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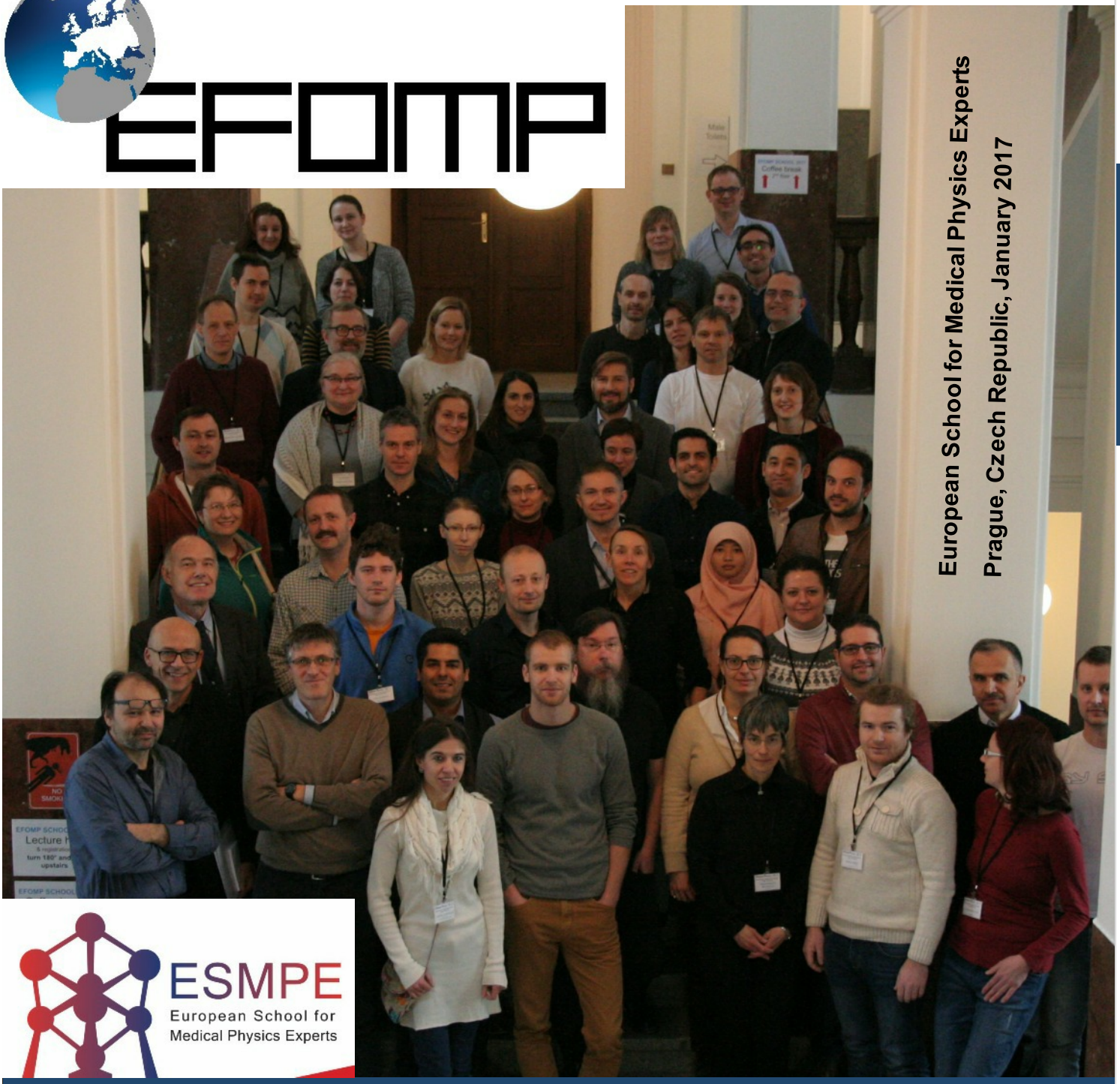

European School for Medical Physics Experts
Prague, Czech Republic, January 2017

ESMPE
European School for Medical Physics Experts

The European Federation of Medical Physics Organizations Bulletin

EMP News Summer 2017

European Medical Physics News

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THE EUROPEAN MEDICAL PHYSICS NEWS A BIANNUAL PUBLICATION OF THE EUROPEAN FEDERATION OF ORGANIZATIONS FOR MEDICAL PHYSICS August 2017

Contents

Editorial

Dear Readers,

An important responsibility of EFOMP's Communications and Publications Committee is the publication of EMP News. EMP News is the newsletter and bulletin of EFOMP. Currently, it is published twice a year. EMP News is publishing EFOMP related matters (committee reports, activities for the International Day of Medical Physics, reports from National Members Organizations, European School for Medical Physics Experts' activities/announcements), news on EFOMP Protocols, as well as general Medical Physics subjects. Announcements and reports for conferences and congresses also find their place in EMP News, which I encourage to send us (pubcommittee@efomp.org).

This issue of EMP News is opened by a message from EFOMP President, Prof. J. Damilakis, who highlights the relevance of being aware of, and suitably managing, any radiation dose risk for health professionals, and the efforts of EFOMP for appropriate education and teaching related to this important topic.

From this Issue on, we will publish also short articles (less than 600 words) describing medical physics research all around Europe, with particular attention to hosting scientific news of interest for our international audience, written by young medical physicists. If you have such a news you want to share with your international colleagues, please send your short article, a 50-word bio and your photo to pubcommittee@efomp.org. Both solicited and unsolicited articles will be hosted in EMP News.

As many as 34 National Member Organizations are represented in EFOMP. Starting from this issue, we will publish short articles describing each Organization, for a widespread knowledge of medical physics in the various European regions.

You will find most of the above types of article in this rich issue: the Editorial Board of EMP News hopes you will find it of your interest!

Paolo Russo

Chair of the EFOMP Communications and Publications Committee
Professor of Medical Physics at Università di Napoli Federico II, Dipartimento di Fisica "Ettore Pancini" Napoli, Italy

Efi Koutsouveli

EFOMP Internet Manager
Medical Physicist at Medical Physics Dept. Hygeia Hospital, Athens, Greece

Markus Buchgeister

Chair of the EFOMP Education & Training Committee
Professor at Beuth University of Applied Sciences Berlin

EFOMP President's message

Awareness of radiation dose and associated risk among health professionals and the critical role of medical physicists in radiation protection education and training

Literature review shows that knowledge of radiation dose and risk is poor among referring physicians, radiologists, radiographers, trainees and medical students (1-4). A recent study found that radiologists tend to underestimate patient radiation doses from common X-ray examinations (1). This is of serious concern, as it may lead to (a) provision of inaccurate information to patients about the risks associated with radiation doses and (b) acceptance of many unjustified X-ray procedures. Another very recent research work shows that radiographers also need to improve their knowledge in medical radiation protection (2). Most radiographers surveyed underestimated the doses of almost all X-ray examinations. It is encouraging, however, that young radiographers showed a better knowledge compared with the more experienced radiographers. In another study, a questionnaire was distributed to physicians, nurses and other personnel who use ionizing radiation (3). Results show that systematic training courses for medical personnel must be considered to increase awareness in medical radiation protection. A study was carried out in Australia to assess the radiation awareness amongst physicians in emergency departments (4). Most physicians surveyed reported that they would not be confident discussing radiogenic risks with patients and indicated the need for additional education.

Lack of knowledge in radiation protection and dosimetry may lead to unjustified X-ray examinations, overdoses during CT and fluoroscopically-guided procedures, therapeutic abortions due to accidental exposures of pregnant patients and various other accidents and incidents in imaging and radiotherapy. Education and training in medical radiation protection is of crucial importance for all medical professions working with ionizing radiation. High- standard training courses harmonized at EU level is a key prerequisite to ensure excellence in radiation safety and to implement strategies for dose optimization in medicine. The new European Basic Safety Standards (BSS) states that 'the medical physics expert contributes in particular to the training of practitioners and other staff in relevant aspects of radiation protection'. Medical physicists should coordinate activities to develop educational and training platforms suitable for radiation protection teaching. These platforms are not currently available at a European level. A network of selected teaching centers should be created that will develop high level radiation protection courses to bring health care professionals to the required scientific level in medical radiation protection. EFOMP is working towards this direction. A suitable EU call (H2020 or other) is needed to support financially this important project. Hopefully, we will soon be able to implement plans.

John Damilakis
EFOMP President

References

1. Ramanathan S, Ryan J. Radiation awareness among radiology residents, technologists, fellows and staff: where do we stand? Insights Imaging 2015; 6:133-139
2. Paolicchi E, Miniati F, Bastiani L et al. Assessment of radiation protection awareness and knowledge about radiological examination doses among Italian radiographers. Insights Imaging 2016; 7(2):233-42
3. Szarmach A, Piskunowicz M, Swieton D et al. Radiation Safety awareness among medical staff. Pol J Radiol, 2015; 80:57-61
4. Badawy MK, Sayakkarage D, Ozmen M. Awareness of radiation dose associated with common diagnostic procedures in emergency departments: A pilot study. AMJ 2015;8(11):338-344

New Chairperson of EFOMP Communication and Publications Committee (CP)

Within EFOMP, the CP Committee has the very important responsibility of "the representation and promotion of the application of physical sciences to medicine in the public". Since the beginning of 2017 I have been serving as vice chair of this Committee; last June, at the EFOMP meeting in Girona, Spain, I have been assigned the role of chairperson. This task includes editing the European Medical Physics News. I assure my dedication to this new role, in close collaboration with the EFOMP-CP members, and all EFOMP officers. I thank Dr. Gaspar Sánchez Merino, former chairperson of EFOMP-CP, for all he has done for the Committee and for managing the EMP News.

I am convinced that EFOMP-CP has a very crucial role in the development of the new communications strategy of EFOMP that its Board is pursuing, which implies also the redesign and operation of a new website. To this purpose, a member of the EFOMP-CP, Efi Koutsouveli, has been appointed as Manager of all EFOMP-related internet activities, including the website and the social media presence. Efi has taken care of the start of the new website, which will occur on next September 2017.

I intend to develop EFOMP-CP and the News publication it edits, at the core of a process for promoting the awareness of the European community of medical physicists, one of the largest in the world, as a whole entity. To do this, ways of exchanging cross knowledge will be settled, of the various regional and local activities in medical physics. The key actors of such a strategy will hopefully be the youngest members of such a community. EMP News can be a vehicle for exchanging info on the various activities in which they are involved, starting from their implication in research in medical physics. In my intentions, the publications aspects of EFOMP-CP will also be revisited, including also the establishing of a book Series in Medical Physics.

For this programme, EFOMP-CP relies on the support of all of you, for the realization of our common goal of developing medical physics further in Europe and internationally.

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Paolo Russo

Born in Napoli (Italy), I am 59 year old. I entered medical physics in 1984 as an assistant professor; and since 2001 I am full professor of Medical Physics at University Federico II, Napoli, Italy. My research interests are in medical imaging, for the development of new imaging techniques and detectors in particular for digital mammography and phase contrast breast CT. From 2008 to 2012 I was Associate Editor of the journal "Physica Medica: European Journal of Medical Physics", where from 2013 I serve as Editor-in-Chief. I serve in the Board of Directors of IMPCB, as chair of EFOMP Communications and Publications Committee and vice chair of IOMP Publications Committee.

Paolo Russo

International Day of Medical Physics in Greece

To raise awareness about the role medical physicists play, IOMP organizes annually the International Day of Medical Physics (IDMP) on November 7th. The Hellenic Association of Medical Physicists, considers this occasion a great opportunity to increase awareness of the public regarding the profession.

