A BRIEF HISTORY OF THE AAPM: CELEBRATING 60 YEARS OF CONTRIBUTIONS TO MEDICAL PHYSICS PRACTICE AND SCIENCE

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Abstract — **A short article tracing the history of American Association of Physicists in Medicine (AAPM), reprint with permission from the Journal *Medical Physics*.**

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I. Introduction

To celebrate the 60th anniversary of the founding of the American Association of Physicists in Medicine, the Editor-in-Chief Jeffrey Williamson and President-Elect Bruce Thomadsen asked us to write this brief commemorative history reviewing its formation in 1958 and presenting some of the more important activities and achievements over the ensuing 60 years.

II. The formative years

The need to form a national medical physics society in the U.S. grew out of discussions to form an international medical physics federation (ultimately to be called the International Organization for Medical Physics).

Senior U.S. medical physicists involved in the formation of the IOMP proposed that this new international organization be comprised of national societies, not individuals; but the U.S. did not have such a society, hence the urgent need to establish one.

In June1958, a Steering Committee was formed with the task to develop a proposal to form a national society and present it to medical physicists nationwide, firstly by mail, with a formal proposal to be made to those medical physicists attending the RSNA meeting in November of that year, this being the major single conference that medical physicists had been attending each year. After considerable discussion at the meeting, a motion to form the American Association of Physicist in Medicine was made and unanimously approved. A Temporary Constitution was presented and approved. Interestingly, the Constitution stated that the objectives of the new association were:

- To promote the advancement of all branches of physics as they may be related to biology and medicine
- To secure and to maintain high professional standards for scientists in these fields
- To serve the professional interests of those so engaged.

Clearly, the intent was for this to be an organization

FIG. 6. Board Meeting, December 1966, Chicago. *Seated, left to right:* Clarence Karzmark, Rosalyn Yalow, Paul Goodwin, Wayne Meyers, Robert Gorson, Arnold Feldman, Robert Shalek (president), Lawrence Lanzl, Moses Greenfield, James Kereiakes, Walter Mauderli, Kenneth Wright, Leonard Stanton, and Charles Simons. *Standing, left to right:* Past presidents John Laughlin, Warren Sinclair, and Marvin Williams.

Figure 1: AAPM Board of Directors, 1966

concerned primarily with the professional needs of its members. The Steering Committee believed that the scientific needs of the members (meetings and journals in which they could present their research, etc.) would be met through other societies which had medical physicists as members, such as the RSNA, Nuclear Medicine Society, Health Physics Society, etc. However, two years later, the Board of Directors decided that the AAPM should have a strong scientific program in addition to the professional one.

This was discussed at several meetings of the Board of Directors (see Fig. 1) and this culminated in 1969 with the publication of revised Articles of Incorporation within which the term "professional" had been removed. There were two reasons for doing this. The first was that we were, at the time, an Affiliated Society of the American Institute of Physics, and the AIP were not supposed to be involved with professional matters. The second being that we were applying for tax free-status with the Internal Revenue Service, for which we had to demonstrate that we were strictly a "scientific and educational" society. The growth of the organization in the since it was formed in 1958 is illustrated in Figure 2.

III. Meetings of the Organization

Prior to 1969, all Annual Meetings of the AAPM had been held in conjunction with the RSNA Annual Meetings in Chicago. With the new emphasis on science, however, the Board felt that there was a need for the AAPM to have its own Annual Meeting during the summer months, with the meeting at the RSNA becoming a midyear meeting. The 1st standalone AAPM Annual Meeting was held in Washington DC in 1969 and the tradition of having the Annual Meeting in the summer and the midyear meeting in the winter at the RSNA continues to this day. The impact of the Annual Meetings can be ascertained from their growth (Figure 3). The early meetings were held in hotels with conference facilities but, for the past several decades, they became too large for hotels and had to be held in Congress Centers. Most recent data show the overall attendance is over 4,000, with about 20% of attendees being from outside North America. This is by far the largest annual medical physics meeting in the world. Of special note is that all the presentations at the Annual Meeting are recorded and available free to all AAPM members through the Virtual Library, and to all others after a one-year embargo.

