

**A reflection on the contributions of Professor John Clifford Patterson –
Prof. Steve Armfield and Prof. Chengwang Lei.**



Born and growing up in Toowoomba, Queensland, Professor John Patterson obtained his PhD in 1975 at the University of Queensland, working on blood flow, and published his first paper in 1975 in the Journal of the Australian Mathematics Society on the measurement of blood pressure. Following his PhD, he took up an ARGC fellowship in the Department of Mathematics at the University of Western Australia, moving to the Department of Civil Engineering in 1977 as a Water Resources Research Fellow. John subsequently held the positions of Lecturer, Senior Lecturer and Associate Professor in the Department of Civil Engineering, and then the Department of Environmental Engineering at the University of Western Australia. He was Head of the Department of Environmental Engineering for 1995-1996. While at the University of Western Australia he established the Centre for Water Research, in association with Prof Jorg Imberger, which became a world leader in the development of instrumentation and modelling for the simulation and management of lakes and reservoirs.

John moved to James Cook University as a Professor and Head of the Department of Civil and Environmental Engineering in 1996. He then became the Foundation Head of the School of Engineering and subsequently served as Head of School for two additional terms. In 2009, John relocated to Sydney to take up the positions of Professor in the School of Civil Engineering and Director of the Centre for Wind, Waves and Water at the University of Sydney. He was later appointed as Associate Dean Research of Faculty of Engineering for 2011-2015. Over his time with the University of Sydney, John made significant contributions that have positively impacted many people. In just a few years after joining the University, John turned an outdated Fluids Lab into a purpose-built modern research and education space. He led the multimillion-dollar refurbishment of the Boundary Layer Wind Tunnel, which is now one of the best wind tunnels in the country. John was also instrumental in the establishment

of the High-Performance Computing Facilities at The University of Sydney, which has benefited many researchers across the university.

During his academic career John also held a large number of visiting positions at Universities in the USA, Canada and Germany. He has taken a major role in the continued development of fluid mechanics in Australasia, as a Chair of the Australasian Natural Convection Workshop, Chair of the Australasian Heat and Mass Transfer Conference, a Member of the Assembly of World Conferences on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, and an Honorary Advisory Board Member of the Asian Union of Thermal Science and Engineering. John was a member of the ARC College of Experts, the ARC Selection Committee for Centres of Excellence, and the ARC ERA Evaluation Committee. He also served as a Secretary of the Australasian Fluid and Thermal Engineering Society and a member of the Editorial Advisory Boards for Theoretical and Applied Mechanics Letters and Aquatic Sciences.

John's research has focused on buoyancy driven flows, particularly with application to mixing in reservoirs. In his earlier work he developed DYRESM, a Lagrangian process based dynamic reservoir simulation model that predicts the density structure of reservoirs subject to inflows, outflows, heating and wind-driven mixing, which has been widely used by industry and government entities. The development and use of DYRESM was reported in a number of well cited papers, for example 'Physical Limnology' in *Advances in Applied Mechanics* (1989). He has also taken a lead role in the development of water quality models combining physical and biological approaches.

In the more general fluid mechanics community, John is best known for his fundamental work on natural convection flow. His first publication in this area was the seminal paper 'Unsteady natural convection in a cavity' in the *Journal of Fluid Mechanics* (1980). This was the first application of Rayleigh type scaling to the startup and full development of natural convection flow in the differentially side heated cavity, providing scaling relations for all the main features of the flow, together with validating numerical simulations. This approach, combining scaling and simulation, has since become widely used in the field, and virtually all papers in this area cite John's 1980 paper as the originating paper. An unusual and sustained feature of John's approach to research in this area has been the integration of analytical, numerical and physical modelling. Along with his research students and postdocs, John conducted an extensive and diverse range of elegant laboratory experiments which have considerably illuminated the key physical processes.