

Preface — Yiu Kee Chau: An Appreciation



Y. K. Chau, National Water Research Institute, Environment Canada

This special issue of *Applied Organometallic Chemistry* is dedicated to Y.K. Chau on the occasion of his retirement from the Public Service of Canada at the end of 1997. Y.K. was a Senior Research Scientist with the National Water Research Institute, Environment Canada, at the Canada Centre for Inland Waters in Burlington, Ontario, Canada.

Y.K. has had an illustrious career in the field of the environmental chemistry of metals and organometallic compounds. He received a B.Sc. in Chemistry from Lingnan University in China and later began his career in water chemistry in 1957 when he was awarded a UNESCO Fellowship to study at the C.S.I.R.O. Marine Biological Laboratory at Cronulla, Australia. The research he carried out in Australia was the major part of his thesis for an M.Sc., conferred in 1961 by the University of Hong Kong. In 1963, he won a British Council Scholarship which enabled him to continue his

studies on the chemistry of seawater with Professor J.P. Riley at the University of Liverpool, (UK), where he received a Ph.D. in 1965. He also taught in Macau and at the University of Hong Kong, and in the period 1960–1968 he was an Associate Professor and Chairman of the Chemistry Department of the Chinese University of Hong Kong. He joined Environment Canada's National Water Research Institute in 1968 and he worked here for 29 years.

In the course of his career, Y.K. has done pioneering research in the areas of oceanography and limnology; the analytical chemistry of inorganic, organic and organometallic compounds; metal complexation; metal speciation and determination by tandem analytical systems such as gas chromatography coupled to atomic absorption spectrophotometry or atomic emission spectrometry; the toxicity of metals to aquatic biota; and the occurrence, pathways, fate and toxicity of organometallic compounds, including those of lead, selenium, arsenic, mercury, tin and manganese. He wrote the Canadian Environmental Protection Act Priority Substances List — 1 Environmental Assessment of Nickel in 1993. He has published over 160 articles in scientific journals, including 19 book chapters, and he has edited two special journal issues on the above topics. He has frequently been invited to international conferences as a keynote speaker or plenary lecturer.

Y.K. received several scholarships in the course of his studies, and several awards during his career. He is a Fellow of the Chemical Institute of Canada and was elected an 'Eminent Scientist of the Great Lakes' by the International Joint Commission in 1988. He holds a cross-appointment at McMaster University (Hamilton, Canada), and visiting professorships at Nankai University (Tianjin, China) and Zhongshan University (Quangzhou, China), he is on the editorial boards of many journals, and he is active in many professional societies. His research achievements have been recognized by the award of the Doctor of Science (D.Sc.) degree by the University of Liverpool in 1981. Other honours include the MOBAY Lectureship (Monsanto–Bayer) at the University of New Hampshire, USA, in 1986, the Editor's Award of the *Journal of Great Lakes Research* in 1986, and a UN/50 Global Citizenship awarded at the commemoration of the 50th Anniversary of the United Nations in

1996 for his contributions to the improvement of the environment. He has served as Associate Editor of the *Journal of Great Lakes Research* (1979–1991) and he currently serves on the editorial boards of *Applied Organometallic Chemistry*, *Environmental Toxicology and Water Quality — an International Journal*, *Acta Scientiae Circumstantiae*, and the *Journal of Environmental Sciences (People's Republic of China)*. In addition, he is active in several professional societies.

Y.K.'s work and reputation have contributed significantly to the international reputation of the National Water Research Institute and the Canada Centre for Inland Waters (CCIW). Throughout his career Y.K. was one of the few staff members who were automatically associated with the name CCIW around the world. If you mentioned the CCIW at a conference in Russia, Indonesia, France or Brazil, frequently the comment you heard would be 'Oh, yes — that's where Y.K. Chau works.' Y.K. has had, and continues to have, international research collaborations, and he has been a great mentor to many scientists.

Y.K. has many friends and colleagues in the Institute and around the world, and his retirement will leave a large void. It was a pleasure to organize this special issue in his honour, and to see the enthusiastic response on the part of the contributors who know and respect his work. All his friends and colleagues wish him peace, happiness and good health in his retirement. He will now have the opportunity to spend more time with his family, and to pursue other interests such as his music. However, we also know that we shall be seeing him frequently, because he is an Emeritus Research Scientist of the Institute.

R. JAMES MAGUIRE

Senior Research Scientist and Acting Director
Aquatic Ecosystem Protection Branch
National Water Research Institute
Environment Canada
Canada Centre for Inland Waters
Burlington, Ontario L7R 4A6 Canada.