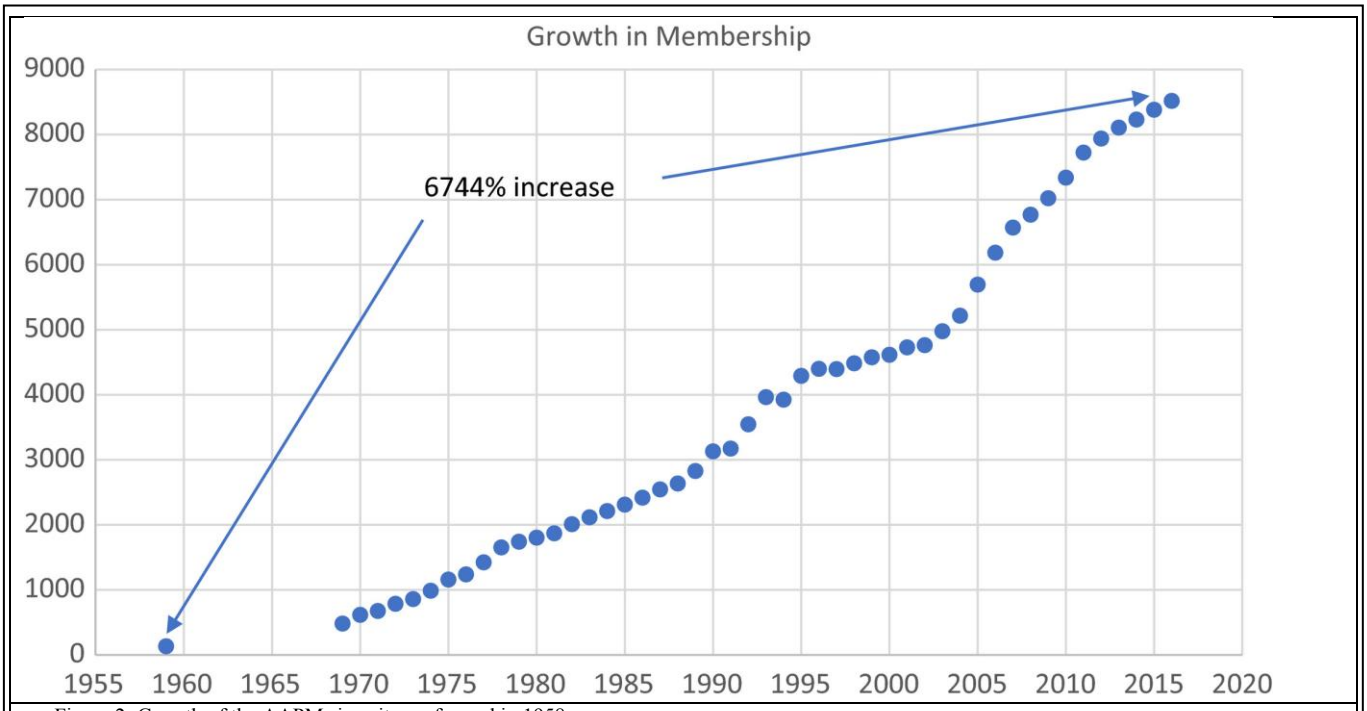

Figure 2: Growth of the AAPM since it was formed in 1958.

