

## 2010 MEDALS & AWARDS

### O.E. MEINZER AWARD

Presented to  
**Mary Jo Baedecker**



Mary Jo Baedecker  
U.S. Geological Survey-Reston

#### Citation by Isabelle M. Cozzarelli

I am honored to introduce Mary Jo Baedecker as the recipient of the 2010 O.E. Meinzer Award of the Hydrogeology Division of the Geological Society of America. This award is presented to Mary Jo in recognition of her pioneering research in the field of contaminant hydrogeology. From her early work on the diagenesis of natural organic compounds in marine sediments, to her later work on degradation of contaminants in aquifers, Mary Jo has focused on elucidating the fundamental electron-transfer processes at work as organic compounds degrade in subsurface environments. She is an expert at understanding complex hydrogeologic systems where organic matter is driving redox reactions. Mary Jo's body of published work represents a major contribution towards understanding and quantifying the transformation of organic compounds and the concomitant inorganic geochemical evolution of groundwater.

Mary Jo Baedecker was born in 1941 in Richmond, Kentucky, USA. She completed undergraduate work at Vanderbilt University (1964) and received the master's degree in chemistry from the University of Kentucky (1967) and the Ph.D. in geochemistry from The George Washington University (1985). From 1968 until 1973 she was a research scientist in Ian Kaplan's research group at the

University of California-Los Angeles. She was trained as an organic geochemist and in her early work she focused on the diagenesis of marine sediments.

In 1974, Mary Jo joined the U.S. Geological Survey (USGS) as a research chemist. Early in her career at the USGS Mary Jo worked with William Back and focused on examining degradation reactions in the highly reducing environment created when an aquifer is contaminated with landfill leachate. In this groundbreaking work Mary Jo used a process-oriented approach that offered, for the first time, a detailed and comprehensive conceptual model of plume evolution and its impact on aquifer chemistry (**Baedecker and Back, 1979, *Ground Water* v.17(5), p. 429-437**). This landmark paper was selected as a 20th century benchmark paper in the field of groundwater by the International Association of Hydrological Sciences. In a related paper, **Baedecker and Back, 1979, *Journal of Hydrology* v. 43, p.393-414**, Mary Jo creatively linked the fundamental redox geochemistry of marine sediments to occurrences of redox zonation in contaminated aquifers. Prior to this research, investigations of contaminated aquifers beneath landfills had been largely qualitative without detailed attention to hydrogeochemical processes. These seminal papers laid the foundation for rigorous thinking about contaminant hydrogeology and geochemistry.

Her work on landfills set Mary Jo on a new research path, developing conceptual frameworks for understanding complex contaminated systems. Perhaps her greatest impact has resulted from her rigorous studies documenting biogeochemical processes at a crude-oil spill site near Bemidji, Minnesota. In **Baedecker, Cozzarelli, Eganhouse, Siegel, and Bennett, 1993, *Applied Geochemistry* v. 8(6), p. 569-586**, Mary Jo used an innovative approach linking organic and inorganic geochemistry, microbial processes, and mathematical modeling. This paper was part of a series of Bemidji papers she published in *Applied Geochemistry* in 1993 (see also Bennett, Siegel, Baedecker, and Hult, 1993, *Applied Geochemistry* v. 8(6), p. 529-549, and Eganhouse Baedecker, Cozzarelli, Aiken, Thorn, and Dorsey, 1993, *Applied Geochemistry* v. 8(6), p. 551-567). Mary Jo was a co-author on numerous papers detailing later follow-up work at the Bemidji site including those that focused on the fate of metabolites of petroleum biodegradation (Cozzarelli, Baedecker, Eganhouse, and Goerlitz, 1994, *Geochimica et Cosmochimica Acta* v. 58 (2), p. 863-877) and

the incorporation of degradation reactions and redox processes into a multispecies reactive solute transport model (Essaid, Bekins, Godsy, Warren, Baedecker, and Cozzarelli, 1995, *Water Resources Research* v. 31 (12), p. 3309-3327).

Mary Jo's sustained research at the Bemidji site represents one of the earliest comprehensive bodies of work on the biogeochemical evolution of a contaminated aquifer, and led to international recognition of the importance of natural attenuation processes in understanding the environmental fate of contaminants. Her early contributions in this field were instrumental in the growth of a major water program at the USGS, the Toxics Substances Hydrology Program.

