

## CURRICULUM VITA

### WILLIAM PARKS BALL

Professor  
Department of Geography and Environmental Engineering  
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### EDUCATION

- Ph.D. Department of Civil Engineering, Stanford University, Stanford, CA (January, 1990)  
Dissertation: "Equilibrium Sorption and Diffusion Rate Studies with Halogenated Organic Chemicals and Sandy Aquifer Material"; Advisor: P.V. Roberts
- M.S. Department of Civil Engineering, Stanford University, Stanford, CA (May, 1977)
- B.S. Department of Civil Engineering, University of Virginia, Charlottesville, VA (June, 1976)

### PROFESSIONAL EXPERIENCE

Executive Director, Chesapeake Research Consortium, Edgewater, MD; Jan 2015 to present

Professor, Dept. of Geography and Environmental Engineering, Johns Hopkins University, Baltimore, MD;  
July 2001 to present (joint appointment with Dept. of Civil Engineering).

Adjunct Visiting Scientist, Chesapeake Research Consortium, Inc., Edgewater, MD; 2007 to 2015.

Braun Intertec Visiting Professor, University of Minnesota, 2000

Associate Professor, Dept. of Geography and Environmental Engineering, Johns Hopkins University, Baltimore, MD; July 1998 to present July 2001 (joint appointment with Dept. of Civil Engineering).

Assistant Professor, Dept. of Geography and Environmental Engineering, Johns Hopkins University, Baltimore, MD; August 1992 to July 1998 (joint appointment with Dept. of Civil Engineering)

Assistant Professor, Dept. of Civil and Environ Engineering, Duke University, Durham, NC; Jan. 1990 - Aug. 1992.

Lecturer, Dept. of Civil and Environmental Engineering, Duke University, Durham, NC; Sept. 1989 - Dec. 1989.

Graduate Assistant, Stanford University, Stanford, CA; Sept. 1983 - Aug. 1989.

Supervising Engineer, James M. Montgomery Consulting Engineers, Washington, DC; Oct. 1980 - Jul. 1983.  
Headed an on-site engineering team responsible for process research and testing, data analysis, and technical report writing associated with the 3-year operation, maintenance and performance evaluation of a 0.5 MGD experimental water treatment plant; U.S. Army Corps of Engineers project reviewed by NRC Committee.

Senior Engineer, James M. Montgomery Consulting Engineers, Reston, VA; May 1980 - Oct. 1980.  
Project engineer on the study of a pretreatment facility to treat wastewater from a major brewery and a large cheese processing plant in Lehigh County, Pennsylvania.

Associate Engineer, James M. Montgomery Consulting Engineers, Walnut Creek, CA, and Williamsburg, VA; Aug. 1978 - May 1980. Assistant project engineer for the design and resident engineer for the construction of a major upgrade to a 19 MGD wastewater treatment plant in Williamsburg, VA.

Teaching Assistant, Ecole Nationale Supérieure des Arts et Industries de Strasbourg, Strasbourg, France. September 1977 - June 1978.

Laboratory Research Assistant, Infilco Degrémont, S.A., Paris, France. June 1977 - August 1977.

### PROFESSIONAL REGISTRATION

Professional Engineer, Commonwealth of Virginia, License No. 12676.  
Board Certified Environmental Engineer, American Academy of Environmental Engineers

### PROFESSIONAL SOCIETIES

American Chemical Society, Environmental Chemistry Division  
American Geophysical Union, Hydrology Section  
American Society of Civil Engineers, Environmental Engineering Division  
American Water Works Association  
Association of Environmental Engineering Professors

Coastal and Estuarine Research Federation  
Engineers for a Sustainable World  
Engineers Without Borders-USA  
International Water Association  
International Humic Substances Society  
National Ground Water Association; Association of Groundwater Scientists and Engineers  
Sigma Xi Scientific Research Society  
Water Environment Federation

## HONORS AND AWARDS

Diversity Recognition Award, Johns Hopkins Institutions Diversity Leadership Council, 2009  
Capers and Marion McDonald Award for Excellence in Mentoring and Advising, 2008  
JHU Office of Student Involvement Outstanding Student Organization Advisor Award, 2007  
AEESP Outstanding Publication Award, 2006 (w/ PhD advisor, Paul V. Roberts)  
AEESP/CH2M Hill Doctoral Thesis Award, 2006 (w/ advisee T. Helen Nguyen)  
Excellence in Review Award, *Environmental Science and Technology*, 2004  
Rudolph Hering Medal, American Society of Civil Engineers, 1999 (with A. Braghetta and F.A. DiGiano).  
Advisor; Outstanding student paper award, 1998 AGU Spring Meeting (G. Xia)  
Advisor, 1997 API/NGWA Scholarship (C. Liu)  
Presidential Young Investigator Award; National Science Foundation, 1991  
Academic Achievement Award -- Second Place Doctoral Dissertation; American Water Works Assoc., 1991  
Summer Faculty Research Program Award, United States Air Force, 1991  
Who's Who in America in Science and Engineering / Who's Who in American Education  
Abel Wolman Doctoral Fellowship, American Water Works Association, 1986  
Achievement Reward for College Scientists, ARCS Foundation, 1985 and 1986  
Nelson Taylor Fellowship, Stanford University, 1977  
Graduated with Highest Distinction, University of Virginia, 1976  
Shannon Award for Academic Achievement, University of Virginia, 1976  
A.S.C.E. W. S. Thompson Student Award, University of Virginia, 1976  
Raven Society, Service and Academic Honorary, University of Virginia  
Chi Epsilon, Civil Engineering Honorary, University of Virginia  
Tau Beta Pi, Engineering Honorary, University of Virginia

## RESEARCH INTERESTS

Environmental Engineering: Physical and chemical processes affecting pollutant fate and treatment in natural environments and engineered systems with focus on the integration of modeling, experimental data, and observations from full-scale monitoring to obtain better process understanding of complex aquatic systems. Applications include water treatment, subsurface remediation, and regional management for the protection of surface water, with current emphasis on the Chesapeake Bay.

## PUBLICATIONS (\* indicates student advisee)

### Refereed Journals (in preparation or submitted)

1. Zhang,\* Q., C.J. Harman, and J.W. Kirchner. "Evaluation of Methods for Estimating Long-Range Dependence in Irregular Water Quality Time Series", submitted to *Hydrology and Earth Systems Science* (2017).
2. Wilusz,\* D. C., Ball, W.P., Harman, C.J., "Modeling the sensitivity of catchment transit times to estimate rainfall variability under present and future climate," submitted to *Water Resources Research* (2017).
3. Zhang,\* Q. and W.P. Ball. "Non-stationary Concentration-Discharge Relationships: A Top-down Synthesis of Nutrient and Sediment Patterns in the Major Tributaries to Chesapeake Bay", manuscript in preparation.
4. Zhang,\* Q., W.P. Ball, and K. Staver. "What Can We Learn from Limited Data? Statistical Inferences and Uncertainties of Riverine Fluxes and Trends with Limited Sampling of Extreme-Flow Events", manuscript in preparation for *Environmental Science and Technology Letters*.

## Refereed Journal Articles

1. Zhang,\* Q. and W.P. Ball, "Improving Riverine Constituent Concentration and Flux Estimation by Accounting for Antecedent Discharge Conditions," DOI: 10.1016/j.jhydrol.2016.12.052, *Journal of Hydrology*, 547(April): 387–402 (2017).
2. Zhang,\* Q., W.P. Ball, and D.L. Moyer, "Decadal-scale Export of Nitrogen, Phosphorus, and Sediment from the Susquehanna River Basin, USA: Analysis and Synthesis of Temporal and Spatial Patterns," DOI: 10.1016/j.scitotenv.2016.03.104, *Science of the Total Environment*, 563–564: 1016–1029 (2016).
3. Zhang,\* Q., C.J. Harman, and W.P. Ball, "An Improved Method for Interpretation of Riverine Concentration-Discharge Relationships Indicates Long-Term Shifts in Reservoir Sediment Trapping," DOI:10.1002/2016GL069945, *Geophysical Research Letters*, 43 (2016).
4. Zhang,\* Q., R.L. Hirsch, and W.P. Ball, "Long-Term Changes in Sediment and Nutrient Delivery from Conowingo Dam to Chesapeake Bay: Effects of Reservoir Sedimentation," DOI: 10.1021/acs.est.5b04073, *Environmental Science and Technology*, 50(4): 1877–1886 (2016).
5. Zhang,\* Q., D.C. Brady, W.R. Boynton, and W.P. Ball, "Long-term Seasonal Trends of Nutrients and Sediment from the Non-tidal Chesapeake Bay Watershed: An Assessment of Progress," DOI: 10.1111/1752-1688.12327, *Journal of the American Water Resources Association*, 52(6):1534-1555 (2015).
6. Murphy,\* R.R., E. Perlman, W.P. Ball, and F.C. Curriero, "Water-Distance-Based Kriging in Chesapeake Bay," DOI: 10.1061/(ASCE)HE.1943-5584.0001135, 05014034, *J. Hydrol. Eng.*, 20(9) (2014).
7. Kelley,\* C.D., A. Krolick, L. Brunner,\* A. Burklund,\* D. Kahn,\* W.P. Ball,\* and M. Weber-Shirk, "An Affordable Open-Source Turbidimeter," DOI: 10.3390/s140407142 *Sensors*, 14(4): 7142-7155 (2014).
8. Yang,\* J.; J.L. Bitter, B.A. Smith, D.H. Fairbrother, and W.P. Ball, "Transport of multi-walled carbon nanotubes through porous media: influences of aquatic chemistry, surface oxidation, and natural organic matter," DOI: 10.1021/es402448w, *Environmental Science and Technology*, 47(24): 14034-14043 (2013).
9. Zhang,\* Q., D.C. Brady, and W.P. Ball, "Long-term seasonal trends of nitrogen, phosphorus, and suspended sediment load from the non-tidal Susquehanna River Basin to Chesapeake Bay," *Science of The Total Environment*, DOI: 10.1016/j.scitotenv.2013.02.012, 452–453: 208-221 (2013).
10. Murphy,\* R.R., W.M. Kemp, and W.P. Ball, "Long-Term Trends in Chesapeake Bay Seasonal Hypoxia, Stratification, and Nutrient Loading," DOI:10.1007/s12237-011-9413-7, *Estuaries and Coasts*, 34(6): 1293-1309 (2011).
11. Silliman, S., R.H. Mohtar, K.G. Paterson and W.P. Ball, "Engineering Academic Programs for Hydrophilanthropy: Commonalities and Challenges," Universities Council on Water Resources: *Journal of Contemporary Water Research & Education*, 145: 5-29 (2010).
12. Perlman, R. Burns, M. Kazhdan, R. Murphy\*, W.P. Ball, and N. Amenta. "Organization of Data in Non-Convex Spatial Domains," *Scientific and Statistical Database Management, Lecture Notes in Computer Science*, DOI: 10.1007/978-3-642-13818-8\_25, 6187: 342-359 (2010).
13. Chen, K.L., B.A. Smith, W.P. Ball, and D.H. Fairbrother, "Assessing the Colloidal Properties of Engineered Nanoparticles in Water: Case Studies from Fullerene C60 Nanoparticles and Carbon Nanotubes," invited review, DOI:10.1071/EN09112, *Environmental Chemistry*, 7: 10-27 (2010)
14. Cho, H-H, K. Wepasnick, B.A. Smith, F. K. Bangash, D. Howard Fairbrother, and W.P. Ball, "The Roles of Graphenic Carbon and Carboxyl Functional Groups on the Sorption of Zn(II) by Multi-Walled Carbon Nanotubes in Aqueous Solution," DOI: 10.1021/la902440u, *Langmuir* 26(2), 967–981 (2010).
15. Murphy,\* R., F.C. Curriero, W.P. Ball, "Comparison of Spatial Interpolation Methods for Water Quality Evaluation in the Chesapeake Bay," invited paper, DOI:10.1061/(ASCE)EE.1943-7870.0000121, *ASCE J. of Environmental Engineering*, 136(2):160-171 (2010).
16. Bai\*, J., C. Liu, and W.P. Ball, "Study of Sorption-Retarded U(VI) Diffusion in Hanford Silt/Clay Material," DOI: 10.1021/es901306c, *Environmental Science and Technology*, 43(20): 7706–7711 (2009).
17. Smith, B., K. Wepasnick, K.E. Schrote, H-H Cho, W.P. Ball, D.H. Fairbrother, "Influence of Surface Oxides on the Colloidal Stability of MultiWalled Carbon Nanotubes: A Structure-Property Relationship," DOI: 10.1021/la901128k, *Langmuir* 25(17): 9767–9776 (2009).
18. Smith, B.A., K.W. Wepasnick, K.E. Schrote, A.R. Bertele, W.P. Ball, C.R. O'Melia, and D.H. Fairbrother, "Colloidal Properties of Aqueous Suspensions of Acid-Treated, Multi-Walled Carbon Nanotubes," *Environmental Science and Technology*, 43(3): 819-825 (2009).