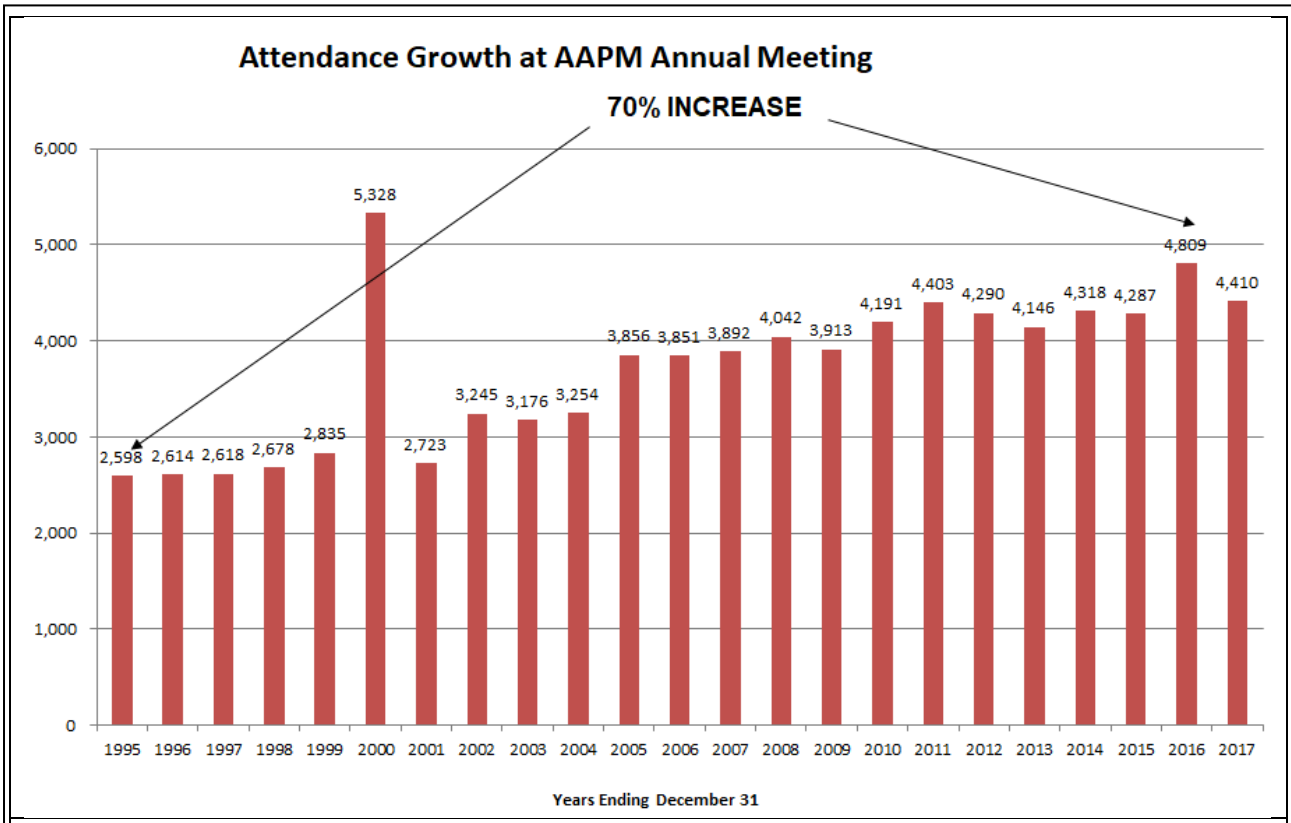

Figure 3: Recent growth in attendance at the AAPM Annual Meeting

In 2012, the AAPM launched another meeting held annually, the Spring Clinical Meeting, which replaced the Annual Meeting of the American College of Medical Physics when the AAPM absorbed many of the functions of the ACMP when it was dissolved. As its title suggests, this is mainly a clinical physics meeting, leaving scientific, educational and professional matters to the Annual Meeting. Current attendance is about 400 each year. As with the Annual Meeting, all presentations are recorded and available free to all AAPM members through the Virtual Library, and to all others after a one-year embargo.

In order to meet the educational needs of members, annual Summer Schools on specific specialty topics were introduced in 1969, the 1st being held at Trinity College, Burlington VT. These Summer Schools are designed primarily for practicing medical physicists to keep them apprised of the latest developments. They are a continuing education opportunity with current attendance typically about 250 each year. Proceedings of all Summer Schools have been published and are available from Medical Physics Publishing, Madison, WI and, like the Annual and Spring Clinical Meetings, all the presentations can be viewed by AAPM members through the AAPM Virtual Library, and by all others with a one-year embargo.

With the early Annual Meetings and Summer Schools being devoted primarily to clinical, scientific and educational endeavors, members were concerned that the AAPM was not meeting their professional needs and consideration was given to formation of a separate professional society. This was discussed at length at the 1973 Annual Meeting but the decision to form a new professional organization was tabled and, instead, a new Professional Council was formed in 1973. At the same time the Science and Educational Councils were formed and many of the existing Committees were assigned to the appropriate Councils.

The major roles of the Councils were to oversee the activities of the Committees within their purview and to act as the liaison between these Committees and the Board of Directors. Of special importance were the Reports that were being written by Task Groups within the Committees.

Without question, AAPM Task Group Reports have defined the practice of medical physics in the U.S. and have strongly influenced practice on the international level. Some of these were published in Medical Physics and some have been standalone in hardcopy format, but ALL are available in digital format from the AAPM website. They are published "open access" to anyone. As such, they not only define the practice of medical physics in the USA, but do so for countries all over the world. Following are some of the most influential of these TG Reports:

