

# Professor Benjamin M.W. Tsui

Siu Lien Ling Wong Visiting Fellow 2007/2008, Chung Chi College, The Chinese University of Hong Kong

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Professor Benjamin Ming Wah Tsui was born and raised in Hong Kong. He received his Form Five High School Diploma from St. Paul's Co-Educational College in 1965, matriculated and enrolled in the Department of Physics, Chung Chi College, The Chinese University of Hong Kong in 1966. He graduated with a B.S. degree in Physics in 1970 and was granted a fellowship to go to the USA for his graduate education in the same year. He began his graduate study in Physics with a concentration in solid-state Physics at Dartmouth College, Hanover, New Hampshire, and received an A.M. degree in Physics in 1972. Sensing limited career opportunities in physics at the time, he decided to enter a new field of study and enrolled in the Graduate Programme of Medical Physics in the Department of Radiology at the University of Chicago, Illinois, USA that year. He chose medical imaging, with an emphasis in nuclear medicine, as the focus of his Ph.D. study. In 1977, he received his Ph.D. degree in Medical Physics from the University of Chicago.

After graduate study, Professor Tsui remained at the University of Chicago as a postdoctoral fellow and was then appointed as an Assistant Professor until he left in 1982 to accept a position as a Research Associate Professor in the Curriculum in Biomedical Engineering and the Department of Radiology at the University of North Carolina at Chapel Hill (UNC-CH), USA. He was promoted to Associate Professor in 1987 and Professor in 1992. He became the Vice Chair of the newly established Department of Biomedical Engineering in 1992 and was Interim Chair for a year before he left in 2002. During his tenure at UNC-CH, Professor Tsui established and built up a medical imaging research laboratory (MIRL) that grew into fifteen members, including faculty, research associates, postdoctoral fellows, graduate students and staff. The Laboratory had been active in medical imaging research and was supported by several major research grants from the US National Institutes of Health (NIH) and commercial companies.

In 2002, Professor Tsui and the MIRL moved to the Russell H. Morgan Department of Radiology and Radiological Science of the Johns Hopkins University (JHU) where they established a new Division of Medical Imaging Physics (DMIP), one of the two departmental divisions that focus on state-of-the-art medical imaging research. The Division has prospered during the last five and a half years, where it has expanded the scope of research to include additional medical imaging modalities and increased the level of research funding and research personnel and staff.

Professor Tsui's main research has been in the field of biomedical imaging, as applied to clinical diagnostic radiology, and research in biomedical sciences. The two decades spent at UNC-CH saw the establishment and growth of Professor Tsui's research career in a newly emerging medical imaging modality, single photon emission computed tomography (SPECT) which is a combination of conventional nuclear medicine imaging techniques and the theory and application of image reconstruction from projections. Professor Tsui also became involved in magnetic resonance imaging (MRI), another new revolutionary medical imaging technique. His approach to incorporate the underlying physics involved in SPECT imaging in image reconstruction and processing have resulted in significant improvements to image quality. This work has been adopted by many investigators in the field and by commercial companies for clinical applications. He developed computer simulation tools that generate simulated data which realistically mimic clinical data. The four-dimensional computer generated phantom of the human developed through his research has enjoyed world-wide usage by other researchers in the field. In addition, Professor Tsui and his research team have engaged in the development and application of image quality assessment methods to evaluate new medical imaging instrumentation and image acquisition, reconstruction and processing techniques. Clinical applications of these research efforts have included cardiac, breast and cancer imaging. The research has been supported by grants from the NIH and industry contracts. After firmly establishing his laboratory in these research areas towards the end of his stay at UNC-CH, Professor Tsui led his team in exploration of new frontiers of biomedical imaging including positron emission tomography (PET), multi-detector computer tomography (MDCT), molecular imaging and multimodality imaging techniques.

The last five and a half years in the Department of Radiology and Radiological Science at JHU have provided Professor Tsui and his laboratory additional resources and opportunities to further expand their research interests and areas in biomedical imaging. With new research funding and personnel recruitments, they are fully engaged in research on PET, MDCT and multi-modality imaging, including PET/CT and SPECT/CT as applied to diagnostic radiology. In collaboration with an industrial partner, they are developing a new generation CT technology based on x-ray photon counting detector. Their pioneering work in the molecular imaging of small animals has opened up a new line of research activities with support from the NIH and the industry. The results of their research in small animal SPECT/CT imaging have also been adapted for commercial use. The expanded activity has led to the expansion of DMIP to over thirty current members.

Besides his research pursuits, Professor Tsui has been active in the education and training of graduate students and young research scientists in medical imaging. He has been the principal advisor of seventeen M.S. and eleven Ph.D. students and sixteen postdoctoral research fellows. Currently, Professor Tsui holds joint appointments in the Department of Electrical and Computer Engineering and the Department of Environmental Health Sciences and an Adjunct appointment in the Department of Biomedical Engineering at JHU and serves as advisor to Ph.D. students from these departments. He is currently advising ten Ph.D. students and mentoring six postdoctoral fellows and research associates.

Professor Tsui is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and the American Institute for Medical and Biological Engineering (AIMBE), a Fellow and Chartered Physicist of the Institute of Physics (IOP), and a member of seven other professional organizations and societies. He is the author and co-author of over 300 publications and book chapters and the principal investigator of 4 NIH research grants and several industrial research contracts. He is a frequently invited speaker at academic institutions world-wide and national and international conferences. He has served as a member of numerous scientific review committees of various federal agencies, including the NIH, National Science Foundation, Department of Energy and Department of Defense, state agencies and private foundations at the USA. Also, he has been a regular reviewer and a member of the editorial boards of many scientific journals.