Nozaki Memorial Issue: Recent Progress in Marine Geochemistry Preface

Yoshiyuki (“Yoshi”) Nozaki came to Yale in 1974 after completing his thesis under his professor, Shizuo Tsunogai. He had studied the distribution of ^{210}Po and ^{210}Pb in the upper layers of the ocean water column throughout the North Pacific, and because of this he became part of the Yale effort in studying oceanic profiles for the same nuclides in the GEOSECS enterprise. In an effort to understand the role of atmospheric transport of ^{210}Pb and ^{210}Po to the oceans we modeled the expectation of delivery of these nuclides to the surface of the North Pacific Ocean in 1977. This effort ineluctably led to our involvement in the SEAREX campaign of atmospheric sampling across the Pacific Ocean led by Robert Duce. This international program also included Yoshi’s mentor, Shizuo Tsunogai. Attempts at measuring atmospheric fluxes led Yoshi and the group at Yale to develop a technique for measuring the flux of ^{210}Pb using soil profiles—a program that became an important part of our efforts at Yale leading to the measurement of both ^{222}Rn fluxes from soils and determining the mean residence time of aerosols through the study of ^{210}Pb fluxes to soils.

Yoshi was tireless in his search for ways to exploit new techniques for solving unusual oceanographic problems. He undertook to activate the radiocarbon laboratory at Yale using the technique of liquid scintillation counting. The problems we solved at Yale using radiocarbon assaying ranged from the growth rates of hydrothermal vent clams to the rates of accumulation of sediment from those rift areas using cores obtained by submersibles. Deciphering the carbon isotope record in a Bermuda coral, also part of the activities involving the radiocarbon laboratory, was fundamental to our understanding of the exchange rate of carbon between the surface ocean and the atmosphere as well as changes in upwelling rates with time in a mid-ocean region.

As you can see, during Yoshi’s four years at Yale he had established that he would use any technique he could to understand the major problems of nuclide distribution in the oceans and the importance to understanding oceanic processes.

His work on the distribution of the thorium isotopes in the ocean water column, appearing in several papers, is fundamental to our understanding of reactive nuclides in the ocean column. Although attempts at understanding these processes were initiated during the GEOSECS campaign by Yoshi’s long-time friend, S. Krishnaswami, the ultimate resolution using all three Th isotopes was uniquely a triumph of Yoshi.

His work in understanding the distribution of the rare earth elements was a logical extension of his thorium work. (It is a curious note in history that Bertram Boltwood, who invented radioactive geochronometry at Yale in 1908, discovered ^{230}Th —“ionium”—because of his prowess in rare earth element chemistry. Yoshi, in a sense, went in the reverse direction!)

It is not surprising that Yoshi should construct the first synthetic marine geochemical chart of distribution of the elements in the oceans, published in the *Encyclopedia of Ocean Sciences*, of which he was an Associate Editor.

His most recent work involved tracking the behavior of nitrate as a nutrient in the Indian Ocean using ^{228}Ra distribution. Hidden near the end of the paper describing his results on ^{228}Ra and nitrate is a discussion of another “nutrient” element, silicon. In that paper he proposed that the delivery of siliceous dust during glacial times increased the silica content of the oceans thus increasing the preferential production of diatoms over coccolithophores thus affecting the carbon dioxide content of the atmosphere. He had had this idea for quite a while and presented it at several meetings but the full exposition occurred in this paper.

I cite this paper because it ties together all the different facets of this remarkable marine geochemist’s life. He understood the power of natural radionuclide tracers, he applied them to the biological realm and fearlessly entered into the domain of climate change. Such breadth of talent, imagination and energy, all found in one man, is unique.

Yoshi Nozaki, a man of limitless talent and brilliance will be sorely missed.

Karl K. Turekian