O.E. MEINZER AWARD

Presented to
Chunmiao Zheng

Chunmiao Zheng
University of Alabama

Citation by Mary P. Anderson

The 2013 O.E. Meinzer Award is presented to Chunmiao Zheng for contributions to understanding and quantifying solute transport in groundwater. His landmark modeling code MT3DMS (Zheng, C., and P.P. Wang, 1999, Contract Report SERDP-99-1, U.S. Army Engineer Research and Development Center, Vicksburg, MS, 169 pp.) is a boon to researchers and has fundamentally transformed the groundwater consulting industry by providing an open-access, user-friendly platform to construct reliable transport models. Moreover, the availability of MT3DMS motivated others to develop biochemical and geochemical reaction modules (e. g. RT3D, PHT3D) that link with MT3DMS to simulate complex multi-species bio/geo- chemical reactions. Furthermore, MT3DMS has been adapted as a heat transport code and is the building block for SEAWAT, a USGS supported code for simulating density-dependent transport in groundwater.

Chunmiao is also recognized for his textbook *Applied Contaminant Transport Modeling*, first published in 1995 and now in a 2nd edition (Zheng, C., and G.D. Bennett, 2002, John Wiley & Sons, New York, 621 pp.). This popular textbook provides comprehensive treatment of the fundamentals of transport modeling and is extremely well written, presenting material with exceptional clarity and at a level accessible to both students and experienced practitioners.

Chunmiao was born in 1962 in Fuzhou, China. He received the B.S. in geology from Chengdu College of Geology (now Chengdu University of Technology) and came to the United States in 1984, receiving the PhD in Hydrogeology from the University of Wisconsin-Madison in 1988. There he developed an interest in writing codes for solute transport. After graduation he worked for S.S. Papadopulos & Associates, Inc. where he honed his modeling skills. In 1993, he joined the faculty in geological sciences at the University of Alabama, where he was named the Lindahl Endowed Professor. Starting in 2006, he began making professional visits to his native China and currently is a Chair Professor at Peking University where he founded and directs the Center for Water Research.

Chunmiao is extremely generous, freely giving his time to mentoring students, helping colleagues, and serving on numerous editorial and advisory committees for professional societies and governmental agencies in the U.S., China, and internationally.

Response by Chunmiao Zheng

Thank you, Mary, for the most generous citation and very kind words. I am deeply honored and grateful to receive the 2013 O.E. Meinzer Award. When I saw a letter in my mailbox from the Geological Society of America in May, I thought it must be another reminder to renew my GSA membership. After I realized it was to notify me of the O.E. Meinzer Award, I was ecstatic and overwhelmed. The thought that I will join the illustrious list of former Meinzer awardees was truly humbling. I wish to express my sincerest gratitude to the GSA, the Hydrogeology Division, and the Meinzer Award Committee for presenting me this tremendous honor.

In June I was fortunate to meet József Tóth in Beijing where he was to attend a workshop commemorating the 50th anniversary of the publication of his landmark papers on regional groundwater flow system analysis for which he received the inaugural Meinzer Award in 1965. It seems fitting that the earliest and the latest Meinzer award recipients for the past 50 years shall meet for the first time in China, where the problems of water scarcity and groundwater contamination will confront the hydrogeologists in China and beyond for the next 50 years.

Let me look back at the events that led to the two publications cited for this award. After I graduated from Chengdu College of Geology in China (now Chengdu University of Technology) in 1983, I received a Chinese government scholarship to study at the University of Wisconsin-Madison with Mary Anderson. I recall that a few days after I arrived at UW in December 1984, Mary hosted a big welcome party for me at her home. That was the first cultural shock to me as I never imagined a famous professor would do something like that for a new graduate student from China! When it was time to choose a thesis topic, Mary and I thought I should study, with financial support from Ken Bradbury at Wisconsin Geological and Natural History Survey, how shallow agricultural drainage ditches affect the patterns of groundwater flow around those ditches in the context of managing agricultural chemicals in the shallow aquifer.

At that time, the USGS groundwater flow model, MODFLOW, was just released. I was applying it to my research very effectively. However, I needed something more, that is, a tool that would allow me to visualize the flow patterns and calculate the flow paths under transient conditions. There was still no particle tracking code for use with MODFLOW then. I was very appreciative that Mary would support me to develop one despite my very limited programming skills. That effort led to PATH3D, which came out around the same time as MODPATH, as two particle tracking companions for MODFLOW but with different computational algorithms.

After I graduated from UW-Madison, Charlie Andrews gave me the first job at S.S. Papadopulos & Associates, Inc. for my industrial practical training. While there, working on remedial investigation and feasibility studies at Superfund sites, I needed a solute transport model that would allow me to simulate 3D contaminant concentration distributions based on the flow solutions of MODFLOW. Since there was nothing available for that purpose at that time, I decided to expand the scope of PATH3D to accommodate dispersion and reactions in addition to advection. My work was inspired by the MOC2D code by Lenny Konikow and John Bredehoeft. The result was the MT3D code released in the early 1990s. The release would not have been possible without a grant from the U.S. Environmental Protection Agency for which Stavros Papadopulos was directly responsible. During the "darkest hours" of which I struggled to make the code work, Charlie Andrews provided the steady support and guidance without which MT3D would never have materialized. Gordon Bennett, who had just retired from the USGS

and joined SSPA at that time, edited the MT3D manual thoroughly, as he did for the MODFLOW manual while he was still at the USGS. Other SSPA colleagues, including Remy Hennet and Steve Larson, influenced me deeply with their passions and innovations for solving real-world problems.