The year 2017 will be the biggest event ever with 4 hellenic women medical physicists being awarded for their work. The event will be held at the National and Kapodistrian University of Athens under the auspices of the University. The event is under the auspices of UNESCO that has a pioneering programme for the promotion of women in science. It is also, supported by the Hellenic Institute of Cultural Diplomacy. The primacy of culture in health education activities is to deepen and extend the possibilities of progressive approaches that focus on culture. The coordinator of IDMP, Prof John Damilakis, current President of EFOMP will open the event followed by presentations devoted to the work and current global status of medical physicists.

The final part of the session will be devoted to honour Stavros Niarchos Foundation for the large scale grant, supporting the replacement of obsolete linear with new, state-of-the-art machines. HAMP has received an important donation for implementation of training programs for the medical physicists of these hospitals. The programs included theoretical and practical training in Greece and abroad, to ensure optimal operation of radiotherapy equipment.

Virginia Tsapaki
President, Hellenic Association of Medical Physicists (HAMP)

Virginia Tsapaki is the head of the Medical Physics department at Konstantopoulio General Hospital of Athens, Greece. Her field of expertise: Patient and staff dosimetry, optimization, diagnostic reference levels, dose tracking software. She is the President of HAMP since 2012 and chair of the EFOMP Projects Committee.

Chien Shiung Wu

Rosalyn Yalow

Maria Mayer

Harriet Brooks

Irene Joliot Curie

Medical

X-rays

Quality

Treatment

Radiology

Protection

Radiation

Physics

Research

Safety

Diagnostic

150th Birthday of Marie Skłodowska Curie

http://www.iomp.org/IOMP-W/

Medical Physics: Providing a Holistic Approach to Women Patients and Women Staff Safety in Radiation Medicine

7 November 2017

International Day of Medical Physics

IOMP

International Day of Medical Physics in the Republic of Moldova

In the Republic of Moldova the International Day of Medical Physics in 2017 will be celebrated for the 5th time. The motto proposed by IOMP – Medical Physics: Providing a Holistic Approach to Women Patients and Women Staff Safety in Radiation Medicine – is actual and in 2017 marks the 150th Anniversary of Marie Curie. At the beginning of 2016 by the initiative of the President of the Association of Medical Physicists from the Republic of Moldova (AFM Moldova) was proposed the formation of the separate group of women (as they are 25% of Association's members), which will deal with safety of women exposed to radiation in both: as patient and professional. As in the past, the AFM Moldova will organize the meeting and invite the specialists from different fields. The target audience could be representatives from academic institutions (State University of Moldova, and State University of Medicine and Pharmacy), ministries (Labour, and Education), and different medical institutions. The invitation and programme of the meeting will be published through the site of the Association (www.afmmoldova.org) and members of the Association will share the information through social networks.

IDMP celebration in the Republic of Moldova facts: – In 2013 a group of 7 specialists in medical physics promised to celebrate this day annually according to the event motto as is established by IOMP; – Second celebration of the IDMP(2014) as round table with 3 reports was organized by SRL ALARAD at the National Centre of the Nuclear Security Support of the Technical University of Moldova, number of participants extended to 45 specialists from different fields of medical physics including representatives of the regulatory institutions; – In 2015 SRL ALARAD organized IDMP forum where 6 reports were presented to 23 participants from different technical support organizations; – In 2016 IDMP was organized for the first time by the Association of Medical Physicists from the Republic of Moldova, there are 8 reports were presented including report from Romania for 35 participants from different medical and regulatory institutions.

Alexandru Hustuc, President of the Association of Medical Physicists from the Republic of Moldova

Physicist with University Diploma (State University of Moldova) and more than 20 years practical experience in fields of medical physics: radiation protection and health physics. Started the career in public health service institution (Centre of Radiation Protection, 1993-2014), in 2001 IAEA International expert, and in 2014 established a private company as Technical Service Organization: Medical Physics Service Provider (SRL ALARAD). Co-author of 15 national and international scientific papers including book on Hygiene of Radiations, Radiation Protection No.180, and National Radiation Protection Norms (2001). From 2016 – elected President of the Association of Medical Physicists from the Republic of Moldova.

International Day of Medical Physics in Germany

A public lecture with video streaming will be organized on November 7th 2017 at 19:00 at the Ludwig-Maximilians-Universität München (LMU), Germany. This event, organized in the framework of the School of the EU Marie Skłodowska-Curie Training Network OMA (Optimization of Medical Accelerators) aims at celebrating the 150th anniversary of Marie Skłodowska-Curie's birth by addressing the impact of EU Marie Curie Actions on supporting ion beam cancer therapy through education and research opportunities for young generations across Europe. The lecture will be held by Prof. Katia Parodi, who is head of the Department of Medical Physics at LMU and president of the German Society of Medical Physics (DGMP). This initiative, promoted by the OMA coordinator Prof. Carsten Welsch from the University of Liverpool, will be endorsed by DGMP.

Katia Parodi, President of the German Society of Medical Physics (DGMP)

Katia Parodi received her Ph.D. in 2004 in Dresden, Germany. After a postdoctoral fellowship in Boston, USA, she became tenured scientist in Heidelberg in 2006. Since 2012 she holds the Chair of Medical Physics at Ludwig-Maximilians-Universität München. Since 2017 she also serves as president of the German Society for Medical Physics (DGMP).

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Medical Physics in France

Medical physicist (MP) community in France represents around 700 professionals working in clinical services. In France, medical physics training yields to an agreement valid for all specialities (radiation therapy, nuclear medicine and medical imaging). A great majority of MPs works in radiation therapy: 640 persons representing 572 full-time equivalent (fte) were identified in 2016. 150 MPs are involved in imaging (nuclear medicine and radiology) but only 48 declare more than 0.8 fte in these specialities. Some MPs are working in national agencies dedicated to safety and radiation protection in university/research laboratories : 14 Medical Physics Department have a dedicated time for research for 23 medical physicists (SFPM survey in 2016). In the last ten years, medical physics service companies hiring MP are in constant positive evolution especially in medical imaging services.

After the accidents of Epinal and Toulouse, the government decided in 2009 to increase the number of MPs working in radiation therapy from 350 to 600 (for 65.6 million inhabitants in France). After a peak of 98 students in 1998, the number of Medical Physics Master students allowed to start the clinical training is now stable at 40/year. The consequence is that clinical MP population is remarkably young, with most clinical MPs under 40 as can be seen in the graph below (Fig. 1).

The first Master degree in Medical Physics ("radiophysics") was created in 1970, and up to 1997 the training of the French MPs consisted in that one-year academic training including 2 months in a clinical environment and 4-5 months dedicated to a research project. In 1997, a National Decree created the professional diploma (DQPRM, for "Diplôme de Qualification en Physique Radiologique et Médicale", delivered by INSTN (National Institute of Nuclear Sciences and Techniques). This major step forwarded a 10 months training in a clinical environment in selected centres. Today, seven Master degrees in medical physics are accredited as prerequisite to apply for the competitive entrance examination to the DQPRM. A further evolution of professional training scheme was introduced in

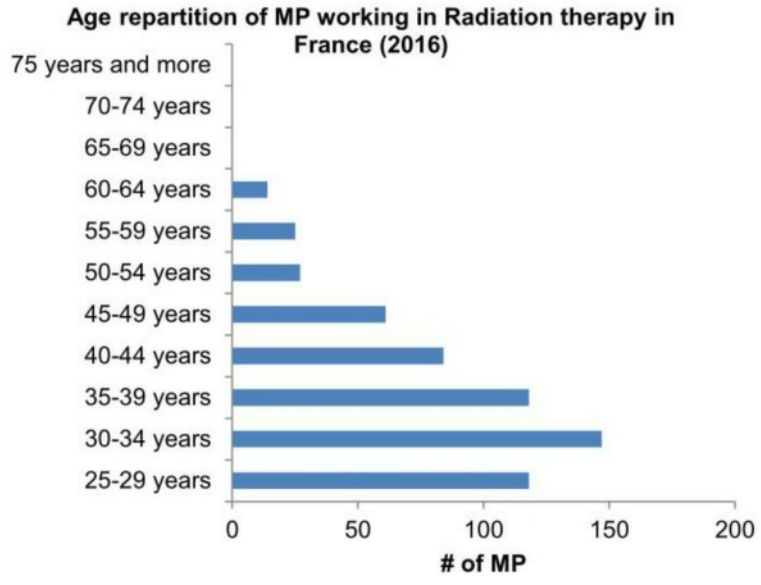

Fig. 1: Age repartition of Medical Physicists in Radiation Therapy in France

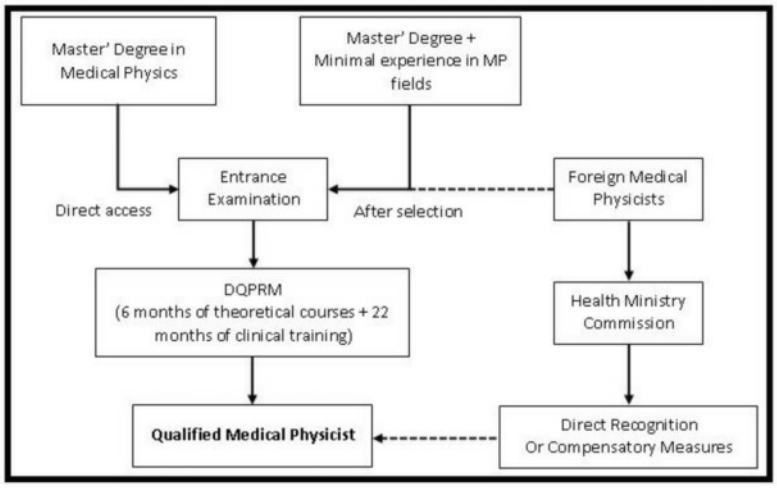

Fig. 2: Schematic diagram of Medical Physics training in France in 2017

2013, by increasing the duration of the professional training to 28 months after the MSc in Medical Physics, divided into 6 months of courses centralised at INSTN (Saclay) and 22 months of practical period in clinical departments (radiation therapy, nuclear medicine and medical imaging) in order to come closer to EFOMP recommended training standards. Foreign MP wanting to work in France have to apply for recognition of their diploma to a health ministry commission who will evaluate the original training compared to the DQPRM. Three decisions can be given: direct recognition, reject or compensatory measures to complete training (see diagram in Fig. 2).

The analysis of past accidents in France highlighted the difficulty for MP to fulfil their mission in a clinical environment, due to the absence of a clear definition of the speciality in the healthcare regulation system. In 2014, the French Republic President announced the 3rd national Cancer Plan, where the acknowledgement of Medical Physicist and Dosimetrist as healthcare professionals was formally inscribed. That official recognition was formally achieved in January 2017 with the publication of the ordinance positioning the speciality of medical physicist in the French Public Health Code. The law now describes the role and main missions of the MP in clinical practice. A new text will be soon published that described precisely acts, conditions of intervention of the MP in diagnostic and treatment processes of patients receiving ionising and non-ionising radiations. In parallel, regulation of acts for radiation technologist has been modified to integrate MP responsibilities shared with physicians. Dosimetrist profession, has been considered by law as an extension of radiation technologist profession, dosimetrists depend in all of their acts on the MP.

Vincent Marchesi

SFPM president

president@sfpm.fr

Vincent Marchesi obtained his PhD at the University of Nancy in 2003 and is working in the Medical Physics department of the Comprehensive Cancer Centre of Nancy. He's specialized in external radiation therapy, IMRT and stereotactic treatments. He joined the SFPM board in 2010 and has been President since June 2016.

Medical Physics in the Republic of Moldova

The first mention about professional society in the field of medical physics starts from 1992 in the Medical Physics World (Bulletin of the International Organization for medical Physics, Volume 8 (No. 1&2, 1992), Secretary–General's Report. Later, in the Volume 12 (Medical Physics World, No. 2, December 1996) was published first Report from Moldova Association of Medical Physics presentedby Mr.Gheorghe Zaharcenco as Chairman.

