

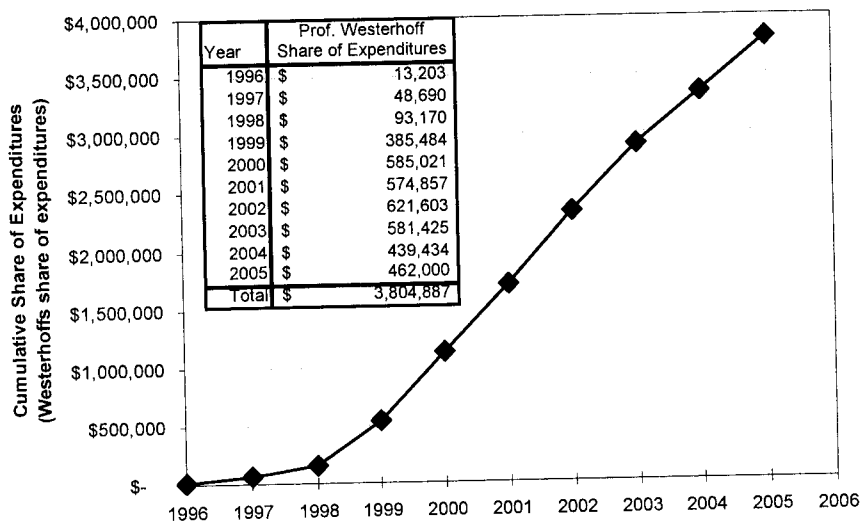
6. CANDIDATE'S STATEMENT

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Research and teaching are not mutually exclusive. Teaching and mentoring undergraduate, graduate, and post-doctoral researchers in the field, laboratory, and academics is critical to the success of a research program. This document highlights key accomplishments in research and teaching, and defines a plan for their future direction.

RESEARCH PLANS

I have served as principal investigator and co-PI on over sixty projects funded by local city, state, national, federal and private sources on topics ranging from water and wastewater treatment to algae biotechnology. This includes over 20 projects directly related to my specific research area of drinking supported by the prime funding agencies in this area: US Environmental Protection Agency or American Water Works Association Research Foundation (AwwaRF). This includes three highly competitive AwwaRF unsolicited projects as PI which are selected to address potentially high-risk / high-return research of importance to the drinking water industry. The other 30-40 projects are funded by a wide variety of agencies. Overall my allocated "share" of the research expenditures, as tracked by ASU, is over \$3.8 million. The graphic below summarizes the initiation of my research program in the mid-1990's and then over the past six years the success of a sustainable research program capable of supporting 8 to 10 graduate students, post-docs and technicians. The broad base of support and ability to identify new areas of funding it should be possible to maintain research at funding levels commensurate with the past six years. However, my personal goal is to approximately double my annual research expenditures by identifying and leading clusters of faculty in new research areas.



My area of expertise is drinking water quality & treatment which can be synthesized down to three basic research themes: (1) characterization of the sources, amount, structure and reactivity of dissolved organic matter, (2) occurrence and treatment of trace organics and emerging pollutants, and (3) treatment of oxo-anions (bromate, nitrate, arsenate, etc.). My current research is currently focused on organic nitrogen (4 AwwaRF projects & local funding), arsenic and co-contaminant treatment evaluations, modeling, sensor development and new technologies (EPA/Battelle, AwwaRF, private, and local funding), and emerging

nano- and organic- contaminants (EPA, NSF). For the past 8 years I have been involved (and lead for the past 6 years) a project supported by local cities and water providers to study algae, organic matter, and hydrologic-related regional water quality issues for central Arizona (<http://enpub.fulton.asu.edu/pwest/tasteandodor.htm>). This long-term project and spin-off projects related with national funding sources has resulted in over \$2.2M of research for ASU and is an example of how social embeddedness supports other university missions.

With over 50 journal articles, over 150 presentations and other means of disseminating our results, my research group has covered a wide range of topics. Research by every one of my graduate students has lead to journal articles and/or presentations. Approximately 25% of the papers are with interdisciplinary authors from biology, chemistry, or ecology. My journal papers have been cited over 440 times, based upon Web-of-Science citation index (see vitae). The presentations and publications have resulted in several poster/presentation awards and the following other awards:

- 2006 Paul L. Busch Research Award from the Water Environment Research Foundation for \$100,000 for "Tools to Characterize and Understand the Risk of Biogenic and Commercial Nanomaterials in Wastewater Effluents" (selected and award will be selected on October 24, 2006)
- 2005 Walter L. Huber Civil Engineering Research Prize for "Reactions between natural organic matter and micropollutants with ozone, chlorine, and bromine"
- 2002 Quentin Mees Research Award, Arizona Water Pollution Control Association – resulting in "Removal of 2-methylisoborneol and geosmin in surface water treatment plants in Arizona." Bruce, D., Westerhoff, P., and Brawley-Chesworth, A., *Journal of Water Supply Research and Technology-Aqua*, 51(4), 183-197.
- 1999 American Water Works Association Journal Publications Best Overall Paper Award
- 1999 American Water Works Association Water Quality Division Best Journal Paper Award.
- 1997 Quentin Mees Research Award, Arizona Water Pollution Control Association resulting in "Numerical Kinetic Models for Bromide Oxidation to Bromine and Bromate", P. Westerhoff, R. Song, G. Amy, and R. Minear. *Water Research*, 32:5:1687-1699 (1998).

