslin, the EFOMP President before Dr. Inger-Lena Lamm, who established the first official contacts with ECR initially and EAR (later), and I pursued this idea very hard with the constant involvement of medical physicists selected by EFOMP in the scientific programme of the European Radiology Congress and the EAR activities. Similarly, together with the Medical physicists involved in Nuclear medicine I started the procedure to establish a Physics Committee within EANM, which is now the privileged bridge between the two societies.

3) The European Congress of Medical Physics

Even before becoming EFOMP President I was promoting the idea that EFOMP should organise an annual or at least biennial European Congress of Medical Physics, and not just be hosted with its committee by a national congress of one of the European Medical Physics associations. This is now reality and the EFOMP Congress has been renamed European Congress of Medical Physics. I am happy to say that the first transition was in 2007 in Italy ("Il Ciocco", Pisa), where the contribution and organisation of the congress was synergic between the Italian Medical Association (AIFM) and EFOMP. While I was Past-President, Prof. Wolfgang Schlegel from Germany was the President and Stelios Christofides from Cyprus was the incoming President. This Presidential trilogy can be seen in the photograph below.

4) The official European Journal of Medical Physics

Since 1988, as a member of the committee of the Italian Medical Physics Society (AIFM), at that time AIFB, I was the Editor-in-Chief of the Journal "Physica Medica", that was the Italian Medical Physics official journal. I strived for many years, and especially during my EFOMP presidency, to bring this journal under EFOMP responsibility and to make it the European Journal of Medical Physics. I must say that this dream that took many days and nights of my work has become reality. In 2008, Elsevier took over as publisher of the journal. Nowadays, "Physica Medica - The European Journal of Medical Physics" is the official journal of EFOMP and of many of European Medical Physics societies and is competing very well with Medical Physics (AAPM) and Physics in Medicine and Biology (IOP).

I remember very well the three years of my EFOMP Presidency and the preceding years as Chair of the Scientific Committee and as Vice-President and later on as Past-President. I made a lot of friends and of course some enemies (I hope not many!). It was a wonderful experience and a very busy period. I would do it again, every pinch of it.

The "three Presidents" at the Gala dinner of the European Congress of Medical Physics in "Il Ciocco(Pisa)", Italy (2007). From left to right: Wolfgang Schlegel (President EFOMP), Alberto Del Guerra (Past-President), Stelios Christofides (Incoming President). Photo courtesy of Ioannis Georgiannis, Cyprus.

Alberto Del Guerra took the degree in Physics (Laurea in Fisica) in March 1968 at the University of Pisa. He is an experimental physicist, who has made research in Accelerator Physics, High Energy Physics and since the late '70s in Medical Physics. He has spent several years of his scientific career abroad (CERN, Daresbury Laboratory, UK, Lawrence Berkeley Laboratory-Berkeley, USA, University of Washington, Seattle, USA). He has published more than 400 articles/books/book chapters. He has held scientific and managerial responsibilities in many Italian, European and Worldwide scientific societies: AIFB, AIFM, EFOMP (President), EANM, ECR, IEEE_NPSS. He has been a member of IEEE-NPSS since 1987, member of several NPS committees: RISC, NMISC, CIP, TNC (founding member), Oversight Committees. He has been NSS chair of the 1999 IEEE NSS/ MIC Conference in Seattle, General Chair of the 2004 IEEE NSS/MIC Conference in Rome (Italy), MIC Chair of the 2011 IEEE NSS/MIC Conference in Valencia (Spain). He has been elected NPSS ADCOM member representing NMISC (2011-2014), Member of the Marie Curie Award committee (2013-2015), NPSS Distinguished Lecturer (2017-to date), Vice Chair (2016-2018), Chair (2018-2019) and Past Chair (2020-to date) of the JOS NPSS Committee, member of the NPSS Fellow Evaluation Committee (2018-2019), Chair of the NPSS Fellow Evaluation Committee (2020-to date). He has been regular Reviewer, Associate Editor and Editor in chief for more than 10 scientific journals. He has been assessor of projects for many Italian, European and extra European research institutions and for EU (FP6, FP7 and Horizon 2020). He has been one of the promoters of medical physics research in Italy and is a reference scientist in medical physics worldwide. He has been full professor of physics at University of Napoli (1987-1991), Ferrara (1991-1998) and Pisa (1998-2014). He is now retired Professor of Medical Physics at the University of Pisa and is still active in teaching and research.

EFOMP's 40th Anniversary – Recollections of the 11th President

Prof. Peter Sharp held the office of EFOMP President from 2012-14. In this article he writes about the developments at EFOMP prior to and during his time in office.

The invitation by the editor to contribute to the recollections by past presidents was somewhat daunting. It's not because nothing of note happened during my presidency (although there were things better forgotten) rather it is because that while Presidents might be thought to be steering the boat, other people (the EFOMP Board) are pulling on the oars. To continue the nautical theme, the boat had already started its journey when I took over the tiller from Stelios Christofides as EFOMP President in 2012 and much of the future direction was already mapped out for the federation.

A boat needs to be watertight and so when I joined EFOMP as treasurer in 2004 I felt that one important task was to finish the work started by my predecessor as treasurer, Peter Smith, in compiling an operational manual for EFOMP. In fact, that is a continuing task as EFOMP evolves. Another continuous task is the updating of the website, important not only for communicating with our own members, but also as the face of EFOMP to the wider world.

A professional society, and in particular one encompassing many countries, needs to be confident about the way in which it runs. It must also be clear as to its identity and work to be recognised as such by fellow organisations. So, with invaluable guidance from Ian Wolstencroft, who was our financial adviser at the time, we set up EFOMP as a limited liability company in 2006, thereby creating a legally recognised entity.

So what course were we following? EFOMP had been involved in working with the European Commission to obtain recognition of the role of the Medical Physics Expert (MPE). We recognised that, once this had been achieved, there would be a need to ensure that the standards required of an MPE were maintained. This led to the setting up of an Examination Board with the award of European Diploma of Medical Physics and the European Attestation Certificate to those Medical Physicists that have reached the MPE level.

It was also necessary to set up a system for allowing medical physicists to access education at the level of the MPE, particularly in those countries which did not have a formal system of training. One of the challenges we faced during this time was the closing of the popular European School of Medical Physics held annually at Archamps and which we sponsored with ESI. But as Albert Einstein said, "Failure is success in progress." Our progress was to move towards facilitating training programmes at the MPE level. The first of what has become The European School for Medical Physics Experts was held in 2013 and has since flourished under the guidance of Marco Brambilla and Alberto Torresin.

The creation of a limited liability company has allowed EFOMP to represent European Medical Physics in EU funded projects, of which there have been a number in recent years. This proved particularly useful in supporting Hilde Bosmans in getting EU funding for the training programme known as EUTEMPE-RX. I was able to go with Hilde to Brussels and give her the backing of European Medical Physics Societies.

We also needed to put a process in place to accredit other training courses to the appropriate standard. The Board was advised that it needed to set up a body independent of EFOMP to do this, otherwise we would find ourselves in the position of accrediting our own courses. This led to us setting up EBAMP, which has been ably led by Pedro Galan.

How did EFOMP change during my presidency? The fundamental principle of EFOMP was that it is a federation of medical physics societies. While the Board is the executive of EFOMP, the governing body is the EFOMP Council, made up of representatives from the national member organisations. The future of EFOMP depended, in my view, on the member societies feeling that membership was of benefit to them and that they had a real say in what EFOMP was doing. I was concerned that NMOs were not sufficiently involved in EFOMP and one of the steps I took to remedy this was to set aside time during the Council meeting for each NMO to report on local activity and to raise issues that were of particular importance to them. As to benefits, EFOMP made significant moves towards providing more services for its member societies, particularly in education and training. My successors have further developed this by forming the ECMP and introducing individual membership. We also forged links with other societies where we shared common interests, such as ESTRO and AAPM, by way of Memoranda of Understanding.

It was a privilege to be an officer of EFOMP and it undoubtedly gave me a wider view of medical physics in Europe. Thus, the failure of the UK to remain in the EU was a particularly hard blow to me. Handing over the boat to a new captain is always an occasion tinged with regret about what I failed to achieve. But I knew that in John Damilakis the boat was in capable hands as Cretans are renowned sailors!

Prof. Peter Sharp is the Emeritus Professor of Medical Physics at Aberdeen University. Until his retirement in 2012 he was Head of the Department of Medical Physics and Clinical Director of Medical Physics in Aberdeen.
He has been involved in research into imaging techniques for over 40 years; initially in Nuclear Medicine and latterly also in ophthalmology. He set up the first NHS PET Centre in Scotland and chaired the committee that advised the Scottish Government on the introduction of PET for cancer management for the whole of the Scottish health service. He has published over 150 papers in peer reviewed journals and 3 books. He has been awarded the Norman Veal Medal of the British Nuclear Medicine Society, the Queen's Anniversary Prize 2000, in recognition of his department's "Pre-eminence in medical imaging technology for over 30 years", and the Healthcare Science Award from the Scottish Government. In 2013 he was awarded the Lady Margaret MacLellan Prize, in recognition of outstanding contributions to medical science in Scotland. He has been involved in many committees dealing with the training and regulation of healthcare scientists, including chairing the Association of Clinical Scientists and the Scottish Forum for Healthcare Science. He has been a member of the Science Council's Registration Authority that monitors standards for the award of Chartered Scientist (CSci), and a member of the Federation for Healthcare Science. As well as being a past-President of EFOMP, he was President of IPEM. He is a Fellow of the Royal Society of Edinburgh and in 2012 he was made an Officer of the Order of the British Empire for his services to healthcare science.

EFOMP 40th BIRTHDAY ARTICLE

EFOMP's 40th Anniversary – Recollections of the 12th President

Prof. John Damilakis served as President of EFOMP from 2015-17. In his article he summarises the important developments and changes that occurred during his time in office.

At the EFOMP-IPEM meeting, held at IPEM headquarters, York, in September 2017

It has been an honour and privilege for me to have served as EFOMP President from January 2015 to December 2017. When CPCom Chair David Lurie invited me to write an article about my recollections of key events during my Presidency, I felt that it was also an opportunity to express my deepest gratitude to all European colleagues for their support. Cooperation with excellent colleagues kept me inspired and kept me going.

My first priority was to establish the European Congress of Medical Physics (ECMP), a European biennial scientific meeting covering all fields of Medical Physics. I had the honour to be the President of the 1st ECMP which was organized in September 1-4, 2016 in Athens. This event was organized by EFOMP and hosted by the Hellenic Association of Medical Physicists (HAMP). Together with Dr. Virginia Tsapaki (at that time HAMP President), we worked very hard to organize the 1st ECMP. Despite the fact that the time available for preparations was extremely limited, the meeting was a great success.

EFOMP established its Examination Board (EEB) in 2016 to facilitate the harmonisation of Medical Physics education and training standards throughout Europe. EEB introduced the European Diploma of Medical Physics (EDMP) and the European Attestation Certificate to those Medical Physicists that have reached the Medical Physics Expert level (EACMPE). As the 1st Chairman of the EEB from 2011 until 2019, I had the privi lege to lay the foundations of this important initiative together with the Board members.

The 1st EEB exams were organised in Prague in 2017, the 2nd EEB exams in Copenhagen in 2018 and the 3rd exams in Warsaw, Poland in 2019. All events were very successful. External evaluation of Medical Physics educational programmes to determine if standards are met is an important process to ensure the quality of services. EFOMP established the European Board for Accreditation in Medical Physics (EBAMP) as an independent organisation to evaluate and accredit education and training courses in Medical Physics. On 20th June 2016, EFOMP Council ratified by postal ballot the first Board of EBAMP among those candidates appointed by EFOMP Board of Directors. The President of EBAMP has been Dr. Pedro Galan since its establishment. A list of accredited events can be found at EBAMP's website www.ebamp.eu

The Projects Committee was very active during the period from 2017 to 2019. Projects such as "BSS transposition", "ENETRAP III", "ENEN+" and "MEDIRAD" played and continue to play an important role in Medical Physics. The "BSS transposition" project evaluated European Member States' activities for the transposition and implementation of Council Directive 2013/59/Euratom in the medical area. The "ENETRAP III" European Network on Education and Training in Radiological Protection focused on training for the radiation protection expert (RPE) in the medical sector. The "ENEN+" project financially supported, through mobility grants, students and professionals willing to carry out any education or training activity in Medical Physics. The "MEDIRAD" project, the first large-scale medical research and innovation project funded by the EURATOM scheme, focuses on implications of medical low dose radiation exposure. EFOMP is represented on the advisory panel of the project.

To meet challenges and address major issues, it is important to develop a strong and positive relationship with other international organizations and interested parties. During the period January 2015 to December 2017, EFOMP signed memoranda of understanding and agreements with AAPM, ESR, COCIR, MEFOMP, EANM and other organisations.
EFOMP, together with the European Association of Nuclear Medicine (EANM), the European Federation of Radiographer Societies (EFRS), the European Society of Radiology (ESR) and the European Society for Radiotherapy and Oncology (ESTRO), established the European Alliance for Medical Radiation Protection Research (EURAMED) in 2017 as a non-profit organisation registered in Austria. The main aim of EURAMED is to jointly improve medical care through sustainable research efforts in medical radiation protection. This initiative created a medical counterpart equal in weight to existing platforms such as MELODI (Multidisciplinary European Low Dose Initiative), EURADOS (European Radiation Dosimetry Group), ALLIANCE (European Radioecology Alliance), and NERIS (European Platform on Preparedness for Nuclear and Radiological Emergency Response and Recovery). I had the honour to be the first EURAMED President from 2017 to 2019.

I want to thank EFOMP Board members and, once again, all colleagues for supporting EFOMP and me during my term of office. I am proud of having served such a great community of professionals.

With my warmest wishes!

John Damilakis
John Damilakis is professor and chairman at the Department of Medical Physics, School of Medicine, University of Crete and director of the Department of Medical Physics of the University Hospital of Heraklion, Crete, Greece. He is Vice President and President-elect of the International Organization for Medical Physics (IOMP). Research interests: medical dosimetry, medical radiation protection. Number of publications in PubMed: 213, h-index 45 (Google Scholar). He is editor and co-author of 2 books published by IOP Publishing and Springer-Verlag and co-author of 2 chapters in books published by Springer and Academic Press. John Damilakis has given more than 300 invited presentations at national and international conferences including ECR, RSNA, AAPM, IAEA, ICRP, IOMP and EFOMP meetings. He has received 10 awards for his work.

EFOMP 40th BIRTHDAY ARTICLE

Reflections on my EFOMP Presidency, 2018-20

EFOMP President Marco Brambilla reflects on the progress and changes which have occurred within EFOMP during his time in office

When my presidency started in January 2018, I was not a "newbie" in EFOMP, having been previously appointed as Secretary General in 2012.

Without this previous experience, it would have been simply impossible to achieve the strategic goals we envisaged for the development of the community of European Medical Physicists. Nonetheless, the knowledge of the mechanisms of functioning of EFOMP would have meant nothing without the assistance of a wonderful team of colleagues (Officers, Council delegates, Scientists or individuals) who accepted to work with me on the basis of the common principles and ideas we shared about the future of EFOMP:

Autonomy

We share excellent relationships with many scientific and professional organisations at the European level, which are based on the common understanding that we, as EFOMP, are representing now ALL the medical physicists in Europe, no matter if they are working in radiotherapy, nuclear medicine, radio-diagnostics, radiation protection or in other fields. The past concept of having separate subspecialty committees working autonomously inside medically-driven organisations has now been inserted into a framework, at the centre of which lies EFOMP.

Identity

EFOMP has today a well-reputed scientific journal: Physica Medica – EJMP; a viable European Congress: ECMP, which brings together the medical physicists working in different fields; and an established school: ESMPE, which provides high level education events at affordable prices covering an increasing number of topics in an ever-expanding number of countries.

Sustainability

EFOMP used to be based in the past on only one pillar: The National Member Organisations, which still are and will be in the future the fundamental architrave of our organisation. But we have enriched the structure by reinforcing or building *ex-novo* two other pillars: The Company Membership and the Individual Associate Membership. Using a metaphor, we could say that instead of resembling a tower, EFOMP is now approaching more the structure of a gothic cathedral! The more pillars we will be able to add in the future, the more stable (and fascinating) will be the structure.

Communicate and integrate

Our website and social media channels, together with our newsletter EMP News, keep together and updated the community of Medical Physicists. Without the impressive development of these tools we would have never been able to communicate to the exterior the impression of a smart, dynamic, restless organisation. With the establishment of the e-learning platform opened to whoever is interested in the field of medical physics (no need to be European, no need of being a medical physicist to have access to the contents) we aim to integrate a wider community, by sharing knowledge.

I am aware that, by declaring the vision which guided my activity inside EFOMP, I am violating the prescription of one of my favourite authors, JD Salinger:

"It's funny. Don't ever tell anybody anything. If you do, you start missing everybody."

But, since my Presidency is coming to and end, I will take the risk and go ahead by wishing every good luck and fortune to my successor and friend, Paddy Gilligan.

Dr. Marco Brambilla
President of EFOMP
Head of Medical Physics Department, University Hospital of Novara, Italy

EFOMP 40th BIRTHDAY ARTICLE

EFOMP Vice-President's Report

Paddy Gilligan will take over the reins as President of EFOMP in January 2021. Here, he muses on the recent past and present and describes how he plans to take EFOMP forward.

In January 2020 I was honoured and privileged to be accepted as Vice President of EFOMP. 2020 has been a dramatic for year for EFOMP and indeed for all people in the world. All going well, I will assume the presidency in January 2021. I am excited, humbled and daunted by the chance to lead such an important organisation that provides a fabric for medical physics throughout Europe.

I think everyone will agree that Dr. Brambilla's Presidency has led EFOMP to many notable achievements in the last three years and he leaves EFOMP in a very strong state with many new developments. Marco's commitment, energy and effort was an unstoppable force in EFOMP's progress. These include Individual Associate Membership , the development of the online education platform, the delivery of successful medical physics schools, the strengthening of the Journal and the ECMP conference.

US Senator Robert Kennedy once said that an ancient Chinese curse is "to live in interesting times" and this is more true than ever in 2020. Two seismic events outside of our control have shaped history in Europe and EFOMP and the NMOs have not escaped these. The first is Brexit which has led us to begin moving the EFOMP offices and registration from U.K. to the Netherlands to facilitate access to EU structures and funding. The efforts of the IPEM and Fiona McKeown have contributed greatly to EFOMP and should be acknowledged. COVID-19 is a once-in-a century health crisis that has had tragic consequences for many citizens and impacted the delivery of healthcare services. Among other things it led to postponement of many of EFOMP's education activities and the ECMP 2020 conference. However, the wonderful response to the crisis by the medical physics community also led to many positive developments and acceleration of the implementation of good ideas. Never before were the three pillars of EFOMP's slogan "educates, communicates and integrates" as relevant as they are during this crisis.

