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Editorial

40th Anniversary Issue (25 Years of Medical Engineering & Physics)



This Special Issue has been compiled to mark the anniversary of its launch as the *Journal of Biomedical Engineering*, in 1979, by founding editor W.J. (Jack) Perkins and the then president of the Biological Engineering Society, H.A.F. Dudley, as the official journal of the Society and for the benefit of the wider biomedical engineering profession. For an overview of the Journal's origins, readers may refer to the editorial written by Professor Colin Roberts to mark the 30th anniversary of the Journal [1]. The Journal was renamed *Medical Engineering & Physics* in 1994 to reflect the academic and hospital-based communities it serves, and the professional body that was constituted around that time to represent those communities: the Institute of Physics and Engineering in Medicine (IPEM).

Medical Engineering & Physics is one of three journals owned by the Institute along with *Physiological Measurement* and *Physics in Medicine and Biology*. IPEM's role is to advance the application of physics and engineering to medicine and biology for the public good. Its membership comprises over 4000 physicists, engineers and technologists working in healthcare, academia and industry. Much of the work of the Institute depends on its members giving generously of their time, knowledge and expertise; likewise, its scientific journals and publications, which provide an important revenue stream for the Institute. All scientific journals rely on competent and willing members of the academic community to assure the quality of articles accepted for publication in the scientific literature by a process of peer review. That the rejection rate of *Medical Engineering & Physics* consistently exceeds 70% is an indicator of the high standards demanded of papers accepted for publication in the Journal. (The Journal's Impact Factor is currently 1.785; the 5-year Impact Factor is 2.183, placing the Journal 45th out of 80 titles in the 'Engineering, Biomedical' category).¹ Each year, the Jack Perkins Prize, established in honour of the founding editor, is awarded to the authors of the best paper published in the Journal as determined by those anonymous reviewers and the Editorial Board.

On becoming Editor in 1993, Colin Roberts stated his intention to broaden the author and reader base, and to make it more international (most of the articles published in the early years originated from researchers based in the UK). In the years since, under his editorship and that of his successors in this role, Robert Allen (Southampton) and Sally Clift (Bath), the Journal has grown to become a truly global enterprise, with me and the editorial team now processing around 700 submissions a year, on average, from au-

thors based all over the world. Most of the papers published in the Journal today originate from groups elsewhere in Europe, followed closely by authors in the USA, Canada, China, Australia, Japan and South Korea. Unsurprisingly, perhaps, is the growth in papers submitted and accepted for publication from authors based in the People's Republic of China, currently placed third in terms of volume of papers published in recent years.

Soon after I took on this role in 2012, it became clear that the workload had become too onerous for one individual: with the exception of special issues, I handled the majority of submissions to the Journal, overseeing the peer-review process, undertaking searches for appropriate reviewers, sending reviewer invitations and decision letters, etc.; and while members of the editorial board were invited from time to time to review manuscripts and to assist in the decision-making process, many did not play an active role – a state of affairs that was neither sustainable nor in the best interests of the Journal. In order to address this concern, and with the support of the editorial office at Elsevier and IPEM, the structure and membership of the Board was reviewed and a management model more in line with other leading academic journals was adopted, whereby associate editors and editorial board members alike share the burden of responsibility in terms of the management of submissions and peer review. Several new Board members have been appointed in the years since and I believe the current editorial team reflects better the broad scope of the Journal. A search of the Journal archive reveals the sheer breadth and scope of our discipline: from the study of biomechanics and mass transport to signal and image processing, the work of physicists and engineers underpins many of the devices and technologies used to diagnose and treat patients. Pathologies often develop over many years before symptoms manifest themselves; understanding the complex molecular and biophysical interactions in disease states, and the differentiation of these sites from healthy tissue, represent major challenges for researchers. Recent advances in medical imaging, modelling and simulation techniques, and laboratory and clinical instrumentation afford researchers and clinicians the means to visualise, model and predict the behaviour of physiological systems with greater fidelity than ever before. Such advances offer the real prospect of more accurate and early diagnosis, better surgical planning, and more effective treatment and follow-up of patients.