The Published Papers of Y.K. Chau

1. Y. K. Chau, The coastal circulation of N.S.W. from drift card results, C.S.I.R.O. Div. Fish. Oceanogr. Report (Cronulla, Australia), No. 13, 1957, 14 pp.
2. Y. K. Chau, Some hydrochemical features of surface waters of the Pearl River estuary between Hong Kong and Macau. *Hong Kong Univ. Fish. Res. J.*, No. 2, 37–41 (1958).
3. Y. K. Chau and R. Abesser, A preliminary study of the hydrology of Hong Kong Territorial waters. *Hong Kong Univ. Fish. Res. J.*, No. 2, 43–58 (1958).
4. Y. K. Chau, The influence of the outflow from Pearl River on the surface waters of the South China Sea. *Preprints, First Int. Oceanogr. Congr.*, 1959, pp. 678–682.
5. Y. K. Chau and C. S. Wong, Oceanographic investigations in the northern region of the South China Sea off Hong Kong. *Hong Kong Univ. Fish. Res. J.*, No. 3, 1–26 (1960).
6. Y. K. Chau, The phosphate and nitrate fertilization of the coastal waters of the South China Sea by river runoff from the Pearl River system. Chinese University of Hong Kong, *Chung Chi J.* 2, 62–75 (1962).
7. Y. K. Chau and J. P. Riley, The determination of selenium in sea water, silicates and marine organisms. *Anal. Chim. Acta* 33, 36–49 (1965).
8. Y. K. Chau and J. P. Riley, Determination of amino acids in sea waters. *Deep Sea Res.* 13, 1115–1124 (1966).
9. Y. K. Chau, L. Chuecas and J. P. Riley, The component amino acids of some marine phytoplankton species. *J. Mar. Biol. Ass. (UK)* 47, 543–554 (1967).
10. Y. K. Chau, S. S. Sim and Y. H. Wong, Determination of chromium by atomic absorption spectrophotometry of chromium acetoacetate — determination of chromium in sea water. *Anal. Chim. Acta* 43, 13–18 (1968).
11. Y. K. Chau, Determination of trace amounts of scandium by atomic absorption spectroscopy. *Talanta* 15, 421–424 (1968).
12. Y. K. Chau and P. Y. Wong, Determination of scandium in sea water by atomic absorption spectroscopy. *Talanta* 15, 867–870 (1968).
13. Y. K. Chau and K. Lum-Shue-Chan, Atomic absorption determination of microgram quantities of molybdenum in lake waters. *Anal. Chim. Acta* 48, 205–212 (1969).
14. Y. K. Chau and K. Lum-Shue-Chan, Errors in the use of volumetric flasks for extraction in atomic absorption spectroscopy. *Anal. Chim. Acta* 48, 434–437 (1969).
15. Y. K. Chau and V. K. Chawla, Trace elements in Lake Erie. *Proc. 12th Conf. Great Lakes Res.*, 1969, pp. 760–765.
16. Y. K. Chau and K. Lum-Shue-Chan, Complex extraction of vanadium for atomic absorption spectroscopy. *Anal. Chim. Acta* 50, 201–207 (1970).
17. Y. K. Chau and H. Saitoh, Determination of submicrogram quantities of mercury in lake waters. *Environ. Sci. Technol.* 4, 839–841 (1970).
18. Y. K. Chau, V. K. Chawla, H. F. Nicholson and R. A. Vollenweider, Distribution of trace elements and chlor-