Nevertheless, the Association was known abroad, the official registration of the Non-Governmental Association "Association of Physicists-Medics of Moldova" was performed at 7 March, 2000 by Mr. Anatol Levinta – best friend and colleague of Mr. Zaharcenco. He registered the Association at the Ministry of Justice of the Republic of Moldova. Mr. Levinta as President and Ms. Galina Rusnac as Secretary are mentioned in the Member Organization directories of the IOMP and EFOMP. Obviously, the number of the members of the Association decreased dramatically in the period 2000-2010 due to health state, retired age and migration of the members, which conducted to the stagnation of the Association's activity for 2010-2015 period.

In parallel, Mr. Alexandru Hustuc prepared first report to the IAEA Regional Workshop on Status of Medical Physics Education and Training, 27-28 October 2011, Vienna, Austria. During the meeting he has discussions with the representatives of IOMP, EFOMP, ESTRO, as well as with the representatives of the National Members Organizations from Belarusi, Bulgaria, Lithuania, Poland, Russia, Ukraine, etc.

During 2012-2015 Mr. Levinta have several meetings with Mr. Hustuc which suggested restoring the activity of the professional organization. The process of reforming and reorganizing the Association was started in 2015. It was based on the participation of Mr. Hustuc in the following events:

- On-line phase of the EUTEMPE-RX Module "Development of the profession and the challenges for the MPE (Diagnostic and Interventional Radiology) in Europe" (February 9-13, 2015, Prague, Czech Republic),
- IAEA Regional Meeting on Medical Physics (May 7-8, 2015, Vienna, Austria)

These meetings and other Mr. Hustucs participations gave a real boost to the Association's reorganization process.

Mr. Hustuc appreciated advices and encourages from the world medical physics leaders Dr. Slavik Tabakov, Prof. John Damilakis, Dr. Madam Rehani, Prof. Carmel J. Caruana, Dr. Stelios Christophides, Prof. Eliseo Vano, Prof. Hilde Bosmans, Mr. Stephen Evans, Prof. Peter Sharp, Dr. John Malone.

The restoration of the activity of the professional society in Medical Physics belongs to an initiative group composed of 9 people: Dr. Vasile Benea, Mr. Iurie Chiruta, Mr. Eugen Costov, Mr.Valeriu Plesca, Ms. Olesea Rihlea, Ms. Galina Rusnac, Mr. Dumitru Scortescu, and Ms. Rodica Sinita under the direction and organization of Mr. Hustuc. Mr. Levinta accepted the membership of the new 9 persons in the Association, which organized the Extraordinary General Assembly on 28 December 2015. Based on the decision of the General Assembly, the following were performed: election of the President of the Association, approval of the Statute of the Association in a new edition in conformity with actual legislation, election of the Association Council,

appointment of the Auditing Commission, changing the name and address of the Association, etc. The legal part of the reorganization was proposed to a professional lawyer and lasted until January 28, 2016 when the Ministry of Justice of the Republic of Moldova issued the registration document for the Non-Governmental Association "Association of Medical Physicists from the Republic of Moldova" with 10 active members.

On February 6, 2016, the Officers from the Association of Medical Physicists of the Republic of Moldova were appointed by the Executive Committee of the Association: Dr. Benea as Secretary General, Ms. Galina Rusnac as Treasurer, and Mr. Levinta as Past President; Mr. Chiruta was elected as vice-president.

In the first months of 2016, the members of the Association worked intensively groups of interest for establishing the accountant, registration at the relevant national bodies, designing and making the Association logo, site creation, hosting and registration, (www.afmmoldova.org), establishing the organizational chart of the Association, also other activities for the promotion of medical physics in the Republic of Moldova was approved.

At the same time under the supervision of the Executive Committee were created the Association's Committees (Executive Committee, Finance Committee, Professional Committee, Rules and Nominations Committee, and Coordination Committee), and Association Expert Groups and their chiefs were established.

The main task proposed by the Association's President for the duty period is the establishment of the medical physics as profession (Ministry of Education), and to introduce the speciality of medical physicist in the classification of the occupations (Ministry of Labour).

Alexandru Hustuc

ahustuc@gmail.com

President of the Association of Medical Physicists from the Republic of Moldova

Physicist with University Diploma (State University of Moldova) and more than 20 years practical experience in fields of medical physics: radiation protection and health physics. Started the career in public health service institution (Centre of Radiation Protection, 1993- 2014), in 2001 IAEA International expert, and in 2014 established a private company as Technical Service Organization: Medical Physics Service Provider (SRL ALARAD).

Co- author of 15 national and international scientific papers including book on Hygiene of Radiations, Radiation Protection No.180, and National Radiation Protection Norms (2001).

From 2016 – elected President of the Association of Medical Physicists from the Republic of Moldova.

Medical Physics in Greece

Main activities 2016-2017

Fig.1: ECMP 2016 venue (Athens, September 2016)

The Hellenic Association of Medical Physicists (HAMP) was formed in March 1969. The Association has a scientific, professional and educational orientation. HAMP organises every year a number of events and training activities in order to promote the application of Medical Physics and Radiation Protection and raise awareness on all areas of ionising and non ionising radiation.

In 2016, the 1st European Congress of Medical Physics (ECMP) has been organised in Athens by the European Federation of Medical Physics and hosted by HAMP. The venue of the congress was the Eugenides Foundation, an independent, non profit entity with a mission to enhance scientific and technical education to the general public and especially to the younger generations. 653 participants and 106 invited speakers and chairs from all over the world attended the works of ECMP2016 in the Eugenides technological and educational multi-center (Fig. 1). The scientific program of the congress consisted of scientific sessions, refresher courses, professional symposia, oral presentations, invited talks, satellite lectures, joint and poster sessions.

Accepted abstracts have been published on a supplement issue of the European Journal of Medical Physics. A side event under the title «Academic and Professional mobility of young Medical Physicists» was organised by HAMP, along with the congress. The event gave the opportunity to young medical physicists to be informed from distinguished scientists about the opportunities to work as medical physicists in Europe and USA and discuss challenges faced or issues that one needs to encounter if he or she decides to apply for work outside the country of residence or origin.

The Italian Association of Medical Physicists was the invited society of the «ECMP welcomes a nation» project that has been launched in Athens (Fig. 2). The concept of this initiative is to strengthen relationship between neighbouring countries and foster exchanges about projects and collaborations between the National Member Organisations.

Fig. 2: ECMP welcomes Italy

Fig. 3: Linear accelerator installation (courtesy Stavros Niarchos Foundation)

During the period 2016-2017, HAMP was a recipient of a grant by the Stavros Niarchos Foundation (SNF) - 'Radiotherapy Program'. In July 2014, the Stavros Niarchos Foundation announced a large scale fund, supporting the replacement of obsolete linear accelerators in seven public hospitals around Greece with new, state-of-art and high precision linear accelerators, contributing significantly to the treatment of cancer patients in the country (Fig. 3).

The Foundation's total contribution stands at 20 million euros and includes the installation of 10 linear accelerators.

HAMP established and is currently implementing the training program for the Medical Physicists of each hospital that is about to receive the new radiotherapy equipment.

The program includes theoretical and practical training in Greece and abroad, in order to ensure optimal use of the equipment and the provision of high quality, modern radiotherapy treatments around the country, radically improving the quality of medical care for cancer patients.

ESTRO courses on Imaging in Radiotherapy, Quality management and Patient safety, Radiotherapy Planning techniques and Image Guided Radiation Therapy have been attended by 13 medical physicists (HAMP members). Workshops on relevant subjects have been also organised.

Fig. 4: Race for the Cure 2016

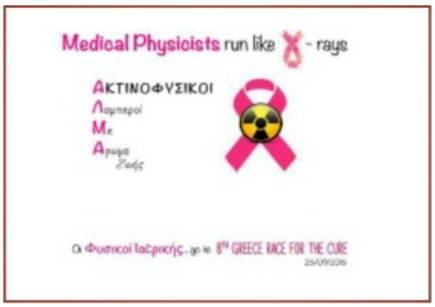

Fig. 5: T-shirt logo

One of HAMP communication aims is to increase the public support and understanding for the medical physics science, clear up misinformation and emphasise the important roles of medical physicists for the benefit of patients and general public.

HAMP's running team participated in the «Race for the Cure 2016» in Athens (Fig. 4).

Printed T –shirts bearing a medical physics logo (Fig. 5) have been prepared and HAMP's group photo won the 1st price on the photographic contest organised by the «Greece Race for the Cure Against Breast Cancer».

Educational, informative, social and athletic activities have been planned for the period 2017-2018 to further engage the general public and disseminate scientific information to a bigger audience.

Efi Koutsouveli

HAMP Public Affairs & Communication

Efi Koutsouveli, is a member of the Medical Physics department of Hygeia Hospital, Athens, Greece since 1993. Her field of expertise is on modern radiotherapy techniques with a special interest on Hospital Quality Management Systems and Radiotherapy Quality Audits. She is the Public Affairs and Communications of HAMP since 2014 and EFOMP Internet Manager.

Virginia Tsapaki

HAMP President

Virginia Tsapaki is the head of the Medical Physics department at Konstantopoulio General Hospital of Athens, Greece. Her field of expertise is on patient and staff dosimetry, optimization, diagnostic reference levels, dose tracking software. She is the President of HAMP since 2012 and chair of the EFOMP Projects Committee.

Medical Physics in Austria

With the beginning of the modern age and the development of natural sciences and technology medicine was offered new possibilities for examination and treatment methods. After the discovery of the X-rays and their direct medical use, physicians were assisted by physicists and technicians due to increasingly complex devices. In 1927, the "Röntgentechnische Versuchsanstalt im AKH der Stadt Wien" was founded and directed by the physicist Dr. Gottfried Spiegler. Increasing tasks in quality control and quality assurance led to a steadily growing share of physicists in medicine. With the Radiation Protection Act adopted in 1969, additional areas of activity within the scope of radiation protection opened up.

Austrian physicists founded the society "Gesellschaft für Krankenhausphysik" in 1980. At the same time they became a member of the European Association of Organizations for Medical Physics (EFOMP). Two years later the society joined the "International Organization for Medical Physics (IOMP)".

In 1985, the name was changed into its present name "Austrian Society of Medical Physics (ÖGMP)".

The interdisciplinary fields in which physicists work are diverse and include the use of ionizing radiation (radiation therapy, X-ray diagnostics and nuclear medicine) and non-ionizing radiation (ultrasound, ultraviolet, laser, magnetic resonance tomography MR) in diagnostics and therapy. Other areas of expertise include medical informatics or image processing, audiology, optics, medical acoustics and management

tasks. Due to these different demands, professional recognition of the medical physicist was introduced by ÖGMP in 1996 with a postgraduate training, further education and advanced training.

A six-semester university course for Postgraduate Training in Medical Physics (ULG) was set up at the University of Vienna and was adapted to new training requirements at the Medical University of Vienna (MUW) in 2004.

In 2016, further medical education for the "Medical Physics Expert", a specialty of medical physics with the highest level of expertise, was introduced in accordance with the recommendations of the EFOMP and the European Guideline on Medical Physics Expert (Radiation Protection No 174).

Currently more than 230 physicists are members of the ÖGMP, more than one third being women.

For a nation in the centre of Europe, contact with neighboring scientific societies has always been of particular interest. Joint annual meetings with the German Society of Medical Physics and the Swiss Society for Radiology and Medical Physics have been organized from the beginning onwards. A success story that emerged from this was the founding of a winter school in 1989, its venue being Pichl in Styria. The combination of medical physics topics combined with sports activities has always been well attended.