19. CBEO Project Team (W.P. Ball, D. Brady, M. Brooks, R. Burns, B.E. Cuker, D.M. Di Toro, T.F. Gross, W.M. Kemp, L. Murray, R. Murphy\*, E. Perlman; M. Piasecki, J. Testa, I. Zaslavsky), "A Prototype System for Multi-Disciplinary Shared Cyberinfrastructure –Chesapeake Bay Environmental Observatory (CBEO)," DOI: 10.1061/(ASCE)1084-0699, *ASCE Journal of Hydrologic Engineering*, 13(10): 960-970. (2008)
20. Cho, H-H, B.A. Smith, J.D. Wnuk, D.H. Fairbrother, and W.P. Ball, "Influence of Surface Oxides on the Adsorption of Naphthalene onto Multiwalled Carbon Nanotubes," *Environmental Science and Technology*, 42(8): 2899–2905 (2008).
21. DiGenova, T., B. Yohannes, D. Hill, W.P. Ball, R. Shklyan, Y. Li, and D. Alcock, "Sustainable engineering requires community collaboration," *World Water and Environmental Engineering*, January/February: 34-37 (2008).
22. Haws, N.W., W.P. Ball, and E.J. Bouwer, "Implications of intraparticle contaminant distributions on desorption modeling and long-term availability," *Journal of Environmental Quality*, 36 (Sept-Oct): 1392-1402 (2007).
23. Hammes, K., M.W.I. Schmidt, L.A. Currie, W.P. Ball, T.H. Nguyen, and 35 others, "Comparison of quantification methods to measure fire-derived (black/elemental) carbon in soils and sediments using reference materials from soil, water, sediment and the atmosphere," DOI:10.1029/2006GB002914, *Global Biogeochemical Cycles*, 21(3): art. no. GB3016 (2007).
24. Nguyen,\* T.H., H-H Cho, D. L. Poster, and W.P. Ball, "Evidence for a Pore-Filling Mechanism in the Adsorption of Aromatic Hydrocarbons to a Natural Wood Char," *Environmental Science and Technology*, 41(4): 1212-1217 (2007).
25. Haws, N. W., M. R. Paraskewich, Jr.,\* M. Hilpert, and W.P. Ball, "Effect of fluid velocity on model-estimated rates of radial solute diffusion in a cylindrical macropore column," DOI:10.1029/2006WR005751, *Water Resources Research*, 43, W10409, (2007)
26. Nguyen,\* T.H. and W.P. Ball, "Absorption and Adsorption of Hydrophobic Organic Contaminants to Diesel and Hexane Soot," *Environmental Science and Technology*, 40(9): 2958-2964 (2006).
27. Dong, W., G. Xie, T.R. Miller, M.P. Franklin, T.P. Oxenberg, E.J. Bouwer, W.P. Ball, R.U. Halden, "Sorption and Bioreduction of Hexavalent Uranium at a Military Facility by the Chesapeake Bay," *Environmental Pollution*, 142: 132-146 (2006).
28. Brown,\* R.A., A.K. Kercher, T.H. Nguyen,\* D.C. Nagle, and W.P. Ball, "Development of Synthetic Wood Chars as Models of Naturally Occurring Carbon Sorbents," *Organic Geochemistry*, 37: 321-333 (2006).
29. Haws, N.W., E.J. Bouwer, and W.P. Ball, "The influence of biogeochemical conditions and level of model complexity when simulating cometabolic biodegradation in sorbent-water systems," *Advances in Water Resources*, 29: 571-589 (2006).
30. Haws, N.W., W.P. Ball, and E. J. Bouwer, "Modeling and Interpreting Bioavailability of Organic Contaminant Mixtures in Subsurface Environments," *Journal of Contaminant Hydrology*, 82(3-4) 255-292 (2005).
31. Dong, W., W.P. Ball, C. Liu, Z. Wang, A.T. Stone, J. Bai\*, and J. Zachara, "Influence of Calcite and Dissolved Calcium on U(VI) Sorption to a Hanford Subsurface Sediment," DOI: 10.1021/es0505088, *Environmental Science and Technology*, 39(20): 7949-7955. (2005).
32. Nguyen,\* T. H., I. Sabbah, and W.P. Ball, "Immobilization of Soot Particles in a Silica Matrix: A Solvent-Carrier System for Studying Organic Chemical Sorption," DOI: 10.1021/es048271n, *Environmental Science and Technology*, 39(17): 6527-6534 (2005).
33. Sabbah, I., W.P. Ball, D.F. Young, and E.J. Bouwer, "Misinterpretations in the Modeling of Contaminant Desorption from Environmental Solids when Equilibrium Conditions Are Not Fully Understood," *Environmental Engineering Science*, 22(3): 350-356 (2005).
34. Nguyen,\* T. H., K-U Goss, and W.P. Ball, "Polyparameter Linear Free Energy Relationships for Estimating the Equilibrium Partition of Organic Compounds between Water and the Natural Organic Matter in Soils and Sediments," *Environmental Science and Technology*, DOI: 10.1021/es048839s, 39(4): 913-924 (2005).
35. Nguyen,\* T. H., I. Sabbah, and W.P. Ball, "Sorption Nonlinearity for Organic Contaminants with Diesel Soot: Method Development and Isotherm Interpretation, DOI: 10.1021/es0499748, *Environmental Science and Technology*, 38(13): 3595-2603 (2004).