The COVID crisis has also led to a period of reflection and will shape the direction of EFOMP over the next three years. Indeed, on the 40th birthday of EFOMP it is worth reading the president's messages on the website. In terms of identity, the organisation now represents over 9000 members in 36 countries. The geographical distances, economic circumstances and range of languages, legal systems and cultures are staggering. However, no matter where we are we have one goal that is to use physics to benefit patients' diagnosis and treatment. Sharing the rich scientific heritage and diversity in Europe is what makes EFOMP unique. The COVID crisis accelerated the use of digital communication training tools as face-to-face meetings. The increase in relevance, identity, inclusion and access to shared experience for all EFOMP members is something that I hope to build on. I also believe that digital tools give us the possibility for NMOs to further develop shared scientific events between themselves, even if geographically they are very separate.

EFOMP thrives because of the voluntary work carried out by the Council, the Board, the Committees, the WGs, each NMO, the schools, workshops, publications and communications staff. EFOMP will continue to develop, with new ideas and active participation and I would like to hear from you about what you think will help you and will contribute to the development of EFOMP. I have listed some ideas below, that could form the basis for discussion by the Board and Council in the short term. Stay safe, and educate integrate and communicate!

Area	
Education	• Increased online access and content on EFOMP education platform. • Liaison with EBAMP and EEB to look at accreditation of MSc and PhD programmes. •Continuation and development of ESMPE schools.
Identity	• Increased relevance of EFOMP in day-to-day medical physics activities through Working Groups. • Increased participation of younger physicists in EFOMP structures and a voice for their future, reflecting inclusion and diversity. • Enabling tools such as science writing and mentorship in research. • Development of medical physics profile activities and volunteerism in areas including non-ionising, MRI, ultrasound and AI. • Increased EFOMP accreditation of National registration schemes. • Look at the potential to provide software resources, procurement, risk assessment tools and distribute these through EFOMP. • Double the number of IAMs. • Establish a European medical physics mailing list, for the distribution of information, including regulatory issues.
ECMP	• Increased participation through online communication. • Increased profile and support from vendors to facilitate further resources for NMOs.
International Bodies	• Continue to develop contribution of EFOMP in a complementary manner to such bodies.

Paddy Gilligan

Paddy Gilligan is chief physicist in the Mater Private Hospital, Dublin Ireland and current Vice President of EFOMP. In 2019 he chaired the European congress of radiology physics subcommittee. He was past president of the Irish NMO, (now IAPM). He organises the annual medical physics workshop at the Robert Boyle summer school and is a trustee of the Robert Boyle foundation. He teaches on various post graduate courses including a recent participation in the advanced QA in digital radiography as part of the IAEA/ICTP workshop in Trieste. He is associate Clinical Professor in University College Dublin.

Obituary of Professor Jean Chavaudra

EFOMP is very sad to communicate the passing of Prof. Chavaudra, who was EFOMP's second president

We are sorry to have to inform you that our esteemed colleague and friend Professor Jean Chavaudra, former head of the Medical Physics department at Gustave Roussy Institute, passed away on April 2nd 2020 at the age of 82.

Prof. Jean Chavaudra held an engineering degree from the National School of Electricity (École Nationale Supérieure d'Électricité). He met Professor Andrée Dutreix, who convinced him to devote himself to medical physics.

He entered Gustave Roussy Institute where he had a brilliant career as a Medical Physicist and researcher under the supervision of Professor Maurice Tubiana and Professor Andrée Dutreix. He thus actively participated in the development of the Medical Physics specialty in France.

He also devoted himself to academic education in France and abroad. He notably participated in the creation of the first Master Degree of Medical Physics in France, in 1970, with Professors Daniel Blanc, Andrée and Jean Dutreix. He played an important role in the creation of the European Federation of Organisations for Medical Physics (EFOMP) in 1980, over which he presided from 1984 to 1986. He also participated in the creation of the Master's Degree of medical physics in Wuhan (China) in the years 2000.

He was successively appointed assistant at the faculty of medicine of Paris-Sud in 1969, lecturer in 1985, associate professor of universities in 1987, and professor in 1995 at the Institut National des Sciences et Techniques Nucléaires (INSTN) in Saclay.

Member of several medical physics and radiotherapy societies, author of numerous publications, Prof Jean Chavaudra acquired during his career an international reputation.

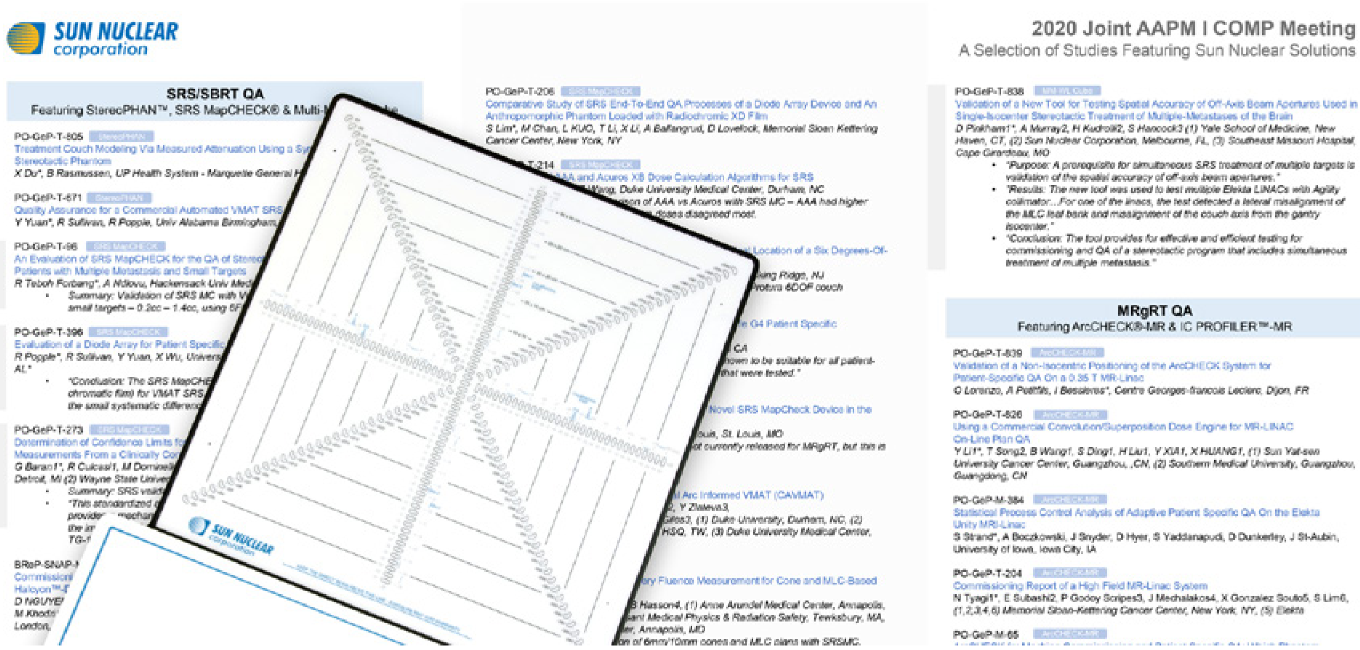
He worked as an expert for various institutions, notably with the National Bureau of Metrology, the CEA (Atomic Energy Council), the French Academy of Sciences, the Academy of Technologies, the International Atomic Energy Agency (IAEA) and the International Commission on Radiation Units & Measurements (ICRU).

An excellent scientist, an outstanding pedagogue, Prof. Jean Chavaudra will be missed. The Medical Physics community wish to express its gratitude and its warmest condolences to Prof Chavaudra's family.

Obituary communicated by Dr. Arnaud Dieudonné, on behalf of the Société Française de Physique Médicale (SFPM)

EFOMP COMPANY MEMBER ARTICLE

Sun Nuclear: Quality Management Highlights from AAPM & COMP



Overview of 92 abstracts, featuring Sun Nuclear solutions such as IC PROFILER™ shown above. Click here to review them all.

Emphasising the importance of independent Quality Assurance, this year's virtual AAPM & COMP Meeting included an astounding 92 abstracts featuring Sun Nuclear products. From validating new techniques to shaping new best practices, the breadth and depth of this work is important to the Medical Physics community. Four abstracts of note focus on automated Patient QA, Stereotactic QA, and AAPM Task Group 142 Machine QA.

Dr. Núria Jornet, of Hospital de la Santa Creu i Sant Pau, published **EPID 2D TRANSMISION IN VIVO DOSIMETRY: Can It Detect Clinically Relevant Differences in Lung SBRT?**, which evaluated the sensitivity of a commercial 2D EPID transmission In Vivo Dosimetry (IVD) system (SunCHECK™ Patient) to detect imposed anatomy and positioning differences in a series of patients for SBRT-lung techniques. Dr. Jornet's team learned that sensitivity of the system to detect clinically relevant changes is dependent upon dose distribution with respect to the volumes of interest, and increasing the number and distribution of 2D portal images increases sensitivity.

A related abstract from Dr. Yorke of Mercy Health Cancer Center in Ohio, entitled **Implementation of the Full SunCheck Platform DoseCheck and PerFraction in a Community Setting**, validates the accuracy of SunCHECK™ Patient against several well-known Pre-Treatment and Secondary QA solutions with great results, and notes that automation makes daily in-vivo QA for every patient and every fraction possible.

Dr. Teboh Forbang of Hackensack University Medical Center published **An Evaluation of SRS MapCHECK for the QA of Stereotactic Radiotherapy Plans for Patients with Multiple Metastasis and Small Targets.** This abstract features the SRS MapCHECK® for single isocenter multi-met plans, in particular using vertex fields and targets down to 0.2 cc. All the results were excellent with even the most complex case passing at 97.7% with 2/2 criteria.

Finally, Dr. Barbee, from NYU Langone Health, published **Clinical Experience Implementing an Ion Chamber Array for Monthly Beam Constancy Versus Ion Chamber in Water.** This study summarises 15 months of dosimetry checks data from the IC PROFILER™ versus a Farmer chamber. It concludes that beam quality measurements produced by the IC PROFILER were more consistent than the Farmer chamber, and also notes an impressive 50-66% time decrease for monthly dosimetry checks.

For more information on publications, we are pleased to let you know that the newly updated publications page on sunnuclear.com makes it easy to search through hundreds of key QA publications over the last few years. Also, for French-speaking Medical Physicists looking to highlight their own research, we are holding a French Poster Contest. Submissions are due September 14th, with the chance to win prizes and be invited to present your findings as a webinar. Learn more here.

Soufiane Chouaf
M.Sc. Medical Physics

Soufiane Chouaf is a Clinical Applications Physicist for Sun Nuclear, the leader in Quality Management solutions for Radiation Therapy and Diagnostic Imaging. In this role, he supports customers in France and Switzerland — providing training and demonstrations of the latest QA solutions available from Sun Nuclear, and helping customers get setup and troubleshoot their QA solutions. Soufiane obtained a bachelor's degree in Applied Physics in collaboration with the Corpuscular Physics Laboratory (LPC) of Clermont-Ferrand, followed by a master's degree in Medical Physics at University Blaise Pascal.

In parallel to his medical physics pathway, he was an intern at Cancerology Center of Grand Montpellier working on CBCT based dose calculation for VMAT head and neck patients with the view to approach adaptive radiotherapy in clinic.

EFOMP 40th BIRTHDAY ARTICLE

EFOMP 1980-2020 Austrian NMO recollections

Austrian delegates Werner Schmidt and Klara Jarzcyk describe the positive impact EFOMP has had on their society

Due to major technical developments, large changes in medicine occurred in the 1970s. The first applications of the newly invented CT in radiology began as well as the rise of linear accelerators in radiotherapy and the availability of new nuclides and scintillation cameras. Computer technology changed to integrated circuits, making data measurement, evaluation and storage faster and easier.

Those developments were accompanied with the creation of a new profession, the medical physicist - not only in research but on site, in hospitals. New challenges like comparison of results with other hospitals and countries, new mechanisms for QA, integration of different systems into one network, harmonization of different manufacturers etc. lead to the need of a connected medical physics community. At that point some communities already had existing societies but many European countries did not have appropriate organisations.

The first EMP newsletter (1980) notes that starting in 1978 it took 27 months to establish the EFOMP. At that time Austria had no medical physics society! Around 10 to 20 physicists were working, most of them by themselves, in different Austrian cities. So first of all a new association had to be founded, the "Austrian Society of Hospital Physicists" (President F. Hawliczek). The society, in London represented by H. Bergmann, was actually one of the EFOMP founding members.

In 1984 the society was renamed to "Austrian Society for Medical Physics" (OeGMP) and led by Mrs. G. Keck who had a chair in physics at the Veterinary Medicine institute in Vienna. She also presided over the second EFOMP meeting in Innsbruck in 1987. This meeting represented the "first contact" of one of the authors (W. Schmidt) with EFOMP and resulted in a long-lasting co-operation.

In the past 40 years many beneficial collaborations between EFOMP and OeGMP took place. Even though not all can be listed, some of them shall get further attention.

In the 80s there were no rules in Austria regarding how to become a medical physicist. Some physicians tried to become "medical physicists" with an additional short course of some months, but without a university degree in physics. It was time to define which studies a medical physicist needed, what and how much practical experience is necessary and if there was a need for continuing education etc.

In establishing these education requirements, EFOMP was of invaluable help, since complete sets of curricula from other member countries were provided. In 1989 a 3-year apprenticeship training to become a "Medical Physicist" at the Medical University of Vienna, following a Master's degree in Physics, was established. This was of significant importance in negotiations with the Ministry of Health regarding Austrian legislation. Since 2017 the role of medical physicists, the educational requirements as well as the need for continuing education are fixed by law.

Nowadays the OeGMP has more than 220 members, approximately 30% of whom are female. Intensive discussions, especially with the Ministry of Health, concluded in a now established mandatory number of Medical Physicists necessary in radiology, nuclear medicine and radiation oncology.

The OeGMP organises national annual meetings, sometimes in co-operation with other Austrian, German or Swiss physics or medical societies. Together with neighbouring Southern or Eastern countries, OeGMP founded the Alpe-Adria Medical Physics Meetings group (AAMPM) which has organised biennial meetings since 2002. Although the participating countries are only a small step away from each other, different languages are spoken. Knowledge exchange is the main goal for these meetings.

Vienna is a "conference city". The presence of international organisations in Vienna (IAEO), the annual ECR or three yearly ESTRO, which often include special physics sessions, are always of interest to medical physicists and help to establish further personal connections to medical physicists all over the world.

Dr. Werner Schmidt has been active in radiotherapy and radioprotection since 1977. During his career, Werner has been involved with the development of treatment modalities (TBI, stereotaxy, permanent implants, IMRT, angiographic beta irradiations) and instruments. Werner is a member of the Austrian Board of OeGMP and was president from 2009-12. He has been active in education since 1988 (universities, colleges, radiation protection) and has an interest in continuing education. Werner has been an Austrian EFOMP delegate since 2000.

Klara Jarczyk works as a medical physicist in the hospital Klinik Landstrasse in Vienna, Austria. Her professional interest is in radiology, nuclear medicine and radiation protection. Since 2017 she has acted as an EFOMP delegate for Austria.

俳句

EFOMP Haiku contest, 2020

In the light of EFOMP's 40th anniversary, EMP News invites all medical physicists to write a Haiku and participate in this contest!

The Haiku is a popular Japanese verse form in which deep thoughts may be expressed in just 3 lines and 17 syllables. The first line has 5, the middle one 7 and the last one again 5 syllables. It is as easy as this, and still it is intriguing.

Show your poetic ability and combine your rational side with your feelings! A reference to medical physics, Europe or EFOMP in your haiku is appreciated, but is not mandatory.

Here are some examples for inspiration:

Cel-e-bra-ting this
an-ni-ver-sa-ry is just
what we need these days

Phy-sics lays right down
in the heart of me-di-cine,
dri-ving the sys-tem

Me-di-cal Phy-sics
In Eu-rope is a great feat
Cel-e-brate this now!

SendyourHaikus

Send your Haikus (maximum of 3 per entrant) to the EMP News Editorial Board (pubcommittee@efomp.org) before October 15th 2020.

If you have a version of your haiku in your own language, please feel free to submit this along with the English version – we will publish both if you are a winner!

Winning Haikus will be published in the EMP News Winter edition, a fine read for Christmas.
The winners will gain eternal fame and the joy of satisfaction...

EFOMP COMPANY MEMBER ARTICLE

PTW: Track-it – Access all your QA data anytime, anywhere

PTW THE DOSIMETRY COMPANY

QA data management with Track-it: Quickly find and sort results by keyword search or filters. Photo credit: Frank Szafinski.

Any medical physicist who has prepared the annual audit of a linear accelerator knows the time and effort involved: The quality assurance (QA) reports of several hundred measurement tasks must not only be documented in a reproducible manner, but must also be complete and easy to find regardless of whether they are in digital or paper form. The annual audit is not the only challenge – monthly, weekly and daily QA tasks also demand a great deal of time and effort.

PTW has developed the browser-based Track-it QA data management platform, which is accessible to any number of authorised users, via a local area network connection. In Track-it, QA data from different sources can be documented, monitored and accessed at any time using any end device, whether PC, laptop, tablet or smartphone. Data can also be entered offline in the treatment room and is automatically transferred to the Track-it database when the network is available again. The Marien Hospital in Düsseldorf is one of the first clinics to use Track-it and here is what they have to say about it.

Simplifies daily operation, saves significant time

The main motivation for introducing Track-it was to simplify daily operations: it allows all QA data to be kept in a central database, structured and available at all times, where it can be easily accessed and updated quickly. Additionally, with Track-it, individual measurement results and entire measurement series can be retrieved quickly and easily using convenient search functions. This not only considerably reduces the time required for the annual audit, but it also helps to streamline the daily workflow. What's more, filters composed of different search parameters can be saved, meaning they can be used repeatedly for multiple queries.

Track-it is also used for the monthly monitoring of the treatment planning chain, which is now a legal requirement in Germany. The complete measurement protocol has been set up in Track-it, making the task much easier. Moreover, since necessary data are stored uniformly, it can be seen at a glance which QA tasks have already been completed and which are still pending.

Effective monitoring

With just a few mouse clicks a trend plot can be created in Track-it, allowing critical parameters to be monitored over any chosen time period and thus providing an early indication if certain measured values are moving towards the tolerance limits.

In addition, the digital logbook makes it possible to store and quickly retrieve service and maintenance files for radiation devices, such as manuals or service reports and notes. Both, entries and attached service documents, e.g., operating instructions or images, can be stored and viewed at any time. This is very effective and useful when troubleshooting, as the digital logbook allows to find relevant entries on the issue much more rapidly.

Flexibility and a paperless future

If test procedures change due to new regulations, the data management system provides a further advantage: Implementing these changes is pretty simple with Track-it. The protocols stored in the database are created using templates, which can be easily changed or adapted accordingly.

Track-it could well make paper documentation on the linear accelerators superfluous in the near future. Furthermore, the open, flexible design of Track-it allows protocol templates to be adapted to the individual needs of the hospital and to even be used for other QA tasks, e.g. in diagnostic imaging. All in all, this data management software allows all required tests to be accomplished much more conveniently and efficiently.

Further information can be found at: www.ptwtrackit.com.