- ophyll *a* in Lake Ontario. *Proc. 13th Conf. Great Lakes Res.*, 1970, pp. 659–672.
19. Y. K. Chau and M. E. Fox, Gas chromatographic method for the determination of NTA in lake waters. *J. Chromatogr. Sci.* **9**, 271–275 (1971).
20. Y. K. Chau, Determination of trace metals in natural waters. *Proc. Int. Symp. Identification, Measurement of Environ. Pollutants*, Ottawa, 1971, pp. 354–357.
21. Y. K. Chau and M. T. Shiomi, Complexing properties of nitrilotriacetic acid in the lake environment. *J. Water, Air Soil Pollut.* **1**, 149–164 (1972).
22. Y. K. Chau, Some aspects of determination of trace metals in natural waters by atomic absorption spectroscopy. *Proc. 18th Canadian Spectroscopy Soc. Symp.*, 1971, pp. 20–25.
23. Y. K. Chau, Complexing capacity of natural waters — its significance and measurement. *J. Chromatogr. Sci.* **11**, 579 (1973).
24. Y. K. Chau and H. Saitoh, Mercury in the International Great Lakes. *Proc. 16th Conf. Great Lakes Res.*, 1973, pp. 221–232.
25. R. Gachter, K. Lum-Shue-Chan and Y. K. Chau, Complexing capacity of the nutrient medium and its relation to inhibition of algal photosynthesis by copper. *Schweiz. Z. Hydrol.* **35**, 252–261 (1973).
26. Y. K. Chau and H. Saitoh, The determination of methyl mercury in lake waters. *J. Environ. Anal. Chem.* **3**, 133–139 (1973).
27. Y. K. Chau and K. Lum-Shue-Chan, Determination of labile and strongly bound metals in lake waters. *Water Res.* **8**, 383–388 (1974).
28. Y. K. Chau, R. Gachter and K. Lum-Shue-Chan, The determination of the apparent complexing capacity of lake waters. *J. Fish. Res. Bd. (Canada)* **31**, 1515–1519 (1974).
29. Y. K. Chau, M. E. Fox, W. A. Glooschenko, K. L. E. Kaiser, W. M. J. Strachan and D. G. S. Wright, An evaluation of research needs for eighteen polluting substances in the Canadian-US Agreement. C.C.I.W. Unpublished Manuscript Series, 1974, 12 pp.
30. Y. K. Chau and K. Lum-Shue-Chan, Measurement of complexing capacity of lake waters. *Proc. Int. Meeting on Humic Substances*, Nieuwersluis, The Netherlands, 1975, pp. 11–12.
31. P. T. S. Wong, Y. K. Chau and L. Luxon, Methylation of lead in the environment. *Nature (London)* **253**, 263–264 (1975).
32. Y. K. Chau and P. T. S. Wong, Chemical and biological studies on Babine Lake, B.C. A Report to the Babine Lake Watershed Change Program Committee. C.C.I.W. Unpublished Report Series, 1975, 16pp.
33. Y. K. Chau, P. T. S. Wong and P. D. Goulden, Gas chromatography–atomic absorption method for the determination of dimethyl selenide and dimethyl diselenide. *Anal. Chem.* **47**, 2279–2281 (1975).
34. Y. K. Chau, P. T. S. Wong and P. D. Goulden, Determination of alkyl lead and selenium compounds in the atmosphere by GC–AAS system. *Proc. Int. Conf. Heavy Metals in the Environment*, Toronto, 1975, pp. D-84–85.
35. P. T. S. Wong, Y. K. Chau, P. L. Luxon and B. Silverberg, Methylation of lead and selenium in the environment. *Proc. Int. Conf. Heavy Metals in the Environment*, Toronto, 1975, pp. C-220–221.
36. Y. K. Chau, P. T. S. Wong and P. D. Goulden, A gas chromatograph–atomic spectrophotometer system for the determination of volatile alkyllead and selenium compounds. *Proc. Int. Conf. Heavy Metals in the Environment*, Toronto, Vol. 1, 1975, pp. 295–301.
37. Y. K. Chau, P. T. S. Wong and P. D. Goulden, A GC–AAS system for the determination of volatile alkyl lead and selenium compounds, *5th Int. Conf. Atomic Spectroscopy*, Melbourne, 1975, p. A-33.
38. G. Burnison, P. T. S. Wong and Y. K. Chau, Toxicity of cadmium to freshwater algae. *Proc. 18th Ann. Can. Fed. Biol. Soc.*, 1975, p. 182.
39. Y. K. Chau, P. T. S. Wong, P. D. Goulden and H. Saitoh, Determination of methylated lead compounds in water, sediment and atmosphere. *1st Chem. Congress of the N. American Continent*, Mexico City, 1975, ENVI-70.
40. Y. K. Chau, P. T. S. Wong and H. Saitoh, Determination of tetraalkyllead compounds in the atmosphere. *J. Chromatogr. Sci.* **14**, 162–164 (1976).
41. Y. K. Chau and P. T. S. Wong, Complexation of metals in natural waters. *Proc. IJC Workshop on 'Toxicity to Biota of Metal Forms in Natural Waters'*, Duluth, 1976, Chapter 9, pp. 187–196.
42. B. A. Silverberg, P. T. S. Wong and Y. K. Chau, Localization of selenium in bacterial cells using TEM energy-dispersed X-ray analysis. *Arch. Microbiol.* **107**, 1–6 (1976).
43. Y. K. Chau, P. T. S. Wong and P. D. Goulden, Gas chromatography–atomic absorption method for the determination of tetraalkyllead compounds. *Anal. Chim. Acta* **85**, 421–424 (1976).
44. Y. K. Chau, P. T. S. Wong, P. L. Luxon and G. A. Bengert, Methylation of selenium in the aquatic environment. *Science* **192**, 1130–1131 (1976).
45. B. A. Silverberg, P. T. S. Wong and Y. K. Chau, Ultrastructural examination of *Aeromonas* culture in the presence of organic lead. *Appl. Environ. Microbiol.* **32**, 723–725 (1976).
46. Y. K. Chau and P. T. S. Wong, Selenium in the environment. *Science* **195**, 594–595 (1977).
47. B. A. Silverberg, P. T. S. Wong and Y. K. Chau, Effect of tetramethyllead on freshwater green algae. *Arch. Environ. Contam. Toxicol.* **5**, 305–313 (1977).
48. Y. K. Chau, W. J. Snodgrass and P. T. S. Wong, A sampler for collecting evolved gases from sediment. *Water Res.* **11**, 807–809 (1977).
49. Y. K. Chau and P. T. S. Wong, An element-specific technique for the determination of organometallic compounds. In: *Methods and Standards for Environmental Measurement*, Kirchoff, W. H. (ed.), NBS, 1977, pp. 485–490.
50. Y. K. Chau, GC retention data of tetra(methyl-ethyl)leads. *J. Chromatogr.* **141**(3), D-54 (1977).
51. P. T. S. Wong, Y. K. Chau, P. L. Luxon and G. A. Bengert, Methylation of arsenic in the aquatic environment. *Trace*