In 2003 a further biennial cooperation with the medical physicist partners in the Alpe Adria region was established with the "1st Austro- Italian and Slovenian Physics Contribution to Radiation Therapy Meeting". This year, as many as 7 countries (Austria, Croatia, Italy, Hungary, Slovakia, Slovenia and Serbia) have participated in the 8th meeting in Novi Sad.

In an ever changing professional environment, the ÖGMP is a non-profit organization with the task of research and teaching in the field of medical physics, the safe application of physical methods in medicine and the targeted use of medical technology. A board which is elected every two years in a general meeting of all members, conducts business and is supported by an advisory board of approximately 25 members.

Brigitte Zurl

President ÖGMP

I am a medical physics expert in the department of radiooncology of the Medical University in Graz, Austria. I am married and have two sons. My hobbies are cycling, traveling and singing in a chorus.

Medical Physics in
Austria - France - Greece - Republic of Moldova

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The Heidelberg Ion Beam Therapy Facility at the University Clinic Heidelberg

Heidelberg Ion Beam Therapy Facility (HIT) is a treatment unit, operated by the Heidelberg University Clinic and is the result of a clinical pilot project operated at the German heavy ion research facility GSI in Darmstadt. Within a cooperation project between Heidelberg University Clinic, DKFZ and GSI, patient treatment started nearly 20 years ago in late 1997 using a scanned beam of carbon ions to treat cancer patients for the first time worldwide. At the GSI facility 440 patients were treated with carbon ions until 2008, before the technology and know-how could be transferred to a clinical facility, the HIT facility in Heidelberg, which started patient treatments in September 2009.

Since then more than 4000 patients have been treated with scanned beams of protons and Carbon ions.

The machine operates 24/7 and patient treatments are done typically 12 hours a day from Monday to Saturday. Consequently a relatively large medical physics team of 12 people is employed at HIT, together with another 12 physicists and technicians, operating the accelerator in 3 shifts per day. Many of the research projects are running in close cooperation with the dep. for medical physics in radiation oncology at DKFZ, where around 40 physicists are employed.

At HIT three treatment rooms are available for patient treatments and one for preclinical research, all of them equipped with active beam scanning.

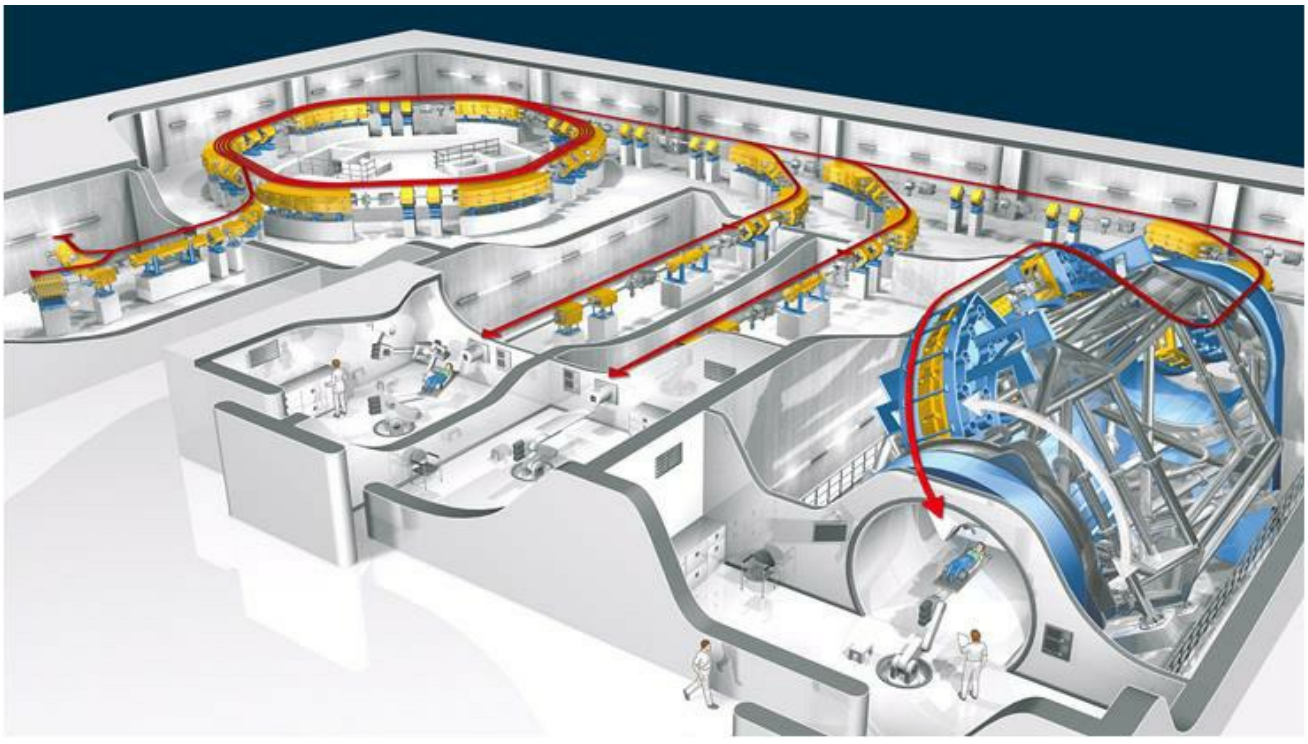

Fig. 1: The figure shows the layout of the Heidelberg Ion beam Therapy Facility at the University Hospital Heidelberg. On the bottom left, the ion sources are shown, as well as the linac injector. On the top left, the synchrotron is seen, with high energy beam-lines leading to the horizontal beam treatment rooms in the middle and the gantry on the right side of the figure (Image: Heidelberg University Hospital).

While two of the treatment rooms and the experimental room are equipped with a fixed horizontal beam-line, a third treatment room is equipped with the world's first isocentric proton-carbon gantry. The gantry started operation in 2012. In the meantime also beams of Helium and Oxygen ions have been commissioned for scanning at HIT and are being used for preclinical research (1). Clinical research focuses mainly on studies to investigate the efficacy of carbon ions in relation to protons and to explore new indications for ion beams. To do so, numerous clinical trials are ongoing (See clinicaltrials.gov for a complete list, and (2)), e.g. for comparative studies in chordoma and chondrosarcoma of the skull base tumors and for some high risk prostate cancer patients (3). The potential of carbon ions is being explored in novel treatment concepts for adenoidcystic carcinoma and malignant meningeoma in combination with chemotherapy and also in pancreatic and liver tumors.

The clinical program is accompanied by a wide range of research projects in medical physics and radiobiology. As an example only recently the first measurements with a water calorimeter in a scanned carbon beam were completed in cooperation with our national standard laboratory PTB and demonstrated unprecedented accuracy in dosimetry (4). Another novel approach is the combination of physics and biology detectors using a fluorescent nuclear track detector combined with a monolayer of cells. This detector allows visualization and correlation of microscopic dose parameters with damage at a cellular level (5).

The very active radiobiology group has a longstanding experience in animal models. As an example, very systematic studies were performed to understand the radiobiological effects of fractionation at different LETs in rat spinal chord and a unique library of RBE data measured in vivo has been created, which is valuable to benchmark radiobiological models use din treatment planning (6). On a more fundamental level, it has been demonstrated recently, that carbon ions lead to a more homogenous response in tumors with very different differentiation (7).

Currently, substantial work is being done at all levels at HIT to prepare for patient treatments using Helium-4 ions (1,8). The main advantage of Helium is the significantly sharper lateral penumbra as compared to proton beams, while RBE is only moderately enhanced between entrance region and the Bragg peak. Like for the other ions, a beam library of 255 energies with four different beam widths and 5 intensity levels has been established for Helium.

References

1. Tessonier T. et al: Experimental dosimetric comparison of ^{1}H, ^{4}He, ^{12}C and ^{16}O scanned ion beams. Phys Med Biol. 2017 May 21;62(10):3958-3982.
2. Uhl M, et al: Comparing the use of protons and carbon ions for treatment. Cancer J. 2014 Nov-Dec;20(6):433-9.
3. Habl G, et al: Acute Toxicity and Quality of Life in Patients With Prostate Cancer Treated With Protons or Carbon Ions in a Prospective Randomized Phase II Study--The IPI Trial. Int J Radiat Oncol Biol Phys. 2016 May 1;95(1):435-43.
4. Osinga-Blättermann JM, et. Al: Direct determination of k_Q for Farmer-type ionization chambers in a clinical scanned carbon ion beam using water calorimetry. Phys Med Biol. 2017, 62(6):2033-2054. .
5. Niklas M, et al: Subcellular Spatial Correlation of Particle Traversal and Biological Response in Clinical Ion Beams. Int J Radiat Oncol Biol Phys. 2013, 87(5):1141-7.
6. Saager m et al: Carbon ion irradiation of the rat spinal cord: dependence of the relative biological effectiveness on linear energy transfer. Int J Radiat Oncol Biol Phys. 2014, ;90(1):63-70
7. Glowa C, et al: Carbon ion radiotherapy decreases the impact of tumor heterogeneity on radiation response in experimental prostate tumors. Cancer Lett. 2016 Aug 10;378(2):97-103.
8. Mairani A, et al:Biologically optimized helium ion plans: calculation approach and its in vitro validation.

Oliver Jäkel

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Prof. Oliver Jäkel studied Physics and holds a PhD intheoretical physics since 1994. He then worked at DKFZ for the pilot project for cancer treatments with carbon ions at GSI. Since 2005 he is Medical Physics director of the Heidelberg Ion Beam Therapy Facility. Since 2010 he is professor for Medical Physics and in 2014 he became head of the department for Medical Physics in Radiation Oncology at the DKFZ.

Heidelberg Ion-Beam Therapy Center (HIT), Heidelberg, Germany
German Cancer Research Center, Dep. Medical Physics in Radiation Oncology,Heidelberg, Germany

News from CNAO, Pavia, Italy

The National Center for Oncological Hadrontherapy (CNAO) of Pavia (Italy) is a multi-ion facility and represents the latest advanced therapy to fight cancer.

Nowadays more than 60 centres in the world practice hadrontherapy, but only six of them are able to offer treatments both with protons and carbon ions. CNAO is one of these centres and it is the reference facility not only for the Italian patients but also for the Europeans ones, together with the centre of Heidelberg in Germany.

More than 1300 patients have been treated so far with remarkable results and even if the follow-up period is relatively short, 80% of the treated patients show substantial stable disease.

On September 2016 CNAO obtained the complete CE label of the synchrotron from the Istituto Superiore di Sanità demonstrating the compliance and safety of CNAO medical device for the treatment of tumours eligible for hadrontherapy. This important goal allows CNAO to receive more patients affected by tumours from Italy and from abroad.