Sebastian Wellner, Marien Hospital, Düsseldorf.
Photo credit: Frank Szafinski

Sebastian Wellner is a Medical Physicist at Marien Hospital Düsseldorf, Clinic for Radiation Oncology and Radiology. After his training as an MTRA (radiologist/dosimetrist) at the University Hospital Münster he studied Medical Physics at the University of Düsseldorf and was accredited as a Medical Physics Expert (MPE).

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PTW THE DOSIMETRY COMPANY

EFOMP e-learning

EFOMP's e-Learning platform was launched in January 2019. It contains a wealth of information, including video recordings and pdfs of lectures given during seven recent editions of the European School for Medical Physics Experts (ESMPE), as well as complete recordings of the highly-informative "Lockdown webinars" organized by EFOMP and IAPM in Spring 2020.

Access to the EFOMP e-Learning platform is provided to all **Individual Associate Members (IAM) of EFOMP**. Becoming an IAM is very simple – just complete an online registration form and pay a subscription fee of €15 (renewable annually). You will receive immediate access to the e-Learning platform.

Registration as an EFOMP IAM is available to anyone, in any location (including outside Europe) who is interested in continuing and supplementing their education and training in Medical Physics.

EFOMP Officers' Meetings – Spring and Summer 2020

Efi Koutsouveli and David Lurie provide an update on the EFOMP Officers' meetings which took place online in April and July

The EFOMP Officer's Spring 2020 meeting was scheduled to take place in Gustavelund, Finland, hosted by the Finnish Association of Medical Physicists in conjunction with their annual meeting in April 2020. Unfortunately, the coronavirus pandemic put paid to those plans, so that instead of discussing EFOMP matters in a delightful lakeside town 30 km north of Helsinki, we met online in our own homes. Despite the fact that we couldn't enjoy beers together (or indeed saunas) in the beautiful location that was planned, nevertheless the three meetings, held over the weekend of 24th-26th April, were productive and enjoyable, as you can see from the smiling faces in the photo!

The 11 attendees at the Spring Officers' meeting, from top-left: D. Lurie, E. Koutsouveli, P. Russo, P. Gilligan, J. Ptacek, Y. Prezado, M. Brambilla, O, Casares-Magaz, M. Mannivanan, A. Lammertsma, A. Maas.

During the video-conference, EFOMP's President Dr. Marco Brambilla gave an overview of the leadership meetings held with the National Member Organisations (NMOs) board members in the period 2018-2020 which aimed in strengthening the relationships with NMOs, the renewal of the European Journal of Medical Physics agreement between Elsevier-EFOMP-AIFM (2021-2024) and the new structure of the Editors' Board of the journal. He also discussed EFOMP's support to Regional Meetings of Medical Physics such as the Alpe-Adria and Baltic Conference of Medical Physics and to the EUTEMPE network.

The Chairs of EFOMP Committees presented the work of the committees during the first quarter of the year, as follows:

Communications & Publications committee: further development of the e-Learning platform, planning of webinars and online EFOMP school editions, live streaming of EFOMP events and preparation of EFOMP 40 anniversary activities.

European Matters committee: a Memorandum of Understanding (MoU) has been signed between EFOMP and the European Radiation Dosimetry Group (EURADOS) to establish the terms of long-term collaboration. Links have been created with the European Organisation for Research and Treatment of Cancer (EORTC) during the last year.

Professional Matters committee: adaptations have been made to the original document of the National Registration Schemes (NRS) approval by adding two points; the documents describing the NRS do not have to be in English. If not, then each document should be accompanied by a brief summary in English and it is also recommended that all criteria have an explanation in English. The approval has a validation time of 10 years after which the NMO has to apply for renewal of the approval. A National Registrations Schemes (NRS) survey has been completed by 32 of the 35 NMOs. The government's role, the education & training programme and duration (bachelor's, master's), the clinical training, the structure and supervision of the NRS, MPE certification and professional registration were discussed. EFOMP supports NMOs during the discussions with their national authorities about the Medical Physics specialty. Four NMOs have been granted approval of their NRS (Germany, Netherlands, France and Austria).

Scientific committee: finalisation of the work of the Working Group "Revision of EFOMP Policy Statement 14 – Safety of MRI" chaired by Simone Busoni. Consultation and approval of the document will be asked by the NMOs. A virtual event on Particle Therapy will be organised this year, following the EFOMP school edition "Statistics in Medical Physics".

Institutional matters that were discussed comprised the nomination of the Planning Committee of the 4th European Congress of Medical Physics (ECMP2022) which will be held in Dublin, Ireland in August 2022 and plans for EFOMP's move out of United Kingdom (UK) as a company, due to Brexit.

The first online meeting was followed by a second half-day online meeting in July 2020, attended by 15 Officers (Committee vice-chairs were included).

During this meeting, the company accounts were approved by the Directors and will be presented to the Council in November 2020. A roadmap with all steps needed to move EFOMP out of UK was presented by EFOMP's treasurer, Dr. Mannivanan.

A new Working Group under EFOMP's Professional matters committee: Policy statement PS17 "Involvement of MPEs in the different phases of the Life Cycle of Medical Devices" was approved by the delegates and is now open for candidates (see the call within this issue of the newsletter and here).

EFOMP will participate in the advisory board of the EURAMED "rocc-n-roll" project and in the Advisory Committee of IUPESM –World Congress 2021.

Institutional news included the recent results of the election for EFOMP School scientific board members: those joining the board are Anna Makridou (HAMP, Greece), Jose Perez-Calatayud (SEFM, Spain) and Joao Seco (DGMP, Germany). The following EFOMP Officers were also elected and will take their positions on January 2021: Tomasz Piotrowski – Communications & Publications Committee Vice Chair (PSMP, Poland), Constantinos Koutsojannis – Projects Committee Vice Chair (HAMP, Greece) and Jaroslav Ptáček – Treasurer (CAMP, Czech Republic).

Undoubtedly, we missed our face-to-face Officers' meetings where stronger bonds are created between colleagues and brainstorming can be done even during coffee breaks, lunches and dinners. We have also missed the hospitality offered by the NMOs which have hosted Officers meetings during previous years.

The next Council meeting is scheduled to take place in Athens in November and we are keeping our fingers crossed that we will be able to meet there, in person!

Efi Koutsouveli works as a Medical Physics Expert in the Medical Physics department of Hygeia Hospital, Athens, Greece. Her professional focus is on radiotherapy units (external radiotherapy & brachytherapy). Her special interest is on Hospital Quality Management Systems and Oncology Information Systems and she has been actively involved in various hospital quality committees since 1996. She is currently the Vice President of the Hellenic Association of Medical Physicists (HAMP), EFOMP's Internet Manager and Assistant Secretary General. In 2019, she received the IOMP-IDMP award for promoting medical physics to a larger audience.

David Lurie holds a Chair in Biomedical Physics at the University of Aberdeen, UK, where he has researched and taught MRI Physics since 1983. His research group works on the technology, methods and applications of low-field MRI. He was awarded the Academic Gold Medal of IPEM in 2017. David Lurie is Chair of the Communications and Publications Committee of EFOMP and Vice-Chair of the Course Accreditation Committee of IPEM.

ESMPE European School for Medical Physics Experts

Particle Therapy: State of the art and future developments

Virtual online School: 10th-11th December 2020

EFOMP would like to invite you to the next ESMPE in **Particle Therapy: State of the art and future developments**. The school will be organized as a 2-day virtual meeting, which will be held on 10th-11th December 2020.

The school will be focused on the Medical Physics aspects of Particle Therapy and will be aimed at presenting the state-of-the-art and future developments in Particle Therapy.

This two-day event will be accredited by EBAMP (European Board of Accreditation for Medical Physics) as a CPD event for Medical Physicists at EQF Level 8 and is intended for Medical Physicists Experts who wish to expand their knowledge in Particle Therapy. Certificates of attendance will be issued to those who attend the whole course.

Content

Technical aspects
Dosimetry and quality assurance
Treatment planning
Positioning, moving organs
Radiobiology
Innovation (including Flash therapy, proton arc therapy, spatial fractionation, sources)

Organisers

Alberto Torresin (Chair of the School),
Yolanda Prezado (Scientific Chair),
Juan Diego Azcona Armendariz (Co-Chair)

Faculty

Lectures will be delivered by world experts in the field, including: **Ugo Amaldi** (Milan University/IT), **Juan Diego Azcona** (Clinica Universitaria de Navarra/ES), **Xuanfeng Ding** (Beaumont/US), **Marco Durante** (GSI Helmholtz Centre for Heavy Ion Research/DE), **Faustino Gomez** (Universidad de Santiago de Compostela/ES), **Oliver Jackel** (German Cancer Research Center – DKFZ/DE), **Tony Lomax** (Paul Scherrer Institute/CH), **Kenneth Long** (Imperial College London/UK), **Ludovic de Marzi** (Institut Curie/FR), **Alejandro Mazal** (Quiron Proton therapy Centre/ES), **Radhe Mohan** (MD Anderson/US), **Harald Paganetti** (Massachusetts General Hospital/US), **Yolanda Prezedo** (Institut Curie/FR), **Joao Seco** (German Cancer Research Center – DKFZ/DE), **Marco Shippers** (Paul Scherrer Institute/CH)

Further Information

Course language	English
Level	Medical Physics Expert (MPE)
Registration fee*	Free of charge to Individual Associate Members of EFOMP
Maximum number of participants	100
Duration	10th December 2020 – 11th December 2020
Study load	8h
Venue	Online
Website:	EFOMP school
Information, programmes at:	www.efomp.org
Registration	Electronic registration via EFOMP website
Registration period	15th September 2020 – 1st December 2020

* *Free registration is reserved for Individual Associate members of EFOMP, who must register for the online School on a first-come, first-served policy.*

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Physica Medica: Editor's Choice

In this regular feature, the Editor-in-Chief of Physica Medica – European Journal of Medical Physics, Paolo Russo, gives his choice of recently-published articles

For this Autumn issue of EMP News I selected the following four articles recently published in Physica Medica (EJMP), which attracted my attention.

Apostolos Raptis et al. **Cancer risk after breast proton therapy considering physiological and radiobiological uncertainties** Phys. Med. 2020;76:1-6 DOI:https://doi.org/10.1016/j.ejmp.2020.06.012

https://www.physicamedica.com/article/S1120-1797(20)30143-5/fulltext

The authors quantified the impact on second cancer risk predictions of breathing motion and variable relative biological effectiveness, for breast cancer patients treated with proton or photon radiation therapy. The study is very commendable and very specific in the field, in the line of research of the group of Prof. Iuliana Toma-Dasu at Stockholm University. While confirming that the organs at risk receive less dose in proton therapy than in photon therapy, and after observing that this reduced risk for protons holds also taking into account breathing and/or RBE variations, the authors found that while "… total risks from the photon plans were seen to increase with the integral dose, no such correlation was observed for the proton plans". This article then indicates that the advantages of proton vs. photon therapy for breast cancer patients apply also to risk estimates of second cancer induced by the radiation therapy: good news for cancer cases representing 25% of all cancers in women. The article is for free download from the EJMP website.

J.C. Santos et al. **Leadership and mentoring in medical physics: The experience of a medical physics international mentoring program.** Phys. Med. 2020;76:337-44 DOI: https://doi.org/10.1016/j.ejmp.2020.07.023

https://www.physicamedica.com/article/S1120-1797(20)30183-6/fulltext

"Mentoring aims to improve careers and create benefits for the participants' personal and professional lives." These words started the abstract for this manuscript, and attracted my attention: Yes, I thought, it is absolutely true!

Mentoring is also a significant part of my University tasks, and it underpins the spirit of teaching, whose ultimate aim, in my opinion, is to help individuals to know themselves a little more, every day. In this article, the point is how mentoring actions can be effective to support young professionals in developing countries. One key point raised here is that mentoring can be effective in developing leadership attitudes of mentees. I know personally three of the authors and I can witness how these words and intentions are effective in the continuous professional actions of these colleagues and friends. EJMP includes in its scope themes of Education and Training, we do publish many articles per year in this context. But this article was particular for me. Very well written and inspirational, it addresses also issues related to the development of leadership abilities and motivations in medical physicists, in the framework of an international programme called "Medical Physics: Leadership & Mentoring" (https://medphysmentoring.wixsite.com/medphys-mentoring). Will this article be appreciated also by you? Please read it and tell me

Robert Bujila et al. **A validation of SpekPy: A software toolkit for modelling X-ray tube spectra.** Phys. Med. 2020;75:44-54
DOI: https://doi.org/10.1016/j.ejmp.2020.04.026

https://www.physicamedica.com/article/S11201797(20)30108-3/fulltext

I am particularly sensible to articles describing X-ray spectral models, since I use these tools commonly in my daily lab work, and I know their performance varies among different codes and needs continuous improvements, and also because I love the field of X-ray tube technology and physics. Not so many spectral models exist, and they continue to deserve ameliorations since the physical problem is normally addressed with many simplifying assumptions, which in the course of the time the authors refine. One of this well known model and related application is SpekCalc, for tungsten anode tubes. Here, the SpekPy software tool (developed in Python language) was presented and validated against other spectral models, vs. Monte Carlo simulated spectra and reference half value layer measurements. As improvements vs. the SpekCalc model, SpekPy includes L-line fluorescence emission from the tungsten target, new electron penetration characteristics in W simulated via the Monte Carlo code EGSnrc, use of the NIST bremsstrahlung cross-section tabulations. You can freely access SpekPy from the public software repository https://bitbucket.org/spekpy/spekpy_release.

David W. O. Rogers. **On pathlength and energy straggling of megavoltage electrons slowing down.**
Phys. Med. 2020;75:404-43
DOI: https://doi.org/10.1016/j.ejmp.2020.05.017

https://www.physicamedica.com/article/S11201797(20)30130-7/fulltext

I was happy to see this article by Prof. David Rogers submitted to EJMP. From his profound experience in the physics of ionizing radiation and in related Monte Carlo simulations, he draw a Note pointing some subtle effects to the reader, in the process of slowing down of electrons in matter, elucidated via EGSnrc Monte Carlo simulations. These effects are related to the effects of range straggling due to electron elastic scattering, and to energy-loss straggling, in the Continuous Slowing Down Approximation. This article is pedagogical in nature, written "… to understand how both multiple scattering and energy-loss straggling contribute to range straggling in clinical electron beams", but the effects shown are somehow unexpected, and I know by experience how gratifying can be the understanding of these physical effects learnt in a simple way via Monte Carlo simulations (having learnt Monte Carlo simulations over 30 years ago also following the EGS course in Ottawa held by David Rogers and Alex Bielajew in 1990, a great experience). I will leave to the interested readers the genuine sense of intellectual gratification arising from this "lecture" by Prof. Rogers. The article has then been left for free download from the EJMP website.

Paolo Russo

Professor of Medical Physics at University of Naples "Federico II", Naples, Italy, with 36 years of staff academic experience. His scientific interests are in the field of 2D and 3D X-ray breast imaging, photon counting pixel detectors, semiconductor based compact gamma cameras. He is Editor-in-Chief of Physica Medica (2013-2020), the official scientific journal of EFOMP, past Chair of the Communications and Publications Committee of EFOMP, Chair of the Publications Committee of IOMP, member of the Board of Directors of the International Medical Physics Certification Board, member of the Scientific Committee of the Italian Association of Medical Physics.

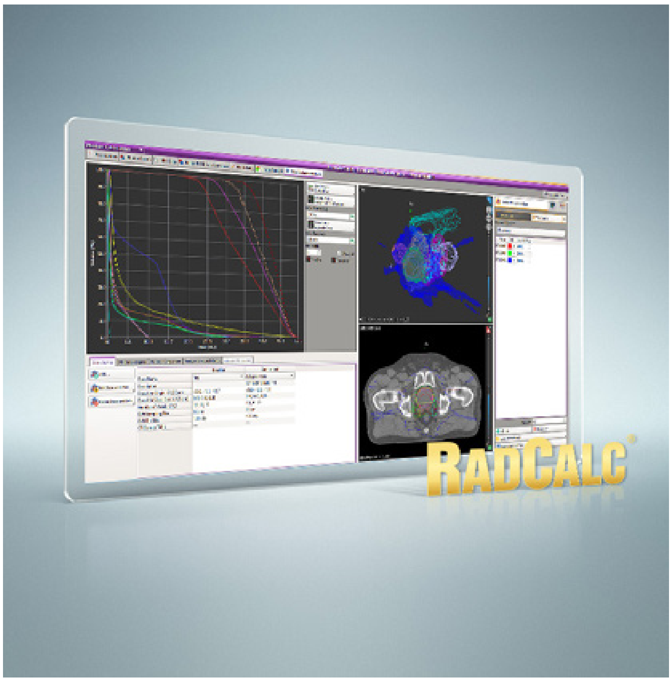
EFOMP COMPANY MEMBER ARTICLE

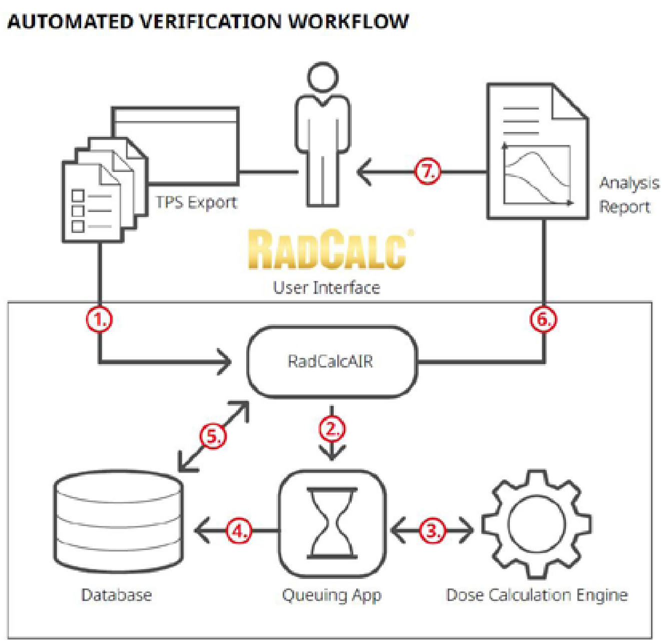
LAP: Quality assurance is even more important in these times of COVID-19

LAP places strong focus on QA projects for radiotherapy

Radiotherapists worldwide have been confronted with many unknown factors since the outbreak of the pandemic. Patients aren't showing up for treatments because they are afraid of infection or are in quarantine. RT centres are also having to put off treatments because resources are unavailable or must be reassigned. Cancer patients are a high-risk group and require protection from infection even more urgently.

ware adapts to user requirements with modules that can be combined as needed. The latest version of RadCalc is available with the Monte Carlo module. The Monte Carlo calculation method is considered the gold standard and is characterised by the highest precision. It allows accurate calculation of even very inhomogeneous structures, like lung tissue.





RadCalc software has been meeting the highest standards of quality assurance in radiotherapy for 20 years and has been part of the LAP product portfolio since 2019. This expert software helps medical physics specialists check patient treatment plans efficiently and safely. RadCalc is manufacturer-independent and so offers the ideal basis for re-checks of treatment plans.