36. Nguyen,\* T.H., R.A. Brown,\* and W.P. Ball, "An Evaluation of Thermal Resistance as a Measure of Black Carbon Content in Diesel Soot, Wood Char, and Sediment," DOI: 10.1016/j.orggeochem.2003.09.005 *Organic Geochemistry*, 35(3): 217-234; (2004).
37. Weiss, W.J., E.J. Bouwer, W.P. Ball, C.R. O'Melia, R. Aboytes, and T. Speth, "Riverbank Filtration: Effect of Ground Passage on NOM Character," *J. Water Supply: Research and Technology-AQUA*, 53(2): 61-83 (2004).
38. Weiss, W.J., E.J. Bouwer, W.P. Ball, C.R. O'Melia, H. Arora, and T. Speth, "Comparing Riverbank Filtration with Bench-Scale Conventional Treatment for Precursor Reduction," *J. AWWA*, 95(12): 67-79 (2003).
39. Weiss, W.J., E.J. Bouwer, W.P. Ball, C.R. O'Melia, M.W. LeChevalier, H. Arora, and T. Speth, "Riverbank Filtration: Fate of DBP Precursors and Selected Microorganisms," *J. AWWA*, 95(10): 68-82 (2003).
40. Klausen, J., P.J. Vikesland, T. Kohn, D.R. Burris, W.P. Ball, and A.L. Roberts, "Longevity of Granular Iron in Groundwater Treatment Processes: Solution Composition Effects on Reduction of Organohalides and Nitroaromatic Compounds," *Environmental Science and Technology*, 37(6): 1208-1218 (2003).
41. Vikesland, P.J., J. Klausen, H. Zimmermann,\* A.L. Roberts, and W.P. Ball, "Longevity of Granular Iron in Groundwater Treatment Processes: Changes in Solute Transport Properties over Time," *Journal of Contaminant Hydrology*, 64(1-2): 3-33 (2003).
42. Allen-King, R.M., P. Grathwohl, and W.P. Ball, "New Modeling Paradigms for the Sorption of Hydrophobic Organic Chemicals to Heterogeneous Carbonaceous Matter in Soils, Sediments, and Rocks," *Advances in Water Resources*, 25(8-12): 985-1016 (2002).
43. Liu,\* C. and W.P. Ball, "Back Diffusion of Chlorinated Solvent Contaminants from a Natural Aquitard to a Remediated Aquifer under Well-Controlled Field Conditions: Predictions and Measurements," *Ground Water*, 40(2): 175-184 (2002).
44. Xia,\* G. and W.P. Ball, "Polanyi-Based Models for the Competitive Sorption of Low-Polarity Organic Contaminants on a Natural Sorbent," *Environmental Science and Technology*, 34(7): 1246-1253 (2000).
45. Young,\* D.F., and W.P. Ball, "Column Experimental Design Requirements for Estimating Model Parameters from Temporal Moments under Nonequilibrium Conditions," *Advances in Water Resources*, 23(5): 449-460 (2000).
46. Mackay, D.M., R.D. Wilson, M.P. Brown, W.P. Ball, G. Xia,\* and D.P. Durfee,\* "A Controlled Field Evaluation of Continuous versus Pulsed Pump-and-Treat Remediation of a VOC-Contaminated Aquifer: Site Characterization, Experimental Setup, and Overview of Results," *Journal of Contaminant Hydrology*, 41: 81-131 (2000).
47. Liu,\* C., J.E. Szecsody, J.M. Zachara, and W.P. Ball, "Use of the Generalized Integral Transform Method for Solving Equations of Solute Transport in Porous Media," *Advances in Water Resources*, 23(5): 483-492 (2000).
48. Arnold, W.A., W.P. Ball, and A. L. Roberts, "Polychlorinated Ethane Reaction with Zero-Valent Zinc: Pathways and Rate Control," *Journal of Contaminant Hydrology*, 40: 183-200 (1999).
49. Young,\* D.F. and W.P. Ball, "Two-Region Linear/Nonlinear Sorption Modeling: Batch and Column Experiments," *Environmental Toxicology and Chemistry*, 18(8): 1686-1693 (1999).
50. Liu,\* C. and W.P. Ball, "Application of Inverse Methods to Contaminant Source Identification from Aquitard Diffusion Profiles at Dover AFB, DE," *Water Resources Research*, 35(7): 1975-1985 (1999).
51. Xia,\* G. and W.P. Ball, "Adsorption-Partitioning Uptake of Nine Low-Polarity Organic Chemicals on a Natural Sorbent," *Environmental Science and Technology*, 33(2): 262-269 (1999).
52. Young,\* D.F. and W.P. Ball, "Estimating Diffusion Coefficients in Low Permeability Aquitard Material Using a Macropore Column," *Environmental Science and Technology*, 32(17): 2578-2584 (1998).
53. Braghetta, A., F.A. DiGiano, and W.P. Ball, "NOM Accumulation at the NF Membrane Surface: Impact of Chemistry and Shear," *Journal of Environmental Engineering, ASCE*, 124(11): 1087-1098 (1998).
54. Njoroge,\* B.N.K., W.P. Ball, and R.S. Cherry, "Sorption of 1,2,4-Trichlorobenzene and Tetrachloroethene within an Authigenic Soil Profile: Changes in  $K_{oc}$  with Soil Depth," *Journal of Contaminant Hydrology*, 29(4): 347-377 (1998).
55. Zhang, W., E.J. Bouwer, and W.P. Ball, "Bioavailability of Hydrophobic Organic Contaminants - Effects and Implications of Sorption-Related Mass Transfer on Bioremediation," *Groundwater Monitoring and Remediation* 18(1): 126-138 (1998).

56. Liu,\* C., W.P. Ball, and J.H. Ellis, "An Analytical Solution to the One-Dimensional Solute Advection-Dispersion Equation in Multi-Layer Porous Media," *Transport in Porous Media*, **30**: 25-43 (1998).
57. Liu,\* C., and W.P. Ball, "Analytical Modeling of Diffusion-Limited Contamination and Decontamination in a Two-Layer Porous Medium," *Advances in Water Resources*, **24**(4): 297-313 (1998).
58. Ball, W.P., C. Liu,\* G. Xia,\* and D. F. Young,\* "A Diffusion-Based Interpretation of Tetrachloroethene and Trichloroethene Concentration Profiles in a Groundwater Aquitard," *Water Resources Research*, **33**(12): 2741-2758 (1997). [Note: Three corrections were published in *Water Resources Research*, **37**(1): 189 (2001)]
59. Young,\* D.F. and W.P. Ball, "Injection Mode Effects on Tracer Experiments in Columns," *Journal of Hydrologic Engineering, ASCE*, **2**(3): 113-119 (1997).
60. Braghetta, A., F.A. DiGiano, and W.P. Ball, "Influence of pH and Ionic Strength on Removal of Natural Organic Matter by Nanofiltration," *Journal of Environmental Engineering, ASCE*, **123**(7): 628-641 (1997).
61. Young,\* D.F. and W.P. Ball, "Effect of Column Conditions on First-Order Rate Modeling of Nonequilibrium Solute Breakthrough -- Cylindrical Macropores vs. Spherical Media," *Water Resources Research*, **33**(5): 1149-1156 (1997).
62. Ball, W.P., G. Xia,\* D.P. Durfee,\* R.D. Wilson, M.J. Brown and D.M. Mackay, "Hot-Methanol Extraction for the Analysis of Volatile Organic Chemicals in Subsurface Core Samples from Dover AFB, DE," *Ground Water Monitoring and Remediation*, **17**(1): 104-121 (1997).
63. Young,\* D.F. and W.P. Ball, "Effect of Column Conditions on the First-Order Rate Modeling of Nonequilibrium Solute Breakthrough," *Water Resources Research*, **31**(9): 2181-2192 (1995).
64. Young,\* D.F., and W.P. Ball, "A Priori Simulation of Tetrachloroethene Transport Through Aquifer Material Using an Intraparticle Diffusion Model," *Environmental Progress*, **13**(4): 9-20 (1994).
65. Freiburger,\* E.J., T.L. Jacobs, and W.P. Ball, "Probabilistic Evaluation of Packed Tower Aeration Designs for VOC Removal," *Journal of the American Water Works Association*, **85**(10): 73-86 (1993).
66. Ball, W.P. and P.V. Roberts, "Long-Term Sorption of Halogenated Organic Chemicals by Aquifer Materials - Part 1. Equilibrium," *Environmental Science and Technology*, DOI: [10.1021/es00019a002](https://doi.org/10.1021/es00019a002), **25**(7): 1223-1237 (1991).
67. Ball, W.P. and P.V. Roberts, "Long-Term Sorption of Halogenated Organic Chemicals by Aquifer Materials - Part 2. Intraparticle Diffusion," *Environmental Science and Technology*, DOI: [10.1021/es00019a003](https://doi.org/10.1021/es00019a003), **25**(7): 1237-1249 (1991).
68. Ball, W.P., Ch. Buehler, T.C. Harmon, and P.V. Roberts, "Characterization of Sandy Aquifer Material at the Grain Scale," *Journal of Contaminant Hydrology*, **5** (3): 253-296 (1990).
69. Mackay, D.M., W.P. Ball, and M.G. Durant, "Variability of Aquifer Sorption Properties in a Field Experiment on Groundwater Transport of Organic Solutes: Methods and Preliminary Results," *Journal of Contaminant Hydrology*, **1**(1): 119-132 (1986).
70. Ball, W.P., M.D. Jones, M.C. Kavanaugh, "Mass Transfer of Volatile Organic Compounds in Packed Tower Aeration," *Journal Water Pollution Control Federation*, **56**(2): 127-136 (1984).

#### Book Chapters and Other Refereed Publications

1. Fairbrother, D.H., B.A. Smith, J. Wnuk, K. Wespanick, W.P. Ball, H-H Cho, and F.K. Bangash, "Surface Oxides on Carbon Nanotubes (CNTs): Effects on CNT Stability and Sorption Properties in Aquatic Environments," pp 131-156 in *Nanoscience and Nanotechnology*, V.H. John Wiley & Sons, Inc. (2008).
2. Liu, C. and W.P. Ball, "Application of the Generalized Integral Transform Technique for Solute Transport Modeling in Heterogeneous Porous Media," Chapter IV in *Hybrid Methods in Environmental Transport Phenomena*, R.M. Cotta, R. Goldstein, P.F.L. Heilbron, M.J. Unga (Eds.), Center for Analysis and Simulations in Environmental Engineering (CASEE), Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, pp. 59-81 (2005).
3. Weiss, W. J., E.J. Bouwer, W.P. Ball, C.R. O'Melia, H. Arora, and T.F. Speth, "Reduction in DBP Precursors and Pathogens during Riverbank Filtration at Three Midwestern Drinking Water Utilities," in *Riverbank Filtration: Improving Source-Water Quality*, C. Ray, G. Melin, and R.B. Linsky (Eds.), Kluwer Academic Publishers, Boston, 390 pp (2003).
4. Ball, W.P. and C. Liu,\* "Diffusion-Limited Contamination and Decontamination in a Layered Aquitard: Forensic and Predictive Analysis of Field Data," in *Resource Recovery, Confinement, and Remediation of*

- Environmental Hazards; IMA Volumes in Mathematics and its Application, No. 131*, J. Chadam, A. Cunningham, R.E. Ewing, P. Ortoleva, and M.F. Wheeler (Eds.), Springer-Verlag, NY, pp. 179-194 (2002).
5. P.C. D'Adamo, E.J. Bouwer, E.J., and W.P. Ball, "Coal Tar Contamination: Bioremediation and Bioavailability," in *Resource Recovery, Confinement, and Remediation of Environmental Hazards; IMA Volumes in Mathematics and its Application, No. 131*, J. Chadam, A. Cunningham, R.E. Ewing, P. Ortoleva, and M.F. Wheeler (Eds.), Springer-Verlag, NY, pp. 217-230 (2002).
  6. Ball, W.P., A.T. Stone, and A.L. Roberts, "Laboratory Study of Completely Mixed Flow Reactors Using UV/Visible Spectrophotometry," Chapter 1.2.1 in *AEESP Environmental Engineering Processes Laboratory Manual*, S. E. Powers, J.J. Bisogni, Jr., J. G. Burken, and K. Pagilla (Eds.), Association of Environmental Engineering and Science Professors, Champaign, IL(2001).
  7. Ball, W.P., G.P. Curtis and P.V. Roberts, "Physical/Chemical Processes Affecting the Subsurface Fate and Transport of Synthetic Organic Chemicals," Chapter 3 in *Subsurface Restoration*, C.H. Ward, R.M. Scalf, and J. Cherry (Eds.), Ann Arbor Press, Chelsea, MI, pp. 27-58 (1997).
  8. Ball, W.P. and P.V. Roberts, "Diffusive Rate Limitations in the Sorption of Organic Chemicals," Chapter 13, *Organic Substances and Sediments in Water: Vol. 2, Processes and Analytical*, R. A. Baker (ed.), Lewis Publishers, Inc., Chelsea, MI, pp. 273-310 (1991).
  9. Harmon, T.C., W.P. Ball, and P.V. Roberts, "Nonequilibrium Transport of Organic Contaminants in Groundwater," Chapter 16, *Reactions and Movement of Organic Chemicals in Soils*, SSSA Special Publication, No. 22, pp. 405-437 (1989).