- TG-21: A protocol for the determination of absorbed dose from high-energy photon and electron beams (1983), now replaced by:
- AAPM Report 68: TG-51: A protocol for clinical reference dosimetry of high-energy photon and electron beams (1999)
- AAPM Report 13: Physical aspects of quality assurance in radiation therapy (1984), now replaced by:
- AAPM Report 46: TG-40: Comprehensive QA for radiation oncology (1994)
- AAPM Report 32: TG-25: Clinical electron-beam dosimetry (1991)
- AAPM Report 44: Academic program for Master of Science degree in medical physics (1993)
- AAPM Report 51: TG-43: Dosimetry of interstitial brachytherapy sources (1995), now replaced by:
- AAPM Report 84: Update of AAPM Task Group No. 43 Report: A revised AAPM protocol for brachytherapy dose (2004)
- AAPM Report 59: TG-56: Code of practice for brachytherapy physics (1997)
- AAPM Report 68: TG-64: Permanent prostate seed implant brachytherapy (1999)
- AAPM Report 79: Academic program recommendations for graduate degrees in Medical Physics (2002)
- AAPM Report 82: Guidance document on delivery, treatment planning, and clinical implementation of IMRT (2003)
- AAPM Report 142: Quality assurance of medical accelerators (2009)
- AAPM Report 197: Academic program recommendations for graduate degrees in Medical Physics
- AAPM Report 229: Dose calculation for photon-emitting brachytherapy sources with average energy higher than 50 keV (2012)
- AAPM Report 249: Essentials and guidelines for clinical Medical Physics residency training programs (2013)
- AAPM Report 258: Monitor unit calculations for external photon and electron beams (2014)
- AAPM Report 151: Ongoing quality control in digital radiography (2015)
- AAPM Report 283: TG-100: Application of risk analysis methods to radiation therapy quality management (2016)

IV. ROLE OF THE AAPM IN JOURNAL PUBLISHING

Another major activity of the AAPM has been publication of two journals, Medical Physics and the Journal of Applied Clinical Medical Physics.

Medical Physics

By 1971, it became obvious that there were enough members publishing papers that the AAPM needed to consider having its own scientific journal. Members had been publishing their work in either radiology journals or Physics in Medicine and Biology which, since 1962, had been designated the official journal of the AAPM. A Journal Exploratory Group was formed, which polled the membership on the need for establishment of AAPM's own journal. The response was overwhelmingly positive, and the Board of Directors voted to begin publication of its new journal Medical Physics in 1974. It was agreed that the journal would replace the AAPM Quarterly Bulletin, which at the time was being published by the AIP with AIP support staff, so arrangements were made for the AIP to continue as the publisher of Medical Physics. Initially, there were just six issues published per year, but demand for more pages led to this being increased to the present number of 12 issues/year in 1985. This has turned into a truly international journal, with about half the authors coming from outside the USA. Medical Physics is currently receiving about 1,400 manuscripts/year, with over 6,000 pages published /year. A large number of articles are now being published open access so that anyone in the world can access them free of charge. These include:

- Editor's Choice
- Editorials
- Medical Physics Letters
- Review Articles
- Future of Medical Physics (formerly Vision 20/20)
- Point/Counterpoint
- Focus Series
- Award Winning Papers

Journal of Applied Clinical Medical Physics

This is a by-monthly online only, open access journal, so is available for anyone to read for free. This makes it a truly international journal, especially since about 50% of the papers published are from outside North America. The JACMP was first published in 2000 by the American College of Medical Physics but was taken over by the AAPM in 2015. Currently, the JACMP website records over one million views/year. This is an average of about one visit/week for every medical physicist in the world!

Since 2013, the JACMP has been publishing the AAPM's Medical Physics Practice Guidelines, which provide information on the minimal levels of medical physics support (staffing levels, equipment, etc.) for a variety of medical physics services. The eight MPPGs published thus far are:

- CT protocol management and review

• Commissioning and quality assurance of X-ray-based image-guided radiotherapy systems
• Levels of supervision for medical physicists in clinical training
• Development, implementation, use and maintenance of safety checklists
• Commissioning and QA of treatment planning dose calculations - megavoltage photon and electron beams
• Performance characteristics of radiation dose index monitoring systems
• Linear accelerator performance tests
• SRS-SBRT

V. Role of the AAPM in the Education of the Next Generation of Medical Physicists

AAPM's educational contributions go beyond its Education Council and its associated task group reports and refresher courses presented at the Summer and Spring Meetings. For example, an important program developed by the AAPM was the Commission on Accreditation of Medical Physics Education Programs (CAMPEP), which was formed and administered by the AAPM in the mid-1980s although, since 1994, it has been an independent organization. The stated purpose of CAMPEP is to review and accredit medical physics graduate and residency training programs. Currently, over 50 graduate programs and over 110 residency programs have received CAPMEP accreditation. Without question, CAMPEP has improved the teaching and training of medical physicists, and assures that medical physicists who graduate from these programs have being properly educated and trained. Indeed, graduation from a CAMPEP-accredited residency program is now a requirement for certification by the American Board of Radiology (ABR).