- Substances in Environmental Health—XI*, Hemphill, D. (ed.), Missouri University Press, 1977, pp. 100–106.
52. Y. K. Chau and P. T. S. Wong, An element- and speciation-specific technique for the determination of organometallic compounds. In: *Environmental Analysis*, Ewing, G.W. (ed.), Academic Press, New York, 1977, pp. 215–225.
 53. P. T. S. Wong, B. A. Silverberg and Y. K. Chau, Lead and the aquatic biota. In: *Biogeochemistry of Lead*, Nriagu, J.O. (ed.), Elsevier, 1978, Chapter 17, pp. 279–343.
 54. P. T. S. Wong, Y. K. Chau and P. L. Luxon, Toxicity of a mixture of metals on freshwater algae. *J. Fish. Res. Bd (Canada)* **35**, 479–481 (1978).
 55. Y. K. Chau and P. T. S. Wong, Biotransformation of elements. *Water Qual. Bull. (WHO)* **3**(4), 4 pp (1978).
 56. Y. K. Chau and P. T. S. Wong, Occurrence of methylation of elements in the aquatic environment. In: *Organometals and Organometalloids—Occurrence and Fate in the Environment*, Brinckman, F.E. and Bellama, M. (eds), ACS Symp. Series no. 82, American Chemical Society, Washington DC, 1978, pp. 34–53.
 57. Y. K. Chau, P. T. S. Wong, G. A. Bengert and O. Kramar, Determination of tetraalkyllead compounds in water, sediment and fish samples. *Anal. Chem.* **51**, 168–188 (1979).
 58. B. Radziuk, Y. Thomassen, J. C. Van Loon and Y. K. Chau, Determination of alkyllead compounds in air by gas chromatography and atomic absorption spectrometry. *Anal. Chim. Acta* **105**, 255–262 (1979).
 59. B. Radziuk, Y. Thomassen, P. Butler, J. C. Van Loon and Y. K. Chau, A study of atomic absorption and atomic fluorescence atomization systems as detectors in the gas chromatography determination of lead. *Anal. Chim. Acta* **108**, 31–38, (1979).
 60. C. G. M. van den Berg, P. T. S. Wong and Y. K. Chau, Measurement of complexing materials excreted from algae and their ability to ameliorate copper toxicity. *J. Fish. Res. Bd. (Canada)* **36**, 901–905, (1979).
 61. P. T. S. Wong, G. Burnison and Y. K. Chau, Cadmium toxicity to freshwater algae. *Bull. Environ. Contam. Toxicol.* **23**, 487–490, (1979).
 62. P. T. S. Wong and Y. K. Chau, Methylation and toxicity of lead in the aquatic environment. *Proc. Int. Conf. 'Management and Control of Heavy Metals in the Environment'*, London, 1979, pp. 131–134.
 63. Y. K. Chau, Microbial methylation and volatilization. *NASA Workshop on Global Ecology, 'Interaction of the Biota with the Atmosphere and Sediments'*, Washington, DC, 1979, pp. 77–78.
 64. Y. K. Chau, P. T. S. Wong, O. Kramar, G. A. Bengert, R. B. Cruz, J. O. Kinrade, J. Lye and J. C. Van Loon, Occurrence of tetraalkyllead compounds in the aquatic environment. *Bull. Environ. Contam. Toxicol.* **24**, 265–269, (1980).
 65. P. T. S. Wong, C. I. Mayfield and Y. K. Chau, Cadmium toxicity to phytoplankton and microorganisms. In: *Cadmium in the Environment*, Nriagu, J. O. (ed.), Wiley-Interscience, New York, 1980, Chapter 13, pp. 571–585.
 66. I. Ahmad, Y. K. Chau, P. T. S. Wong, A. J. Carty and L. Taylor, Chemical alkylation of lead(II) salts to tetraalkyllead(IV) in aqueous solution. *Nature (London)* **287**, 716–717, (1980).
 67. Y. K. Chau, P. T. S. Wong and P. D. Goulden, A sensitive technique for the analysis of tetraalkyllead compounds. In: *Lead in the Marine Environment*, Branica, M. and Konrad, Z. (eds), Pergamon 1980, pp. 77–81.
 68. Y. K. Chau and P. T. S. Wong, Biotransformation and toxicity of lead in the aquatic environment. In: *Lead in the Marine Environment*, Branica, M. and Konrad, Z. (eds), Pergamon 1980, pp. 25–231.
 69. P. T. S. Wong, Y. K. Chau, O. Kramar and G. A. Bengert, Accumulation and depuration of tetramethyllead by rainbow trout. *Water Res.* **15**, 621–625, (1981).
 70. Y. K. Chau, P. T. S. Wong, O. Kramar and G. A. Bengert, Methylation of tin in the aquatic environment In: *Heavy Metals in the Environment*, CEP Consultants, Edinburgh, 1981, pp. 641–644.
 71. M. D. Baker, P. T. S. Wong, Y. K. Chau, C. I. Mayfield and W. E. Inniss, Methylation of Pb, Hg, As and Se in the acidic environment. In: *Heavy Metals in the Environment*, CEP Consultants, Edinburgh, 1981, pp. 645–648.
 72. Y. K. Chau and P. T. S. Wong, Some environmental aspects of organoarsenic, lead and tin. In: *Environmental Speciation and Monitoring Needs for Trace Metal-containing Substances from Energy Related Processes*, NBS Special Publication No. 618, Washington DC, 1981, pp. 65–80.
 73. Y. K. Chau, P. T. S. Wong, A. J. Carty and L. Taylor, Evidence for the chemical methylation of lead(II) and tin(II) in aqueous solution. *Proc. Xth Int. Conf. Organometallic Chem.*, Toronto, 1981, p. 59.
 74. Y. K. Chau, P. T. S. Wong and G. A. Bengert, Determination of methyltin(IV) and tin(IV) species in water by gas chromatography–atomic absorption spectrophotometry. *Anal. Chem.* **54**, 246–249 (1982).
 75. P. T. S. Wong, Y. K. Chau, O. Kramar and G. A. Bengert, Structure–toxicity relationship of tin compounds on algae. *Can. J. Fish. Aquat. Sci.* **39**, 483–488 (1982).
 76. P. T. S. Wong, Y. K. Chau and D. Patel, Physiological and biochemical responses of several freshwater algae to a mixture of metals. *Chemosphere*, **11**, 367–376 (1982).
 77. R. J. Maguire, Y. K. Chau, G. A. Bengert, E. J. Hale, P. T. S. Wong and O. Kramar, Occurrence of organotin compounds in Ontario lakes and rivers. *Environ. Sci. Technol.* **16**, 698–702 (1982).
 78. Y. K. Chau, P. T. S. Wong and O. Kramar, The determination of dialkyllead, trialkyllead, tetraalkyllead and lead(II) ions in water by gas chromatography/atomic absorption spectrometry. *Anal. Chim. Acta.* **146**, 211–217 (1983).
 79. Y. K. Chau and P. T. S. Wong, Direct speciation analysis of molecular and ionic organometals. In: *Trace Element Speciation in Surface Waters and its Ecological Implications*, Leppard, G. G. (ed.), Plenum, New York, 1983, pp. 87–103.
 80. M. D. Baker, W. E. Inniss, C. I. Mayfield, P. T. S. Wong and Y. K. Chau, Effect of pH on the methylation of