#### **Discussion Papers, Book Reviews**

1. Allen-King, R.M. and W.P. Ball, "Comment on 'Sorption Kinetics of Organic Contaminants by Sandy Aquifer and its Kerogen Isolate'," *Environmental Science and Technology*, **40**(7); 2489-2490 (2006).
2. Nguyen, T. H., I. Sabbah, W.P. Ball, "Response to Comment on 'Sorption Nonlinearity for Organic Contaminants with Diesel Soot: Method Development and Isotherm Interpretation'," *Environmental Science and Technology* **38**(20): 5486-5487 (2004).
3. Ball, W.P., C. Liu,\* G. Xia,\* and D. F. Young,\* "Correction to 'A Diffusion-Based Interpretation of Tetrachloroethene and Trichloroethene Concentration Profiles in a Groundwater Aquitard'," *Water Resources Research*, **37**(1): 189 (2001).
4. Ball, W.P., "Book Review: 'Diffusion in Natural Porous Media: Contaminant Transport, Sorption/Desorption and Dissolution Kinetics' by Peter Grathwohl," *Ground Water* **37**(1):5 (1999)
5. Ball, W.P., Goltz, M.N., Roberts, P.V., Valocchi, A.J., and Brusseau, M.L., "Comment on 'Field-Scale Transport of Nonpolar Organic Solutes in 3-D Heterogeneous Aquifers'," *Environmental Science and Technology* **32**(17): 2654-2655 (1998)
6. Ball, W.P. and P.V. Roberts, "Comment on 'Long-Term Sorption of Halogenated Organic Chemicals by Aquifer Material. 1. Equilibrium'," *Environmental Science and Technology*, **26** (11) pp. 2301-2302 (1992).
7. Ball, W.P., M.N. Goltz, and P.V. Roberts, "Comment on 'Modeling the Transport of Solutes Influenced by Multi-Process Nonequilibrium' by M.L. Brusseau, R. Jessup, and P.S.C. Rao," *Water Resources Research*, **27** (4) 653-656 (1991).

#### **Data Publications**

1. Zhang, Q. and W.P. Ball. 2016. "Data associated with Improved Method for Interpretation of Concentration-Discharge Relationships in Riverine Water-Quality Data", *Johns Hopkins University Data Archive*, [dx.doi.org/10.7281/T18G8HM0](https://dx.doi.org/10.7281/T18G8HM0).
2. Zhang, Q. and W.P. Ball. 2016. "Data associated with Decadal-scale export of nitrogen, phosphorus, and sediment from the Susquehanna River basin, USA: Analysis and synthesis of temporal and spatial patterns", *Johns Hopkins University Data Archive*, [dx.doi.org/10.7281/T1QN64NW](https://dx.doi.org/10.7281/T1QN64NW).
3. Zhang, Q. and W.P. Ball. 2014. "Data associated with Long-term seasonal trends of nutrients and sediment from the nontidal Chesapeake Bay Watershed", *Johns Hopkins University Data Archive*, [dx.doi.org/10.7281/T1VD6WC7](https://dx.doi.org/10.7281/T1VD6WC7).
4. Zhang, Q. and W.P. Ball. 2014. "Data associated with Long-term seasonal trends of nitrogen, phosphorus, and suspended sediment load from the non-tidal Susquehanna River Basin to Chesapeake Bay", *Johns Hopkins University Data Archive*, [dx.doi.org/10.7281/T1KW5CX5](https://dx.doi.org/10.7281/T1KW5CX5).



**Conference Presentations and Proceedings Publications (LAST 10 YEARS; presenter underlined)**

1. Zhang, \* Q., C.J. Harman, and W.P. Ball. 2016. "An Improved Method for Interpretation of Concentration-Discharge Relationships in Riverine Water-Quality Data", poster presentation at *American Geophysical Union Fall Meeting*, San Francisco, CA, December 12-16, 2016.
2. W.P. Ball and Q. Zhang. \* 2016. "Improving Riverine Constituent Concentration and Flux Estimation by Accounting for Antecedent Discharge Conditions", presentation at *American Geophysical Union Fall Meeting*, San Francisco, CA, December 12-16, 2016.
3. Zhang, Q., R.M. Hirsch, and W.P. Ball, 2016. "Temporal Changes in Net Deposition of Sediment and Nutrients behind Conowingo Dam under Different Flow Conditions: Statistical Evaluations of Monitoring Data between 1987 and 2013", oral presentation at *Chesapeake Modeling Symposium*, Williamsburg, VA, June 1-2, 2016.
4. Zhang, Q., D.C. Brady, W.R. Boynton, and W.P. Ball, 2016. "Nutrient and Sediment Trends from the Nontidal Chesapeake Bay Watershed: Synthesis of Progress by Season for the Nine Major Tributaries", oral presentation at *Chesapeake Modeling Symposium*, Williamsburg, VA, June 1-2, 2016.
5. Zhang, Q., R.M. Hirsch, and W.P. Ball, 2016. "Effects of Reservoir Filling on Sediment and Nutrient Delivery from Susquehanna River to Chesapeake Bay: Input-Output Analyses based on Long-Term Monitoring", invited oral presentation at *U.S. Geological Survey MD-DE-DC Water Science Center Seminars*, Baltimore, MD, April 12, 2016.
6. Zhang, Q., R.M. Hirsch, and W.P. Ball, 2016. "Effects of Reservoir Filling on Sediment and Nutrient Removal in the Lower Susquehanna River Reservoir System: An Input-Output Analysis based on Long-Term Monitoring", invited oral presentation at *Chesapeake Bay Program's Scientific and Technical Advisory Committee (STAC) Workshop: Conowingo Infill Influence on Chesapeake Water Quality*, Annapolis, MD, January 13-14, 2016.
7. Ball, W.P., Wainger, L., Harman, C.J., Brady, D., Ortiz-Bobea, A., Kemp, M.W., Testa, J.M., Murray, L., Wilusz,\* D.C., "Project Overview: Impacts of Climate Change on the Phenology of Linked Agriculture-Water Systems", poster presentation at the *2016 Water Sustainability and Climate NSF Investigator Meeting*, March 9-11, Arlington, VA; (2016).
8. Zhang,\* Q and W.P. Ball. 2015. "Non-stationary Concentration-Discharge Relationships for Nitrogen, Phosphorus, and Sediment for Nine Major Tributaries of the Chesapeake Bay", oral presentation at *American Geophysical Union Fall Meeting*, San Francisco, CA, December 14-18 (2015).
9. Wilusz,\* D.C., C. J. Harman, W. P. Ball, "Implications of an "inverse storage effect" (ISE) on the sensitivity of watershed transit times to rainfall variability at Plynlimon, Wales", poster presentation at the *American Geophysical Union (AGU) Fall Meeting*, December 14-18, San Francisco, CA, Abstract H21F-1434; (2015).
10. W.P. Ball, Q. Zhang\*, and R.M. Hirsch. 2015. "Effects of Reservoir Filling on Sediment and Nutrient Removal in the Lower Susquehanna River Reservoir: An Input-Output Analysis Based on Long-Term Monitoring", invited oral presentation at *American Geophysical Union Fall Meeting*, San Francisco, CA, December 14-18 (2015).
11. Zhang,\* Q. and W.P. Ball. 2015. Concentration-Discharge Relationships for Nutrients and Sediment in Major Tributaries to Chesapeake Bay: Typical Patterns and Non-Stationarity, poster presentation at *Maryland Water Monitoring Council Annual Conference*, Linthicum Heights, MD, November 13 (2015).
12. Zhang,\* Q., W.P. Ball., and D.L. Moyer. 2015. "Long-Term Export of Nitrogen, Phosphorus, and Sediment in the Susquehanna River Basin: Analysis of Decadal-Scale Trends and Sub-Basin Mass Balances", oral presentation at *Geological Society of America Annual Meeting*, Baltimore, MD, November 1-4 (2015).
13. Wilusz,\* D. C., C.J. Harman, W.P. Ball, "A statistical approach to regionalizing lumped parameter transit time model parameters in the Chesapeake Bay Watershed", oral presentation at the *2015 Geological Society of America Annual Meeting*, November 1-4, Baltimore, MD; (2015)
14. Chow, S.J., T. Banerji, W.P. Ball, and M. Kosek, "Bacteriologic Assessment of a Locally Derived Dry Toilet System: A Case Study in Iquitos, Peru," *WEFTEC® 2015 Annual Technical Exhibition and Conference of the Water Environment Federation*, September 28-30, Chicago, IL (2015).
15. Ball, W.P., Q. Zhang,\* D.C. Brady, and W.R. Boynton. 2015. "Long-term Trends of Nutrients and Sediment from the Non-tidal Chesapeake Watershed: An Assessment of Progress by River and Season",