On 2016, the treatment with protons of the first patients affected by eye melanoma, a serious disease which represents the 90% of all ocular tumours, started at CNAO. The active scanning system with proton beams has the advantage of ensuring the organ preservation and, in most cases, the preservation of the visual acuity. In addition the quality of life, with respect to the alternative treatment consisting in the eye enucleation, is much improved. Until today in Italy a limited number of patients could be treated at the INFN National Laboratories of the South, but most of the Italian patients were directed abroad, mainly in France and Switzerland. Now also for this disease CNAO will be an important point of reference. This result is a collaboration between CNAO, the Politecnico of Milan, the INFN (National Institute of Nuclear Physics, section of Pavia)

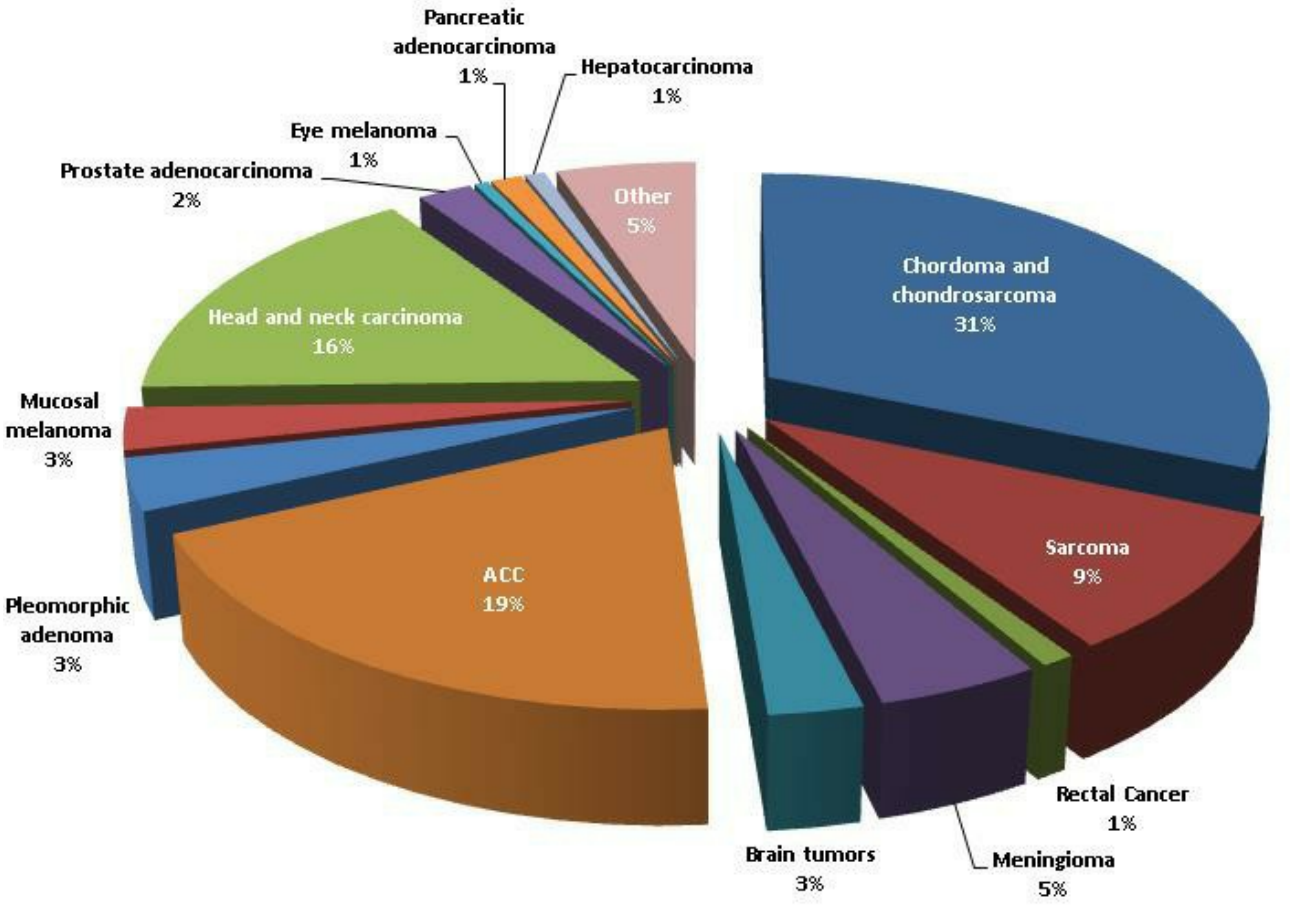


Fig. 1: Histologies treated at CNAO

Fig. 2: CNAO simulation room equipped with the tools used for the treatment of eye melanoma

and the Galliera Hospital in Genoa.

Noteworthy is also the fact that on March 2017 a law extends public coverage of hadrontherapy to all Italian citizens, as before this measure only patients coming from Lombardy and Emilia Romagna could have access to hadrontherapy treatment within the National Health System. Offering one of the most advanced therapy in the oncological field and being one of the six centres in the world able to provide both protons and carbon ions, CNAO is also organized with an office dedicated to private patients with front desk personnel English, Russian, French and German speaking. Also the clinical personnel is English speaking and if requested, we are able to offer a door to door support with a specialistic external dedicated team.

CNAO, from the beginning of its activity, is connected with the most important research and care institutions in the field of hadrontherapy. In the future international collaborations will be strengthened to launch clinical trials protocols with the aim to demonstrate the advantages of particles in the treatment of various pathologies. As a matter of fact CNAO is carrying out randomized clinical trials protocols with the Italian Sarcoma Group for the treatment of the sacral cordoma and with France Hadron for the sarcoma and adenoid cystic carcinoma with carbon ions. Moreover, we are finalizing all the procedures regarding an important randomized study with the UTSW of Dallas for the treatment of the pancreas tumour with carbon ions.

Thanks to the continuous increase of treated patients and its research programmes, CNAO can greatly contribute to the international clinical trials, which compare hadron therapy treatments with those of conventional radiotherapy, demonstrating the efficacy of this innovative technique on the basis of clinical evidence.

Regarding the European projects CNAO is involved in the MEDICIS-PROMED and in the Marie Curie project Optimization of Medical Accelerators (OMA) having as research goals the tumour tracking in particle therapy, light ion therapy software for data exchange and innovative imaging techniques. In June 2017 CNAO has organized and hosted the Summer School for both these research programmes.

Sandro Rossi

Director ONAO

Sandro Rossi is Director General of the National Centre for Oncological Hadrontherapy in Pavia, commissioned and financed by the Ministry of Health with the purpose of treating oncological patients with innovative techniques based on the use of particle beams (protons and carbon ions). Since 2003, Sandro Rossi coordinated first as Technical Director and since 2008 as General Manager, the design, construction and start-up of the accelerators and the instruments for the treatment of patients at CNAO. During his career Sandro Rossi has published several scientific articles, is a member of committees and commissions, has participated as a speaker in many conferences and for some years he has taught University courses in Physics and Particle Physics Applied to Medicine. In his career he has also received a contract as a Scientific Associate at CERN and has been Technical Director and board member of the TERA Foundation, Novara.

News from Medical Physics in Leuven, Belgium

Fig. 1: Proto-type of the grating-based phase-contrast system.

At the university hospital of Leuven, Belgium, Janne Vignero is working on exploring the potential clinical applications of grating-based phase-contrast imaging. A proto-type grating-based phase-contrast system, designed by Carestream Health, has been installed two years ago. The system provides for each exposure an attenuation based image, a phase contrast image and a dark field image. Maximal field of view is 8cmx8cm. Supported by a close collaboration with the medical staff in the hospital and the scientists in the university, several potentially interesting tissue samples could be imaged. Physics investigations provide a sound basis for understanding the image characteristics, while dialogue and clinical feedback lead to practical benefits and a better response to the needs of today's physicians and their inside in the interpretation of the images.

Janne Vignero
Master Medical Radiation Physics
Katholieke Universiteit Leuven
KULeuven, Belgium

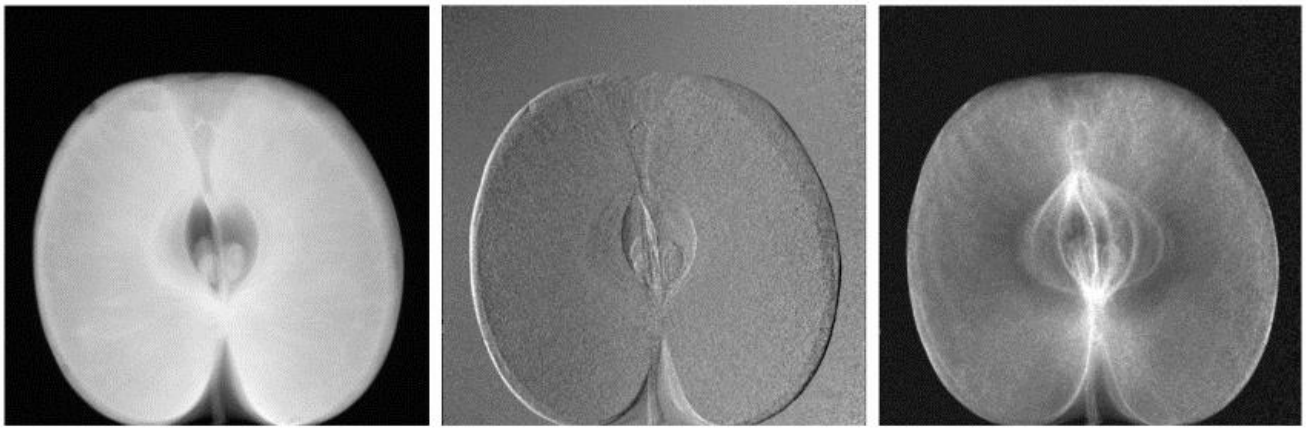


Fig. 2: Phase-contrast images of an apple.

The Trento Institute for Fundamental Physics and Applications (TIFPA)

A National center for applied nuclear physics

The Trento Institute for Fundamental Physics and Applications (TIFPA) is a National Research Center of the Italian Institute for Nuclear Physics (INFN) in association with the Trento Healthcare Agency (APSS), the University of Trento (UNITN), and the Bruno Kessler Foundation (FBK). TIFPA is an innovative research center, one of a kind, an experiment for a federation of research, academy and medical institutions unique in Europe. The task is to concentrate on applied sciences, and to cover the full path from fundamental research to knowledge transfer on the territory. The center has three main activities. Space, which exploits the large experience of UNITN with spaceflight experiments such as Lisa Pathfinder, and the space radiation protection activity at he accelerator; sensors, where FBK is a leading center on the construction and testing of silicon-based microdevices; and medical physics, which imposes on the APSS proton therapy center.

As proton therapy is becoming an established treatment methodology for cancer patients, the number of proton centers is rapidly growing worldwide. The economical effort for building these facilities is motivated by the clinical aspects, but should also supported by the potential relevance for the research community. Experiments with high-energy protons are needed for both therapy-related (medical physics, biology) and non-medical (detector development, space research, radiation hardness tests, nuclear physics) research. Not surprisingly, many of the new proton therapy centers include an experimental room, where pre-clinical and non-clinical research can be performed.

TIFPA recently opened the new research room in the APSS proton therapy center in Trento (Fig. 1), a clinical center build by IBA (Proteus®PLUS). Over 300 patients have been treated at the gantries, with a 30% of pediatric patients and a 30% or re-irradiations.

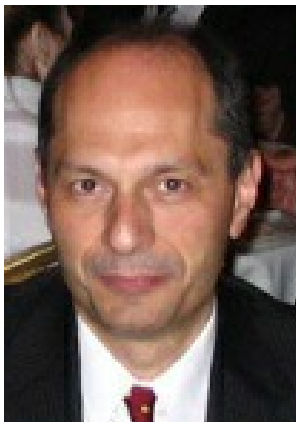
The proton accelerator is a key infrastructure for TIFPA. The experimental room (Fig. 2) has two beamlines, one at 0 and one at 30 degrees, dedicated to radiobiology and proton physics, respectively. The beam has been characterized in air and energies between 70 and 230 MeV

at intensities between 10^2 to 10^9 protons/s. The

Fig. 1: The proton therapy center in Trento.