"Customers tell us about their current challenges in performing quality assurance. RadCalc can make the process substantially easier and accelerate users' work. With RadCalc QA software we assist our customers and help cancer patients the world over," says Jens Gauthier, managing director at LAP.

QA processes differ not just from country to country, but from RT centre to RT centre. RadCalc is flexible and can be integrated into the specific processes. This QA soft-

Another milestone in the LAP QA segment is the THALES 3D MR SCANNER water phantom. This MRI-compatible system consists of the phantom, its carriage system, and software. The electronic components are integrated in the carriage system. The THALES 3D MR SCANNER was developed for the "MRIdian" MR LINAC made by ViewRay. There is still no simple and efficient commissioning method or regular QA routines for the MRIdian. The LAP water phantom consistently earns the praise of first users and greatly simplifies the necessary quality assurance.

"We have been positively impressed by the quality of the 3D MR compatible water phantom system prototype that was provided to us for evaluation with the ViewRay MRIdian LINAC. We're looking forward to the market launch of the water phantom system from LAP," says Winston Wen, PhD, MBA, director of clinical physics in the Radiation Oncology department at the Henry Ford Medical Center in Detroit.

The THALES 3D MR SCANNER was developed together with first users of the MRIdian. The focus was on simple use, compact design, and time efficiency. Setup, including filling the phantom on site, only takes about 15 minutes. Measurement chambers by the well-known manufacturers can be used for measurement. Measurement precision is +/- 0.25 mm. The THALES software offers special analysis methods for characterizing large and small fields in FFF mode

Contact us directly if you have questions about the THALES 3D MR SCANNER.
Dr. Thierry Mertens is looking forward to a discussion among professionals!
E-mail: t.mertens@lap-laser.com
You can find more information on the THALES 3D MR SCANNER water phantom and the RadCalc QA software on the LAP website, YouTube, and LinkedIn.

EJMP ANNOUNCEMENTS

Important Announcements from Physica Medica (European Journal of Medical Physics)

Editor-in-Chief of Physica Medica, Prof. Paolo Russo, provides announcements about the 2019 Galileio Galilei Award and a forthcoming Special Issue of the journal

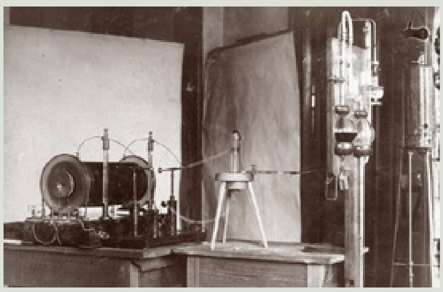
Announcement: Galileo Galilei Award for Best Paper in 2019

Physica Medica - the European Journal of Medical Physics, is happy to announce that the paper “**Development of a 3D printed anthropomorphic lung phantom for image quality assessment in CT**” by Irene Hernandez-Giron, Johan Michiel den Harder, Geert J. Streekstra, Jacob Geleijns and Wouter J.H. Veldkamp, published in *Physica Medica*, Volume 57, January 2019, Pages 47-57 (DOI: https://doi.org/10.1016/j.ejmp.2018.11.015) has been elected the best paper published in the journal in the year 2019.

The Galileo Galilei Award, consisting of a medal and a certificate, will be given to the authors during the ECMP 2020 Conference in Turin, Italy, 16-19 June 2021 (http://www.ecmp2020.org/).

Announcement: Special Focus Issue of Physica Medica in November 2020

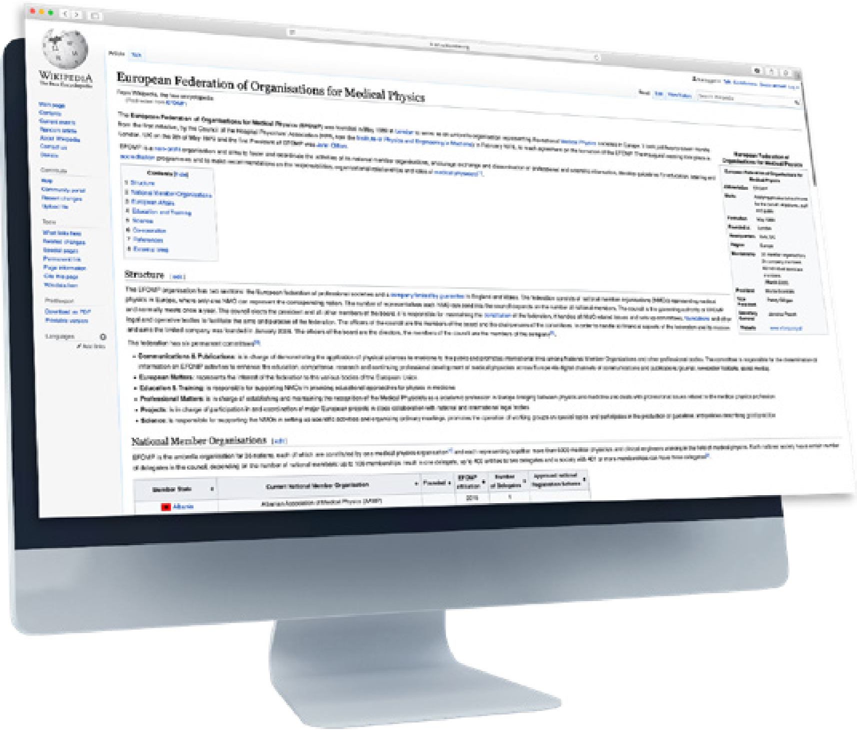
On 8th November 1895, the German physicist Wilhelm Conrad Röntgen discovered X-rays, and on the 28th of December, 1895, he published a comprehensive report of his findings. *Physica Medica – European Journal of Medical Physics (EJMP)* will publish in November 2020 a Focus Issue “125 Years of X-rays” dedicated to celebrating the 125 years from Röntgen’s discovery of X-rays, a ground-breaking step which gave rise to fundamental diagnostic and therapeutic applications in medicine. The Focus Issue will include invited articles from leading scientists in medical physics, highlighting important achievements, recent advances and present challenges for medical physics, related to the use of X-rays.


Röntgen’s laboratory in Würzburg, Germany, in 1895

Paolo Russo, Università di Napoli Federico II, Naples, Italy. Editor-in-Chief of Physica Medica - European Journal of Medical Physics

It's official – EFOMP is on Wikipedia!

EFOMP now has its own page on Wikipedia. Here, Stephan Klöck describes the background, motivation and challenges in creating EFOMP's new Wikipedia page.



In March 2020 I contacted EFOMP as I was planning to write some articles for submission to Wikipedia about medical physics and radiation therapy in Europe; I asked EFOMP if they could perhaps provide some background information. The immediate answer was "yes – but since you have experience of the technicalities of writing for Wikipedia, could you help EFOMP to prepare its own entry?" So began an interesting few months, resulting finally in the publication of a Wikipedia page about EFOMP: https://en.wikipedia.org/wiki/European_Federation_of_Organisations_for_Medical_Physics

When starting to write an article on Wikipedia you have to think about how to deliver evidence of notability for your subject. If this fails, it will be deleted after you have finished. There are clear criteria within the Wikipedia community about notability and the sources to prove it. The references are supposed to be secondary and independent of the subject. For organisations and companies [1] in particular the criteria are pretty tough in order to avoid self-promotion.

However, notability itself is an interesting property. Actually, it is difficult to find an objective measure of it and therefore it is difficult for a physicist to understand it. Obviously, it's important, especially nowadays. It's one essential incentive even in our scientific world to become worth a notice. But notability is not an absolute concept, it has to become and can be constructed as well. The latter is one reason for the tremendous increase in the number of scientific journals and yearly publications. On the other hand, there is the concept of relevance and quality… It's one of the aspects in the game and struggle of life.

Knowing this, it becomes pretty funny to read the history of Wikipedia on … Wikipedia [2]. However, relax! The authors deliver more than 250 references (nevertheless, with a substantial portion of self-references). Launching in January 2001, Wikipedia exceeded 50 million articles in 309 language editions [2] in March 2019. This is equivalent to 20,000 printed volumes of the Encyclopædia Britannica [3], which was started in 1768 and contains roughly 65,000 articles today. The biggest Wikipedia language edition is the English one with more than 6 million articles. The worldwide monthly readership reached approximately 495 million in September 2018 with 15.5 billion monthly page views.

> *"…any object becomes apparently notable, if it appears on Wikipedia"*

It needs to be mentioned that any object becomes apparently notable, if it appears on Wikipedia. By the way, Wikipedia excludes explicitly this from the notability criteria. Why do we actually trust this open source encyclopaedia? There are several complications: the most important is whether the writer themself is equipped with the individual skills, background and interests [4]. Anybody can become an author on Wikipedia. Nevertheless, amongst other criteria, Wikipedia demands that the writer of an article should be independent of the subject. This causes problems if the subject is complex and needs a lot of insight, knowledge and substantial maintenance, especially in a rapidly moving field. There is rescue in this paradox: the counterbalancing swarm of specific experienced editors, who are not always capable of providing a peer review, but can take methodological care of articles following the rules.

What about medical physics in this encyclopaedia? Only a few articles are currently available. Does this actually represent the amount of notable knowledge in the total field of science and collective memory of humanity? Personally, I do not think so. We are an applied scientific discipline with a lot of fascinating content regarding pure science and technology, but also with links to other disciplines, history, organisational structures and finally, biographies. I am convinced that Wikipedia is the perfect platform to present and explain this knowledge in its complexity to interested parties. And you are welcome to join the group of active editors!

Asking the question, where to start in this (almost) non-existing field, I ended up with the vertex points of our network: the National Member Organisation societies. I created an article about EFOMP, happily addressing the issues mentioned above and some more regarding legal aspects. A first version is now online [5] and can be iteratively improved. For this project, I got great support by some elected officials of EFOMP, especially Efi Koutsouveli – thank you and your team!

Finally to be disclosed: everything in life has consequences: by writing this article, I produced another reference for EFOMP's Wikipedia …and all future articles about medical physics – looking forward to seeing them!

References

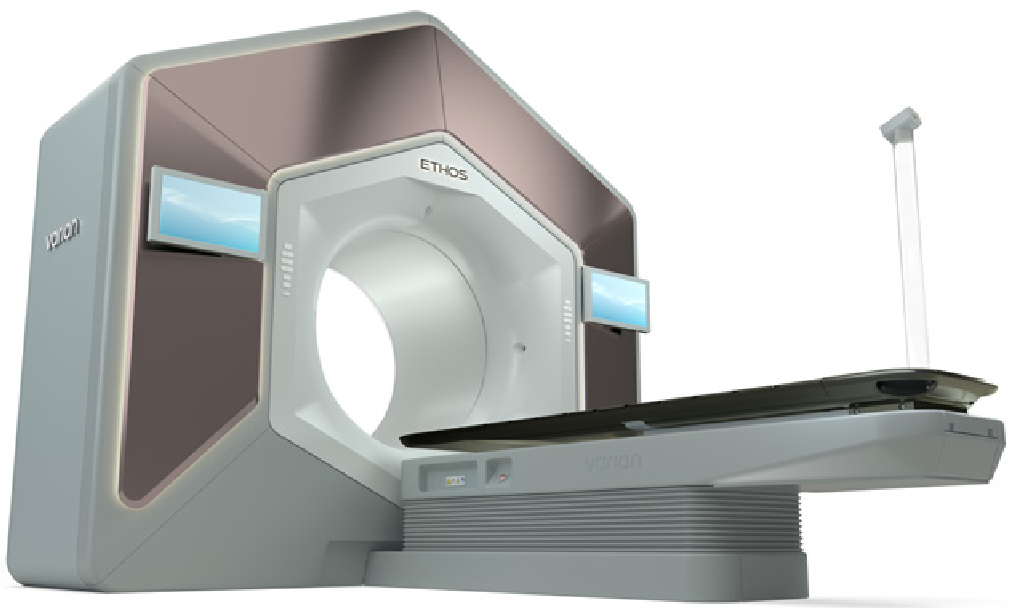
1. https://en.wikipedia.org/wiki/Wikipedia:Notability_%28organizations_and_companies%29
2. https://en.wikipedia.org/wiki/History_of_Wikipedia
3. https://en.wikipedia.org/wiki/Encyclop%C3%A6dia_Britannica
4. https://en.wikipedia.org/wiki/Wikipedia_community
5. https://en.wikipedia.org/wiki/European_Federation_of_Organisations_for_Medical_Physics

Stephan Klöck is head of medical physics in a private radiation therapy facility near Basel, CH. Previously, he was head of medical physics in radiation therapy at the University Hospital Zurich. He started his training in 1994 and his fields of expertise are image guided stereotactic treatments and motion management. Currently, he chairs the exam committee of SSRMP for board certification.

EFOMP COMPANY MEMBER ARTICLE

Varian Medical Systems: Ethos™ Therapy - Intelligent Adaptation Comes to the Clinic

Varian Medical Systems describe their new radiotherapy treatment system that uses artificial intelligence (AI) and machine learning to accomplish adaptive radiotherapy



Adaptive therapy involves the ability to alter a radiotherapy treatment plan based on tumour and anatomical changes over a course of therapy. The goal is to better target the tumour, reduce dose to healthy tissue and potentially improve overall outcomes. To date, achieving this has typically required time-consuming re-planning between treatment sessions or monopolising a linac for an extended period while a patient waits on the treatment couch for new plans to be generated.

Neither of these alternatives has been deemed practical or affordable at scale, as very often clinics don't have the resources even if they have the tools.

To address this challenge, Varian Medical Systems developed Ethos™ therapy, a radiotherapy treatment system that uses artificial intelligence (AI) and machine learning to accomplish adaptive radiotherapy, including treatment planning and delivery, within a typical 15-minute treatment time slot.

The Ethos system allows the clinical team to compare the 3D radiation doses from the scheduled plan — recalculated on today's anatomy — with the 3D doses from the adapted plan, re-optimised on today's anatomy. The user can make a decision based on clinical data presented in a simple format.

New levels of visibility

Ethos therapy integrates multi-modal diagnostic quality images at the point of treatment on the treatment console. By providing a current and detailed view of patient anatomy, Ethos therapy gives clinicians confidence that adapted plans are based on quality imaging. At each treatment, Ethos therapy shows:

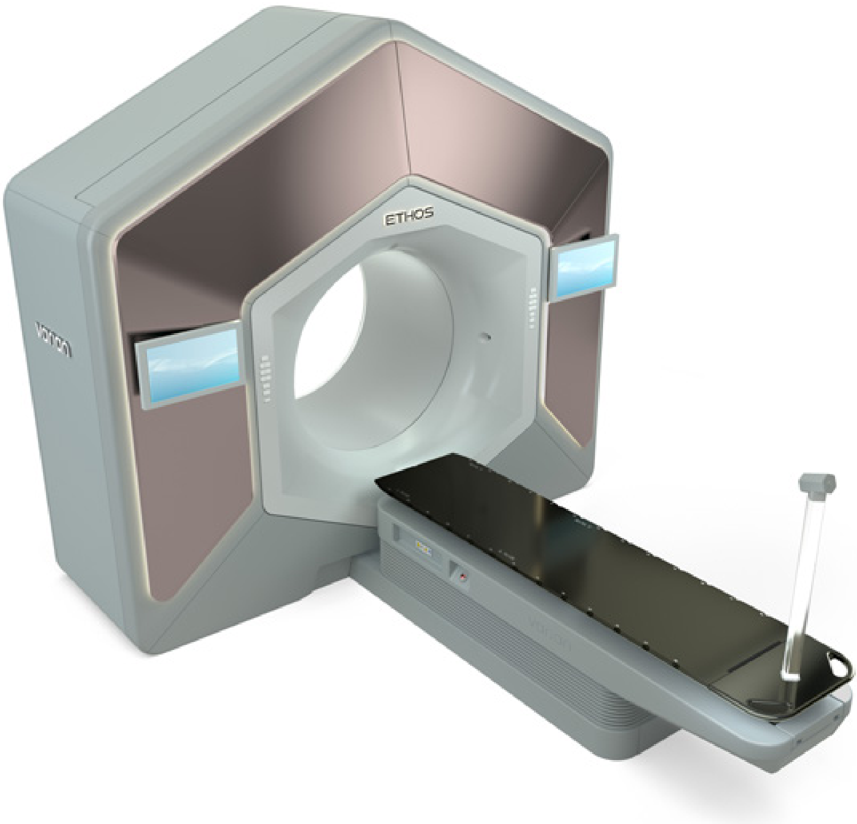
- That day's anatomy with iCBCT images
- Diagnostic-quality CT, PET, MR, and CBCT images
- The expected 3D radiation dose to the target and organs at risk
- A preview of tradeoffs between target and critical structures

Simplified decision-making guided by AI

During initial planning, Ethos therapy quickly produces several customised plans, showing the possible radiation dose distributions. Each day, the clinician selects the plan — original or adapted — that meets his or her intent.

Automated dose accumulation

Each day, the Ethos therapy system reconstructs delivered dose in relation to today's anatomy. This capability demonstrates that the patient is receiving the intended dose and reduces the need for dose calculations by technical personnel.



Familiar, efficient QA
QA for Ethos therapy follows a familiar workflow. Initial planning and adaptive planning at the console use the same algorithms for consistency. Independent adaptive plan QA can be performed on-demand, without impeding treatment workflow.

Ethos Therapy at Herlev Hospital in Denmark
In September 2019, Herlev Hospital in Denmark became the first site in the world to commence patient treatments using the Ethos system. At Herlev, bladder cancer patients were the first to be treated using online adaptation, with more than 160 fractions delivered to date using this approach. The online adaptive treatments have enabled a median reduction of the treatment volumes of around 40% compared to non-adaptive treatments, resulting in reduction of dose to risk organs without compromising the target coverage. Not surprisingly, since the margins mainly comprise intra-fractional variation of the bladder, the adaptive plan has been selected for almost 100% of the treatments.

In the future, the Herlev clinical team aims to be able to run adaptive treatments with the Ethos system in the same manner as they now deliver non-adaptive CBCT-guided treatments, i.e. the radiation therapist will be able to handle the process without the presence of an MD or physicist. So far, six radiation therapists have been trained to evaluate and edit the AI-generated structures.

Today the duration of the adaptive process, from CBCT imaging to treatment delivery, varies from patient to patient and between different clinical team members. Departmental statistics so far show a median adaptive process duration of around 15 minutes.

The information from Herlev Hospital was provided by Poul Geertsen, MD, Department Head, and David Sjöström, PhD, Deputy Chief Physicist.

Further reading:
Archambault Y, Boylan C, Bullock D et al. Making On-Line Adaptive Radiotherapy Possible Using Artificial Intelligence And Machine Learning For Efficient Daily Re-Planning MEDICAL PHYSICS INTERNATIONAL Journal, Vol.8, No.2, May 2020.

Poul Geertsen, MD is Head of Department at Herlev Hospital, Herlev, Denmark.

David Sjöström, PhD is Deputy Chief Physicist at Herlev Hospital, Herlev, Denmark.