- oral presentation at *Association of Environmental Engineering and Science Professors (AEESP) Annual Conference*, New Heaven, CT, June 13-16 (2015).
16. Wilusz, \* D.C., C.J. Harman, and W.P. Ball, "Exploring the Influence of Climate Variability on Transit Times in a Small Temperate Watershed at Plynlimon, Wales, from 1983-2008", Association of Environmental Engineering and Science Professors (AEESP) 2015 Conference, June 13-16, Yale University, New Haven, CT (2015).
  17. Wilusz, \* D.C., C. J. Harman, W. P. Ball, "Modeling the linkages between transit time distributions and climate variability: opportunities and challenges in the Chesapeake Bay Watershed", poster presentation at the *Geological Society of America (GSA) Northeastern Section 50th Annual Meeting*, March 23-25, Bretton Woods, NH, Paper No. 58-4; (2015).
  18. Wilusz, \* D.C., C.J. Harman, and W.P. Ball, "The Modeling of Time-Varying Stream Water Age Distributions: Preliminary Investigations with Non-Conservative Solutes", Oral Presentation at *American Geophysical Union (AGU) Fall Meeting*, December 15-19, San Francisco, CA, Abstract H21L-02; (2014).
  19. Ball, \* W.P., Q. Zhang\*, D.C. Brady, and W.R. Boynton, "Long-Term Loads of Nutrients and Sediment from Non-Tidal Regions of the Chesapeake Bay Watershed: An Assessment of Seasonal Trends and Progress", Poster presentation at *American Geophysical Union (AGU) Fall Meeting*, December 15-19, San Francisco, CA, Abstract H23G-0958; (2014).
  20. Zhang, \* Q., C.J. Harman, and W.P. Ball, "Evaluation of Methods for Estimating Long-Range Dependence in Water Quality Time Series with Missing Data and Irregular Sampling", Poster presentation at American Geophysical Union (AGU) Fall Meeting, December 15-19, San Francisco, CA, Abstract H13D-1151; (2014).
  21. Wei, \* H., D. Ha, \* Q. Zhang, \* and W.P. Ball, "Effectiveness of Nitrogen Assimilation in the Non-Tidal Chesapeake Bay Watershed: Evaluations Based on Thirty Years of Data", Poster presentation at American Geophysical Union (AGU) Fall Meeting, December 15-19, San Francisco, CA, Abstract H23G-0959 (2014).
  22. Wei, H., \* D. Ha, Q. Zhang\*, and W.P. Ball, "Retrospective Analysis of Phosphorus Source Input and Riverine Output in the Chesapeake Bay Watershed", Poster presentation at Maryland Water Monitoring Council (MWMC) 20th Annual Conference, Linthicum Heights, MD; November 21 (2014).
  23. D. Ha, \* H. Wei, \* Q. Zhang, \* and W.P. Ball, "Nitrogen Source Input from the Non-Tidal Chesapeake Bay Watershed and Output in the Major Rivers: Evaluation of Changes Based on Long-term Data", Poster presentation at Maryland Water Monitoring Council (MWMC) 20th Annual Conference, Linthicum Heights, MD; November 21 (2014).
  24. D. Ha, \* H. Wei, \* Q. Zhang, \* and W.P. Ball, "Retrospective Analysis of Sediment-associated Phosphorus Concentration in the Non-Tidal Chesapeake Bay Watershed", Poster presentation at Maryland Water Monitoring Council (MWMC) 20th Annual Conference, Linthicum Heights, MD; November 21 (2014).
  25. MacDonald, \* L.A.S., E. Schoenberger, W.P. Ball, "Household Water Treatment & Safe Storage: Knowledge Development & Diffusion in the Scientific Literature & Its Potential Impact on Practice" Poster Presentation at Water and Health: Where Science Meets Policy, October, Chapel Hill, NC, (2014)
  26. Ball, W.P. and J. Yang, \* "Effects of Surface Oxides and Natural Organic Matter on the Aquatic Behavior of Carbon Nanotubes," **invited** seminar, University of Texas at Austin, Austin, TX, July 14 (2014).
  27. Zhang, \* Q. and W.P. Ball, "Decadal-scale Trends of Nutrients and Sediment from the Non-tidal Chesapeake Bay Watershed: Are We Making of Progress in Loading Reduction", Poster presentation at Gordon Research Conference (GRC) - Environmental Sciences: Water, June 22-27, Holderness, NH; (2014).
  28. Zhang, \* Q. and W.P. Ball, "Nutrient and Sediment Delivery from the Susquehanna River to Chesapeake Bay: Long-term Changes in Loading Trend and Reservoir Sedimentation", Oral presentation at Chesapeake Modeling Symposium (ChesMS), May 28-29, Annapolis, MD (2014).
  29. Wilusz, \* D.C., W.P. Ball, "Simulating the effects of intra-monthly rainfall variability on Chesapeake Bay water quality under a changing climate", poster presentation at the Chesapeake Modeling Symposium (ChesMS), Annapolis, MD, May 28-29; (2014).
  30. MacDonald, \* L.A.S., E. Schoenberger, W.P. Ball, "Safe Water Provision in Ghana: A Scaled Approach," Invited Talk at Carnegie Mellon Chapter of the Environmental Water Resource Institute, Pittsburgh, PA, February (2014).

31. Zhang, \* Q. and W.P. Ball, “Long-term Trends and Mass-Balance of Nutrient and Sediment Loadings in the Lower Susquehanna River Watershed”, Oral presentation at Chesapeake Bay Program Modeling Quarterly Review Meeting, Annapolis, MD; January 7 (2014).
32. Zhang, \* Q., and W.P. Ball, “Long-term Seasonal Trends of Nutrients and Sediment from the Non-tidal Chesapeake Bay Watershed: An Assessment of Progress in Loading Reduction,” oral presentation, 2013 AWRA Annual Water Resources Conference, Portland, OR, Nov. 4-7(2013).
33. MacDonald, \* L.A.S., W.P. Ball, and E. Schoenberger, “Household water treatment and safe storage in Ghana: Challenges and policy implications,” oral presentation, 2013 Water and Health Conference, Chapel Hill, N.C., Oct. 14-18 (2013).
34. Zhang, \* Q., D.C. Brady, and W.P. Ball, “Application of a USGS Statistical Tool (WRTDS) toward Assessing Watershed Management and Reservoir Function in the Susquehanna River Basin,” poster presentation, 2013 AEESP Education and Research Conference (“Environmental Engineers and Scientists of 2050: Education, Research, and Practice”), Colorado School of Mines, July 14-16 (2013).
35. MacDonald, \* L.A.S., W.P. Ball, and E. Schoenberger, “Household water treatment and safe storage in Ghana: Challenges and policy implications,” oral presentation, 2013 AEESP Education and Research Conference (“Environmental Engineers and Scientists of 2050: Education, Research, and Practice”), Colorado School of Mines, July 14-16 (2013).
36. Yang, \* J., J.L. Bitter, B.A. Smith, D.H. Fairbrother, and W.P. Ball, “Transport of Oxidized Multi-Walled Carbon Nanotubes through Porous Media,” 2nd Gordon Research Conference on Environmental Nanotechnology, Stowe, VT, June 2-7, 2013.
37. Prosser, \* E., J. Berger, P. Desai, A. Goel, E. Marble, \* A. Mullen, H. Normile, R. Spellissy, \* D. Wilusz, \* J. Zheng, and W.P. Ball, "Sustainable Irrigation in South Africa: Optimizing Design and Maintenance of the Alcock Ram Pump System," poster presentation and Winner of Honorable Mention Award at the US EPA’s National Sustainable Design Expo, Washington, DC, April 17-19 (2013).
38. MacDonald, \* L.A.S., W.P. Ball, and E. Schoenberger, “Household Water Treatment: Policy Development Towards Production, Distribution, and Uptake in Rural Ghana,” 2013 AAG Annual Meeting, American Association of Geographers, Los Angeles, CA, April 10, 2013.
39. Zhang, \* Q., D.C. Brady, and W.P. Ball, "Long-term Seasonal Trends of Nitrogen, Phosphorus, and Suspended Sediment Load from the Non-tidal Susquehanna River Basin to Chesapeake Bay,” poster presentation at the Annual Meeting of the Community Surface Dynamics Modeling System (CSDMS), Boulder, CO, Mar. 23-25, 2013.
40. Yang\* J., B.A. Smith, J.L. Bitter, D.H. Fairbrother, W.P. Ball, “Effects of Surface Oxides on the Behavior of Carbon Nanotubes and their Influence on the Mobility of Other Contaminants in Aquatic Environments,” SETAC North America 33<sup>rd</sup> Annual Meeting, Long Beach CA, 11–15 Nov., 2012.
41. Yang\*, J., J.L. Bitter, D.H. Fairbrother, W.P. Ball, “Transport of Oxidized Multi-walled Carbon Nanotubes through Porous Media: Experimental and Modeling Analysis,” ACS Division of Environmental Chemistry, 244<sup>th</sup> National Meeting, Philadelphia, PA, Aug 19-23, 2012.
42. Zhang, \* Q., and W.P. Ball, ““Long-term Seasonal Nutrient Trends from the Non-tidal Portions of the Major Tributaries to Chesapeake Bay,” poster presentation, Chesapeake Community Modeling Program’s Chesapeake Modeling Symposium 2012. Annapolis, MD, May 2012.
43. Murphy, \* R.R., W.P. Ball, and F.C. Curriero, “Estuary-Specific Spatial Interpolation Methods for Water Quality and Model Performance Evaluation,” Chesapeake Community Modeling Program’s Chesapeake Modeling Symposium 2012. Annapolis, MD, May 2012.
44. Murphy, \* R.R., W.P. Ball, and W.M. Kemp, “Long-term trends in Chesapeake Bay seasonal hypoxia, stratification, and nutrient loading,” oral presentation, 21st Biennial Conference of the Coastal and Estuarine Research Federation, Daytona Beach, FL, Nov. 6-10, 2011; *Societies, Estuaries, and Coasts: Adapting to Change, Abstract Book*, p. 151.
45. Yang, \* J., J.L. Bitter, B.A. Smith, D.H. Fairbrother, and W.P. Ball, "Transport of Multi-Walled Carbon Nanotubes in Porous Media," oral presentation, 2011 AEESP Education and Research Conference (“Global Sustainability and Environmental Engineering and Science: Implications for Research, Education, and Practice”), University of South Florida, Tampa, FL, July 10-12, 2011.
46. Murphy, \* R.R., and W.P. Ball, “Long-Term Trends in Chesapeake Bay Seasonal Hypoxia, Stratification, and Nutrient Loading,” poster presentation, 2011 AEESP Education and Research Conference (“Global Sustainability and Environmental Engineering and Science: Implications for Research, Education, and Practice”), University of South Florida, Tampa, FL, July 10-12, 2011.