- mercury and arsenic by sediment microorganisms. *Environ. Technol. Lett.* **4**, 89–100 (1983).
81. P. V. Hodson, B. R. Blunt, P. T. S. Wong, O. Kramar, Y. K. Chau and D. M. Whittle, Alkyllead contamination of fish from the St Lawrence River. *Proc. 26th Conf. on Great Lakes Res.*, Oswego, 1983, p. 37.
82. M. D. Baker, P. T. S. Wong, Y. K. Chau, C. I. Mayfield and W. E. Inniss, Methylation of arsenic by freshwater algae. *Can. J. Fish. Aquat. Sci.* **40** 1254–1257 (1983).
83. P. T. S. Wong, Y. K. Chau and D. Patel, The use of algal batch and continuous culture techniques in metal toxicity study. In: *Aquatic Toxicity*, Nriagu, J. O. (ed.), John Wiley, New York, 1983, pp. 449–466.
84. Y. K. Chau, P. T. S. Wong and F. C. Elder, Studies on leaching of metals from domestic water supplies. NWRI Report No. 8326, 1983, 84pp.
85. Y. K. Chau, P. T. S. Wong, G. A. Bengert and J. L. Dunn, Determination of dialkyllead, trialkyllead, tetraalkyllead and lead(II) compounds in sediment and biological samples. *Anal. Chem.* **56**, 271–274 (1984).
86. P. T. S. Wong and Y. K. Chau, Structure–toxicity of triaryl phosphate compounds in freshwater algae. *Sci. Total Environ.* **32**, 157–165 (1984).
87. Y. K. Chau, R. J. Maguire, P. T. S. Wong, B. A. Glen, G. A. Bengert and R. J. Tkacz, Occurrence of methyltin and butyltin species in environmental samples in Ontario. NWRI Report No. 8401, 1984, 26pp.
88. Y. K. Chau and P. T. S. Wong, Organic lead in the aquatic environment. In: *Biological Effects of Organolead Compounds*, Grandjean, P. (ed.), CRC Press, Boca Raton, 1984, pp. 21–31.
89. P. V. Hodson, D. M. Whittle, P. T. S. Wong, U. Borgmann, R. L. Thomas, Y. K. Chau, J. O. Nriagu and D. J. Hallett, Lead contamination of the Great Lakes and its potential effects on aquatic biota. In: *Toxic Contamination in the Great Lakes*, Nriagu, J. O. and Simm, M. S. (eds), Wiley–Interscience, New York, pp. 335–369.
90. P. T. S. Wong, Y. K. Chau, S. Rhamey and M. Docker, Relationship between water solubility of chlorobenzene and their effects on a freshwater alga. *Chemosphere* **13**, 991–996 (1984).
91. P. T. S. Wong, R. J. Maguire, Y. K. Chau and O. Kramar, Uptake and accumulation of tin by a freshwater alga, *Ankistrodesmas falcatus*. *Can. J. Fish. Aquat. Sci.* **41**, 1570–1574 (1984).
92. Y. K. Chau, J. J. Cooney, W. R. Cullen, R. J. Maguire and J. A. J. Thompson, *Organotin Compounds in the Aquatic Environment: Scientific Criteria for Assessing their Effects on Environmental Quality*, NRC (Canada) Publication No. NRCC 22494, 1985, 284pp.
93. Y. K. Chau, P. T. S. Wong, G. A. Bengert, J. L. Dunn and B. Glen, Occurrence of alkyllead compounds in the Detroit and St Clair Rivers. *J. Great Lakes Res.* **11**, 313–319 (1985).
94. Y. K. Chau, R. J. Maguire, P. T. S. Wong and M. E. Sanderson (eds), Detroit River–St Clair River. Special Issue, *J. Great Lakes Res.* **11**(3), 191–419 (1985).