UPCOMING MEETING ANNOUNCEMENT

ETRAP

International Conference on Education and Training in Radiation Protection

The 7th International Conference on Education and Training in Radiation Protection, organised by SCK CEN and the University of Groningen in cooperation with EUTERP, IRPA and IAEA, is scheduled to take place 23-26 March, 2021 in Groningen, the Netherlands. If the situation around the COVID-19 pandemic does not permit an on-site conference, alternative plans are being made for an online conference. The general theme (and title) of the meeting is "Education and training in radiation protection: evolution and challenges". A Train-the-Trainer course will be organised during the first day of the meeting (separate registration required).

Clearly, the topic of the meeting is of interest for medical physics experts and it is good to know that EFOMP is formally involved through a representative on the Scientific Programme Committee, namely Prof. dr. Adriaan Lammertsma, chair of EFOMP's Education & Training Committee.

Abstracts: The deadline for submission of abstracts is December 1st, 2020. The call for abstracts can be found through this link, which includes a link to the abstract submission portal.

Abstracts can be submitted in the following general themes:

- **Online learning**
  The COVID-19 pandemic has boosted the use of online tools. How is online learning influenced by this? Is distance learning/e-learning now implemented to the full and are there results available of comparative studies with traditional learning methods?

- **Train the trainer**
  Trainers need to be experts in the scientific or technical topic they transfer, demonstrate excellent didactical skills and be able to use the most recent tools and methods. How do they obtain and maintain their competences to the state of the art requirements?

- **E&T policy in radiation protection**
  The interaction between research, E&T and legislation is a basis for policy makers. What is the status of the E&T activities within the different networks and to which extent is the BSS now fully implemented? Are the national qualifications compliant with the legislative framework?

- **Stakeholders engagement and attracting the young generation**
  Stakeholder engagement is of utmost importance for the future development and success of education and training activities. Which professionals need specific attention in the development of E&T in radiation protection and what actions are taken for them?

- **Communication, ethical issues and radiation protection culture**
  While the science itself may not be controversial, its application often is. There is a growing awareness of the importance of being able to consider this wider context. How to deal with these complex items in ed-

Full information about the conference is available on the ETRAP web page, www.etrap.net.

EFOMP WORKING GROUP REPORT

Results of the Survey on Artificial Intelligence in Medical Physics

EFOMP's Working Group on Artificial Intelligence presents its findings

The term "Artificial Intelligence" (AI) was first coined by John McCarthy in 1956. However, AI has not been a hot topic until recent years, when the computing technology has achieved sufficient power and a large amount of digital data has become available. AI technology has shown potential improvement over human performance. This fact has not gone unnoticed in healthcare or in the field of medical physics, as great improvements in diagnostic, therapy and personalised medicine have been presented in publications and in all the main international radiology conferences in recent years (ECR, RSNA, etc.).

Such disruption has raised some concern within the healthcare community of how AI could affect the daily work and how professionals should be prepared for the new challenges. In this line, a Working Group (WG) on AI was created in June 2019 under the auspices of the European Federation of Organisations for Medical Physics (EFOMP). The main objective of the WG is to build an educational and professional curriculum for medical physics experts (MPE) working in diagnostic imaging, radiotherapy and other disciplines where MPEs work daily, such as computer science, research and industry. The proposed curriculum could be leveraged to provide an educational platform around AI through the European School of Medical Physics Expert (ESMPE) course modules, which are annually organised to provide a basic and advanced up-to-date training for medical physicists on an international level.

The workgroup conducted an international online "flash" survey between February and March 2020 (one month and a half) in order to assess the current knowledge and experience of MPEs on AI, evaluate the perception of the community around AI applications and identify their needs in order to address them to the professional curriculum at the European level.

The survey, which included 25 questions, was distributed through e-mail lists and social media (i.e. Twitter, LinkedIn) of EFOMP and several of its National Member Organisations (NMOs). A total of 219 responders from 31 countries participated in the survey, where French responders represented 37% of the total recorded responses (Figure 1). Responders included 150 male participants (69%), 64 females (29%), while and 5 participants (2%) preferred not to state their gender. The average age of participants was 42±10 years old (minimum 24, maximum 79). 76% of the responders worked primarily in the public sector and the remaining 24% had a primary job in the private sector. Furthermore, 41% of the participants were early career medical physicists (≤10 year of work experience), whereas the remaining 59% were experienced MPEs (> 10 years).

Most of the participants (81%) believed that AI will improve the medical physics profession. With respect to AI skills, responders were asked to rate their own AI knowledge on a 1-to-5 scale (Figure 2). The average rate was 2.3±1.0 (mean ±standard deviation). In most of the cases (63%), participants learnt AI skills through continuous learning (e.g. reading literature, in-person and online courses, workshops). Further questions illustrated that 88% of participants think that MPEs need specific training on AI and should be part of the professional curriculum. In fact, some of the participants expressed their concern because there is a lack of AI courses covering medical physics aspects.

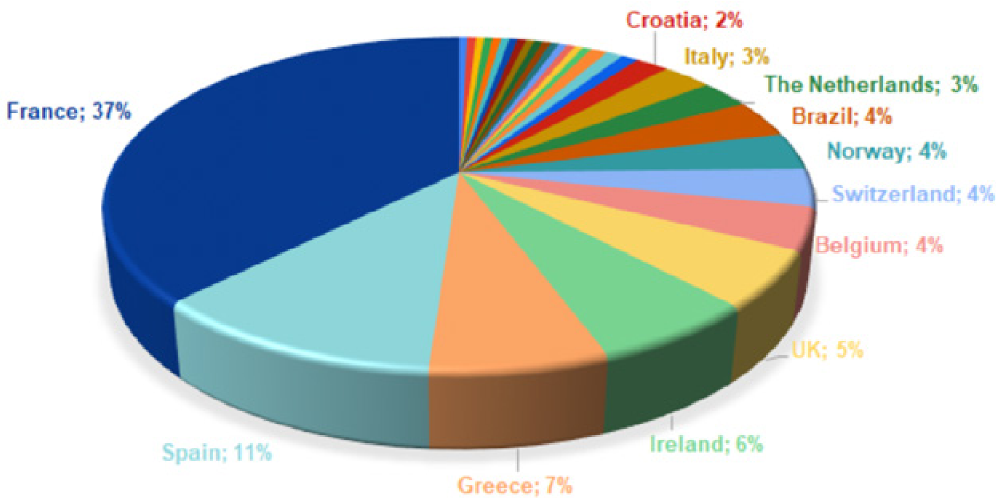


Figure 1: Distribution of participants per country of work.

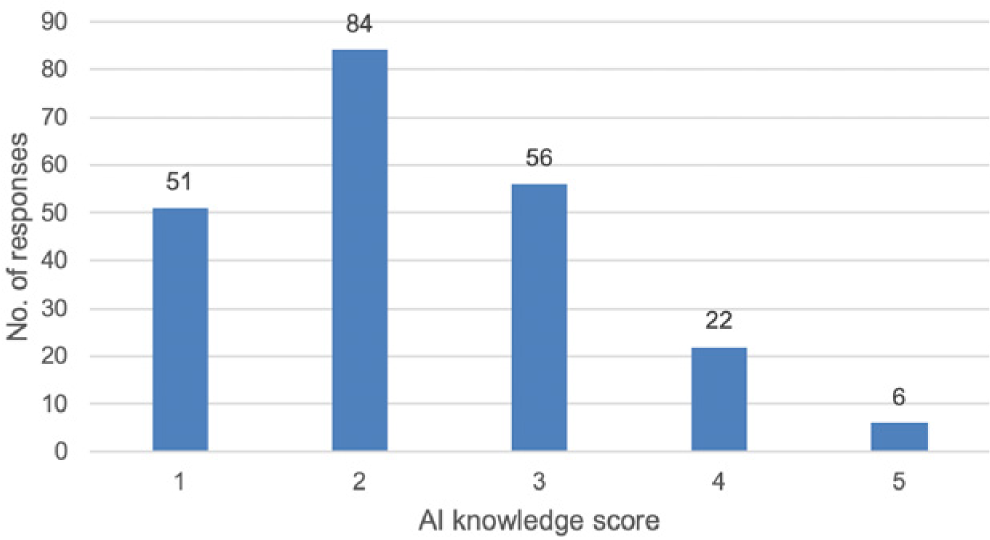


Figure 2: Results for "How would you rate your knowledge of AI". Results were on a scale from 1 to 5 (horizontal axis); vertical axis is the number of responses for a specific score.

"Most responders (96%) showed a high interest in improving their AI skills"

Most responders (96%) showed a high interest in improving their AI skills and 90% of them expressed their desire to participate in an AI School dedicated to medical physicists. The participants showed equal preferences for either following a fully online course or a blended learning strategy (40% in each option). The most popular topics included: basics of AI, QC applications, integration of AI in clinical workflow, evaluation of AI tools, medical image analysis, programming skills, data curation, commissioning and ethics and legal aspects.

Another interesting observation from the survey was that only 28% of participants are already involved in AI-related projects. 64% of them do not participate in AI projects, although they indicated that they would like to take part in such projects. This is an important aspect to be considered and developed in the near future since the role of the MPE in such AI projects should be taken into account when designing or implementing.

AI software, technology and use in clinical practice. Also, it was observed that female responders had a significantly smaller AI knowledge rate than male participants (2.0±1.0 vs 2.4±1.0) and that significantly fewer female participants lead AI projects compared to male partners (3% vs 19%). Thus, specific strategies might be considered to foster the participation of female MPEs in AI projects.

A detailed analysis of the results of the survey has been submitted to Physica Medica: European Journal of Medical Physics (EJMP) for publication. Stay tuned!

Federica Zanca is a medical physicist with more than 20 years of experience in healthcare, with a strong focus on innovation and digital transformation. She has a multidisciplinary background built across academia (Professor at the University of Leuven) and industry settings (Chief scientist and Director at GE Healthcare) as well as entrepreneurial competences. She currently owns her consulting company (Palindromo) and she works with researchers, hospitals, start-ups and corporates to build and evaluate medical imaging products and AI tools through clinical research.

Gabriele Guidi is Director of Medical Physics at the Az. Ospedaliero-Universitaria di Modena (Italy). He is currently a member of several working groups in EFOMP and the National Association. He is an expert on adaptive radiation therapy, predictive methods and machine learning methods with current research in clinical automation and computer science based on AI application for diagnosis and therapy.

Oliver Díaz is Lecturer at the Mathematics and Computer Science at the University of Barcelona (Spain). He is currently a member of several medical physics working groups: EFOMP Working Group on AI, AAPM/EFOMP task group No. 282, EFOMP Working Group on Digital Breast Tomosynthesis quality control and working group on breast tomosynthesis of the Spanish Society of Medical Physics (SEFM). He is an expert in Monte Carlo simulations and his current research interests include the development of AI applications for cancer diagnosis.

EFOMP Professional Matters Committee seeks nominations for new Working Group

Ad Mass and Wim van Asten provide additional information on the recent call for WG members

At the end of July, EFOMP sent out a call for members for a Working Group on the Involvement of Medical Physics Experts in the Life Cycle of Medical Devices. The aim of the WG is to prepare an EFOMP Policy Statement on the Involvement of MPEs in the Life Cycle of Medical Devices.

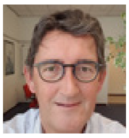
MPEs are trained in the application of physical principles in the healthcare business. They have a solid scientific background and excellent analytic capacities. Based on these facts, they are very well suited to contribute to several phases of the life cycle of medical devices: inventory planning, procurement, acceptance testing, advising how to use the equipment effectively and safely, training of users, connecting to the hospital information system, advising in maintenance and removal of the equipment from the hospital according to environmental laws. So, the MPE can play an important role in the governance of medical devices in a hospital.

The purpose of this WG is to analyse these life cycle phases and determine where the input of MPEs is important for the balanced life-cycle management of medical devices in a hospital.

The new EFOMP WG will be composed of members, observers and consultants and is chaired by Dr. Wim van Asten from the Netherlands. The Professional Matters Committee seeks MPEs with a broad experience in the mentioned life cycle phases, e.g. as head or member of a Medical Technology Department or those having experience in the role of project manager. A balanced spread of representatives from all European countries is sought. Candidates have to be nominated through their National Member Organisation (NMO) before 25th October 2020.

Details of how to apply can be found at https://www.efomp.org/index.php?r=news/view&id=186.

Dr. Ad Maas is the Chair of EFOMP's Professional Matters Committee. He was Head of the Medical Physics Department of the Jeroen Bosch Ziekenhuis in 's-Hertogenbosch (NL) from 1988 until 2014. He is now retired but still working for EFOMP and a member of the Medical Ethics Review Committee, Brabant.



Dr. Wim van Asten has been a Medical Physics Expert since 1991. He is founder of the Medical Physics Department of Zuyderland Medical Centre in Heerlen (NL) and still works there as an MPE.

EFOMP COMPANY MEMBER ARTICLE

RTsafe: End-to-End verification of advanced IGRT systems

In contemporary Stereotactic Radiosurgery (SRS) treatments performed by a linear accelerator (linac), the role of the Image and Surface Guidance systems is very important and becomes vital for the safe and efficient implementation of each clinical procedure. The accurate and precise patient positioning in the treatment couch for a single fraction or hypofractionated SRS applications, as well as the accurate patient monitoring during the dose delivery, can be achieved with advanced Image Guidance Radiation Therapy (IGRT) and Surface Guidance Radiation Therapy (SGRT) techniques. IGRT and SGRT systems combine high-end technology with sophisticated software aiming to improve the treatment outcome. Specifically, the most recent integrated IGRT/SGRT systems provide x-ray imaging through embedded Cone Beam Computed Tomography (CBCT) systems or mounted x-ray tubes and corresponding detectors, surface optical imaging with cutting-edge optical cameras combined with mounted light sources detecting the patient's 3D surface structure, and surface thermal imaging using specially designed thermal cameras acquiring the patient's external thermal surface.

However, the more advanced the hardware and software used by these systems is, the higher level of complexity is introduced and subsequently, End-to-End verification is mandatory. International committees and task groups strongly recommend the implementation of End-to-End tests during the commissioning and/or periodic Quality Assurance (QA) of IGRT/SGRT systems. The complexity that hybrid systems have introduced leads to the need for more realistic simulation of the clinical procedure during End-to-End testing. If we can summarise, the main goal of QA in SRS with IGRT/SGRT applications is the verification of the precision on localisation and accuracy on dose delivery.

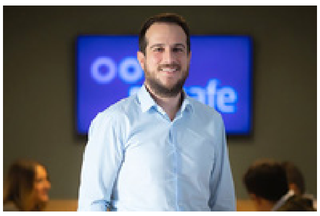
RTsafe, following the trends in modern SRS, is continuously developing adapted solutions to the most demanding QA needs. Specially designed anthropomorphic head phantoms have been modified and equipped accordingly, to be used for the End-to-End evaluation of advanced IGRT/SGRT systems. The combination of anthropomorphic anatomy and bone/soft tissue equivalency that phantoms offer is a fact that makes them a must-have tool in every radiotherapy department. More specifically, the realistic contrast of bone and soft tissue in CT (Computed Tomography) and MR (Magnetic Resonance) imaging, the patient-like anatomy, and the ability to be filled with warm water (internal human temperature, heated up to 45°C/113 °F) make them the best candidate for testing the patient positioning and monitoring systems. Moreover, RTsafe's head phantoms offer the ability to accommodate small metal spheres at any desired or predefined location acting as reference points visible in CT, CBCT, and x-ray imaging. The external surface of the phantoms can be modified to provide realistic external morphological characteristics, with dull surfaces minimising artifacts and unwanted reflections on optical imaging. The end-users also have the ability to perform point and 2D dose measurements using appropriate inserts fitted into the phantoms.

At RTsafe we have a clear strategy; safer and more efficient SRS treatments will benefit patients ensuring a better treatment outcome, medical personnel allowing them to gain confidence in adopting new techniques, and clinics boosting and safeguarding their brand name. Our team is always ready to work with you and support you

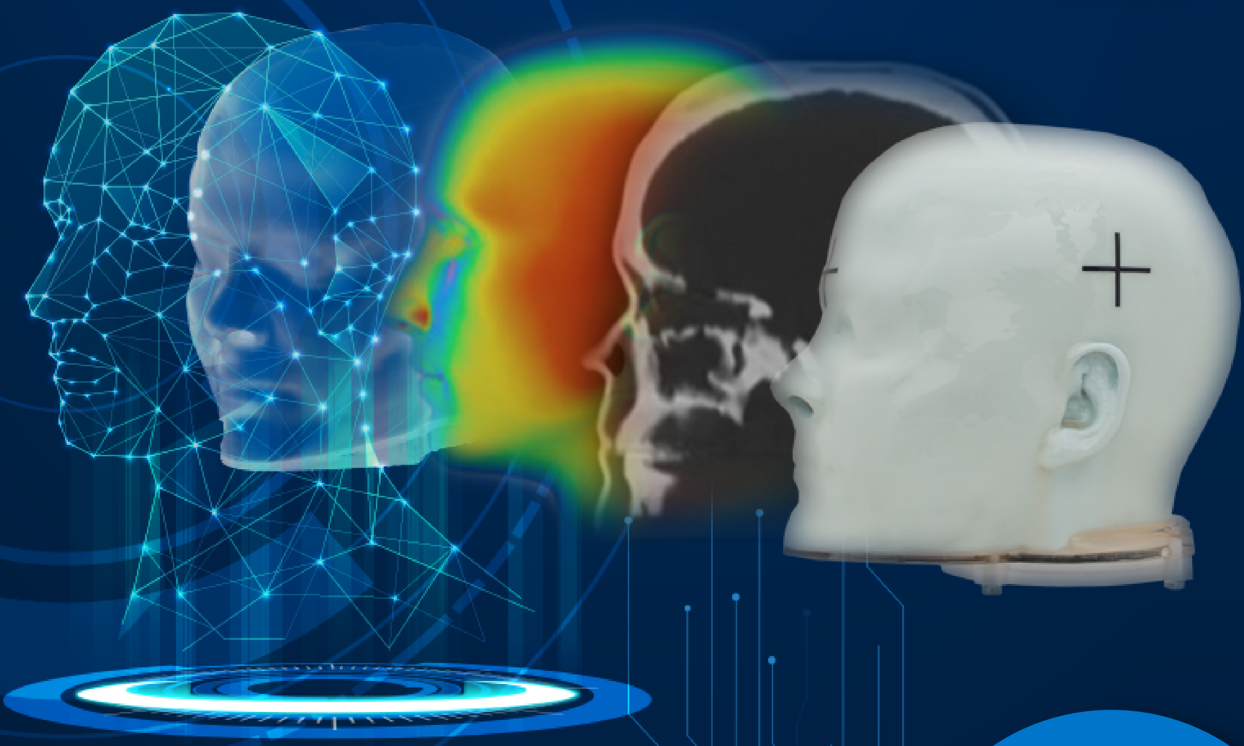
For more information visit

www.rt-safe.com or email info@rt-safe.com

Georgios Kalaitzakis
Product Manager
Georgios is responsible for the 3D digital design of the 3D printed phantom, the data analysis, the communication and the whole scientific support and guidance of the end user. He has a diploma in Electronic & Computer Engineering, where he focused on the estimation of pharmacokinetic parameters via dynamic contrast enhancement imaging in order to annotate the perfusion of the brain tumour. During his PhD in medical school in the University of Crete, he introduced advanced MRI biomarkers in CNS diseases.