47. MacDonald, \* L.A.S., E. Schoenberger, and W.P. Ball, "Aid Efficacy for Point-of-Use Water Treatment: Following Interventions from Inception through Implementation to Evaluation," poster presentation, 2011 AEESP Education and Research Conference ("Global Sustainability and Environmental Engineering and Science: Implications for Research, Education, and Practice"), University of South Florida, Tampa, FL, July 10-12 (2011).
48. Ball, W.P., J. A. Bosch, D.C. Brady, D.D DiToro, W.M. Kemp, R.R. Murphy, J.M. Testa, "Hypoxia in Chesapeake Bay: Mining Decades of Data for New Insights," oral presentation, 2011 AEESP Education and Research Conference ("Global Sustainability and Environmental Engineering and Science: Implications for Research, Education, and Practice"), University of South Florida, Tampa, FL, July 10-12, 2011.
49. Fairbrother, D.H., B.A. Smith, B., K. Wepasnick, J. Yang, H-H Cho, J.L. Bitter, and W.P. Ball, "Influence of Surface Chemistry on environmentally relevant properties of carbon nanotubes in aquatic environments" 85<sup>th</sup> ACS Colloid and Surface Science Symposium, McGill University, Montreal, Canada, June 19-22, 2011
50. Fairbrother, D.H., B.A. Smith, B., K. Wepasnick, J. Yang,\* H-H Cho. H., J.L. Bitter, and W.P. Ball, "Influence of Surface Chemistry on Environmentally Relevant Properties of Carbon Nanotubes." poster presented at 1<sup>st</sup> Gordon Research Conference Environmental Nanotechnology (Life Cycle Perspectives of Nanostructured Materials: Synthesis, Characterization & Risk Assessment for Public Health), Waterville Valley Resort, NH, US. May 29 - June 3, 2011.
51. Yang,\* J., J.L Bitter, B.A. Smith, D.H. Fairbrother, and W.P. Ball,, " Deposition and Attachment of Multi-Walled Carbon Nanotubes to Amorphous Silica Beads During Column Transport Studies," poster presented at 1<sup>st</sup> Gordon Research Conference on Environmental Nanotechnology (Life Cycle Perspectives of Nanostructured Materials: Synthesis, Characterization & Risk Assessment for Public Health), Waterville Valley Resort, Waterville Valley, NH, May 29-June 3, 2011.
52. Yang,\* J., J.L. Bitter, B.A. Smith, D.H. Fairbrother, and W.P. Ball, "Transport of oxidized multi-walled carbon nanotubes through porous media." ICEIN 2011 3rd Annual International Conference on the Environmental Implications of NanoTechnology & EPA Nano Grantees Meeting, Durham, NC, May 9–11, 2011.
53. Smith, B.A., J. Yang,\* J.L. Bitter, W.P. Ball, W.P., and D.H. Fairbrother, "Influence of surface chemistry on the sorption properties and colloidal stability of carbon nanotubes in the presence of NOM," ICEIN 2011 3rd Annual International Conference on the Environmental Implications of NanoTechnology & EPA Nano Grantees Meeting, Durham, NC, May 9 – 11, 2011.
54. Fairbrother, D.H. B.A. Smith, B., K. Wepasnick, J. Yang, H-H Cho, J.L. Bitter, and W.P. Ball, "Characterizing the surface chemistry of carbon nanotubes (CNTs) and the impact of CNT surface properties on environmentally relevant behavior," presented at a symposium in the Division of Environmental Chemistry, 241<sup>st</sup> American Chemical Society (ACS) National Meeting, Anaheim, CA, March 27-31, 2011.
55. Fairbrother, D.H., B.A. Smith, K. Wepasnick, J. Yang, J., H-H Cho, J.L. Bitter, and W.P. Ball, "Influence of nanoparticle surface chemistry on NOM sorption and colloidal stabilization: particle properties matter," presented at a symposium in the Division of Colloid and Surface Chemistry, 241<sup>st</sup> American Chemical Society (ACS) National Meeting, Anaheim, CA, March 27-31, 2011.
56. Ball, W.P., "Environmental Transport, Transformation, and Fate of Nanomaterials," presentation to the second meeting of the Science and Technology Working Group Meeting (STWG) of the US-Russia Bilateral Presidential Commission (Nanotechnology Subgroup, Environmental Health and Safety session) , Moscow, Russia, February 27- March 4, 2011. (**invited**)
57. MacDonald,\* L., W.P. Ball, and E. Schoenberger, "Aid Efficacy for Point-of-Use Water Treatment: Following Interventions from Origin through Implementation to Evaluation," poster presentation, International Conference on Water and Health: Where Science Meets Policy, The University of North Carolina at Chapel Hill, Chapel Hill, NC, October 25-26, 2010.
58. Yang,\* J., J.L. Bitter, B.A. Smith, D.H. Fairbrother, and W.P. Ball, W., "Transport of Multi-Walled Carbon Nanotubes in Porous Media," presented at a symposium in the Division of Environmental Chemistry, 240<sup>th</sup> American Chemical Society (ACS) National Meeting, Boston, MA, Aug. 22-26, 2010.
59. Cho, H-H, J. Yang,\*and W.P. Ball, "Influence of oxygen-containing functional groups and graphenic carbon on Zn[II] sorption by multiwall carbon nanotubes: Application of Two-Site Langmuir model,"

- presented at a symposium in the Division of Environmental Chemistry, 240<sup>th</sup> American Chemical Society (ACS) National Meeting, Boston, MA, Aug. 22-26, 2010.
60. Cho, H-H., J. Yang,\* and W.P. Ball, "Comparison of nonpolar organic compounds and divalent metallic ions sorption with carbonaceous materials," presented at a symposium in the Division of Environmental Chemistry, 240<sup>th</sup> American Chemical Society (ACS) National Meeting, Boston, MA, Aug. 22-26, 2010.
  61. Perlman, E., R. Burns, M. Kazhdan, R. Murphy\*, W.P. Ball, and N. Amenta. "Organization of Data in Non-Convex Spatial Domains," *22nd International Conference on Scientific and Statistical Database Management*, June 31 July 2, 2010, Heidelberg, Germany (2010).
  62. Bai\*, J., C. Liu, and W.P. Ball, "U(VI) Sorption and Diffusion in Packed Cells of Hanford Silt/Clay Material," Abstract #544, *Seventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds*, Monterey, CA, May 24–27, 2010.
  63. Murphy, R.R. and W.P. Ball. "Statistical Modeling of Spatial and Temporal Trends in Chesapeake Bay Hypoxia and Stratification." Chesapeake Community Modeling Program's Chesapeake Modeling Symposium, May, 2010.
  64. Ball, W.P., D. DiToro, W.M. Kemp, B. Cuker, M. Piasecki, I. Zaslavsky, T. Gross, A. Voinov, and D. Jasinski. "The Design and Application of a Chesapeake Bay Environmental Observatory," Chesapeake Community Modeling Program's Chesapeake Modeling Symposium, May, 2010. (**invited**)
  65. Ball, W.P. "Environmental Transport, Transformation, and Fate of Nanomaterials," INBT 2010 Annual Symposium, Baltimore, MD, April 29 (2010) (**invited**)
  66. MacDonald,\* L.A.S., E. Schoenberger, W.P. Ball, "Aid Efficacy for Point of Use (POU) Water Treatment: A Study of selection processes and the factors affecting success," Oral Presentation at the Annual Meeting of the Association of American Geographers (AAG), April, Washington, D.C., (2010)
  67. CBEO Project Team: W. P. Ball, R. Burns, B.E. Cuker, D.M. Di Toro, W. M. Kemp, L. Murray, M. Piasecki, I. Zaslavsky, M. Aguayo, J. Bosch, D.C. Brady, R. R. Murphy\*, E. Perlman, M. Rodriguez, J. M. Testa, T. Whitenack, "The Design and Application of a Chesapeake Bay Environmental Observatory," *Eos Trans. AGU*, 90(52), Fall Met. Suppl., Abstract H51H-0859, December 18, 2009.
  68. Murphy, R.R., W.P. Ball, Testa, J.M., and W.M. Kemp., "Increasing Stratification of the Chesapeake Bay: Causes and Impacts on Summertime Hypoxic Conditions." Coastal and Estuarine Research Federation Meeting, Portland, OR, November, 2009.
  69. Schwab, K., M.E. Figueroa, W. Ball, S. Guickema, B. Zaitchik, and C. Young, "JHU Global Water Program," poster presented at the 2009 Johns Hopkins University Collaborative Research Symposium, Johns Hopkins University Applied Physics Laboratory, Laurel, MD, August 11, 2009.
  70. Murphy,\* R.R. and W.P. Ball, "Use of Spatial Statistics to Evaluate the Long-Term Relationship Between Hypoxic Volume, Nitrogen Load, and Stratification in Chesapeake Bay," presented at the 2009 Biennial Meeting of the Association of Environmental Engineering and Science Professors: Grand Challenges in Environmental Engineering and Science: Research and Education, University of Iowa, Iowa City, IA, July 26-29, 2009.
  71. Cho, H-H, B.A. Smith, J. Yang,\* D. Fairbrother, and W.P. Ball, "Sorption properties of multi-walled carbon nanotubes and their transport in columns packed with glass beads," Poster #58, presented at the 2009 Biennial Meeting of the Association of Environmental Engineering and Science Professors: Grand Challenges in Environmental Engineering and Science: Research and Education, University of Iowa, Iowa City, IA July 26-29, 2009.
  72. Smith, B.A., K. Wepasnick, W.P. Ball, D.H. Fairbrother, "Influence of surface chemistry on the deposition and transport properties of carbon nanotubes." International Conference on the Environmental Implications and Applications of Nanotechnology, Amherst, MA, USA. June 9-11, 2009.
  73. D.H. Fairbrother, B.A. Smith, K.A. Wepasnick, H.H-H Cho, and W.P. Ball, 'Influence of Surface Chemistry on the Behavior of Carbon Nanotubes in Aquatic Environments,' International Conference on the Environmental Implications and Applications of Nanotechnology, Amherst, MA, USA. June 17-18, 2009
  74. Smith, B.A., K. Wepasnick, W.P. Ball, C.R. O'Melia, D.H. Fairbrother, "Influence of Surface Oxides on the Colloidal Stability of Multi-Walled Carbon Nanotubes: A Structure-Property Relationship for Engineered Nanoparticles." poster presented at the 83rd Colloid and Surfaces Meeting, New York City, NY, USA. June 17-18, 2009.
  75. Cho, H-H., Yang, J., Wepasnick, K., Fairbrother, D.H., and Ball, W.P. "Influence of co-sorbate on adsorption of Cd(II) onto multi-walled carbon nanotubes", presented at a symposium of the Division of

