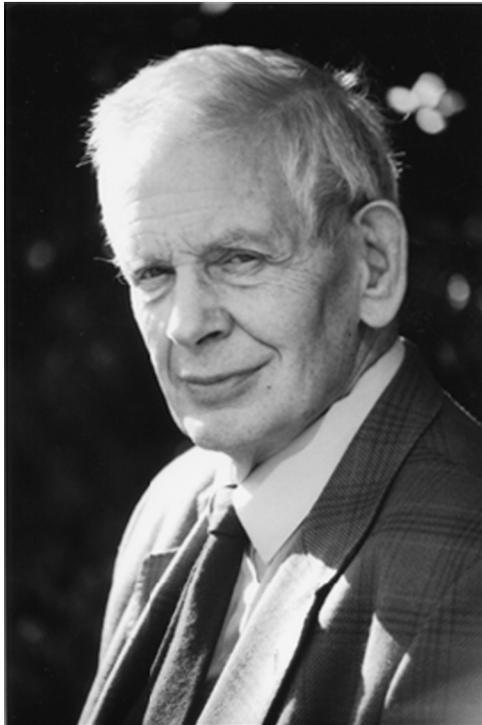


Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Journal of Biomechanics

journal homepage: www.elsevier.com/locate/jbiomech
www.JBiomech.com

In Memoriam: Professor John P. Paul (1927–2013)



It was with great sadness that we learned of the death of Prof. John Paul on 13th November 2013. He passed away after a short illness, with his family by his side. Many readers will know him personally from his decades of work in the international bioengineering community, and for his lifetime achievements in the field of musculoskeletal biomechanics and joint replacement, and we think we speak for all of them in passing on our condolences to the family.

John grew up in Glasgow, Scotland, near the shipyards where his father worked. He excelled at Allan Glen's school, both academically and on the rugby pitch, where he was a forward. He continued to play rugby for Allan Glen's well into his thirties then refereed for some years afterwards and he believed it was too many years of contact sports that led to him needing his first hip replacement at the age of 51. Joint replacements would become his professional speciality and, ironically, he would receive four new hips altogether, plus one knee replacement, so no one can accuse him of not practising what he preached! His wife, Bette, was horrified that just a couple of hours after he emerged from surgery following that first hip replacement, she arrived at the hospital to find him out of bed and walking along a corridor while some of his

students measured his gait. Each operation was a research opportunity to him.

John studied mechanical engineering at the Royal College of Science and Technology (which later became the University of Strathclyde). He then started working with Professor Robert Kenedi at Strathclyde and when, in the early 1960s, an orthopaedic surgeon asked for the department's help in the design of pins to secure fractured femurs in elderly women, John was put on the case and Strathclyde's involvement with the relatively new subject of bioengineering began.

He soon discovered there was no information available about the forces transmitted by bones when a person is in motion and set out to put that right. He designed and built a force plate in the floor of the laboratory that would record all six load-components, most likely preceded only by Cunningham and Brown's design of the Fundamental Studies of Human Locomotion and Other Information Relating to Design of Artificial Limbs, the legendary second postwar project of the University of California. With that instrument and with two 16 mm cine-cameras he started watching healthy young student volunteers walking. Combining ground reaction forces with the position and orientation of a lower limb during the gait cycle, he defined free-body-diagrams. Then, using equilibrium equations, and the knowledge of which muscles are active, he estimated muscle and joint forces at the hip joint during walking. In 1967 he charted all his findings in a Ph.D. thesis entitled "Forces at the Human Hip Joint", which he would say later in life was probably the achievement of which he was most proud. It went on to become a classic international reference text.

In 1969 John started his frequent overseas trips to share his technological insights with colleagues on other continents. He spent a year in the United States in 1969–1970, and was working with scientists in Russia and Bulgaria long before the ending of the Cold War. He would travel to India, China – any country at all that could benefit from his research knowledge and was willing to pay his return economy fare.

The Bioengineering Unit at Strathclyde, his home academic department, was established in 1963 with a grant from the Medical Research Council. At its founding, Robert Kenedi was appointed Professor and head of the Unit. Due to John's pioneering research into musculoskeletal biomechanics, and his leadership in this new field he was recognised by the university, and appointed "Personal" Professor at the Unit.

Foreign students flocked to study bioengineering at Strathclyde as he helped to put the department on the map, and many of them were entertained at John's home as well as being mentored professionally. If they were on their own at Christmas, they joined John's family celebrations. Sometimes students whose residence arrangements fell through stayed in his home for a while. He cared personally for the welfare, and tried to help the career development of all students who passed through his tutelage.

John was always generous in helping others with their research, while continuing with his own. After his work on the hip joint, he went on to assist his Strathclyde colleagues Sandy Nicol and Necip Berme in their work on the elbow joint, and Philip Procter on ankle joint biomechanics. John was also one of the leaders in the development of the first optoelectronic motion capture system. The system he helped to develop with two of his students, Mick Jarrett and Brian Andrews, later became an industrial success, now known as Vicon. Further, John helped and supported the establishment of the National Centre for Prosthetics and Orthotics, and the research and education this institution provided.

In the mid-70s the Bioengineering Unit of the University of Strathclyde was the umbilicus of the bioengineering world. Just being there would have given you the opportunity to meet anyone in the world dealing with this new discipline and be updated with the most recent developments.

John became head of the department of bioengineering at Strathclyde University in 1979, and served on the Senate for 12 years, where he was renowned for his honesty and integrity in the complex world of university politics.

Over this period of time John has tutored very many Ph.D. candidates coming from all over the world. Many of them successfully entered academia and are now renowned scientists. These individuals will certainly miss the gatherings around John and his wife Bette at international conferences when he invited them to have a toast with the Scotch whisky, rigorously made of pure malt, that he bought at his home airport duty-free shop.

John stepped down as head of department in 1992 at the age of 65 but continued to work actively on behalf of Strathclyde University's bioengineering department and became an external examiner for Singapore Polytechnic University's Biomedical Engineering course.

John was a delegate to the International Organisation for Standardisation, Technical Committee Implants for Surgery since its founding in 1972, and Chairman of the subcommittee Bone and

Joint Replacement from 1991, and served with International and British Standards for 36 years altogether. He attended his last International Standards meeting in Brazil in 2011, but continued to peer-review journal articles and examine Ph.Ds until his 85th year.

John received many awards for his research achievements and for his involvement in promoting biomechanics internationally. Among the very many signs of esteem, in 1997 he was to deliver the Muybridge lecture at the Tokyo ISB conference. In addition to his significant contributions to the Standards Organisations, he was president of the International Society of Biomechanics (1987–1990), an active member of the Royal Academy of Engineering, Fellow of the Royal Society of Edinburgh, and he received the prestigious Lifetime Achievement Award from The International Society for Technology in Arthroplasty in 2008.

John has been a member of the Editorial Board for several decades and both an assiduous author and referee for the *Journal of Biomechanics*. This journal and its readers are indebted to him for the amazing contribution.

John's was a rich, full and incredibly valuable life. He made a truly outstanding contribution to biomechanics. From him we learned that in science we must be rigorous and also altruistic, that whisky should be drunk with water but never ice, and that we should fear lack of sense of humour. John will be missed terribly, but not a day will go by when his students and colleagues won't remember some valuable lesson he taught them.

Necip Berme
The Ohio State University, USA
Bertec Corporation, USA

Aurelio Cappozzo
Interuniversity Centre of Bioengineering of the Human
Neuromusculoskeletal System, University of Rome "Foro Italico", Italy