95. R. J. Maguire, R. J. Tkacz, Y. K. Chau, G. A. Bengert and P. T. S. Wong, Occurrence of organotin compounds in water and sediment in Canada. NWRI Report No. 85-78, 1985.
96. Y. K. Chau and P. T. S. Wong, Determination of dialkyl-, trialkyl-, tetraalkyllead and lead(II) compounds in water, sediment, fish and aquatic weeds. *Proc. 10th Ann. Aquat. Toxicity Workshop*, Can. Tech. Rep. Fish. Aquat. Sci. No. 1368, Wells, P. G. and Addison, R. F. (eds), 1985, pp. 221–222.
97. P. V. Hodson, P. T. S. Wong, Y. K. Chau, B. R. Blunt, O. Kramar and D. M. Whittle, The occurrence of alkyllead compounds in the aquatic environment. *Proc. 10th Ann. Aquat. Toxicity Workshop*, Can. Tech. Rep. Fish. Aquat. Sci. No. 1368, Wells, P. G. and Addison, R. F. (eds), 1985, pp. 223–224.
98. P. T. S. Wong and Y. K. Chau, Biological and chemical methylation of lead compounds in the aquatic environment. *Proc. 10th Ann. Aquat. Toxicity Workshop*, Can. Tech. Rep. Fish. Aquat. Sci. No. 1368, Wells, P. G. and Addison, R. F. (eds), 1985, p.235.
99. P. T. S. Wong, H. Shear, Y. K. Chau, C. Nalewajko and S. Rhamey, Ultra-clean techniques in assessing the effects of metals on phytoplankton. *Can. Tech. Rep. Fish. Aquat. Sci. No. 1462*, 1986, pp. 75–94.
100. Y. K. Chau, Analytical aspects of organometallic species determination in freshwater systems. In: *The Importance of Chemical “Speciation” in Environmental Processes*, Bernhard, M., Brinckman, F. E., and Sadler, P. J. (eds), Springer-Verlag, Berlin, 1986, pp. 149–167.
101. Y. K. Chau, Occurrence and speciation of organometallic compounds in freshwater systems. *Sci. Total Environ.* **49**, 305–323 (1986).
102. Y. K. Chau and P. T. S. Wong, Organo-Group VI Elements in the Environment. In: *Organometallic Compounds in the Environment*, Craig, P. J. (ed.), Longman, London, 1986, Chapter 7, pp. 254–278.
103. Y. K. Chau and P. T. S. Wong, Occurrence of molecular and ionic alkyllead compounds in environmental samples. *Proc. ‘Chemicals in the Environment’*, Lester, J. N., Perry, R. and Sterritt, R. M. (eds), Selper, London, 1986, pp. 77–82.
104. R. J. Maguire, R. J. Tkacz, Y. K. Chau, G. A. Bengert and P. T. S. Wong, Occurrence of organotin compounds in water and sediment in Canada. *Chemosphere* **15**, 253–274 (1986).
105. Y. K. Chau, Book Review, *Inductively Coupled Plasma–Atomic Emission Spectroscopy*, by A. K. Winge, V. A. Fassel, V. J. Peterson and M. A. Floyd, Elsevier, 1985. *Geochim. Cosmochim. Acta* **50**, 1568 (1986).
106. Y. K. Chau, Speciation of organolead in the environment and methylation of lead. In: *Pathways, Cycling and Transformation of Lead in the Environment*, Stokes, P. M. (ed.), The Commission on Lead in the Environment, The Royal Society of Canada, 1986, pp. 171–184.
107. G. A. Bengert, N. Madsen and Y. K. Chau, *The NWRI Microlayer Sampler Mk-II*. NWRI Contribution No. 86-187, 1986, 12pp.
108. M. E. Starodub, P. T. S. Wong, C. I. Mayfield and Y. K. Chau, The influence of complexation and pH on individual