Another outgrowth from the Education Council and AAPM members resulted in the 2008 formation of the Society of Directors of Academic Medical Physics Programs (SDAMPP). SDAMPP promotes coordination between academic Medical Physics programs, to establish best practices, to aid in monitoring the production of students relative to the job market, and to serve as a voice for academic program directors. SDAMPP along with the AAPM, CAMPEP, and ABR, aims to effectively and efficiently define, implement, and monitor the education of medical physicists so as to yield clinically-qualified medical physicists for the healthcare environment. (Figure 4)

Educational activities of the AAPM also include the aspect of professionalism and leadership. The Medical Physics Leadership Academy Working Group currently oversees and organizes leadership and management training and experience specific to medical physicists. Training and experience will be accomplished through various meetings and activities all based on the Medical Physics Leadership Academy Curriculum, including collaboration with other related professional leadership programs.

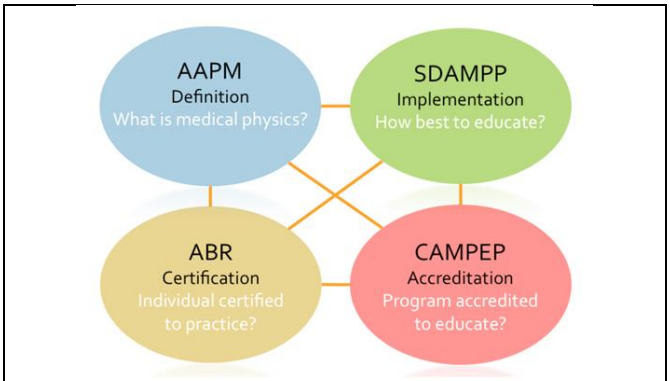

Fig. 4: Relationship between AAPM, CAMPEP, SDAMPP, ABR

VI. Role of the AAPM in Scientific Research Pursuits of Medical Physicists

AAPM scientific research contributions are overseen by the Science Council and enhanced through the annual AAPM meetings, specialized Focused Research (FOReM) meetings, special sections within the Journals, as well as by the various committees and working groups. The Science Council examines specific areas of medical physics, especially those in emerging technologies, addresses scientific questions, and collates and assesses data, and is responsible for the vast majority of clinical and scientific guidance documents and Task Group Reports. For example, Science Council diligently studies the content of the annual summer meeting to both learn and provide suggestions for subsequent years. In order to stay at the forefront of medical physics, it is crucial that AAPM members are kept aware of emerging technologies in imaging science and therapy physics. For example, almost a decade ago, given the rising need for technology assessment, the Technology Assessment Committee (TAC) was initiated as a Presidential ad-hoc committee and ultimately incorporated into Science Council. Most recently, given the rapid rise of big data, radiomics, machine learning, and artificial intelligence in imaging and therapy, Science Council is now creating an Ad Hoc Committee on Big Data, Radiomics, and Machine Learning in order to integrate the needs from both imaging and therapy medical physicists.

For summaries of the role of the AAPM in the development of various scientific and technological advances, Medical Physics published "50th anniversary papers", which can be found at http://aapm.onlinelibrary.wiley.com/hub/issue/10.1002/(ISSN)2473-4209.50thAnniversaryPapers/.

VII. THE FUTURE

Constant review of an organization allows for continued growth. Currently an AAPM effort known as "Medical Physics 3.0" is focusing on goals for the clinical, educational, research, and administrative leadership aspects of medical physicists (http://www.aapm.org/org/charges/MP30.asp).

The goals of the AAPM remain to:

- Promote the highest quality medical physics services for patients.
- Encourage research and development to advance the discipline.
- Disseminate scientific and technical information in the discipline.
- Foster the education and professional development of medical physicists.
- Support the medical physics education of physicians and other medical professionals.
- Promote standards for the practice of medical physics.
- Govern and manage the Association in an effective, efficient, and fiscally responsible manner.

It is clear that the role of the AAPM in the field of medical physics is expanding as is the coverage of the field itself.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

Information:

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Go to https://doi.org/10.1002/mp.12738 to view the original paper in Medical Physics.