

Foreword to the tribute issue for Professor Peter Campbell

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This special issue of *Environmental Chemistry* is dedicated to the career of Prof. Peter G. C. Campbell and was designed to coincide with his retirement from the *Institut national de la recherche – Eau, terre, environnement* (INRS-ETE) at the end of 2015. Peter is probably best known for his work aiming to increase our quantitative understanding of how the toxicity of metals is modified by competing ions, pH, the presence of natural organic matter and water chemistry parameters. Indeed, his early critical synthesis and review of the free ion activity model^[1] has been cited over 1000 times and continues to serve as a reference paper for generations of young scientists entering the field. Nonetheless, Peter's scientific career has also included many other seminal contributions that were made by first understanding the underlying chemical–biochemical basis for an environmental process and then applying that fundamental knowledge to gain practical insight into complex problems. For example, the method for inferring the speciation of trace elements in sediments using sequential extractions that Peter developed in collaboration with Prof. Andre Tessier^[2] has helped thousands of scientists to develop a better understanding of the geochemical behaviour of metals in aquatic ecosystems. Similarly, recent work in the field of metallomics has demonstrated how the uptake and subsequent internal handling of trace metals by aquatic organisms can be better understood by combining state-of-the-art analytical tools with a fundamental physiological understanding.^[3]

The contributions of Prof. Campbell in the fields of metal biogeochemistry and ecotoxicology are matched by only a few other individuals. On one hand, Peter has examined emerging and difficult questions, including the piggyback transport of metals into organisms by anion transporters,^[4] the biogeochemistry of metals in complex systems^[5] and the extremely complex role(s) of natural organic matter on trace metal behaviour.^[6] On the other hand, his work has had important but practical implications for industrial and governmental partners. Peter's expert opinion and balanced scientific assessments are internationally sought and valued- he is regularly solicited by both industrial partners and governmental organisations to solve contentious environmental issues related to metals. Without a doubt, his work has largely moved the risk assessment community to accept the need to take chemical speciation into account during ecotoxicity assessments. The methods that he employs have been developed and extensively tested in his own laboratory and often adopted worldwide.

As demonstrated by these examples, Peter has always strongly favoured a multidisciplinary approach when solving



complex problems, something that was facilitated by his continued interactions, locally and internationally, with diverse environmental scientists including biologists, geologists, modellers and engineers. Indeed, papers in this issue reflect both the multidisciplinary vision of Peter, as well as his capacity to influence a broad cross-section of environmental scientists. For example, metal uptake and toxicity was examined both in a review paper that Peter co-authored^[7] and in three original

papers examining the effects of metal contamination,^[8,9] including one on the toxicity of metallic nanoparticles.^[10] Peter's rigorous work on trace metal speciation inspired three papers that carefully examined the methods and implications of chemical speciation determinations.^[11–13] In line with Peter's sustained influence on the many role(s) of natural organic matter, one paper examined its effects on Cu speciation and toxicity,^[14] whereas another evaluated its role on surfactant toxicity.^[15] Finally, Peter's contributions to large scale metal cycling studies were reflected by two papers that carefully synthesised long-term records in order to better understand complex ecosystem level problems.^[16,17]

On a more personal note, I must attest to the fact that I, like so many others, have greatly benefited from Peter's guidance and mentorship over the years. Peter's inspiration was key to my continuing graduate studies and considering a career in academia. I can only hope that my students will always apply the same rigour to their scientific endeavours as Peter always showed me was necessary. Peter is an extremely generous mentor, providing students, postdocs and young faculty with his undivided attention in order to help them reach their full potential. Among his colleagues, he is simultaneously a team player and a key leader. In spite of the global demands on his time, I know of no other researcher with such a thorough grasp of the literature. It is a pleasure to dedicate this issue to such a renowned professor whose original, distinctive research on the biogeochemistry of metals has influenced the thinking of so many of us.

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