- Environmental Chemistry, 237th American Chemical Society National Meeting, March 22-26, Salt Lake City, UT. *Preprints of Extended Abstracts*, 49(1) (2009).
76. Fairbrother, D.H., B.A. Smith, K.A. Wepasnick, , and W.P. Ball, "Influence of Surface Chemistry on the Behavior of Engineered Nanomaterials in the Environment," presented at a symposium in the Division of Chemical Education, 237<sup>th</sup> American Chemical Society (ACS) National Meeting, March 22-26, Salt Lake City, UT. *Preprints of Extended Abstracts*, 49(1), p. 32 (2009).
  77. Fairbrother, D.H., B.A. Smith, K.A. Wepasnick, H.H-H Cho , and W.P. Ball, "Probing the Influence of Surface Chemistry on the Behavior of Nanomaterials in Aquatic Environments" Gordon Research Conference on Reactions at Surfaces, Venutra, CA (February 2009)
  78. Fairbrother, D.H., B.A. Smith, K.A. Wepasnick, H.H-H Cho, and W.P. Ball, "Influence of surface chemistry on the behavior of engineered nanomaterials in the environment", NIST (National Institute of Standards and Technology), Gaithersburg, MD (January 2009)
  79. Zaslavsky, I., M. Piasecki, T. Whitenack, W.P. Ball, and R. Murphy, "CBEO:N :Chesapeake Bay Environmental Observatory as a Network Node," *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract IN31B-1139. Poster presentation at American Geophysical Union (AGU) Fall Meeting, December 5-9, San Francisco, CA (2008).
  80. Bai,\* J., C. Liu, and W.P. Ball, "Experimental and Modeling Study of Sorption-Retarded U(VI) Diffusion in a Hanford Silt/Clay Material," *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract H41F-0943. Poster presentation at American Geophysical Union (AGU) Fall Meeting, December 5-9, San Francisco, CA (2008).
  81. Ball, W.P., R. Dladla, and D. Alcock, "Sustainable Irrigation Projects for Rural Communities in KwaZulu-Natal, South Africa," NSF Workshop on Globalizing Engineering Education: Lessons Learned from African and USA Partnerships, Cape Town, South Africa, October 17-18 (2008) (**invited**).
  82. Downs, K., E. Toussaint, S. Falconi, and W.P. Ball, "Sustainable Irrigation Projects for Rural Communities in KwaZulu-Natal South Africa," ORPA 4: Operations Research Practice for Africa, ORPA/INFORMS/IFORS Conference, October 10-11, Washington, D.C. (2008) (**invited**).
  83. Ball, W.P., H-H Cho, T.H. Nguyen, B.A. Smith, K.A. Wepasnick, D.H. Fairbrother, "The Chemistry of Sorption by Black Carbon: The Important Role of Surface Oxides," Abstract No. 665-6, Joint Annual Meeting of GSA, ASA-CSSA, and GCA, 5-9 October, Houston, TX (2008) (**invited**).
  84. Cho, H-H, B.A. Smith, K.A. Wepasnick, D.H. Fairbrother, and W.P. Ball, "Influence of Surface Oxide Groups on the Adsorption of Zn(II) and Naphthalene onto Multiwalled Carbon Nanotubes," presented at a symposium in the Division of Environmental Chemistry, 236<sup>th</sup> American Chemical Society (ACS) National Meeting, Aug. 17-21, Philadelphia, PA, *Preprints of Extended Abstracts*, 48(2), p. 55 (2008).
  85. Fairbrother, D.H., B.A. Smith, K. Wepasnick, W.P. Ball, and C.R. O'Melia, "Colloidal Properties of Oxidized Multiwalled Carbon Nanotubes," poster presented at the Gordon Research Conference on Environmental Sciences: Water, June 22-27, Holderness School, Holderness, N.H (2008).
  86. Cho, H-H, B.A. Smith, K. Wepasnick, D.H. Fairbrother, and W.P. Ball, "Influence of Surface Oxides on Sorption of Zn(II) onto Multi-Walled Carbon Nanotubes," poster presented at the Gordon Research Conference on Environmental Sciences: Water, June 22-27, Holderness School, Holderness, N.H (2008).
  87. Bai\*, J. and W.P. Ball, "Experimental and Modeling Study of U(VI) Diffusion in a Hanford Sediment," poster presented at the Gordon Research Conference on Environmental Sciences: Water, June 22-27, Holderness School, Holderness, N.H (2008).
  88. Murphy\*, R., W.P. Ball, and F. Curriero, "Comparison of Spatial Interpolation Methods for Water Quality Measurements in the Chesapeake Bay," poster presented at the Gordon Research Conference on Environmental Sciences: Water, June 22-27, Holderness School, Holderness, N.H (2008).
  89. You, Y., W.P. Ball, M. J. Ward, and M. Hilpert, "Tetracycline Resistance in the Subsurface of a Poultry Farm: Influence on Bacterial Tetracycline Resistance," poster presented at the Gordon Research Conference on Environmental Sciences: Water, June 22-27, Holderness School, Holderness, N.H (2008).
  90. Fairbrother, D.H., B.A. Smith, K. Wepasnick, Ball, W.P. and H-H Cho, "Applications of Surface Analysis in the Environmental Sciences" 30<sup>th</sup> Annual Symposium on Applied Surface Analysis, June 11-13, Pennsylvania State University , University Park, PA (2008) (**invited**).
  91. Murphy, R., F. Curriero, and W.P. Ball, "Comparison of Spatial Interpolation Methods for Water Quality Parameters in the Chesapeake Bay," Chesapeake Environmental Modeling Symposium, May 12-14, Annapolis, MD (2008).

92. Ball, W.P., D. DiToro, "Development of a Prototypical Chesapeake Bay Environmental Observatory (CBEO)," Chesapeake Environmental Modeling Symposium, May 12-14, Annapolis, MD (2008) **(invited)**.
93. Cho, H-H, B.A. Smith, K. Wepasnick, D.H. Fairbrother, and W.P. Ball, "Influence of Surface Oxides on Sorption of Zn(II) onto Multi-Walled Carbon Nanotubes," poster presented at 2<sup>nd</sup> annual symposium of the Institute for Nanobiotechnology (INBT), May 2, Johns Hopkins University (2008).
94. B.A. Smith, K. Wepasnick, D.H. Fairbrother, and W.P. Ball, "Colloidal Properties of Oxidized Multiwalled Nanotubes," poster presented at 2<sup>nd</sup> annual symposium of the Institute for Nanobiotechnology (INBT), May 2, Johns Hopkins University (2008).
95. Falconi, S., S. Nappier, and W.P. Ball, "Ram Pump Irrigation Systems in KwaZulu Natal, South Africa: Impacts on Food Security, Health and Subsistence Agriculture," Hopkins All-University Seminar on Africa (HAUSA), April 25, JHU School of Advanced International Studies (SAIS), Washington, D.C. (2008) **(invited)**.
96. Hilpert, M., W.P. Ball, M. Ward, and Y. You, "Antibiotic transport in poultry farm soils: influence on bacterial antibiotic resistance." Research Day, Center for a Livable Future, Johns Hopkins University. April 8 (2008) **(invited)**.
97. Falconi, S., S. Nappier, and W.P. Ball, "Ram Pump Irrigation Systems in KwaZulu Natal, South Africa: Impacts on Food Security, Health and Subsistence Agriculture," Research Day, Center for a Livable Future, Johns Hopkins University. April 8 (2008) **(invited)**.
98. Fairbrother, D.H., B.A. Smith, K. Wepasnick, Ball, W.P. and H-H Cho, "Applications of Surface Analysis in the Environmental Sciences," presented at a symposium in the division of Colloid and Surface Chemistry at the 235<sup>th</sup> American Chemical Society (ACS) National Meeting, April 6-10, New Orleans, LA, *Preprints of Extended Abstracts*, 48(1), p. 44, (2008).
99. Smith, B., K. Wepasnick, D.H. Fairbrother, Ball, W.P. and H-H Cho, "Developing structure-property relationships that describe the influence of surface chemistry on the aggregation and sorption properties of carbon nanotubes," presented at a symposium in the division of Colloid and Surface Chemistry, 235<sup>th</sup> American Chemical Society (ACS) National Meeting, April 6-10, New Orleans, LA, *Preprints of Extended Abstracts*, 48(1), p. 49, (2008).
100. Ball, W.P., H-H Cho, B.A. Smith, K. Wepasnick, J.D. Wnuk, and D.H. Fairbrother, "Effects of Surface Oxidation on the Behavior of Carbon Nanotubes in Aquatic Environments," presentation at conference on Nanoparticles in the Environment: Implications and Applications (nanoECO), 2-7 March, Centro Stefano Franscini, Monte Verità, Ascona, Switzerland. Book of Abstracts, p. 35 (2008) **(invited)**.
101. You, Y., W.P. Ball, M. Ward, and M. Hilpert, Tetracycline resistance in the subsurface of a poultry farm: influence of poultry wastes. *Eos Trans. AGU*, 88(52), Fall Meeting Supplement. Presented at the 2007 American Geophysical Union (AGU) Fall Meeting, December 10-14 (2007).
102. Fairbrother, D.H., B.A. Smith, K. Wepasnick L. A. Langley, W.P. Ball and H-H Cho, "Effect of Oxidative Processes on the Colloidal Stability and Sorption Properties of Carbon Nanotubes in Aquatic Environments," Society of Environmental Toxicology and Chemistry (SETAC), 28th Annual Meeting, Milwaukee, WI, November (2007).
103. Ball, W.P., H-H Cho, D.H. Fairbrother, B.A. Smith, K. Wepasnick, and J. Wnuk, "Carbon Nanotubes in Aquatic Environments: Effects of Surface Oxidation on Sorption Properties and Colloidal Stability," 1<sup>st</sup> International Workshop Aquatic Nanoscience & Nanotechnology, Dec. 9-11, Vienna University, Vienna, Austria (2007).
104. DiGenova, T., B. Yohannes, B., D. Hill, W.P. Ball, R. Shklyan, D. Alcock, "Engineers Without Borders: Sustainable Engineering for Developing Communities." 80<sup>th</sup> Annual Water Environment Federation Technical Exhibit and Conference, San Diego, CA, October (2007).
105. Fairbrother, D.H., B.A. Smith, K. Wepasnick, Ball, W.P. and H-H Cho, "Influence of Surface Chemistry on the Stability and Sorption Properties of Carbon Nanotubes in Aquatic Environments" 54<sup>th</sup> International American Vacuum Society Meeting, Seattle, October (2007).
106. Fairbrother, D.H., B.A. Smith, K. Wepasnick, Ball, W.P. and H-H Cho, "Surface Characterization and Reactivity of Carbonaceous Materials in Aquatic Environments" 12<sup>th</sup> European Conference on Applications of Surface and Interface Analysis Brussels, September (2007).
107. Ball, W.P., R.W. Murphy, and D.M. Potsiadlo, "Chesapeake Bay Environmental Observatory (CBEO): Background and Current Work," presented at the 2007 Conference of the Association of Environmental

