

MEDICAL PHYSICS PROFESSIONAL BODIES IN THE UNITED KINGDOM: A BRIEF HISTORY

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Abstract –The Institute of Physics and Engineering in Medicine (IPEM) is the UK-based professional body and learned society for medical physics and engineering. Its members include clinical scientists and technologists working in healthcare, as well as colleagues in academia and industry. The Institute has a strong reputation internationally for its scientific and professional work. IPEM was established in its current form in 1997, but it continues the legacy of several earlier organisations, including the world's first professional organisation for medical physics, the Hospital Physicists' Association (HPA), which played a significant role in the establishment of the International Organisation for Medical Physics (IOMP). This article gives a brief account of the history and heritage of IPEM, focusing particularly on its medical physics legacy.

Keywords – IPEM, medical physics, history

I. INTRODUCTION

On 24th September 1943, a group of around 30 men and women gathered at the offices of the British Institute of Radiology (BIR) in London and decided to establish '...a body... to interest itself in and discuss matters arising out of the natural interests of those engaged in hospital physics' [1]. The following day a name was chosen for this new 'body': the Hospital Physicists' Association (HPA). And so, over the course of two days, the first organisation in the world dedicated to medical physics was both born and christened, dedicating itself to the application of physical science to the relief of human suffering even while the Second World War was still raging.

The relationship between physics and medicine of course has a much longer history than this mid-twentieth-century date would suggest. Some of the greatest scientists in history, including Leonardo da Vinci (1452-1519) and Ibn al-Haytham (965-c1039), sought to use physical principles to understand the functioning of the body, and indeed much of what we now think of as physiology is really applied physics. By the nineteenth century, physics-based technology was pervasive in medical practice and research. There are several published accounts of the fruitful relationship that developed over the centuries between the two fields of endeavour [2, 3]. As in many other walks of life, the role of physics and physicists applying their expertise to medicine was mainly to provide explanations and tools for use by others: physicists themselves were not

yet involved directly in clinical practice. But the growing dependence of medicine on physical science led to a requirement for physics teaching in medical schools, which therefore established academic physics departments that in due course were to provide a springboard for something more [2].

The closing years of the nineteenth century were *anni mirabiles* for physics. Within the space of four years, Wilhelm Röntgen (1845-1923) discovered x-rays, Henri Becquerel (1852-1908) discovered radioactivity, and Pierre and Marie Curie (1859-1906 and 1867-1934, respectively) discovered radium and isolated radioactive isotopes. These discoveries were to revolutionise not only our understanding of fundamental physics, but also medical practice. Astonishingly, X-rays were in clinical use for imaging within three months of their discovery. By the summer of 1896 radiation was being used to treat cancer too, and at around the same time the harmful effects of radiation became apparent. It soon became clear that safe and effective clinical use of radiation required input from physicists; physicists who would not simply invent tools for others to use, as had been the case before, but who would be directly involved clinically.

In some UK teaching hospitals, this emerging need was conveniently met by drawing on the expertise of local academic physicists. So, for example, Professor Gilbert Stead (1888-1979) was appointed as Honorary Consultant Physicist to Guy's Hospital, in addition to his academic duties at Guy's Hospital Medical School. Elsewhere, hospitals employed their own physicists directly, with the first in the UK being Sidney Russ (1879-1963), appointed by the Middlesex Hospital in 1913. Russ was later the inaugural holder of the oldest chair in medical physics in the world, the Joel Professorship of Physics Applied to Medicine

By 1932 there were 10-12 hospital-based medical physicists in the UK, and by the beginning of the Second World War there were 35-40. The time was right for a dedicated organisation to support this new but rapidly growing profession.

II. THE HOSPITAL PHYSICISTS' ASSOCIATION (HPA)

Sidney Russ was unanimously elected as the first Chairman of the HPA at the inaugural meeting in 1943, and work began in earnest. The fortieth anniversary of the

Association was marked by publication of a detailed history [1], which has formed the basis of much of this section of the present paper.

Reading the early history of the HPA, it is clear that the pattern of learned society activities was established early on: scientific meetings, publications, and of course social events (see Figure 1)! These early years also witnessed the forging of strong, mutually beneficial relationships with allied organisations such as the BIR, Faculty (later Royal College) of Radiologists, and Society of Radiographers. Whilst initially work focused purely on clinical applications of ionising radiation, the activities and structure of the Association rapidly adapted to encompass a broader range of medical physics topics. Later strong links were established with government departments, giving the Association and subsequently the Institute an influential voice in policy development, the implementation of legislation and the development of professional guidelines.