In this issue are to be found a number of invited contributions. These take the form of short reviews and position papers that, while citing key advances in the past, highlight recent advances in the state-of-the-art and speculate on future directions. The con-

¹ Journal Citation Reports® (Thomson Reuters) June 2019

tributors are recognised experts in their respective fields, and include members of the Editorial Board past and present, many of whom have contributed to and supported the work of the Journal over many years. The contribution by Associate Editor Rory Cooper and Rosemarie Cooper (Pittsburgh, USA) [2] presents an overview of the advances in rehabilitation engineering and assistive technology over the past 40 years, and makes the case for adopting an inclusive approach in the education and training of all those involved in their design and manufacture, including the end-users. It highlights also the new and emerging areas of research that have the potential to transform the lives of people with disabilities, including robotics, machine learning and artificial intelligence, through their application in rehabilitation as well as aids to daily living and mobility, including sports and recreation.

The article by Associate Editor Cheng-Kung Cheng and colleagues (Beijing, China) [3] addresses the challenging problem of pre-clinical testing orthopaedic implant design, and the failure of such testing to anticipate problems early in the design process and subsequent poor outcomes, despite these tests being carried out in accordance with current international standards, in terms of their design, materials selection and eventual implantation. The role of computer assisted orthopaedic surgery and navigation systems in regard to the latter is the subject of the contribution by consultant orthopaedic surgeon Frederic Picard and colleagues (Clydebank; Glasgow, UK) [4]. The authors review the history and evolution of the technologies available, and the potential for computer-aided devices to assist surgeons to perform knee arthroplasty procedures more reproducibly and according to their patients' needs in terms of implant placement and alignment, and discuss the extent to which these approaches improve functional outcomes and the need for revision surgery. The potential of image-guided surgery, enhanced navigation systems, robotics and artificial intelligence is discussed also.

The application of computer methods and algorithms in the context of the cardiovascular system and devices is presented in the paper by editorial board member Rod Hose and co-authors Patricia Lawford (Sheffield, UK) [5], Wouter Huberts (Maastricht, The Netherlands), Rune Hellevik, Stig Omholt (Trondheim, Norway), and Frans van de Vosse (Eindhoven, The Netherlands), which discusses the role of virtual models for personalised medicine and clinical decision support.

The relatively new field of mechanobiology, as applied to the study of chronic wounds such as pressure ulcers and diabetic foot ulcers, is the subject of the review presented by Associate Editor Amit Gefen (Tel Aviv, Israel) [6], an authority on this topic. The paper provides an overview of the clinical problem and contemporary studies and concepts informing the research into this global health challenge. Further contributions from Christopher (Kit) Vaughan (Cape Town, South Africa) [7] on the potential of novel medical imaging approaches in the diagnosis of breast cancer, and from Leandro Pecchia and colleagues (Warwick, UK) [8] on the methods used in the evaluation of healthcare technologies in the developing world, in particular, complete the special issue.

The issue is complemented by a series of supplements covering the main themes of the Journal, each comprising selected papers from the archive. The papers that appear in these supplements were selected by Gregor Houston, a student of Biomedical Engineering at Strathclyde University, for whose assistance I am grateful. The supplements are not intended to be comprehensive reviews but represent a selection of the more than 3,300 articles published in the Journal over the past 25 years. The guest editorial for this section, written by my colleague Philip Rowe [9], pays tribute to the work of Professor John P. Paul, a pioneer in the field of gait analysis.

I take this opportunity to thank the publishing team at Elsevier and staff at IPPEM, my associate editor colleagues and editorial board members for their support. The publishing landscape is likely to be subject to much change in the years ahead, with the threats of greater competition and open access mandates. Nevertheless, I believe the Journal is in a strong position to meet these challenges.

Last, but not least, I should like to extend my thanks to the contributing authors and reviewers, whose efforts help to ensure that *Medical Engineering & Physics* remains the journal of choice for those engaged in research and development, and the delivery of health care for the benefit of patients worldwide. Long may it continue to keep those researchers, clinicians and the general public abreast of the latest applications of technology to health care.

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