Fig. 2: The two beamlines in the experimental vault in Trento.

experimental vault is designed as user facility, and a Program Advisory Committee (PAC) regulates the access for research institutes and companies. Based on the results of the proton beam characterization, it was possible to host already in 2016 several external groups, involved in both national and international collaborations. The activities performed by the guest groups spanned from radiation hardness (ALICE), to space detectors and shielding applications (ALTEA, Limadou, Rossini2), and detector testing (PRIMA-RDH, QBeRT). At the same time, preliminary studies started dedicated to the irradiation of plant seeds (SHIELD). This demonstrates the large spectrum of research lines that might benefit from accessing the Experimental Room. The PAC approved in April 2017 twelve new applications in the first selection round. The experiments cover proton radiography, range verification, detector calibration, radiobiology, and tests of single event effects in microelectronics. TIFPA welcomes new beamtime applications from excellent research groups. All technical information on the new facility and forms for beamtime applications are available online at www.tifpa.infn.it



Marco Durante

Director TIFPA

Marco Durante was appointed as the Director of the Trento Institute for Fundamental Physics and Applications (TIFPA), of the Italian National Institute for Nuclear Physics (INFN), in April 2015. He previously served as Director of the Biophysics Department at GSI Helmholtz Center for Heavy Ion Research (Darmstadt, Germany) since 2007. He is also Professor of Physics at the University of Naples Federico II in Italy, Adjunct Professor at the Temple University in Philadelphia (USA) and at the Gunma College of Medicine in Japan.

Research in

Belgium - France - Germany - Italy - UK

Steps towards low dose 3D mammography

News from the European Synchrotron Radiation Facility, Grenoble, France

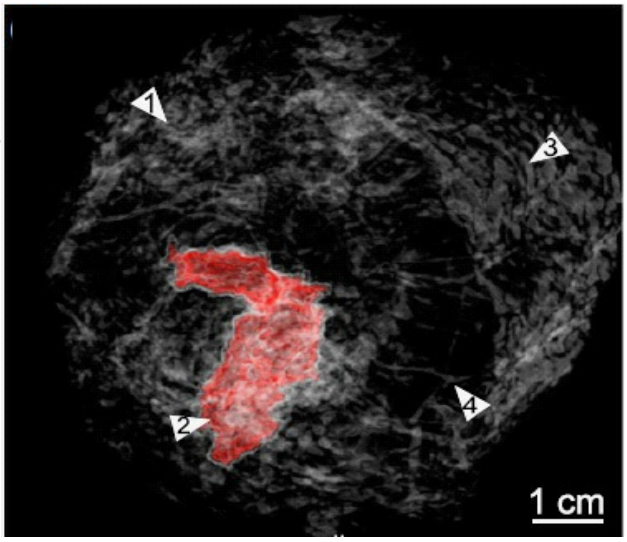


Fig. 1: Three-dimensional volume rendering from XPCI CT data of the tumor (in red); the arrows indicate different fine features: 1, lobules; 2, tumor; 3, skin; and 4, lactiferous duct. Pixel size: 92 microns. Dose: 2 mGy. Reprinted with permission from (4)

Computed tomography (CT) is a clinical diagnostic technique that provides high resolution cross-sectional images of the body; however, two important limitations still affect this exam: 1) its low sensitivity when imaging soft tissues and 2) the hazard associated to X-ray exposure. Other diagnostic techniques not using ionizing radiation such as MRI or ultrasounds possess other limitations and cannot replace CT in several cases. Improving CT imaging and reducing the dose delivered to the patients has become an important research topic, in particular in those diagnostics fields involving highly radiosensitive patients and/or organs, e.g. in paediatrics and in breast cancer detection.

Developing and implementing innovative, high sensitive, low-dose CT imaging methods has therefore become one of the goals of many research groups worldwide. One of the approaches that has been extensively pursuit over the past 20 years is the so-called X-ray phase-contrast imaging (XPCI). The combination of this technique with advanced image reconstruction and processing methods has been validated on numerous and different biomedical and diagnostic fields.

Breast imaging is an emblematic case. Although recent technologies, such as digital mammography, have improved the quality of breast imaging, there are important limitations/risks associated with this examination: the low sensitivity (it misses up to 20% of breast cancers in screening procedures) and specificity (~80-95%, which calls for complementary examinations), and the risk related to radio-induced cancer. It has been shown that dedicated breast CTs could improve sensitivity and specificity, but the spatial resolution is nonetheless limited by the deliverable X-ray dose, and, as a consequence, the capability of detecting microcalcifications is inferior to mammography. Furthermore, some tumors are not visible in CT because the image contrast is determined by the difference of the X- ray absorption coefficients, which is intrinsically small between tumors and normal breast tissues.

In order to address this two-fold problem (radiation dose and sensitivity), within a collaboration between the European Synchrotron Radiation Facility and the Ludwig Maximilians University we have been developing innovative imaging methodologies for low dose breast XPCI-CT. XPCI employs the dual property of X-rays that are simultaneously absorbed and refracted while passing through a tissue. It may allow observing contrast due to the phase modulation of X-rays, even if the amplitude (i.e. absorption) modulation is weak or absent; for a given image quality, the dose to the tissues is reduced compared to absorption imaging[1]. We have validated the medical relevance and potential of different XPCI techniques on various kinds of specimens, including full human organs. The combination of XPCI with advanced CT reconstruction methods is the effective recipe that we have used to address the two main challenges. We implemented mathematical methods able to separate the refraction from the absorption contribution in the images[2,3]. These algorithms allow further improving the image contrast, and quantifying densities in the tissues with high sensitivity and accuracy providing an improved diagnosis. We have also successfully tested the application of novel CT image reconstruction algorithms. One of these allowed obtaining a high resolution 3D visualization of a full breast, with a mean glandular dose of 2.0 mGy (Fig.1), corresponding to a

dose reduction of more than 75% with respect to results obtained using conventional CT reconstruction methods, with no resolution or contrast degradation[4].

Efforts have also been invested to the technical development of refined XPCI setups. In fact, different XPCI techniques exist for visualizing the phase effects; although all yield excellent results in laboratory trials, so far none has fund the clinical diagnostics application because of the existence of stringent requirements in terms of X-ray beam characteristics (coherence, intensity, monochromaticity)[5]. However, thanks to the efforts made by several groups focused on this very promising technique, the objective of making the XPCI technique available for routine X-ray medical diagnostic applications is not far anymore.

References

1. A. Bravin, P. Coan and P. Suortti "X-ray phase-contrast imaging: from pre-clinical applications towards clinics" *Phys. Med. Biol. 58 (2013) R1–R35*
2. Gasilov S, Mittone A, Brun E, Bravin A, Grandl S, Mirone A, Coan P. Tomographic reconstruction of the refractive index with hard X-rays: an efficient method based on the gradient vector-field approach. *Opt Express. 2014 Mar 10;22(5):5216-27*
3. Mirone, E. Brun and P Coan A Dictionary Learning Approach with Overlap for the Low Dose Computed Tomography Reconstruction and Its Vectorial Application to Differential Phase Tomography *PLOS ONE 2014 vol.9, art 0114325*
4. Y. Zhao, E. Brun, P Coan, Z. Huang, A. Sztrókay, P.C. Diemoz, S. Liebhardt, A. Mittone, S. Gasilov, J. Miao, and A. Bravin "High-resolution, low-dose phase contrast X-ray tomography for 3D diagnosis of human breast cancers" *PNAS 2012, November 6, vol. 109, no. 45, 18290–18294*
5. P.C. Diemoz, A. Bravin, M. Langer, and P. Coan "Analytical and experimental determination of signal-to- noise ratio and figure of merit in three phase-contrast imaging techniques" *OPTICS EXPRESS, 2012, Vol. 20, No. 25, 27670-27690*

Paola Coan

Associate Professor at the Ludwig Maximilians University, head of the research group on brilliant X-rays for medical diagnostics. Project leader within the MAP German excellence cluster, member of the IMPRS-APS excellence school, visiting scientist at the ESRF. Co-author of more than 60 peer-reviewed scientific papers on new X-ray imaging methods.

Alberto Bravin

Senior scientist at European Synchrotron Radiation Facility (ESRF) and in charge of the biomedical beamline. Specialized in developing high resolution hard X-ray imaging techniques for medical diagnostics and in innovative radiosurgery applications using microbeams. Co-author of more than 160 peer reviewed papers, he is member of the Editorial Board of Associate Editors of Medical Physics and of the Scientific Reports journal.

Proton Computed Tomography

Imaging News from UK

The PRaVDA consortium, a UK-based collaboration headed by the University of Lincoln and funded by The Wellcome Trust, is developing a new instrument for proton Computed Tomography (CT). Currently, proton therapy delivery is planned using X-ray CT scans of the patient, for defining target volumes and dose and range distributions. However, using X-ray CT for treatment planning requires conversion from Hounsfield numbers (related to the interaction of X-rays with the patient anatomy) to proton Relative Stopping Power – directly quantifying the interaction of protons with tissue. This conversion represents a significant source of uncertainty in treatment planning. This uncertainty can have a substantial impact on the way dose is delivered, for example by creating the need of using larger treatment margins. For a tumor sitting at 20 cm inside the patient body, the uncertainty on the delivered range would be in the order of ±7 mm. The PRaVDA consortium aims to reduce this uncertainty to 1%, by using protons to image patient anatomy prior to treatment, with the potential of fully exploiting the high spatial selectivity of proton beams (Bragg peak) allowing more conformant dose distribution.

The PRaVDA proton CT system is fully based on solid-state detectors. It comprises 33 layers of silicon strip sensors, very similar to those used in the Atlas experiment at the Large Hadron Collider (1). The PRaVDA instrument makes use of two trackers (each made of 6 layers of silicon strip sensors), one placed before and one after the patient, allowing to reconstruct the Most Likely Paths of individual protons through the patient. The trackers are followed by a Range Telescope, a stack of 21 silicon strip sensors, to measure proton range, from which energy loss of the protons inside the patient can be inferred. For proton CT, protons need to be imaged individually – tracked and their energy loss inside the patient measured – which makes the need for a very fast readout (~40 ns for the PRaVDA detectors). Proton CT projections are then 3D-reconstructed using novel reconstruction algorithms developed by the consortium (backprojection-then- filtering) (2). The PRaVDA consortium has recently produced their first proton CT images at iThemba LABS, the South African national cyclotron. While proton CT of surrogated tissues demonstrated the capability in reducing range uncertainty to 1%, the consortium produced the first proton CT images of biological tissues. A comparison between conventional X-ray CT and proton CT of a lamb chop is shown in Figure. The main anatomical features of the sample are visible in both images: adipose tissue, muscle and vertebrate tissue, although with a different resolution. This image shows, for the first time, measurement of proton Relative Stopping Power in a biological sample. The PRaVDA consortium is now taking steps in combining the proton CT technique they have developed – which measures Relative Stopping Power – with other properties of proton interaction with tissue (namely energy straggling, attenuation and scattering power (3), with the aim of further improving treatment planning in proton therapy.

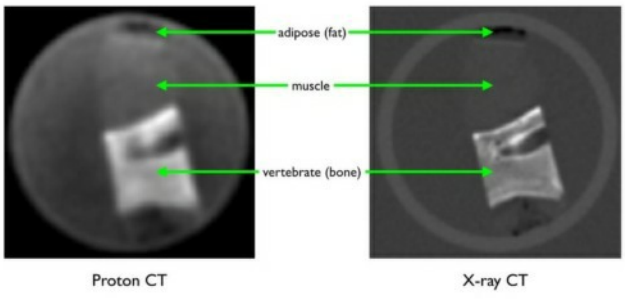
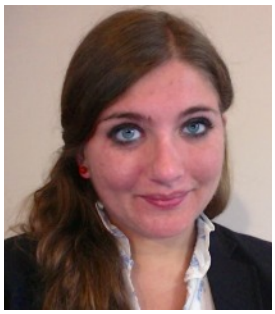


Fig. 1: Proton CT (left) and X-ray CT (right) slice of a biological sample (lamb chop).