Later in her career at USGS Mary Jo took on a number of leadership positions, culminating in her appointment as the Chief Scientist for Hydrology. In that position, she was responsible for the direction and management of research programs in the hydrologic sciences and served as advisor to the Associate Director for Water. She retired from the USGS in 2004, where she continues to explore the frontiers of contaminant hydrogeology as a scientist emeritus. Mary Jo has a long history of service to GSA, which included serving on the Management Board and as Chair of the Hydrogeology Division. The Division awarded her the Distinguished Service in Hydrogeology Award in 2002 in recognition of her dedicated service to GSA, the Hydrogeology Division, and the hydrogeologic community. She has remained an active member of the hydrogeologic community, serving, for example, on the Water Science and Technology Board of the National Research Council (NRC) of the National Academies from 2007 to 2009. Mary Jo's elegant fundamental scientific investigations not only moved the field of contaminant hydrogeology forward but also influenced and inspired younger generations of scientists to tackle the difficult problem of understanding the transformation of organic contaminants in subsurface environments. It is an honor for me to be given the opportunity to highlight these accomplishments. Mary Jo has been an inspiration to me, throughout my career, and I feel lucky to be able to call her mentor, colleague, and friend. Please join me in congratulating Mary Jo Baedecker, recipient of this year's O.E. Meinzer award, based on her outstanding contributions to the science of hydrogeology.

\* Citation publications noted in bold.

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### *Response by Mary Jo Baedecker*

It is an honor to receive the O. E. Meinzer Award from the Hydrogeology Division and I thank the nominating committee, those who supported my nomination and my friend and colleague, Isabelle Cozzarelli for the kind words in the citation. Being selected for this award came as a surprise and it is a nice honor to receive it toward the end of my career with the U.S. Geological Survey (USGS). I understand that the papers for which I am being cited have been used in teaching at universities and I find that very gratifying as I have a great interest in helping young people learn about geochemistry and hydrogeology.

Over the years, there were many people who had significant impacts on my career. First, I would like to recognize my colleague and first mentor in the earth sciences, Ian Kaplan, who at UCLA, hired me to work on the early diagenesis of marine sediments and ignited my interest in organic geochemistry. This was an exciting time to be a part of the Kaplan group in the early 1970s, as many of the students and post-docs have become world-renowned scientists.

Coming to the USGS in 1974, I had the good fortune of being assigned to work with Bill Back, a hydrogeologist, known to all in this field. He told me to “apply what you know to groundwater” and that is how we started working at landfills. We took an interdisciplinary approach combining organic and inorganic geochemistry and hydrogeology to understand processes in and downgradient from a landfill. In 1982, the USGS Toxic Substances Hydrology Program started and few scientists wanted to work in such complicated environments. Because I was working at landfills, it was a natural for me to get involved with this program and I worked at three of the sites, making the Bemidji, Minnesota, oil-contaminated site my primary research site. Don Siegel, Marc Hult, Olaf Pfannkuch and I started the research at the site and we had a long collaboration in the early years. Isabelle Cozzarelli and Bob Eganhouse came to the USGS shortly thereafter, and we have had many years of collaboration at this and other groundwater contamination sites. After a 10-year hiatus on my part, we are working together again at the Bemidji site, along with Barbara Bekins, who renewed

my interest at the site when she asked me to analyze some oil samples.

Bill Back and Blair Jones were two of my USGS mentors who had the ability to look at the larger picture. I am indebted to them for encouraging my research. Another person who shaped my career was Roger Wolff, who thought I had the right skills, and convinced me to give back to the USGS by going into research administration, which I did for 10 years. Unfortunately, Bill Back and Roger Wolff died a few years ago and are no longer with us.

I want to recognize and thank the USGS for providing such a wonderful atmosphere to pursue research, by funding the infrastructure to conduct field investigations, and for encouraging an environment of collaborative research. None of my work could have been completed without the support of other scientists at the USGS and from Universities. Finally, I want to thank my parents, who encouraged me to “think big” and stressed education, and my husband, Philip, and daughter, Cheryl, who were always supportive of my career. I am very pleased to accept the 2010 O. E. Meinzer Award.