Among the more personally exciting presentations was the opportunity to give an invited talk on global arsenic issues and treatment at NAE US-Japan Frontiers of Science meeting (2005). A similar invited NSF workshop at Univ. of North Carolina in 2004 re-energized my focus on water and environmental engineering issues. My basic take-away message from this NSF workshop was that environmental engineers need to embrace nano-bio-cyber to move our field forward. I responded to that message by initiating several projects on the fate/treatment/toxicity (funded by USEPA) and beneficial applications (funded by AwwaRF) of nanotechnology, on the nexus of chemistry and biology issues leading to organic chloramine formation from reactions between disinfectants and biofilms (funded by AwwaRF), and development of sensors (funded by Salt River Project) and sensor networks (proposed to NSF) for management of drinking water and reclaimed wastewater distribution systems. These topics are at the forefront of mind as I develop new research concepts for the next five years and beyond.

Technical research is personally rewarding, and I envision being a researcher rather than a departmental or university administrator over the next ten years. More specifically, my long-term vision is to maintain a research program that investigates emerging applied research issues, develop new technological solutions, and has a multidisciplinary nature. I have been given an opportunity to lead of group of 5-8 ASU

faculty under the umbrella of an Emerging Contaminants Research Cluster (EmRG) where I hope to lead efforts related to some of the following topics:

1. On-site treatment of pharmaceuticals (household, medical care facility) as a pretreatment prior to their discharge to the wastewater collection system
2. Incorporation of environmental toxicity into environmental engineering design criteria – beyond AMES Testing through incorporation of genomics
3. Predicting a-priori the environmental fate of new chemicals or nanomaterials into the environment through use of molecular modeling techniques
4. Development of chemical (and biological) sensors and networks into water and reclaimed wastewater infrastructure to track water molecules and chemical constituents to improve knowledge, operations, and safety of our water supplies.

In addition to these environmental engineering centrist themes, interdisciplinary research with a variety of engineering disciplines, biologists, ecologists, geologists, and others has taught me a great deal about communications and how to view research. I hope to continue interdisciplinary work into the future through continued engagement and more active leadership in the ASU CAP-LTER program (currently the water IPA leader), Urban-ecology IGERT program, as PI on a 8+ year ongoing regional water quality research program, and other new program areas.

TEACHING PLANS

I enjoy the privilege of working with talented undergraduate and graduate students while conducting research, and organizing seminars. I will continue to embrace new in-class teaching experiences and continue development of courses.

At ASU the students evaluate the instructor and course, somewhat independently. The average student instructor evaluation for most Civil and Environmental Engineering classes is between 3.9 and 4.2. My evaluations were typically above these averages.

In addition to graduate student mentoring and course offerings, I have also undertaken a number of international teaching activities. This includes having multiple students (4 students over 3 years) from the University of Poitiers and one student from Hong Kong University work in my laboratory for 3 to 6 months. This is very rewarding and hopefully my students will start more international travel to these and other universities too.

SERVICE

I have served on a wide range of department and college level committees, national profession committees, peer reviewer for multiple journals, federal agency peer review panels, future research direction workshops and project advisory committees (e.g., Awwa Research Foundation project advisory committees, WaterReuse Foundation, USEPA). I serve on several professional committees and am the American Association of Environmental Engineers and Science Professors representative to the Awwa Research Foundation public council meeting. I also received the ASCE J.of Environmental Engineering "Editors Award" for service and excellence in manuscript review. I now serve on the editorial board of Journal of Water Supply: Research and Technology – AQUA.

In 2005 I was invited to give a talk at the National Academy of Engineering US-Japan Frontiers of Science meeting (talk was on arsenic research). Since then I was invited to attend the 2006 Frontiers of Science meeting and asked to organize a session on "water" at the 2007 Frontiers of Science meeting. I am also currently serving as co-organizer of an American Chemical Society conference session.

Probably the most rewarding service activities and for where I have made the largest contributions are 1) ASU search committees in civil and environmental engineering & chemical engineering, and 2) serving as the water and environmental group coordinator and improving our organization and graduate student recruiting activities.

While my research is having a national and international impact, over the next 20 years I would like to become more involved in identifying strategic research needs for country. This interest stems from serving on university research committees, participating in research planning workshops for AwwaRF and USEPA/USGS, helping to create the water quality focus of the Arizona Water Institute (I am the Arizona Water Institute - Water Quality Theme Leader), and somewhat of a futurist personal interest.