References

1. Taylor et al. 2015, J. Inst. 10 C02015
2. Poludniowski et al. 2014, Phys. Med. Biol. 59
3. Taylor et al., Med. Phys. 2016, 43(11)



Michela Esposito

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Michela Esposito is Research Fellow at the University of Lincoln, working on the development of instrumentation for proton CT. Her research activity focuses on the simulation, development and characterization of ionizing and non-ionizing radiation detectors for medical and biological imaging applications.

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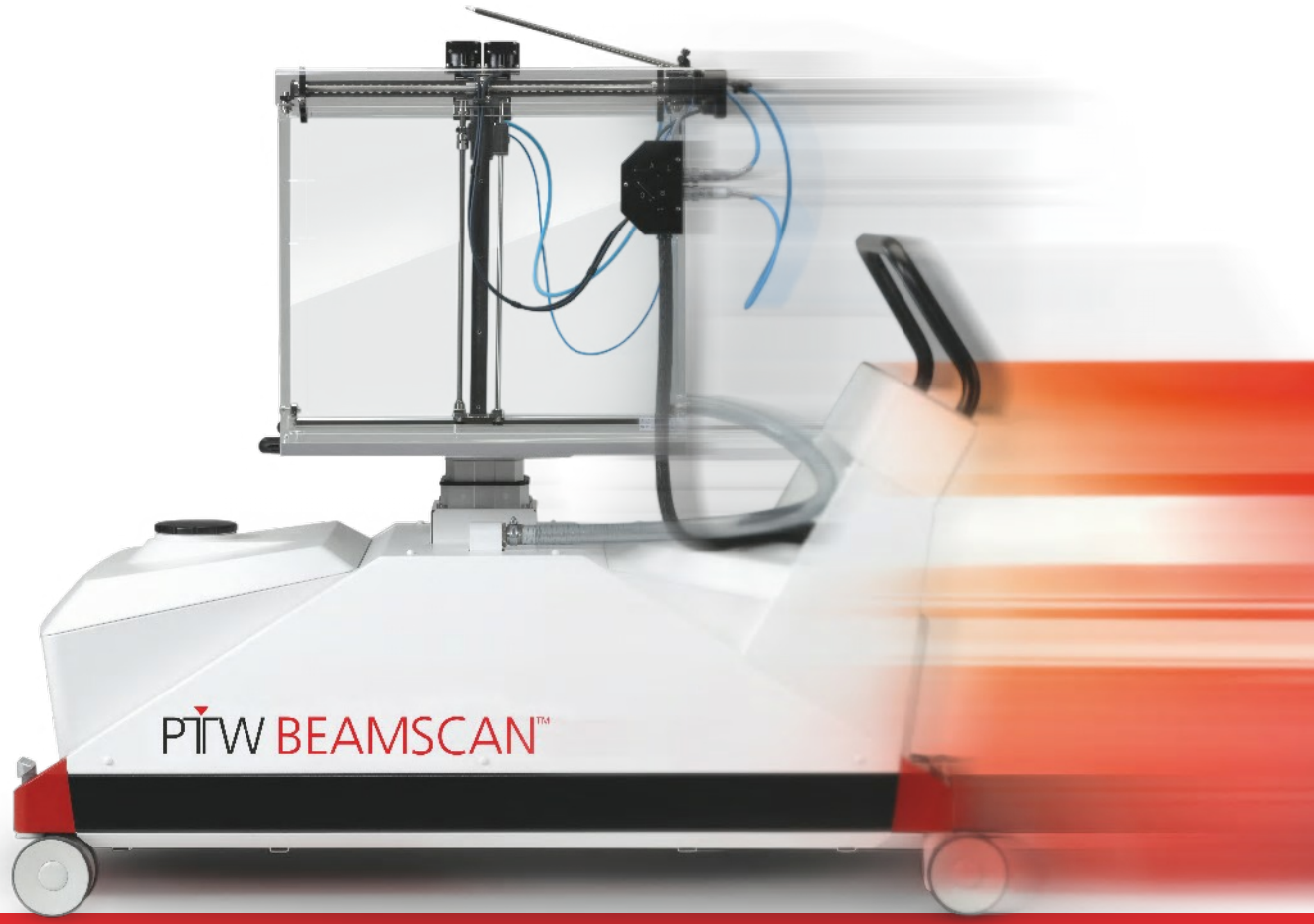

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EFOMP School for Medical Physics Experts (ESMPE)

Imaging in Radiotherapy
26 – 28 January 2017 - Prague, Czech Republic

Our attendance at the first RT EFOMP School for MPE's "Imaging in radiotherapy" was a natural consequence of us being here in Prague on previous EFOMP Schools held in that lively and vibrant city. We have never been disappointed with the level of quality of this event, and this time was no exception. A wide range of topics were covered in a friendly atmosphere. Very informative lectures and lively discussions gave us freedom to ask lecturers and other participants about any kind of problem we may have to deal with at work, helping us to see it from different perspectives. All of this together made this event a great opportunity to undertake as continuous professional development, which would be to our advantage.

Fig. 1: The course venue.

These 3 days which we spent in Prague in the company of 44 other participants, covered well-known radiotherapy imaging techniques like 4DCT, CBCT, ultrasound as well as state-of-the-art technology like functional MRI and PET imaging.

Dimitris Visvikis has shown us how useful functional imaging could be in target volume definition. The given clinical examples helped us to understand not only the advantages of accuracy in tumour delineation, but also the challenges and drawbacks that we should be aware of while using biomarkers in clinical practice. With Christian Fiandra we have found 4DCT and 4DCBCT as a great tool for motion management as well as for stereotactic ablative radiotherapy, apart from its well-known implementation in lung or breast cases. Surprisingly we also rediscovered the clinical value of ultrasound in prostate and breast applications. Rob Tijssen and Uulke van der Heide gave us a chance for much deeper insight in MRI application in radiotherapy than we could have expected.

Jens Edmund focused on advanced technological aspects of acquisition, reconstruction and protocol optimisation for CBCT and MRI, while Emiliano Spezi underlined a need for image dose evaluation in CBCT and presented some new useful dosimetry techniques in details. Gianfranco Loi showed us how to use CBCT for adaptive radiotherapy, what optimisation protocols we would need and the challenges we could face while implementing this new technique into the daily practice. An optical surface imaging based system was presented as a nonionising radiation device that allows fast and quantitative alignments of external surrogates, e.g. in breast radiotherapy. With Alberto Torresin we went through the recently-released version of CBCT quality assurance protocol, impatiently awaiting guideline, that could unify approaches for quality control for this widely-used modality. Discussion on this protocol was another opportunity to immerse ourselves in radiotherapy imaging topics and exchange information and experiences, which could be of great value for both sides.

There were also some practical demonstrations about image registration and integration in radiotherapy from the vendor side given by Stina Svensson, which gave us an overview of what exactly is inside this black box that we use every day at work called the treatment planning system. An integral part of this advanced educational event was the final examination that not only gave us a great chance to check the knowledge we had acquired during the course but we also were rewarded with double CPD points for passing it.

The course was divided into 4 sessions on Thursday and Friday: 2 morning parts and 2 afternoon ones with lunch and coffee breaks between them, Saturday had 2 morning sessions that had finished with an examination. During lunch time we had a chance to chat with lecturers a nd other participants from all over the world to exchange our experiences strengthen newly formed acquaintances with people who face similar daily work challenges.

Fig. 2: Course participants and lecturers

At the end of the first day we got together at a social dinner enjoying the time spent among people with similar interests along with great Czech beer in a Bohemian restaurant.

The organising team (Jaroslav Ptácek, Tereza Hanušová) made the perfect choice in picking the place of venue inside Josefov, an old Jewish part of the city centre full of interesting places to visit after the lectures.

The school was intended for Medical Physics Experts in Radiotherapy or practicing clinical Medical Physicist working towards becoming an MPE. However, the choice of topics and their interdisciplinary nature made the subject matter of the course very useful also for medical physicists who do not deal with radiation therapy in routine daily practice, e. g. working as a physicist in nuclear medicine. In this context, particularly relevant topics were covered like the use of PET imaging to support target volume definition and the role of PET imaging in assessment of treatment response. Broadening the knowledge in this field is also important for cooperation with Departments of Treatment Planning in Radiotherapy. In addition, the school significantly expanded topics carried out during the course of the specialization for medical physicist in Poland, by MRI image guided radiotherapy, advanced quantitative imaging provided by PET in treatment adaptation or optical surface imaging.

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Forthcoming editions of the European School for Medical Physics Expert (ESMPE)

Promoting of education and training programmes is one of the columns of the mission of EFOMP.

In partnership with the Czech Association for Medical Physics, EFOMP organised in 2013 the first module which has been specifically targeted towards Medical Physicists who would like to achieve Medical Physics Expert status in the Nuclear Medicine subspecialty. Since then, eight editions of the school have been completed (4 in Nuclear Medicine, 3 in Diagnostic Radiology and 1 in Radiotherapy) with more than 300 participants coming from all European countries. A distinctive tract of the school is to provide subsidised fees for a certain number of participants coming from low income European countries.

In the following, the upcoming editions of the ESMPE in 2018 will be announced and briefly outlined.

ESMPE Computed Tomography. Technology, Dosimetry, Optimisation
January 25-27, 2018, Prague, Czech Republic

On the 3d of March 2017, EFOMP and the European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry (COCIR) signed in Wien a Memorandum of Understanding. Among the areas of collaboration, it was stated:

"To foster training of medical physicists on the best use of new equipment and technology in imaging and therapy to reduce radiation exposure of patients and users"

To this purpose, EFOMP and COCIR are jointly organising an ESMPE _CT module.

The school will be aimed at advanced tasks connected with Computed Tomography. It will cover the main physics aspects of the CT technology, Dosimetry and Optimization. Lecturers identified by COCIR will give insides on the technical solution adopted by manufacturers in the relevant fields of CT dose reduction and optimization.

This two-and-half day event will be accredited by EBAMP (European Board of Accreditation for Medical Physics) and is intended for practicing clinical Medical Physicists who are involved in Computed Tomography. As usual, there will be an optional examination at the end for those seeking a higher level of certification beyond attendance.

Further information on this edition can be found at EFOMP website and social accounts:

www.efomp.org www.linkedin.com/company/efomp www.twitter.com/EFOMP_org

ESMPE at the second European Congress of Medical Physics
August 22, 2018, Copenhagen, Denmark

The purpose of the 2nd European Congress of Medical Physics (ECMP2018) is to connect the medical physics specialties and create a common forum for networking, sharing knowledge, and focusing on the physics within the field of medicine. The main congress will take place from 23 to 25 August 2018 in Copenhagen. Satellite meetings will be held in conjunction with the ECMP2018 on the 22 of August. Among them, ESMPE is organizing three satellite meetings.

1. Statistics in Medical Physics

The school will be aimed at advanced tasks connected with the application of statistics in Medical Physics, will cover the methods most frequently used in medical statistics and is intended for practising clinical Medical Physicists who are involved in data management and research.

2. Fundamentals of Nuclear Medicine Dosimetry

The school will be aimed at introducing the most recent aspects of Nuclear Medicine Dosimetry and is intended for practising clinical Medical Physicists who are involved, or intend to be involved, in Nuclear Medicine dosimetry.

3. IMRT&VMAT planning in practice

The school will be aimed at improving the skills in the field of the inverse planning for IMRT and VMAT in daily clinical practice. Teaching sessions will cover the main topics of inverse planning and will provide the background for live exercises using clinical cases. Floating licenses of two commercial TPS systems will be available for participants to practice under the guidance of the experts. The event is endorsed by ESTRO.

The one day events will be accredited by EBAMP (European Board for Accreditation in Medical Physics).
Further information on these satellite meetings can be found at:
www.ecmp2018.org and www.facebook.com/ECMP2018/#

Marco Brambilla
EFOMP Vice President & SG
Chair of the ESMPE Scientific Board
Head of Medical Physics Dept. University Hospital "Maggiore della Carità", Novara, Italy.