Emmanouil Zoros
Medical Physicist - Product Manager
Emmanouil is responsible for product management, data analysis, and film dosimetry at RTsafe. He has a Diploma in Applied Mathematics & Physics from the National Technical University of Athens and a Master of Science in Medical Physics from the National and Kapodistrian University of Athens. His research interests focus on radiation therapy with emphasis on quality assurance in stereotactic radiosurgery, experimental and computational dosimetry using Monte Carlo simulation techniques.



NATIONAL MEMBER ORGANISATION (NMO) ARTICLE

The IPEM Masters Level Accreditation Scheme

Dick Lerski and Liz Parvin, Chair and Secretary respectively of IPEM's Course Accreditation Committee, provide an update on IPEM's well-established accreditation scheme

Introduction

From 2010, changes in the UK to the way in which newly-recruited clinical scientists were trained meant that the Institute of Physics and Engineering in Medicine (IPEM) no longer had a central role in administering this training. However, one aspect of the old scheme had been that IPEM accredited the Masters degrees that all trainees took as part of their course. These courses were run by several universities and were used both by UK students and by overseas students. The existence of the IPEM accreditation was highly valued by both these groups.

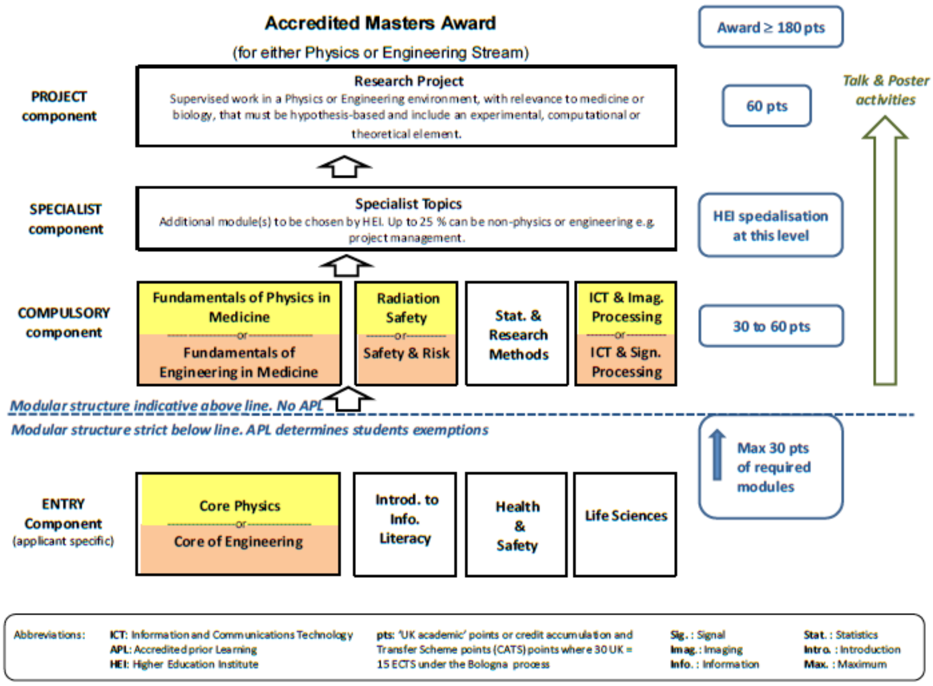
In 2012 a meeting of representatives of these universities agreed that the continuation of the IPEM accreditation scheme would be of great value in guaranteeing academic quality and providing a "kitemark" that would help in student recruitment. It was also clear that an appreciable number of students who took these degrees had employment aspirations outside the UK NHS, for example working in industry or academic research. Overseas students were also keen to attend an accredited course.

The New Accreditation Scheme

Following this meeting a small working party was formed from members of the IPEM Course Accreditation Committee (CAC) and began to construct what became known as the Masters Level Accreditation Framework (MLAF). The aim was to have a framework which would:

- allow students with a wider range of previous qualifications to enter the course (clearly at the individual university's discretion);
- have two streams – Medical Physics and Clinical Engineering;
- ensure that each accredited course contained core content which would cover the essential knowledge and skills for a graduate biomedical engineer or medical physicist;
- have the flexibility to allow universities to tailor their course content to local strengths such as staff expertise and research specialisation;
- not prescribe a fixed modular structure but would allow universities to be flexible.

The decision was made to concentrate on a learning-outcome based approach, focussing on the minimum level that each student must attain to meet the accreditation standard.



The figure shows the overall structure of the framework as it now appears, following some revision in the subsequent years.

Overall the degree must contain 180 UK credit points (CATS) (equivalent to 90 ECTS points on the European system). Depending on the students' backgrounds they will complete some of the entry components which are at undergraduate level. The compulsory component is self-explanatory, viz., what is considered essential to being a physicist or engineer working in medicine or biology. Thereafter there can be diversification as long as the level is maintained at Masters level. A hypothesis-based project is essential (60 UK CATS points) and additionally a talk and poster must be completed by each student during the course.

The Process

Application is via a form and payment of a fee. A one-day visit is carried out, normally with two assessors. There will be discussions with teaching staff, examination of assessment material and project reports and a meeting with present and past students. The assessors report back to the CAC and the outcome can be immediate accreditation with some or no conditions, some recommendations for change or, very infrequently, rejection. The university pays reasonable expenses of the assessors.

"One Overseas programme has been accredited, and others are encouraged to apply"

Commitments and Benefits

IPEM accreditation of a Masters degree is an indication that the degree is suitable for medical physicists/engineers and is of a good academic standard. This aids the university in marketing the course, whether it is a UK course or one based overseas. IPEM is happy to evaluate overseas programmes that are taught in English.

At present, there are 14 accredited degree programmes at 10 different universities; several have completed their first three years of accreditation and have been evaluated and re-accredited for a second period. One overseas programme (in Malaysia) has been accredited, and others are encouraged to apply.

Conclusion

The first few years of operation of this scheme have shown it to be highly regarded, offering credibility to MSc programmes in the medical physics/engineering area. Further applications are encouraged! Information about the scheme is available from the IPEM web site.

Dick Lerski, BSc, PhD, FIPEM, is a retired Director of Medical Physics in Dundee, UK. He was part of the team that developed the accreditation scheme discussed in this article and is currently the Chair of the IPEM Course Accreditation Committee.

Liz Parvin, BSc, PhD, FInstP, MIPEM, is a retired senior lecturer from the Open University and ran their MSc in Medical Physics till 2015. She was part of the team that developed the accreditation scheme discussed in this article and is currently the Secretary of the IPEM Course Accreditation Committee.

BOOK REVIEW

On-treatment Verification Imaging: A study Guide for IGRT

Book cover, reproduced with permission from the publisher. ©CRC Press.

On-treatment Verification Imaging: A study Guide for IGRT by Mike Kirby and Kerrie-Anne Calder, CRC Press, 244 pages, ISBN 9781138499911, hardback GBP 88.99, eBook GBP 80.09.

https://www.routledge.com/On-Treatment-Verification-Imaging-A-Study-Guide-for-IGRT/Kirby-Calder/p/book/9781138499911

This book, written by Mike Kirby and Kerrie-Anne Calder, is a meticulous compilation of all imaging techniques that have been used to date in the (on-)treatment verification. Along with a detailed background rationale, which is given for all currently applied steps in treatment verification procedures, the imaging procedures involved, such as CT in all its variants, MR, ultrasound, PET/CT, PET/MR etc., are presented.

Different sections discuss particular problems of on-treatment verification from different angles using different imaging modalities, partly reflected in clinical case examples as well as the discussion of pros and cons regarding different clinical protocols and their implementation (off-line, on-line etc.). Sections on Quality Systems and Quality Assurance, Protocol Development, Training or Commissioning of New On-treatment Imaging and Techniques as well as hints on legal issues conclude the technical part of the book.

The approach the authors use to structure the material leads to a series of repetitions of information throughout the book, sometimes making the text a bit lengthy and obscuring a common thread. Chapter 2 (The Foundations of Equipment Used for Radiotherapy Verification) and Chapter 3 (Concepts of On-Treatment Verification) serve as examples for this line of argument. However, this approach allows also for a chapter such as the one on “Alternative Technologies” (i.e. alternatives to conventional C-arm LINACs), to provide a concise, reference-based compilation of these methods, which are often more advanced methods rather than just being alternative technologies (such as Cyber-Knife, HALCYON, proton therapy etc.).

All in all, the book’s strength lies in its bird’s-eye view of on-treatment verification imaging in modern radiotherapy. It does not go deeply into the physics behind imaging science or imaging procedures (there are only about 5 equations in the text), but nevertheless explains the main concepts behind them. So don’t expect to understand, for example, image contrast, let alone the Detective Quantum Efficiency (DQE) from the book. However, not only for imaging physics, but in all sections numerous references are given for the reader who does want to dig deeper.

Despite the few, mainly structural deficiencies, the book serves both the experienced medical physicist and the radiographer as a well-compiled compendium; for beginners it is an easy-to-understand introduction to the field.

Prof. Dr. Kay-Uwe Kasch is Chair of EEB. He is Dean of the Department of Mathematics, Physics and Chemistry at the Beuth University of Applied Sciences, Berlin. He served and serves as a member of various professional organizations. He is the German representative to EFOMP Council and (co-)chairs various organizations at national level. He teaches various courses within the Bachelor and Master Curricula of the Applied Physics – Medical Engineering field, mainly with a focus on radiation physics, radiation therapy and nuclear medicine. His research interests are radiation therapy, particularly novel approaches in particle therapy and tomotherapy.

EFOMP COMPANY MEMBER ARTICLE

Accuray: Preliminary Experience with the Radixact® System with Synchrony®

The Città della Salute e della Scienza di Torino is a University Hospital in Turin, Italy; the Radiotherapy facility comprises 5 linear accelerators, 1 HDR brachytherapy and 1 Radixact®, the next-generation TomoTherapy® platform installed in 2019. 3200 patients are treated per year, of whom 400 are SBRT or SRS with hypofractionated schemes. In June 2020, the real time motion synchronisation, Synchrony® (Accuray Inc.), was installed on our Radixact machine. The system utilizes 2D kV X-Ray radiographs at different gantry angles for real-time motion monitoring and adapts the beam delivery by using it with the MLC and jaws during helical delivery. The system has three methods for motion synchronisation: fiducial tracking, fiducial tracking with respiratory modelling and lung tracking with respiratory modelling. In case of lung tracking, a model for predicting the location of the tumour is constructed and updated during treatment as a function of the patient's breath. Four LED markers are used as external surrogates (one for couch movement). The system is able to: 1) identify the tumour position in real time; 2) predict the tumour motion; 3) reposition the beam. The performance of the Synchrony was tested in depth by Chen et al. [Medical Physics 47, 2814-25, 2020]: many mechanical and dosimetric tests were conducted to evaluate the accuracy and reproducibility for clinical use. Our acceptance tests were performed on the 29th of June, 2020; the tests verified the geometry, the dose, and the irradiation pause accuracy in terms of capability of the tracking system to predict the position of the target and to irradiate it correctly. Geometric and dose accuracy were < 1.3 mm and 2% respectively. Since 2003, our department has performed 4DCT with 4DCBCT to account for the breathing cycle of the patient. This technique permits the customisation of the PTV based on the ITV delineation, but doesn't include any intra-fraction correction, leading to possible errors in missing the target or normal tissue over irradiation, especially in the case of breathing cycle differences between planning CT and delivery time.

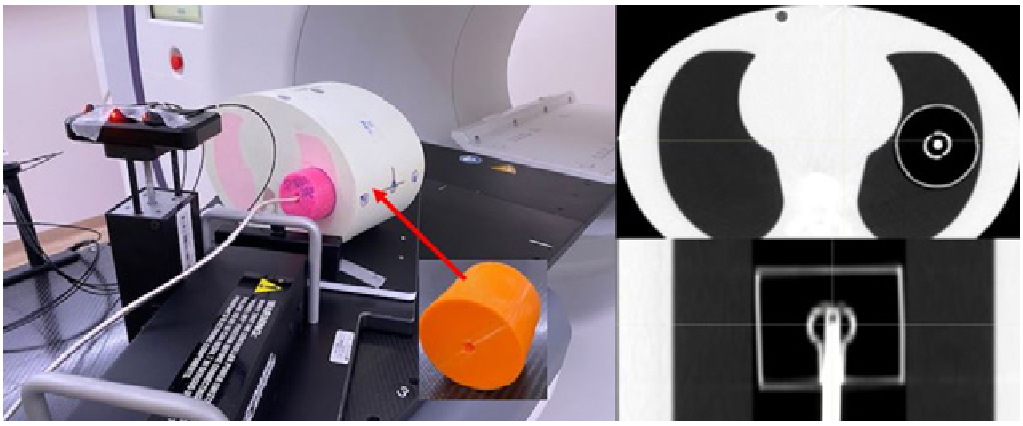
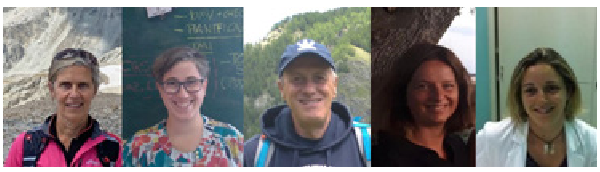


Figure 1: CIRS Phantom with moving platform

This issue has been overcome with the Synchrony system. Two patients, both not eligible for surgery, were enrolled and started treatment on the 20th of July: patient 1 was an 84-year-old male, stage I NSCLC in the right upper lobe, and patient 2 was a 71-year-old female with oligoprogressive lung metastases in the right upper lobe. The prescription dose was 50 Gy in 5 fractions for both; the total in-room time for each treatment session was 24 and 22 minutes for patient 1 and 2 respectively. Before and during the go-live, we were supported by Accuray staff (physicists, dosimetrists and technical support) and their distributor Tecnologie Avanzate (TA).

To test the accuracy of the dose, we used the CIRS dynamic thorax phantom; a new insert inside the left lung, composed of material simulating a target in a high contrast region (useful for tracking with Syn-chrony), was created with a 3D printer, and a thin chamber Exradin A1SL was placed inside (Fig. 1). A sim-ple test was performed to verify the tracking with respiratory modelling: a target around the chamber was irradiated and measured with and without motion. Three measurements were compared: static plan, stat-ic plan with motion of the phantom and no tracking, and tracking plan. When compared to the static plan, the dose difference with the motion and no tracking plan and the tracking plan was 40% and 4% respec-tively. The ArcCheck® instrument was also modified with an insert of a small target surrounded by high-contrast area; in this way, it is possible to measure dose distribution and target dose. The preliminary ex-perience with the Synchrony on the Radixact System opens truly encouraging possibilities.



Medical Physics team at Città della Salute e della Scienza di Torino – Molinette Hospital, from left to right: Francesca Romana Giglioli (senior Physicist), Elena Gallio, Christian Fiandra (senior Physicist), Anna Sardo and Veronica Richetto. Their professional focus is on radiotherapy units (external radiotherapy & brachytherapy) especially on complex procedures as SRS, SBRT, IGRT, automatic planning and dosimetry.

RESEARCH ARTICLE

A method for the quantitative discrimination of breast tissue chemical composition based on the spectral decomposition of X-ray tomographic breast phantom images

Stevan Vrbaski, from Serbia, writes here about his research carried out during an Erasmus internship at the University of Trieste.

Breast cancer

Breast cancer has the highest mortality among all other cancers in women around the world [1]. The diagnosis, besides ultrasound examination, is most often based on x-ray radiology. Here, tissues are discriminated based on their linear attenuation coefficients μ. This quantity is not a unique characteristic for every tissue but rather depends on its effective atomic number, density and the energy of the impinging photons. Based on pure attenuation measurements and in the early stage of tumour development, it is impossible or at least reasonably challenging to distinguish malignant tissue from other soft tissues contained inside the breast.

Multi-energy CT

In my master's thesis work done as a collaboration between the University of Trieste and Elettra Sincrotrone in Italy and Kaunas University of Technology in Lithuania, we aimed to develop a new approach to improved visualisation of cancerous tissue through the quantitative description of all breast contents. The dedicated breast phantom contained six tissue-equivalent materials: water, polymethylmethacrylate (PMMA), polyethylene (PE), nylon (PA), polyoxymethylene (POM) and polytetrafluoroethylene (PTFE). These materials were imaged using synchrotron radiation breast CT, developed by the SYnchrotron Radiation for MAmmography (SYRMA) collaboration, at four well-defined x-ray energies [2].

Figure 1: Patient support table.

The multi-energy approach was proposed almost 50 years ago by Alvarez et al. [3], but its use was limited by the technological advances of that time. Only recently spectral CT machines have been used for many useful applications such as automated bone removal in CT angiography, blood perfusion CT, virtual non-contrast-enhanced imaging, or urinary stone characterization. In this work, a novel material decomposition theoretical model, very sensitive to small attenuation differences in similar low-Z materials,

$$\mu(E) = x_1\, \mu_{PMMA}(E) + x_2\, \mu_{Al}(E)$$

was developed. Images are of high quality, with improved signal-to-noise ratio compared to conventional CT images.

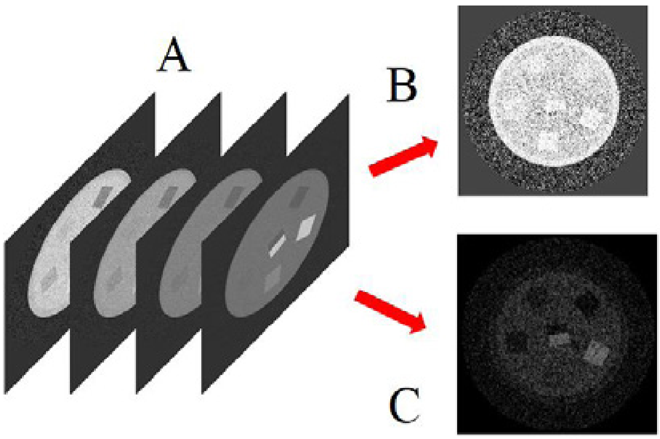


Figure 2: (A) Shows the stack of 4 images of the same phantom position but at different energies. When images are well co-registered, every spatial position corresponds to the same pixel in all four images. The 4 pixels at the same position are then fitted with equation (1) to be represented as some combination of PMMA linear attenuation coefficient (B) and Al attenuation coefficient (C).

Material decomposition

Stripped to its essence, material decomposition refers to describing every voxel of an image in terms of a linear combination of two (or more) arbitrarily chosen materials that will produce the same attenuation in that voxel. A combination of aluminium (Al) and PMMA, chosen in this work, were used to represent every voxel of a phantom image. It is mathematically described as:

where μ_{PMMA} and μ_{Al} are the linear attenuation coefficients of Al and PMMA and x_1 and x_2 are the respective weights.