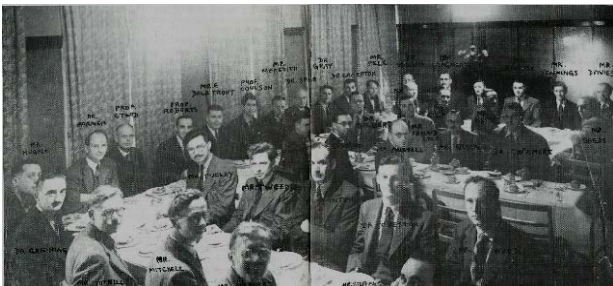


Figure 1. HPA annual dinner 1949. At the centre of the top table is Charles Coulson, at the time Professor of Theoretical Physics at King's College London. At least seven medical physicists with links to King's and its associated hospitals are also in the picture.

A key early initiative was the 'Diagrams and Data Scheme'. This facilitated sharing of scientific data and good practice between members for mutual benefit, a concept still at the core of IPEM's activities today. In 1956 the HPA was instrumental in the establishment of *Physics in Medicine and Biology*, now published by IPEM in association with IoP Publishing, and one of the leading international journals in the field. Publication of specialist reports, often containing advice that is regarded as authoritative internationally, is a further activity strongly associated with IPEM which also began early on in the life of the Association.

Another concern for the Association from its earliest years was the pay and conditions of employment of hospital physicists. This became particularly important following the establishment of the UK National Health Service (NHS) in 1948, at which point such matters became the subject of national negotiation rather than local agreement at individual hospitals, and in 1977 the HPA registered as a trade union in order to strengthen its position in these discussions.

Membership of the HPA grew from 53 in 1943 to 627 in 1965 and nearly 1500 by the early 1980s. The Association was open to medical physicists, but not to technicians working in the field. In 1952, a meeting was held at Guy's Hospital, chaired by Gilbert Stead who was then President of the HPA, to establish the separate Hospital Physics Technicians' Association (HPTA), later renamed the Association of Medical Technologists (AMT) [4].

Education and training were key concerns of the HPA from its early days, and formal discussions about the establishment of a training programme for medical physicists date back to 1963. After lengthy consideration, a graduate training scheme was established in 1981, involving staff rotating through different specialisms to broaden their knowledge.

As the first organisation of its kind in the world, the HPA naturally took a leading role in the development of the medical physics profession globally. The Association was instrumental in discussions leading to establishment of the International Organisation for Medical Physics (IOMP) in 1963 and hosted the inaugural International Conference on Medical Physics (ICMP) in Harrogate in 1965. The HPA was also heavily involved in establishment of the European Federation of Organisations for Medical Physics (EFOMP) in 1980. Over the years there were many bilateral initiatives with colleagues in the developing world, and this continues to feature in IPEM's international strategy.

III. THE INSTITUTE OF PHYSICAL SCIENCES IN MEDICINE (IPSM)

By the early 1980s, it was felt that it would be best to distinguish the scientific and professional work of the HPA more clearly from its trade union role. To this end, the Institute of Physical Sciences in Medicine (IPSM) was established in 1982, and registered as a charity in 1984. The HPA continued solely as a trade union, with its other activities transferred to IPSM. Initially, although the HPA and IPSM were legally separate organisations, it was not possible to join one without also joining the other, the Council of the Institute and Board of the Association had identical memberships, and a single individual was president of both. But the two bodies gradually became more distinct, and in 1993 the HPA merged with the Manufacturing, Science and Finance Union (MSF) and separated completely from IPSM [5]. As a result of subsequent mergers between trade unions, the HPA became a national branch of Unite the Union in 2007.

The new membership structure of IPSM included categories of corporate membership, for the first time conferring the right to postnominal letters for those qualified in medical physics specifically. Membership of the Institute (MIPSM) initially required six years of responsible experience, shorter for those who completed the IPSM Training Scheme. Fellowship (FIPSM) was established as a distinction level of membership, requiring demonstration of

a high standard of scientific achievement and professional responsibility.

Until the early 1990s, it was the exception rather than the rule for new entrants to the profession to undertake the IPSM Training Scheme. Most new staff trained ‘on the job’ in a specific role, often with little opportunity for exposure to other medical physics specialisms. In 1990 a new career structure for NHS scientists was introduced by the government, which for the first time recognised the need for structured initial training and established a training grade (known as ‘Grade A’) for this purpose. Supernumerary posts funded by Regional Health Authorities, not individual hospitals, were in place throughout the country by 1994 [5]. Thus the IPSM Training Scheme became the standard route for training of medical physicists in the NHS, a situation which was to continue until the 2010s.