International Conference on Monte Carlo Techniques for Medical Applications (MCMA2017) 15-18 October 2017, Napoli, Italy

Developers and users of Monte Carlo techniques applied to Medicine in the clinic, industry and academy, are invited to participate to MCMA2017 for presenting, discussing and exchanging information on the scientific and technical innovations in application areas including medical radiation sources, radiation therapy treatment planning in conventional and in particle therapy, brachytherapy, radiation dosimetry, radiation shielding, radiation imaging, nuclear medicine and radiobiology. Connections with technology of inverse optimization, deformable image registration, machine learning techniques, parallel and GPU computing, are also topics of interest in the conference.

Topics

- Updates on MC codes physics
- MC physics and geometric input
- MC models for radiation sources and beams
- MC approaches in brachytherapy
- GPU/parallel implementations and deterministic methods
- MC applications in imaging and nuclear medicine
- MC in particle therapy
- MC treatment planning and evaluation
- MC applications in micro-dosimetry
- MC applications in IGRT and dosimetry
- MC in radiobiology

Scientific Committee

Prof. Antonio Leal Plaza, Dept. of Medical Physiology and Biophysics, University of Seville, Spain (*Chair*)
Prof. Philippe Després, Université Laval, Québec, Canada (*co-Chair*)
Dr. Giuseppe Battistoni, INFN Sezione di Milano, Milan, Italy
Prof. Luc Beaulieu, Université Laval, Québec, Canada
Dr. Michael Fix, Division of Medical Radiation Physics, Inselspital-University of Berne, Switzerland
Dr. Sebastien Incerti, Centre d'Etudes Nucleaires de Bordeaux-Gradignan, Gradignan, France
Dr. Grisel Mora, IBEB, Faculty of Sciences, University of Lisbon, Portugal
Prof. Harald Paganetti, Massachussetts General Hospital, Francis H. Burr Proton Therapy Center, Boston, MA, USA
Prof. Katia Parodi, Ludwig-Maximilians-Universität, Munich, Germany
Dr. Nick Reynaert, Centre Oscar Lambret, Lille, France
Prof. Paolo Russo, Dipartimento di Fisica "Ettore Pancini", Università di Napoli Federico II, Napoli, Italy
Prof. Jan Seuntjens, McGill University, Montréal, Québec, Canada
Dr. Emiliano Spezi, Cardiff University, School of Engineering, Cardiff, UK
Dr. Frédéric Tessier, Measurement Science and Standards, National Research Council, Ottawa, Canada
Prof. Frank Verhaegen, Maastro Clinic, Maastricht, the Netherlands

List of speakers

Dr. Giuseppe Battistoni, INFN Sezione di Milano, Milan, Italy: *"The application of the FLUKA Monte Carlo code in medical physics"*
Prof. Luc Beaulieu, Université Laval, Québec, Canada: " *Monte Carlo dose calculations in brachytherapy*
Dr. G. A. Pablo Cirrone, INFN-LNS, Catania, Italy: " *Review of Geant4 applications in medical physics*
Prof. Xun Jia, University of Texas Southwestern Medical Center, Dallas, USA: *"Recent updates in GPU-based Monte Carlo simulation for radiation therapy*
Dr. Andrea Mairani, CNAO, Pavia, Italy: " *Monte Carlo-based RBE investigations in hadrontherapy*
Dr. Hugo Palmans, National Physical Laboratory, Teddington, Middlesex, UK: *"Monte Carlo simulations for improved reference dosimetry*
Prof. Tony Popescu, B.C. Cancer Agency, University of British Columbia, Vancouver, Canada: " *Modern clinical applications of Monte Carlo simulations for in-vivo patient-specific QA"*
Prof. Bas Raaymakers, University Medical Center Utrecht, The Netherlands: " *The promise of the MRI linac: simultaneous MRI and irradiation*
Prof. Francesc Salvat, Universitat de Barcelona, Barcelona, Spain: " *Modeling of inelastic collisions of charged particles in condensed matter*
Prof. Joao Seco, German Cancer Research Center (DKFZ) & University of Heidelberg, Heidelberg, Germany: *"Monte Carlo study of Helium CT (HeCT) imaging"*
Prof. Jan Seuntjens, McGill University, Montréal, Québec, Canada *"A Monte Carlo perspective on small beam radiation therapy"*
Dr. Frédéric Tessier, Measurement Science and Standards, National Research Council, Ottawa, Canada: " " *EGSnrc update: new features and legacy code upgrade*
Prof. Frank Verhaegen, Maastro Clinic, Maastricht, the Netherlands: " *The use of imaging information in Monte Carlo simulations*
Dr. Carmen Villagrasa, Institut de Radioprotection et de Sûreté Nucléaire, Fontenay-aux-Roses, France: *"First results on DNA clustered damage combining direct and indirect effects with Geant4-DNA"*
Prof. David Rogers, Carleton University, Canada: "Fun with Monte Carlo: or how I keep learning radiation physics"
Prof. Alberto Del Guerra, University of Pisa, Italy : "The dawn of PET Monte Carlo: a personal experience"
Prof. Willi A. Kalender, University of Erlangen-Nuernberg, Germany: "Monte Carlo methods for diagnostic radiology"

Abstract submission

Accepted abstracts will be published in a Supplement of the journal - *Physica Medica* - European Journal of Medical Physics (EJMP).

Focus Issue of *Physica Medica* - European Journal of Medical Physics

Full papers from Conference contributions will be published in a Focus Issue of *Physica Medica* on April 2018. This will be a regular issue of EJMP dedicated to the highlights of the MCMA2017 Conference. Papers will be reviewed using the normal stringent EJMP review process. The deadline for submission of papers to EJMP for this Focus Issue is **31 December 2017** .

Papers published in this Focus Issue will be available for free download from the journal's website up to 31 December 2018.

MCMA2017 is an ***ESTRO endorsed conference,*** Conference website: agenda.infn.it/event/MCMA2017

National Congress of SEFM

Girona, Spain, 13-16 June 2017

On June 13th-16th 2017, the Spanish Society of Medical Physics (SEFM) held its 21st congress at the Palacio de Congresos in Girona on the topic of ' *Radiation: progress and health'* (Figure 1). This is the fifth time the congress has been run with the participation of the Spanish Society of Radiation Protection (SEPR), and with more than 700 attendees present, including national and international experts, the congress was considered to be a marked success.

Fig. 1: Opening ceremony of SEFM Congress.

The scientific program covered all topics relevant to the field of medical physics, and was an occasion for experts to share information and knowledge, to present recent developments, and to debate future challenges in the profession.

The topic '*Radiation: progress and health'* served as a sounding board for advances in medical sciences, many of which have only been made possible thanks to industry investment in research.

The medical physics scientific committee at the congress had to evaluate more than 400 papers, all of which were reviewed by 3 experts. The overall rejection rate stood at 5%. The accepted works reflected the different thematic areas of the congress, thus offering a global vision of the current topics that medical physics professionals work on:

- Basic dosimetry and development of detectors and dummies
- Experimental determination and calculation of absorbed dose:
  - a) Medical Physics (I)
  - b) Radiation Protection (II)
- Movement management in Radiotherapy and diagnosis
- Image:
  - a) Quality Assurance and technical aspects
  - b) Clinical Applications
- Treatment planning and Optimization of treatment plans
- Implementation of new techniques / technologies
- Radiobiology
- Biophysics
- Education, Training and Social Aspects
- Legislation and Regulations

The program for this prestigious scientific congress included the participation of national and international experts, 45 guest speakers, and representatives of the AAPM and EFOMP. In total, 72 papers dealing with the topics listed above were presented during the oral sessions, 2 round tables, 2 debates, 2 symposia and 6 poster sessions. In addition, 6 refresher courses were also organized. The scientific program was rounded off with a poster exhibition that was complemented by a large technical exhibition, which allowed the attendees to discover first-hand the latest technological advances in our field.

Prior to the congress, 2 pre-congress courses were organized: "*In-vivo portal dosimetry*" and "*Magnetic Resonance, from basics to quantification with image biomarkers* ". The congress ended with a symposium by and for technical specialists who perform their duties in departments of medical physics.

Leisure activities were also organised for congress participants, including a race in the *Devesa Park*, which had a great turn out despite the heat. And of course, the traditional closing congress dinner at the world famous *MAS MARROCH* restaurant owned by the Cam Roca brothers who also run the well-known restaurant *CELLER DE CAN ROCA* , which has **three Michelin stars** and was named **the best restaurant in the world** in 2013 and in 2015 It was an incredible evening and there could not have been a better place to close such a magnificent congress.

The next Spanish Society of Medical Physics (SEFM) congress will be held in 2019 in the city of Burgos, and we have no doubt that it will be on par with this year's successful event.

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sefm Sociedad Española de Física Médica

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Congresses/Conferences in Italy - Spain

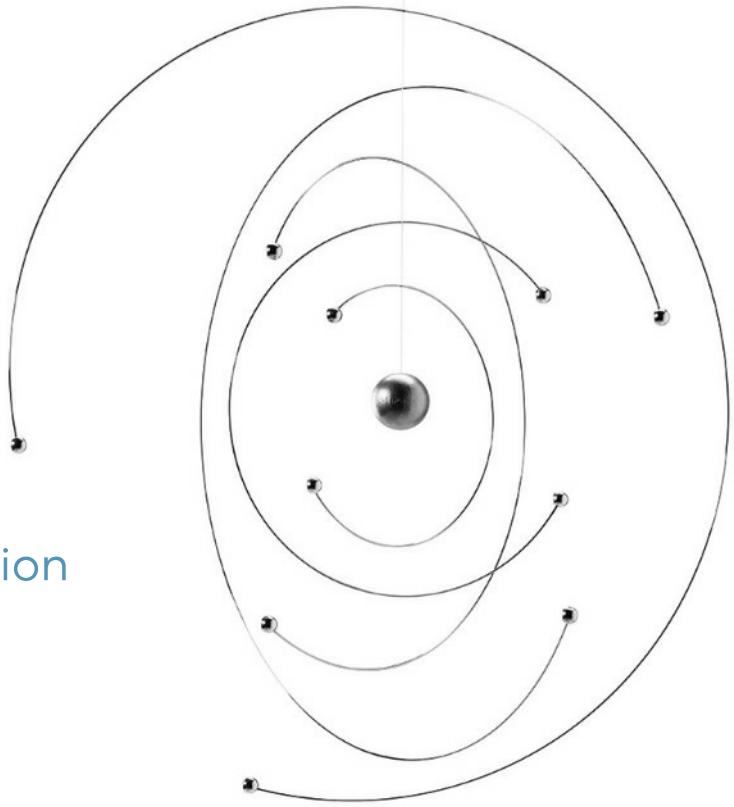
ecmp 2nd 2018

ECMP 2018 welcomes Germany

23 - 25 August 2018
Copenhagen · Denmark

European Congress of Medical Physics 2018

Bridging knowledge across specialties



Main topics

Radiotherapy
Nuclear Medicine
Diagnostic Radiology
Non-ionizing Medical Radiation
Radiation Protection

www.ecmp2018.org

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Organized by EFOMP

Hosted by DSMF Dansk Selskab for Medicinsk Fysik; Svensk Förening för Radiofysik, Swedish Society for Radiation Physics; Svenska Sjukhusfysiker Förbundet

ECMP welcomes DGMP Deutsche Gesellschaft für Medizinische Physik e.V.

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EFOMP

EUROPEAN FEDERATION
OF ORGANIZATIONS FOR
MEDICAL PHYSICS

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 34 national organisations which together represent more than 8000 medical physicists and clinical engineers working in the field of medical physics. The moto 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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