After I left SSPA to take on a faculty position in the Department of Geological Sciences at the University of Alabama, I was fortunate to be able to obtain necessary funding from the Army Corps of Engineers to significantly enhance MT3D with new solvers and new features, which became what was known as MT3DMS for multi-species transport. The support of Mark Dortch at the Army Corps of Engineers was critical to the realization of MT3DMS. Also, MT3DMS benefitted greatly from my two mathematician colleagues at Alabama. Patrick Wang, as co-author, programmed the TVD algorithm, while T.Z. Mai provided the general conjugate-gradient matrix solver.

The first edition of the book "Applied Contaminant Transport Modeling" came out of my desire to provide a more comprehensive treatment of the concepts, techniques and case studies in solute transport modeling beyond the MT3DMS manual. I was fortunate to be able to count on Gordon Bennett again as my co-author. The writing of that book would overwhelm me at times, as I was still an assistant professor trying to earn tenure at Alabama. I remain extremely grateful to my colleagues and administrators at Alabama, especially Harold Stowell, Rona Donahoe, Ernie Mancini and Bob Olin, for providing me the supportive and nurturing environment to succeed.

In more recent years, I have become more of a field experimentalist by working at long-term tracer research sites such as the MADE site and the Hanford site. This line of work has given me a deeper appreciation for complexity of aquifer heterogeneity, both physically and chemically, and provided new inspiration for enhancements and improvements to the MT3DMS code, which, in turn, would be immediately available for applications by practitioners and researchers. I have benefitted immensely from my close collaboration with many colleagues, especially Steve Gorelick, Fred Molz, Jim Butler, Dave Hyndman, Henning Prommer, Chongxuan Liu and John Zachara. Several of my students and post-docs have also contributed significantly to the research program, including Erin Feehley, Gaisheng Liu, Marco Bianchi, and Rui Ma.

As I started to work in China more and more since 2006 on large-scale watershed ecohydrological research and national groundwater contamination assessment programs, I have received great support from my colleagues and administrators at Peking University and Chinese Academy of Sciences, especially Dongxiao Zhang, Shiyi Chen, Honglang Xiao, and Guodong Cheng. Two of my Ph.D. students from Alabama, Jie Liu and Guoliang Cao, also joined me at Peking to help me get things started and rolling. Some of you likely still remember my 2009 Birdsall-Dreiss Lecture tour in which I talked about the challenges that China was facing in securing a sustainable water future. Despite many obstacles, I find it very exciting and rewarding to tackle hydrogeological problems in a country with a fifth of the global population and only seven percent of the planet's water resources. I have and continue to welcome many of my friends and colleagues to visit me in China. I know Don Siegel was thrilled when he was finally able to teach his Chinese cooking lessons to his Chinese audience, while Steve Gorelick and Prabhakar Clement finally had the opportunity to enjoy authentic Peking Duck this past summer. At the other end of the spectrum, Mary Anderson preferred to enjoy Peking Opera during her visit.

In closing, let me echo John Bredehoeft, the 1975 Meinzer awardee, in stressing the important role of modeling in hydrogeological studies, when he stated that he could not understand any hydrogeologist who does not model. Conversely, I also understand the comment by Karsten Pruess, the 2006 Meinzer awardee and developer of the TOUGH2 code, when he said he considered himself a skeptic of modeling. There is no substitute for modeling as an incredibly powerful tool for understanding complex processes and their interactions. But modeling is not an end in itself, rather a means to understand and improve conceptualization of a hydrological system. We should never stop modeling, but we should never model for the sake of modeling.

Finally, in the tradition of Steve Gorelick and John Wilson, let me make a small contribution to the science of hydrogeology by proposing a new index. Some of you might remember in his citation for John Wilson's Meinzer award in 1996 that Steve proposed the "Wilson index", i.e., the ratio of the number of original ideas to the number of actual papers published. John scored the perfect 100 as a man of ideas. In his response, John proposed the "Gorelick index", i.e., the ratio of the number of gourmet meals to the number of conference days times 100. Steve scored 100, too, as a connoisseur of fine food. Notwithstanding the suspicion of self-promotion, I will name my contribution the "Zheng index", i.e., the ratio of the number of people who have helped you to the number of Meinzer awards you have won. My score of the "Zheng index" is also at 100, as I can easily give you the names of 100 people who have helped me in so many ways along my path to today's acceptance of this momentous award. Last but not least, let me thank my family, my wife Hualin and my children Lisa, Amy and Tony, for their support, sacrifice, and inspiration. Without them I would not be standing here today to accept this incredible recognition. Thank you all very much.