IV. THE INSTITUTE OF PHYSICS AND ENGINEERING IN MEDICINE (IPEM)

The Biological Engineering Society (BES) was founded in 1960 to provide a ‘home’ for the growing number of engineers working in biomedicine, as well as medical practitioners and biologists with an interest in engineering [6]. It has always been difficult to draw a clear dividing line between medical physics and biomedical engineering, and there were a number of joint initiatives with the HPA and IPSM in areas such as training. A Memorandum of Understanding signed by the presidents of both organisations in 1992 envisaged ever closer cooperation, and in 1995 members of IPSM and BES voted by a clear majority (90% and 95%, respectively) for full merger [7]. After lengthy consideration, senior officers of the new organisation decided on the name ‘Institution of Physics and Engineering in Medicine and Biology’ (IPEMB). However, this name proved unpopular with the membership, and in 1997 was changed to ‘Institute of Physics and Engineering in Medicine’ (IPEM), although many regretted the implied loss of the link with biology.

The BES had a much more diverse membership base than IPSM, and several additional categories of IPEM membership were needed to accommodate, for example, medically qualified individuals and technologists. Opening up of membership to technologists was a particularly significant development, and led to discussions with the AMT that resulted in a further merger in 1997. This completed the process of mergers and name changes that led to the establishment of IPEM in essentially the form that it has today (see Figure 2). IPEM now has a membership of over 4000, including individuals working (or simply interested) in all aspects of medical physics and engineering.

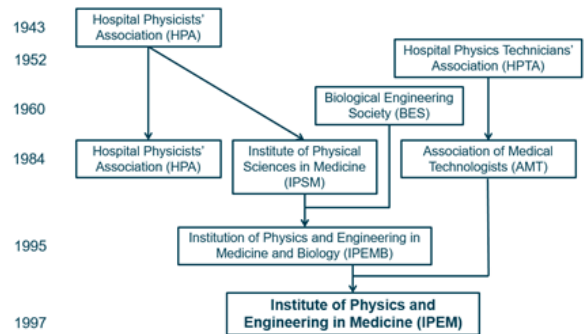


Figure 2. The evolution of UK professional bodies in medical physics and engineering.

Since its formation, IPEM has built on the legacy and reputation of its predecessor organisations and become ‘one of the most effective professional bodies in the field of healthcare’ [8]. One of IPEM’s key strengths is that it brings together both physical sciences and engineering applied to medicine, something that is surprisingly rare internationally. The Institute is licensed by both the Engineering Council and the Science Council in the UK and can award professional registration in both disciplines (CSci, CEng, RSci, IEng, EngTech and RSciTech) to suitably qualified members. Internationally, it is a member of both IOMP and the International Federation for Medical and Biological Engineering (IFMBE).

State registration for scientists working in healthcare, as a means of ensuring professional competence and so protecting the public, was first proposed in the 1980s, and in 1994 a joint ‘indicative register’ was established by IPSM and other professional bodies in the sector. In 2000 state registration became a legal requirement, and ‘clinical scientist’ (encompassing medical physicists and other groups of scientists in healthcare) became a legally protected title. This was clear and important recognition of the role that medical physicist play in patient care. In 2000, IPEM also established the Register of Clinical Technologists (RCT), with strong links to the Institute’s Technologists Training Scheme. The RCT was accredited by the Professional Standards Authority (PSA) in 2015. As a result of changes in government policy, this is currently the closest available equivalent to state registration for clinical technologists.

The IPEM Training Scheme provided the main route to clinical scientist registration for medical physicists and clinical engineers until 2011. In that year, radical changes to scientist training were introduced by the government, and a National School of Healthcare Science was established to deliver these new training programmes in England. Although IPEM no longer runs the training scheme, it was able to influence the structure of training significantly, so that the programme now followed by all trainee clinical scientists bears more than a passing resemblance to the former IPEM scheme. IPEM is also heavily represented in

the structures overseeing and supporting the new training arrangements.

As noted earlier in this article, many early medical physicists came from an academic background. Over the years there has been a steady and healthy flow of scientists moving between academic and clinical work. State registration has made this more difficult in recent years, and IPEM's close involvement with NHS training and workforce issues has led the Institute to have a strong focus on that sector. With responsibility for NHS training removed, IPEM is now reinforcing its position in the academic sector. In 2015 it was agreed that the scientific work of the Bioengineering Society, an informal grouping of academic biomedical engineers, would be transferred to IPEM.

The first joint conference will be held in September 2017 (see <https://www.ipem.ac.uk/ConferencesEvents/MPECMEIbioeng2017.aspx>). Further changes to membership structures have loosened links to NHS training and employment and so made membership more attractive to academic and industrial colleagues. In this way the Institute is building on its strong legacy and consolidating its position as the leading professional body in medical physics and engineering, bringing together clinical and academic activity under a single umbrella to the benefit of both and ultimately of the public that, as a charity, IPEM exists to serve.

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