- Engineering and Science Professors: "Interactions at the Interface -- Making the Connections Between Environments, Disciplines and Nations," Blacksburg, VA, July 28-August 1 (2007) (**invited**).
108. Murphy, R. and W.P. Ball, "Conceptual Design of a Chesapeake Bay Environmental Observatory (CBEO)," PA/Chesapeake AWWA Joint Conference, April 24-27, Hershey, PA (2007).
  109. Sathyanadan, M., S. Nappier, W.P. Ball, and others, "South Africa, Project with Rural Development Impact," EWB-USA International Conference, April 12-14, University of Massachusetts, Amherst, MA (2007).
  110. Smith, B., D.H. Fairbrother, and W.P. Ball, "Influence of Surface Chemistry on the Aquatic Stability of Carbon Nanotubes," presented at a symposium in the Division of Environmental Chemistry, the 233rd American Chemical Society (ACS) National Meeting, March 25-29, Chicago, IL, *Preprints of Extended Abstracts*, 47(1), Abstract #19 (2007).
  111. Smith, B., H-H Cho, W.P. Ball, and D.H. Fairbrother, "Influence of Surface Oxides on the Adsorption of Hydrophobic Organic Chemicals and Heavy Metals onto Carbon Nanotubes," presented at a symposium in the Division of Environmental Chemistry, the 233rd American Chemical Society (ACS) National Meeting, March 25-29, Chicago, IL, *Preprints of Extended Abstracts*, 47(1), Abstract #22 (2007).
  112. Ball, W.P., "Spatial Contaminant Distributions in Porous Media: Effects of Initial Conditions on Modeling and Managing Solute Remediation," AquaTerra Subproject Meeting BIOGEOCHEM combined with KNOWMAN course on Brévilles long-term fate of pollutants in soils: Mobility, stability and transformation. 15-16 March, Eberhard Karls Universität Tübingen, Germany (2007) (**invited**).
  113. Ball, W.P., D. Howard Fairbrother, B.A. Smith, F. Bengash, "Influence of Surface Chemistry on the Sorption Properties of Carbon Nanotubes with Priority Pollutants," presented at the Nanotechnology and Water Treatment (NeWT) Workshop, Rice University, Houston, TX (Feb. 25-27, 2007) (**invited**).

#### **EXTERNALLY SUPPORTED GRANTS (LAST 5 YEARS, EXCLUDING CRC CO-OP AGREEMENTS)**

- National Science Foundation (CBET- 1360415) C. Harman (co-PI), Collaborative Research with 7 other co-PIs at 3 other institutions); \$1,803,346 total of which \$739,288 is at JHU (9/1/14 – 8/31/18)  
Title: "WSC Category 3 Collaborative Research: Impacts of Climate Change on the Phenology of Linked Agriculture-Water Systems"
- NOAA Maryland Sea Grant Program, \$140,000 (02/01/2014-1/31/2016)  
Title: "Retrospective Analysis of Nutrient and Sediment Loadings to the Chesapeake Bay: Exploration of Trends and Affecting Factors"
- NOAA Maryland Sea Grant Program, \$29,994 (02/01/2013-1/31/2015)  
Title: "Seasonal Trend, Source Apportionment, Spatial Budget, and In-stream Cycling of Nutrient and Sediment from the Susquehanna River Basin to Chesapeake Bay"
- National Science Foundation, Interdisciplinary Graduate Education, Research and Training Program, (G. Brush, PI; 5 other co-PIs, \$3,200,000 (09/01/2012-08/31/2017)  
Title: "IGERT: Water, Climate and Health"
- U.S. Environmental Protection Agency, 2012 P3 Awards Program: A National Student Design Competition for Sustainability Focusing on People, Prosperity, and the Planet, \$15,000 (8/15/12 – 8/14/14)  
Title: "Phase I: Sustainable Irrigation in Rural South Africa: Studying the Alcock Ram Pump System for Optimized Manufacture and Reproducibility."
- Water Environment Research Federation award to University of Delaware, D. DiToro (PI), \$75,697 sub-award to graduate student working under my advisement (01/01/2010 - 12/31/2012)  
Title: "Can TMDL Models Reproduce the Nutrient Loading – Hypoxia Relationship?"
- National Science Foundation (CBET- 0854329) collaborative with D. DiToro (U. Del, \$404,202 total; \$252,193 at JHU; (09/01/2009 - 08/31/2014, including two one-year no-cost extensions),  
Title: "Collaborative Research: Process-Based Statistical Interpolation Methods for Improved Analysis of WATERS Test-bed Observations and Water Quality Models"
- Johns Hopkins University Office of the Provost, Framework for the Future Discovery Initiative, w/ K. Schwab (co-PI) and 4 other Johns Hopkins faculty, \$550,000 (1/1/09-12/31/13, including two 1-year extensions).  
Title: "The Johns Hopkins University Global Water Program"



## DOCTORAL STUDENT ADVISING

Bernard N. Njoroge (9/91 – 1/95; Ph.D. 1995 from Duke University)

(Student was co-advised by Robert Cherry at Duke Univ. after WPB relocation to Johns Hopkins Univ. in 1992.)

Dissertation: “Role of Soil Composition on the Sorption of Nonpolar Organic Chemicals”

Currently: Principal, School of Architecture and Engineering, University of Nairobi, Nairobi, KENYA

Anne Braghetta (9/89 – 5/95; Ph.D. 5/95 from UNC-Chapel Hill, Dept. of Environmental Sciences and Engineering)

(WPB was co-advisor after student relocation to UNC-Chapel Hill in 1991, with F.A. DiGiano as principal advisor.)

Dissertation: “The Influence of Solution Chemistry and Operating Conditions on Nanofiltration of Charged and Uncharged Organic Macromolecules”

Currently: Regional Director, Costa Rica, U.S. Peace Corps.

Dirk F. Young (9/90 – 10/97; Ph.D. 1997, Johns Hopkins University)

Dissertation: “Effects of Experimental Conditions on Estimates of Parameters for Characterizing Solute Transport through Porous Media”

Currently: Environmental Engineer, USEPA Pesticides Program Office, Washington, DC

Goushou Xia (9/93 – 10/98; Ph.D. 1998, Johns Hopkins University)

Dissertation: “Experimental Developments and Refined Modeling Approaches for the Prediction of Hydrophobic Organic Chemical Sorption in Subsurface Environments”

Currently: Senior Engineer and Technical Team Lead, ADI Technology Corporation, Alexandria, VA.

Chongxuan Liu (9/94 - 10/98; Ph.D. 1998, Johns Hopkins University)

Dissertation: “Aquitard Impacts on Groundwater Remediation—Analytical Mathematical Modeling and Field-Scale Analysis”

Currently: Senior Research Scientist, Pacific Northwest National Lab, Richland, WA

Thanh H. (Helen) Nguyen (9/00 – 5/05; Ph.D. 2005, Johns Hopkins University)

Dissertation: "Exploring the Role of Surface Characteristics in Determining Sorption Properties of Chars and Soots"

Currently: currently Professor, Civil and Environmental Engineering, University of Illinois, Urbana-Champaign.

Roberta Brown (9/98 – 2/06; Ph.D. 2006; Johns Hopkins University)

Dissertation: “The Role of Wood Char in Organic Chemical Sorption by Soils: Studies in the Absence and Presence of Natural Organic Matter”

Currently: Professor, Northern Virginia Community College

Michael Paraskewich (9/97 – 9/08; Ph.D. 2009; Johns Hopkins University)

Dissertation: “Coupled Diffusion and Non-Linear Sorption as Controlling Factors in the Uptake and Release of an Organic Contaminant in Natural Solids”

Currently: Vice President and Director of Research and Design, Pelsa, Inc.

Jing Bai (9/03 – 0/09; Ph.D. 2010; Johns Hopkins University)

Dissertation: “Experimental and Modeling Study of U(VI) Sorption-Retarded Diffusion in a Hanford Sediment,”

Currently: Senior Risk Analyst, J.P. Morgan Chase, Wilmington, DE.

Rebecca Murphy (1/07 – 8/12; Ph.D. 2012; Johns Hopkins University)

Current doctoral candidate (post-graduate board oral examination): "Development and Use of Interpolation Methods to Analyze Trends in Chesapeake Bay Seasonal Hypoxia and Stratification"

Currently: Water Quality Analyst, USEPA Chesapeake Bay Program Office; Assistant Research Scientist, University of Maryland Center for Environmental Science.

Jin Yang (9/07 – 8/14; Ph.D. 2014; Johns Hopkins University)

Dissertation: “Sorption and Transport Properties of Multi-Walled Carbon Nanotubes (MWCNTs): Influence of Surface Oxides and Aquatic Chemistry and Impacts on Co-Contaminants”

Currently: Programmer/Analyst, Survey Monkey

Qian Zhang (9/11 – 8/16; Ph.D. 2016; Johns Hopkins University)

Dissertation: “Quantifying Nutrient and Sediment Export from the Chesapeake Bay Watershed: Retrospective Analyses and Method Improvements”

Currently: Watershed Effectiveness Data Analyst, USEPA Chesapeake Bay Program Office; Assistant Research Scientist, University of Maryland Center for Environmental Science

Laura MacDonald (1/09 – 10/16; Ph.D. 2016; co-advised with Prof. Erica Schoenberger; Johns Hopkins University)

Dissertation: " Household Water Treatment and Safe Storage in Ghana: An Interim Solution?"

Currently: Knowledge & Research Coordinator, Centre for Affordable Water and Sanitation Technology, Canada

Christopher Kelly (9/10 – present)

Current doctoral student (post-graduate board oral examination): "Design, Construction and Evaluation of Low-Cost, Open-Source Water Quality Monitoring Tools for Application in Under-Resourced Communities "

Dano Wilusz (9/12 – present; co-advised with Assist. Prof. Ciaran Harman)

Current doctoral student (post graduate board oral examination); topic: "The Effect of Climate on Watershed Transit Times, with Implications for Nitrate Transport in the Chesapeake Bay Watershed"