- and combined heavy metal toxicity to a freshwater green alga. *Can. J. Fish. Aquat. Sci.* **44**, 1173–1180 (1987).
109. P. T. S. Wong, Y. K. Chau, J. L. Dunn and O. Kramar, Bioaccumulation of trialkyllead and dialkyllead compounds by a freshwater alga, *Ankistrodesmus falcatus*. *Can. J. Fish. Aquat. Sci.* **44**, 1257–1260 (1987).
 110. Y. K. Chau, P. T. S. Wong, C. A. Mojeski and A. J. Carty, Transmethylation of metals in the aquatic environment. *Appl. Organometal. Chem.* **1**, 235–239 (1987).
 111. P. T. S. Wong, Y. K. Chau and J. Yaromich, Toxicity and accumulation of tetraethyllead in rainbow trout. In *Heavy Metals in the Environment*, Lindberg, S. E. and Hutchinson, T. C. (eds), CEP Consultants, Edinburgh, 1987, pp. 163–165.
 112. Y. K. Chau, P. T. S. Wong, G. A. Bengert and J. Wasslen, Bioconcentration of alkyllead compounds by clams. In *Heavy Metals in the Environment*, Lindberg, S. E. and Hutchinson, T. C. (eds), CEP Consultants, Edinburgh, 1987, pp. 166–168.
 113. Y. K. Chau, Speciation of molecular and ionic organometallic compounds in biological samples. *Sci. Total Environ.* **71**, 57–58 (1988).
 114. P. T. S. Wong, Y. K. Chau, J. Yaromich, P. Hodson and M. Whittle, Alkyllead contamination of the St Lawrence and St Clair Rivers (1981–1987). *Can. Tech. Rep. Fish Aquat. Sci. No. 1602*, 1988, x + 134pp.
 115. Y. K. Chau, P. T. S. Wong, G. A. Bengert and J. Wasslen, Bioaccumulation of alkyllead from water and from contaminated sediment by mussels. *Appl. Organometal. Chem.* **2**, 427–433 (1988).
 116. P. T. S. Wong and Y. K. Chau, Toxicity of metal mixtures to phytoplankton. In: *Heavy Metals in the Hydrological Cycle*, Astruc, M. and Lester, J. N. (eds) Selper, London, 1988, pp. 231–236.
 117. Y. K. Chau, J. H. Weber and P. J. Craig (eds), 'Organometallic Compounds in the Environment', Special Issue, *Appl. Organometal. Chem.* **3**(1), 1–120 (1989).
 118. Y. K. Chau and J. H. Weber, Foreword, 'Organometallic Compounds in the Environment', Special Issue, *Appl. Organometal. Chem.* **3**(1), 1p (1989).
 119. P. T. S. Wong, Y. K. Chau, J. Yaromich, P. Hodson and M. Whittle, The analyses of alkyllead compounds in fish and environmental samples in Ontario, Canada (1981–1987). *Appl. Organometal. Chem.* **3**, 59–70 (1989).
 120. Y. K. Chau and P. T. S. Wong, Organometallic compounds in the aquatic environment. In *Analysis of Trace Organics in the Aquatic Environment*, Afghan, B. K. and Chau, A. S. Y. (eds), CRC Press, Boca Raton, 1989, Chapter 8, pp. 283–312.
 121. D. Liu, Y. K. Chau and B. J. Dutka, Rapid toxicity assessment of water-soluble and water-insoluble chemicals using a modified agar plate method. *Water Res.* **23**, 333–339 (1989).
 122. Y. K. Chau and P. T. S. Wong, Applications of gas chromatography to trace elements speciation. In *Trace Elements Speciation: Analytical Methods and Problems*, Batley, G. (ed.), CRC Press, Boca Raton, 1989, Chapter 7, pp. 219–244.
 123. S. Tian, Y. K. Chau and D. Liu, Biodegradation of bis(n-tributyltin) oxide. *Appl. Organometal. Chem.* **3**, 249–255 (1989).
 124. Y. K. Chau, P. T. S. Wong, G. A. Bengert and J. Yaromich, Bioaccumulation of butyltin compounds by mussels in harbours. *Chem. Speciat. Bioavail.* **1**, 151–156 (1989).
 125. P. T. S. Wong and Y. K. Chau, Zinc toxicity to freshwater algae. *Toxicity Assess.: Int. J.* **5**, 167–177 (1990).
 126. W. C. Li, S. Zhang, Y. K. Chau and A. S. Y. Chau, Preservation of Organics. Part IV. Stability of bis(tri-n-butyltin) oxide in sediment extracts. NWRI Contribution No 90–139, 1990, 12pp.
 127. W. C. Li, S. Zhang, Y. K. Chau and A. S. Y. Chau, Preservation of Organics. Part V. Stability of butyltin species in sediment extracts. NWRI Contribution No 90–146, 1990, 13pp.
 128. B. Scott, Y. K. Chau and A. Rais-Firouz, Determination of butyltin species by GC/Atomic Emission Spectroscopy. *Appl. Organometal. Chem.* **5**, 151–157 (1991).
 129. Y. K. Chau, Recent developments in speciation and determination of organometallic compounds in environmental samples. *Fresenius J. Anal. Chem.* **339**, 640–645 (1991).
 130. Y. K. Chau, Chemical and biological processes of metals in the environment. *Proc. Workshop on 'Environmental Science & Technology'*, Hong Kong University of Science & Technology, 1991, Chen, J. C. and Wong, M. H. (eds), Commercial Press, Hong Kong, 1991, pp. 157–179.
 131. D. Liu and Y. K. Chau, A four hour agar plate method for rapid toxicity assessment of water-soluble and water-insoluble chemicals. *Environ. Toxicol. Water Qual.* **6**, 437–444 (1991).
 132. R. Ebinghaus, R.-D. Wilken, Y. K. Chau and D. Liu, Extraction of adenine nucleotides from bacteria. NWRI Contribution No. 91–53, 1991, 12pp.
 133. Shuzhen Zhang, Y. K. Chau, W. C. Li and A. S. Y. Chau, Evaluation of extraction techniques for butyltin compounds in sediment. *Appl. Organometal. Chem.* **5**, 431–434 (1991).
 134. Y. K. Chau, P. T. S. Wong and G. A. Bengert, Determination of adenine nucleotides in biological samples by isocratic high-performance liquid chromatography. *Int. J. Environ. Anal. Chem.* **44**, 117–125 (1991).
 135. Y. K. Chau, Chromatographic techniques in metal speciation. *Analyst (London)* **117**, 571–575 (1992).
 136. Y. K. Chau, S. Zhang and R. J. Maguire, Determination of butyltin species in sewage and sludge by gas chromatography–atomic absorption spectrometry. *Analyst (London)* **117**, 1161–1164 (1992).
 137. Y. K. Chau, S. Zhang and R. J. Maguire, Occurrence of butyltin species in sewage and sludge in Canada. *Sci. Total Environ.* **121**, 271–281 (1992).
 138. D. Liu, Y. L. Lam, Y. K. Chau and G. J. Pacepavicius, A simple technique for the determination of biofilm formation and growth. NWRI Contribution No. 92–102, 1992, 24pp.
 139. P. T. S. Wong and Y. K. Chau, Occurrence of butyltin compounds in Severn Sound, Ontario. NWRI Contribution No. 92–119, 1992, 26pp.