Quantitative description

For quantitative description, the photoelectric effect and Compton absorption, as the only relevant physical effects at energy range 25 – 32 keV, were considered. After extensive theoretical analysis, including definitions for linear attenua-

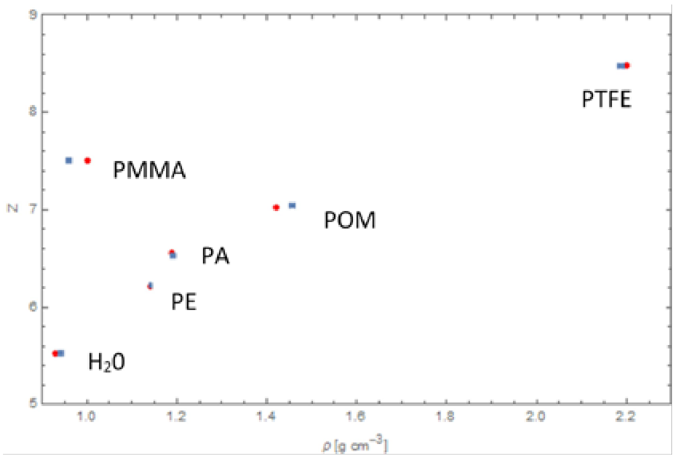


Figure 3: Graph showing the density of material on the horizontal axis and its effective atomic number on the vertical axis. The red dots represent theoretically computed values while blue dots (with very small error bars) represent experimentally obtained data.

tions of Al and PMMA and the application of several transformations, the model was ready. It could take the images as an input and, after going through the mentioned process coded in Python language, the output becomes an effective atomic number (Zeff) and density (ρ) of every material placed into the phantom. In other words, each tissue-equivalent plastic material is described in terms of Zeff and ρ, rather than being distinguished based on the gray level it produces. The six materials including water are graphically represented in Figure 3. The proposed method can obtain the effective atomic number and density information with a precision of better than one percent. The variations of the effective atomic number and density are sufficiently small to be interpreted as the characteristic constant for a material. The team in Trieste is planning on applying this method to breast mastectomies. Stay tuned!

This work will be presented in the 106th congress of the Italian Physical Society on 14-18 September 2020.

Acknowledgments

I would like to express my sincere thankfulness to Dr. Adriano Contillo and Professor Renata Longo for providing me with great support in my Master's thesis project.

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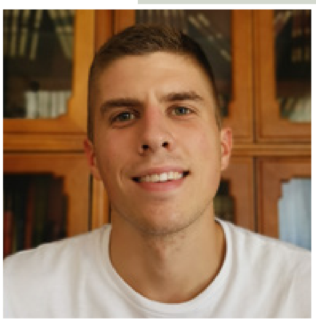

Stevan Vrbaski

As a teenager, Stevan moved to South Carolina, USA to play basketball and earn his high school diploma. Upon returning to Serbia, he enrolled at the University of Novi Sad and after 4 years received a degree in Physics. With most of the elective subjects oriented toward medicine and his bachelor's degree focusing on the analysis of LINAC beam parameters, Stevan developed a passion for medical physics. Two years later he graduated from his Master's studies in Medical Physics at the Kaunas University of Technology, Lithuania. The work described in this paper was a product of a great opportunity to do an Erasmus internship at the University of Trieste. Currently, he is volunteering at the Oncology Institute of Vojvodina and actively looking for a suitable Ph.D. programme!

RESEARCH ARTICLE

X-ray Phase-Contrast Breast Computed Tomography at Elettra

Phantom study investigates image quality metrics using novel X-ray Phase-Contrast imaging for Breast imaging

Computed Tomography (CT) is one of the finest tools of diagnostic radiology, providing 3D X-ray attenuation maps of the investigated object. However, as breast imaging is concerned, the attenuation contrast between breast tissues is faint, thus limiting the visibility of clinically relevant features. This limitation has prevented widespread use of Breast CT (BCT), where the need for high spatial and contrast resolutions is hard to reconcile with a low-dose delivery. On the other hand, the availability of 3D imaging avoiding superposition effects inherent to 2D mammography is regarded as key to improve breast cancer early detection, follow-up, and treatment planning. In this context, the use of X-ray Phase-Contrast Imaging (XPCI) techniques can provide a major advantage. XPCI enables the conversion of phase distortions that occur to X-ray waves travelling through an object into detectable intensity modulations. Phase effects, which do not contribute to the image formation in conventional radiology, are much stronger than attenuation, thus providing another pool of (phase) contrast, improving tissues visibility.

Among XPCI techniques, the so-called "Propagation-Based Imaging" (PBI) is appealing for clinical implementation as it only requires distancing the imaging detector from the imaged organ by one or few metres. On the downside, PBI requires the X-ray source to be highly coherent, presently confining its application mostly to within synchrotron radiation facilities. Upon propagation, phase effects manifest themselves in the form of bright/dark pairs of fringes arising at the interfaces between different tissues. This "edge-enhancement" effect is effectively a boost high spatial-frequency component of the image, obtained without affecting image noise. Acquired images are further processed by applying the so-called "phase-retrieval" filter, ultimately transforming the high spatial-frequency gain into a signal-to-noise ratio boost. At the end of the imaging chain, the final reconstruction features the same contrast as a conventional CT image, but a much higher signal-to-noise ratio, hence better visibility [1].

> *"the study revealed that the synchrotron provides up to a 3-fold higher signal-to-noise ratio and a 5-fold better spatial resolution"*

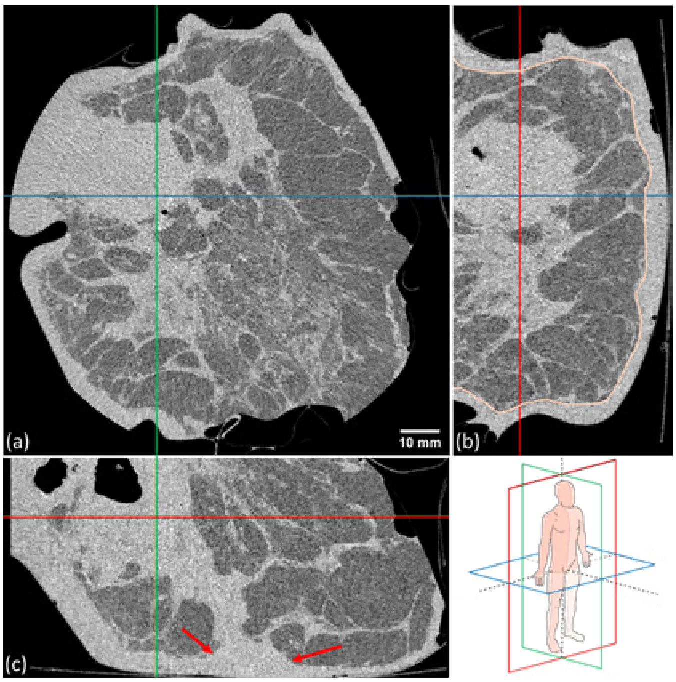

Figure 1.

In this framework, the SYRMA-CT/3D project, funded by the Italian National Institute of Nuclear Physics (INFN) and Elettra synchrotron facility (Trieste, Italy), is developing the first synchrotron-based BCT clinical setup [2]. The project encompasses a large number of novelties, both hardware and software, ranging from an ad-hoc Monte Carlo simulation software for dose evaluation to the integration of a state-of-the-art photon-counting detector (Pixirad-8), featuring a 60 µm pixel pitch and a 650 µm thick CdTe sensor. Recently, a great effort has been devoted to the optimisation of each individual step in the imaging chain, which has led to the implementation of a detector-specific pre-processing software and to the definition of optimal scan energy range, propagation distance, and phase-retrieval parameters.

During the system development, many surgical breast specimens have been scanned at the reference mean glandular dose value of 5 mGy, demonstrating that CT images provide a clear picture of the extension and morphology of tumours, enabling the identification of microcalcifications, spiculations, connections between tumour foci and skin involvement (figure 1). These features, which are cornerstones of therapeutic decision-making, are often difficult, sometimes impossible, to evaluate with standard mammographic techniques.

To get a grasp on the actual difference between the synchrotron and clinical systems, a phantom-based study has been performed in collaboration with the Radboud University Medical Center (Nijmegen, The Netherlands), where one of the few clinically available BCT scanners (Koning KBCT) is installed. The phantom has been scanned with both systems using clinical settings (6 mGy and average energy of 30 keV): results (figure 2) show that the synchrotron offers a much higher overall image quality [3]. In quantitative terms, the study revealed that synchrotron provides up to a 3-fold higher signal-to-noise ratio and a 5-fold better spatial resolution.

Notwithstanding the fact that radiological applications in synchrotrons cannot reach a wide population due to the high infrastructural and economical costs, these clinical studies provide benchmarking results, effectively defining the upper limit in terms of achievable image quality. It is the author's belief that wider use of such applications is key for reaching the critical mass of experienced medical physicists and doctors needed to trigger the long-anticipated transition of phase-contrast imaging from synchrotrons to hospitals, ultimately bringing better X-ray diagnostics to a larger number of people.

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[3] Brombal et al. 2019 Sci. Rep. 9, 17778 (https://doi.org/10.1038/s41598-019-54131-z)

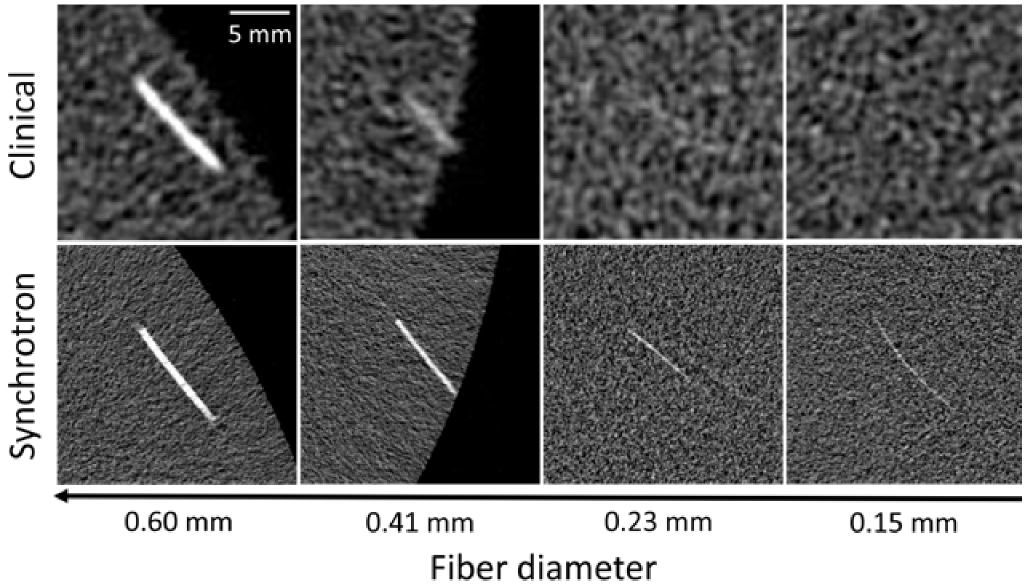
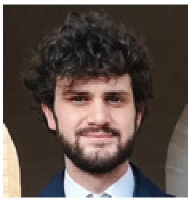


Figure 2



Luca Brombal

Luca Brombal received his PhD in Physics in 2020 from the University of Trieste, Italy, with a dissertation on “X-ray phase-contrast tomography: underlying physics and developments for breast imaging”. His research focuses on image modelling and applications of X-ray phase-contrast imaging both with synchrotron and conventional sources.

EFOMP COMPANY MEMBER ARTICLE

Andra: BlueDose radiation dose monitoring

Integrating DAP systems to analog equipment and dose monitoring systems is a complex task from different viewpoints: workflow, electrical, mechanical and IT. BlueDose is a hardware and software solution able to provide a simple, effective and flexible solution to all these problems. BlueDose components, besides a DAP chamber, are:

1. BlueDose DAP Bridge

Is a device of reduced size and weight able to power DAP systems, manage and optimize their operation during calibration and measurement and provide wireless connectivity with a software interface. The BlueDose DAP Bridge installations do not require any electrical or mechanical intervention on x-ray modalities. BlueDose DAP Bridge is fixed in a simple, safe and removable way to the collimator and connected to the DAP system through its serial interface. BlueDose DAP bridge can be used as an offline air kerma recording device.

2. BlueDose Console

Is a management software designed to associate air kerma data with patient and exam information. Each console can manage an unlimited number of DAP Bridges (e.g. two X-ray tubes in same diagnostic room). By using standard DICOM classes (Modality Worklist Management, Modality Performed Procedure Step and Storage) or HL7 messages the software is able to link automatically kerma data with the corresponding studies and deliver them in the form of Radiation Dose Structured Reports or HL7 messages.

BlueDose Console

FUNCTIONAL CHARACTERISTICS

- Simple and intuitive user interface
- Windows based with minimal resource needs
- Patient data management
- Kerma, exam, patient data and laterality automatic or semi automatic association
- Study and kerma database
- Kerma data caching for off line operations
- Dose report production
- Tube output monitoring
- Easy guided configuration
- System status monitoring
- Integrated Quality Control
- LOG file management

BlueDose DAP Bridge

TECHNICAL CHARACTERISTICS

- Dimensions and weight: 143 (L) x 32 (W) x 85 (H) mm, 450 g
- Ports: 1RS485/422 full-duplex, 1 USB 2, 1A/C in
- Fixing method: 2 Velcro 3M dual lock and security string
- Display: 2'', e-paper low consumption
- LED: 2 led strips blue/green/red with diffusers
- Operating System: Samsung Tizen-RT
- Memory: 16 GB Standard internal SD-card
- Battery: 5 cells Li-Ions, 18-24 hours continuous usage
- Wireless: IEEE 802.11 legacy
- EU RED 53/14 compliant

WORKFLOW AND MAIN FUNCTIONALITIES:

1. **BlueDose DAP Bridge** is fixed to the collimator in a position that allows screen visibility and simple access to its functional keys. The unique LED indicators easily and clearly indicates to operators the status of the system with a simple and effective "traffic light" approach.

2. **BlueDose DAP Bridge** provides wireless connectivity or join an existing wireless network through the Local Area Network.

3. **BlueDose DAP Bridge** can be used as an off-line kerma recorder. Measured kermas are cached in the internal memory to be associated to the corresponding patient and study info in a separate session.

4. Through the network and its DICOM and HL7 interfaces, **BlueDose Console**, installed on a Windows Personal Computer, receives patients and study data plus triggering information. Triggering information can be MPPS notifications, Storage requests and HL7 messages. **Blue-**

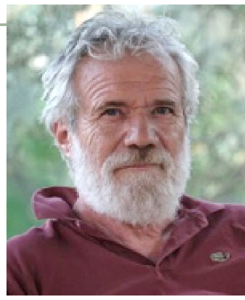
Dose console routing capabilities allows to add in DICOM headers DAP values.

5. With different automatization levels, **BlueDose Console** associates the kerma data sent from the bridge to patients and studies. Automatism is provided by DICOM MPPS, Storage or HL7 notifications. **BlueDose Console** can manage different diagnostic rooms and tubes connected to the same digitizing system (CR or DR).

6. At the end of the examination, kerma data are automatically sent to the storage/monitoring system according to the associated protocol (DICOM RDSR or HL7).

7. Dose and DAP calibration data are stored in **BlueDose Console** with search, printing and sending function.

BlueDose is produced and distributed by Andra SpA, Opera (Milan), Italy.
For any request please mail to andra@andra-med.it or call +39-02-57607050



Michele Dal Sasso, physicist.

Strong technical skill combined with a long-term experience on systems and equipment for radiology. Has worked in the Health Care industry as Product Manager for 30 years, with passion and attention for innovation.

WHAT MEDICAL PHYSICISTS DO IN THEIR FREE TIME

Volunteering work in a cooperative supermarket

Federica Zanca, Belgium

Among other volunteering work, I belong to a participative supermarket: a project supported by citizens wishing to create an alternative to mass food distribution, by offering quality products at affordable prices.

Federica at the cooperative supermarket where she volunteers

The project is based on sustainability, cooperation and solidarity and has a very simple business model: each member is an owner (so you take a share in the Co-operative), a worker (each collaborator commits to working a certain number of hours per month at the supermarket performing all types of tasks needed, there are almost no employees) and a customer (the shop is open solely to its members). I think this model is brilliant as it makes you feel very engaged; indeed, I learn a lot every day for my own business from this experience.

As an owner, each member is asked to shape the non-profit company as a whole, from conceiving its purpose to finding the funds to invest, to making sure that the company's products continue to meet market demand (and being at the same time a customer you have the capability of influencing this as well).

While often overloaded with things to do for my own work, I sometimes find it hard to devote some of my time to voluntary service. That is, until I do it again and again – each time, I am more convinced that this is an excellent way of building skills for the career and the business I want.

> *"I am convinced that this is an excellent way of building skills"*

Here some ways that volunteering can help you build skills and expertise:

1. You get a new perspective on the rich diversity of your community, and you learn to get comfortable talking to people you have just met. Diversity and inclusion are skills you learn.
2. You develop new expertise or sharpen existing skills, like planning and budgeting for example, with the bonus of concurrently developing soft skills such as team building, problem solving and adaptability.
3. You can grow as a leader. A volunteer position may offer you the opportunity to achieve a higher level of responsibility or leadership than the one you have in your current work, allowing you to grow in a relatively risk-free environment and build more self-confidence.
4. You develop professional relationships, new networks, through which you will hear about job openings or even find new customers and increase your visibility among people & resources in your community and beyond. New networks can help connect you to the right people at the right organisation.
5. You boost your performance. The act of engaging with your community stimulates one of the "feel-good" neuro-chemicals, oxytocin, which limits the release of the stress hormone cortisol.

By providing a sense of purpose it also allows you to take your mind off your own worries and allows you to be more focused and sharp in your work.

Volunteering is a great professional experience and an opportunity to lead with gratitude and kindness. I feel blessed that I can do so.

Federica Zanca is a forward-looking and passionate medical physicist with more than 20 years of experience in healthcare, with a strong focus on innovation and digital transformation. She has a multidisciplinary background built across academia and industry settings as well as entrepreneurial competences. She studied Physics as well as Technology Management in Ferrara (IT) and Medical Physics in Radiology in Leuven (BE), where she also completed her PhD. She has worked as Professor at the University of Leuven, as a Chief Scientist and later Director in GE Healthcare where she gained expertise in clinical research, product development, marketing, clinical workflows and regulatory aspects. She currently owns her consulting company (Palindromo) and works with researchers, hospitals, start-ups and corporates to build and evaluate medical imaging products and AI tools through clinical research, while creating strong clinical evidence and delivering regulatory compliant digital health solutions.

WHAT MEDICAL PHYSICISTS DO IN THEIR FREE TIME

Supporting my local volleyball team

Erato Stylianou Markidou, Cyprus

Hobbies play an important role in mitigating some of the stress that we all have in our lives, as they provide us with a medium for creativity, distraction from the daily routine, and something to look forward to. Hobbies bring a sense of fun and freedom to life that can help minimize the impact of chronic stress.