140. D. Liu, Y. L. Lam, Y. K. Chau and G. J. Pacepavicius, Characterization of biofilm development on artificial substratum in natural water. *Water Res.* **27**, 361–367 (1993).
141. P. T. S. Wong, Y. K. Chau, N. Ali and D. M. Whittle, Biochemical and genotoxic effects in the vicinity of a pulp mill discharge. *Environ. Toxicol. Water Qual.* — *Int. J.* **9**, 59–70 (1994).
142. P. T. S. Wong, Y. K. Chau, M. Brown and D. M. Whittle, Butyltin compounds in Severn Sound, Lake Huron, Canada. *Appl. Organometal. Chem.* **8**, 385–391 (1994).
143. D. Liu, Y. L. Lau, Y. K. Chau and G. Pacepavicius, Simple technique for estimation of biofilm accumulation. *Bull. Environ. Contam. Toxicol.* **53**, 913–918 (1994).
144. Y. K. Chau, F. Yang and R. J. Maguire, Speciation of organotin compounds in water, sediment and sewage samples by gas chromatography/atomic emission detection. NWRI Contribution No. 94-70, 1994, 18pp.
145. Y. K. Chau (Task Group Leader), CEPA Priority Substances List Assessment Report, Nickel and its Compounds. Department of Supply and Services Canada, 1994, 82pp.
146. Y. K. Chau, F. Yang and M. Brown, Supercritical fluid extraction of butyltin compounds from sediment. *Anal. Chim. Acta* **304**, 85–89 (1995).
147. J. Kuballa, R.-D. Wilken, A. K. K. Kwan and Y. K. Chau, Speciation and genotoxicity of butyltin compounds. *Analyst (London)* **120**, 667–673 (1995).
148. M. Hempel, K. K. Kwan, B. J. Dutka, D. Liu and Y. K. Chau, Risk assessment on mercury contaminated sites — toxicity of organomercury compounds. *Analyst (London)* **120**, 721–724 (1995).
149. Y. Fang and Y. K. Chau, Laboratory contamination associated with supercritical fluid extraction operations. *App. Organometal. Chem.* **9**, 365 (1995).
150. Y. K. Chau and O. T. R. Kulikovskiy-Cordeiro, Occurrence of nickel in the Canadian environment. *Environ. Rev.* **3**, 95–120 (1995).
151. Yan Liu, V. Lopez-Avila, M. Alcaraz, R. R. Adam, M. K. Behlke, Y. K. Chau, J. W. Cochran, D. M. Gilvydis, D. Green, L. E. Habberger, W. W. Li, B. D. Quimby, R. H. Rieck, P. C. Uden and S. A. Wise, Capillary gas chromatography–atomic emission detection method for the determination of pentylated organotin compounds: interlaboratory study. *Journal of the Association of Official Analytical Chemists* **78**, 1275–1285 (1995).
152. Y. K. Chau, F. Yang and R. J. Maguire, Improvement of extraction recovery for the monobutyltin species from sediment. *Anal. Chim. Acta* **320**, 165–169 (1996).
153. U. Borgmann, Y. K. Chau, P. T. S. Wong, M. Brown and J. Yaromich, The relationship between triibutyltin (TBT) accumulation and toxicity to *Hyalella azteca* for use in identifying TBT toxicity in the field. *J. Aquat. Ecosys. Health* **5**, 199–206 (1996).
154. Y. K. Chau, R. J. Maguire, M. Brown, F. Yang and S. P. Batchelor, Description of sampling locations for 1993–1994 National Water Research Institute Survey for organotin compounds in water and sediment in Canada. NWRI/AEPB-TN-96-03, 1996, 21pp.
155. R. J. Maguire, Y. K. Chau and J. A. J. Thompson, *Proc. Workshop on 'Organotin Compounds in the Canadian Aquatic Environment'*, Sidney, British Columbia, February 19–20, 1996. NWRI Contribution No. 96-153, 1996, 52 pp.
156. J. A. J. Thompson, R. J. Maguire, Y. K. Chau, F. Yang and M. Brown, Organotin concentrations in the surface microlayer of British Columbia coastal waters in 1994. National Water Research Institute Contribution No. 96-167, 1996, 19pp.
157. Y. K. Chau, F. Yang and M. Brown, Evaluation of derivatization techniques for the analysis of organotin compounds in biological tissue. *Anal. Chim. Acta* **338**, 51–55 (1997).
158. Y. K. Chau, F. Yang and M. Brown, Determination of methylcyclopentadienylmanganese tricarbonyl (MMT) in gasoline and environmental samples by gas chromatography with helium microwave plasma atomic emission detection. *Appl. Organometal. Chem.* **11**, 31–37 (1997).
159. M. Brown, Y. K. Chau, R. J. Maguire, F. Yang and S. P. Batchelor, Description of sampling locations for 1995 National Water Research Institute Survey for organotin compounds in mussels in Canada. NWRI/AEPB-TN-97-001, 1997, 11pp.
160. Y. K. Chau, R. J. Maguire, M. Brown, F. Yang and S. P. Batchelor, Occurrence of organotin compounds in the Canadian environment five years after the regulation of antifouling uses of tributyltin in 1989. *Water Qual. Res. J. Can.* **32**, 453–521 (1997).
161. Y. K. Chau, R. J. Maguire, M. Brown and F. Yang, Occurrence of butyltin compounds in mussels in Canada. *Appl. Organometal. Chem.* **11**, 903–912 (1997).
162. Y. K. Chau and F. Yang, A novel technique for direct derivatization of ionic organotin and alkyllead compounds in sediment: simultaneous determination of organotin and alkyllead in sediment by gas chromatography–plasma atomic emission (GC–AED) dual channel detection. *Appl. Organometal. Chem.* **11**, 851–858 (1997).
163. J. A. J. Thompson, S. Douglas, Y. K. Chau and R. J. Maguire, Recent studies of residual tributyltin in coastal British Columbia sediments. *Appl. Organometal. Chem.* **12**, 643–650 (1998).
164. F. Yang, Y. K. Chau and R. J. Maguire, Occurrence of butyltin compounds in beluga whales. *Appl. Organometal. Chem.* **12**, 651–656 (1998).