Out of all my favourite hobbies, for me there is one that stands out the most: watching my favourite team playing Volleyball! Although I have only started watching this sport a few years ago, volleyball is such a great game to follow. Being on the court every week, watching my favourite team playing, together with my friends, is the most relaxing part of a very busy week as a Medical Physicist at the Oncology Centre.

Like with any other sport, any game may end with either a win or a loss, but this is the beauty of the game and this is what generates emotions. Losing is not a very pleasant emotion, however, winning, and especially a strong team, brings such a wave of happiness that any past losses are quickly forgotten.

Over the years that I have been following my favourite team, Omonoia Nicosia, I was very fortunate to create new friendships that go beyond the time at the court. While watching any match together with my friends, we all share our emotions and our thoughts, all anxious about the final result; we cry and laugh together, cheer and get disappointed together. During the last 5 years my team is doing great and together with my friends, we were lucky to experience great times together as we were fortunate to experience 4 Championships, 4 National cups and 5 Super cups!

The feeling that we get after winning a game is the real reason why we continue to watch and love volleyball. I enjoy my Fridays with my "green" friends and during these difficult days of COVID-19, that we have all experienced, I have valued these moments with them, more than anything else. Hopefully, we will all go back to our routine life and enjoy our hobbies again, very soon. I really missed my time at the court watching volleyball and seeing all my friends!

The Omonoia Nicosia volleyball team (2018-19). Photograph © PE Photography and Omonoia Nicosia, used with permission.

Erato with friends, holding one of the national cups! Photograph © PE Photography and Omonoia Nicosia, used with permission.

Erato Stylianou Markidou is a Medical Physicist at the Bank of Cyprus Oncology Centre, Nicosia, Cyprus, where she works on radiation therapy treatment planning and quality assurance and commissioning of radiotherapy and diagnostic equipment. She obtained her bachelor's degree in Physics from the University of Cyprus in 2001 and graduated from Wright State University, OH, USA in 2003 with Master of Science in Medical Physics, with honours. She has recently received the EACMPE in Radiation Oncology (European Attestation Certificate to those who have reached the Medical Physics Expert status). She is the past president of CAMPBE. She is currently the president of BRF (Biomedical Research Foundation) and a member of the Cypriot Medical Physics Registry Council. She has been a member of EFOMP's Communications and Publications Committee for the last two years.

EFOMP COMPANY MEMBER ARTICLE

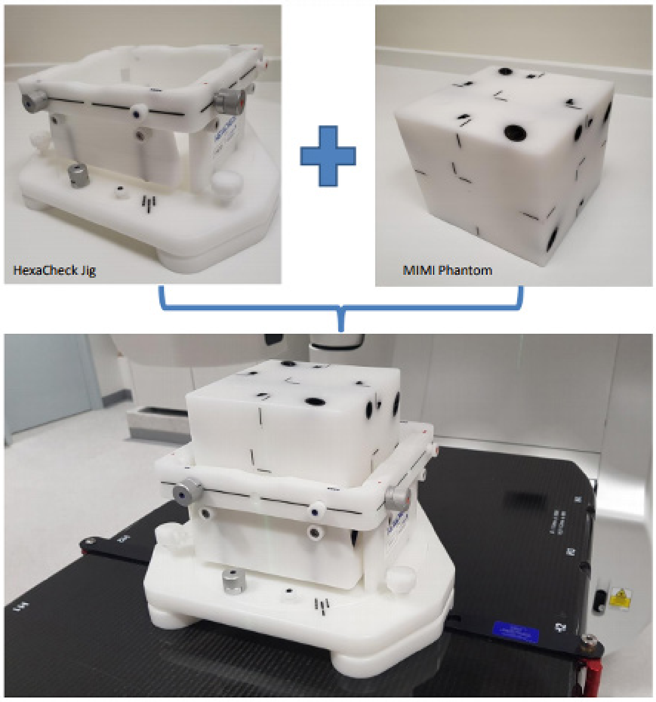
Standard Imaging: Commissioning report of a Varian Six Degrees of Freedom (6DoF) Couch using the Standard Imaging HexaCheck Jig plus MIMI Phantom

Review of the Medical Physics and Engineering Conference 2019 Poster presentation by Geraldine Verschoor, Nikolaos Margellos, and Will Holmes-Smith of Norfolk and Norwich University Hospitals, Norwich, UK. The MPEC 2019 Conference was held in Bristol, UK, in late 2019, and was sponsored by the Institute of Physics and Engineering in Medicine.

Treatment with radiation on a modern linear accelerator relies on the ability to position the patient with incredible accuracy. Therefore it is critically important to verify that the systems used for positioning are all describing the same isocentric point in space as the treatment beam. Treatment couches with 6 degrees of freedom (6DoF) can add additional uncertainty to this system.

The Standard Imaging MIMI (Multiple Imaging Modality Isocentricity) Phantom establishes mechanical stability of the image guidance system by verifying the isocentre described by the MV, kV, CBCT, and other guidance systems is within accepted 1mm tolerances. HexaCheck is an accessory to the MIMI Phantom that allows isocentre rotation using a gimbal system along all three axes of rotation (roll, pitch, yaw) in ±2.5° increments. The gimbal ensures the centre of the phantom will remain at isocentre when there is a rotational offset. This greatly simplifies data analysis and enables commissioning and verification of 6D couch alignment and positioning offsets in a busy clinical environment without the need to write extra software.

In 2018 and 2019, the NNUH commissioned two Varian TrueBeam Linear Accelerators (Linacs) each with a 6DoF couch and reported the following independent study results using the MIMI/HexaCheck to assist with commissioning:



HexaCheck with the MIMI Phantom positioned on the 6DoF couch.

Methods and Materials

First the phantom was CT scanned in the neutral position (i.e. zero rotations) using the H&N protocol and the scan was used as reference for image matching.

Initial tests were carried out to test whether the NNUH's current method of H&N image matching using kV orthogonal pairs could provide sufficient accuracy for online matching compared to CBCT. The phantom was rotationally offset from the neutral position, then either a CBCT scan or a kV pair was taken and matched to the CT image.

The main part of the commissioning focused on CBCT imaging. The phantom was offset and imaged in every possible combination of rotational offset (27 combinations in total).

Online corrections of the 6DoF couch were carried out to correct for the offset, then the phantom was reimaged. The residual error that was recorded gives a measure of the accuracy of the 6DoF couch correction.

Results
The researchers' initial investigation of the accuracy of using matched pair kV images to correct for rotational shifts showed that the accuracy was significantly lower than using CBCT imaging and not adequate for accurate rotational corrections.

Machine	Rotational Deviations (mean±1SD) (°)		
	Yaw (°)	Pitch (°)	Roll (°)
Linac 1	0.00 ± 0.03	0.00 ± 0.11	0.00 ± 0.03
Linac 2	0.01 ± 0.05	0.01 ± 0.08	0.00 ± 0.03

TABLE 1: Corresponding rotational deviations (mean±1SD) deriving from calculations for all 27 different rotational offsets that were tested.

Machine	Translational Deviations (mean±1SD) (mm)		
	Lateral (mm)	Vertical (mm)	Longitudinal (mm)
Linac 1	-0.02 ± 0.32	0.05 ± 0.30	0.07 ± 0.19
Linac 2	-0.17 ± 0.14	-0.05 ± 0.11	-0.03 ± 0.23

TABLE 2: Corresponding translational deviations (mean±1SD) deriving from calculations for all 27 different rotational offsets that were tested.

The researchers noted the corresponding rotational and translational deviations between the two Linacs presented no significant difference, showing consistency of the results from commissioning procedures and adding value to the accuracy of the Linacs' 6DoF modality.

In their concluding remarks, the authors observed this commissioning work has shown rotational errors of less than 0.3° and translational errors of less than 1 mm are possible with the 6DoF couch using CBCT imaging. These results are the same order of magnitude as other studies using different phantoms and methods. This level of accuracy is warranted for clinical radiotherapy utilization and the tolerance of the weekly QA of the couch was set at ±0.5°. In contrast, the NNUH's current method of using kV pairs for H&N was not accurate enough for applying rotational corrections.

For more information, see the full research study at: https://d3udwuy5vw6moa.cloudfront.net/publications/MPEC-2019-poster_FINAL.PDF
or visit our website at:
https://www.standardimaging.com/phantoms/mimi-phantom

The Aurora project – informing about medical technology through comic strips

This is the third comic strip from the Czech Republic's Aurora team, aimed at educating the public about the benefits of technology in medicine, in a highly-original way. This time, Lev the lion ponders his prostate cancer test result but is equally concerned about his squash ranking…

Aurora is a project of the Prague section of the European Physical Society (EPS) Young Minds initiative. The main aim of Aurora is to spread knowledge about ionizing radiation in general, ionizing radiation in medicine and cancer. And how do we intend to spread this knowledge? For example, by creating topical comics! Our team is still expanding. Now, we have two main painters, Marketa Hurychova and Anezka Kabatova. Then, there are four people who create stories for the comics, consult with the painters and translate texts, Barbora Drskova, Petra Osmancikova, Jana Crkovska and Anna Michaelidesova. Anna Michaelidesova is also the coordinator and the person in charge of the whole project.

The Aurora team grants permission and consent to EFOMP and EFOMP NMOs to use the comic strips for educational purposes. In case you would like to translate the comics into another language, email us the translated text and we will modify the comic and send it back to you. No other modifications to the content are allowed. You can contact the Aurora team at aurora@youngminds.cz

The Aurora team are:

Marketa Hurychova
studied Medical Physics at the Czech Technical University in Prague, gaining an MSc degree in 2019. She worked at the Department of Medical Physics at Hospital Na Homolce from 2018, at the Department of Radiation Dosimetry Nuclear Physics Institute of the Czech Academy of Sciences from 2019 and since 2020 she has worked at the Department of Medical Physics at Motol University Hospital.

Anezka Kabatova
has been studying Experimental Nuclear and Particle Physics at the Czech Technical University in Prague since 2015. After receiving her MSc degree, she plans to start a PhD in Astronomy. She has been an active member of the Prague section of EPS Young Minds since 2017, acting as a vice-president of the section between 2018 and 2019.

Barbora Drskova
finished her Medical Physics Masters programme at the Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering in 2019. Since then, she has been working on her PhD. She works as a medical physicist in radiotherapy at General University Hospital in Prague and University Hospital Královské Vinohrady.

Petra Osmancikova graduated from the Czech Technical University in Prague and holds MSc and a PhD degrees in Medical Physics. She is a clinical medical physicist in radiotherapy in Motol University Hospital in Prague.

Jana Crkovska
received her PhD in High Energy Nuclear Physics from the Universite Paris Sud in 2018. Since then, she has continued her research on charmed particles production in the Los Alamos National Laboratory. She is part of the LHCb Collaboration, one of the experiments at the Large Hadron Collider (LHC) in CERN.

Anna Michaelidesova received her MSc and PhD degrees in Medical Physics from the Faculty of Nuclear Physics and Physical Engineering of the Czech Technical University in Prague. She worked as a researcher at the Nuclear Physics Institute of the Czech Academy of Sciences from 2010 to mid 2019. In the period 2012-2017, she was employed as a medical physicist at the Czech Proton Therapy Center. From 2018 to mid 2019, she also worked as a researcher at the Faculty of Nuclear Physics and Physical Engineering of the Czech Technical University in Prague. Since June 2019, she has been a postdoctoral researcher at the department of Translational Radiooncology and Clinical Radiotherapy of the OncoRay® - National Center for Radiation Research in Oncology at the Medizinische Fakultät Dresden Carl Gustav Carus in Germany. She has been a member of the leadership committees of the Prague section of EPS Young Minds and of the IRPA YGN since 2019.

Upcoming Conferences and Educational Activities

This list was correct at the time of going to press.

For a complete, up-to-date list, please visit our Events web page at www.efomp.org/index.php?r=events

Sep 7th, 2020 - Sep 10th, 2020

ESTRO - Physics for Modern Radiotherapy
Online

Sep 9th, 2020 - Sep 11th, 2020

51st Annual Meeting of the German Society for Medical Physics (DGMP)
Online

Sep 30th, 2020 - Oct 2nd, 2020

ESMRMB 2020
Online

Oct 22nd, 2020 - Oct 30th, 2020

EANM2020
Online

Oct 24th, 2020

EUSOMII Virtual Annual Meeting – 'How to prepare for the Digital Age'
Online

Oct 27th, 2020

Artificial Intelligence in healthcare: paving the way with standardization
Online

Nov 5th, 2020 - Nov 6th, 2020

Britsh Institute of Radiology Annual Congress 2020
London, UK

Nov 5th, 2020 - Nov 7th, 2020

Data Analysis with Python for Medical Physicists
Siggiewi, Malta

Nov 6th, 2020 - Nov 8th, 2020

BSBPE 13th National Medical Physics and Biomedical Engineering Conference – NMPEC 2020
Bulgaria

Nov 19th, 2020 - Nov 21st, 2020

EFOMP - European School for Medical Physics Experts (ESMPE) Statistics edition 2020
Athens, Greece

Nov 28th, 2020 - Dec 1st, 2020

ESTRO39
Vienna, Austria and Online

Dec 10th, 2020 - Dec 11th, 2020

EFOMP - European School for Medical Physics Experts (ESMPE) Particle Therapy edition 2020
Online

Upcoming Conferences and Educational Activities

This list was correct at the time of going to press.

For a complete, up-to-date list, please visit our Events web page at www.efomp.org/index.php?r=events

Feb 1st, 2021 - Feb 4th, 2021

EURADOS Annual Meeting
Belgrade

Feb 16th, 2021 - Feb 19th, 2021

IAEA-International Conference on Advances in Radiation Oncology (ICARO-3)
Online

Mar 23rd, 2021 - Mar 26th, 2021

7th International Conference on Education and Training in Radiation Protection
Groningen, The Netherlands

Apr 11th, 2021 - Apr 13th, 2021

NACP2021 Symposium
Reykjavik, Iceland

Apr 19th, 2021 - Apr 21st, 2021

8th MR in RT Symposium 2021
Heidelberg, Germany

Jun 16th, 2021 - Jun 19th, 2021

EFOMP - 3rd European Congress of Medical Physics
Torino, Italy

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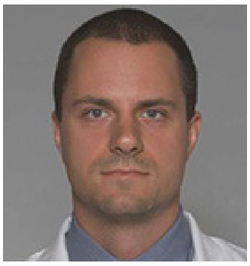

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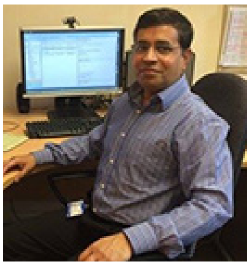

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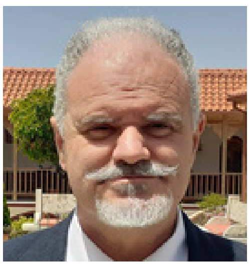

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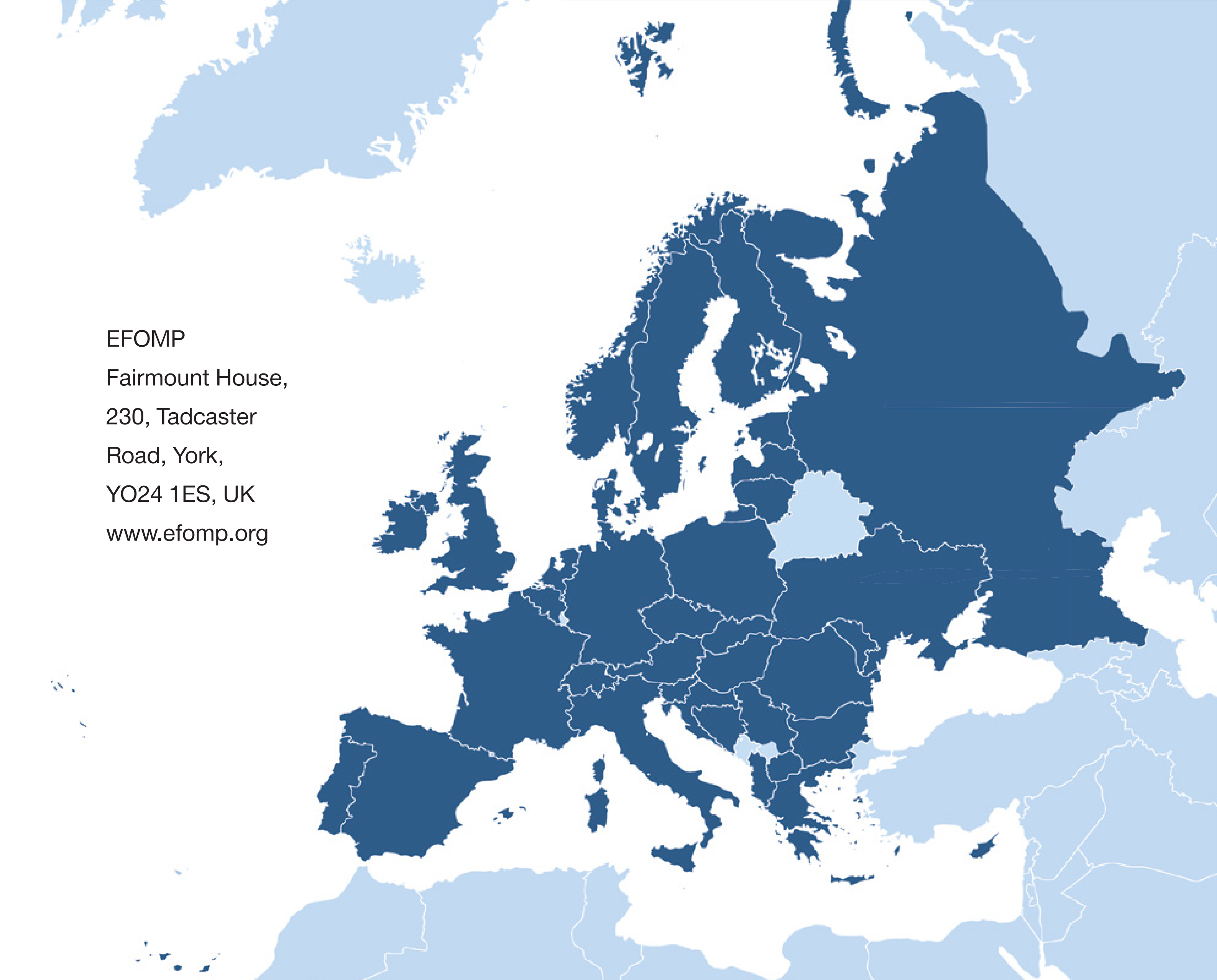

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EFOMP

EUROPEAN FEDERATION
OF ORGANIZATIONS
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The European Federation of Organisations in Medical Physics (EFOMP) was founded in May 1980 in London to serve as an umbrella organisation for medical physics societies in Europe. The current membership covers 36 national organisations which together represent more than 9000 medical physicists and clinical engineers working in the field of medical physics. The motto developed and used by EFOMP to underline the important work of medical physics societies in healthcare is “Applying physics to healthcare for the benefit of patients, staff and public”.

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