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EDUCATION

1986	Ph.D. Environmental Engineering and Science	Stanford University
1977	M.S. Environmental Engineering	University of Cincinnati
1975	B.S. Civil Engineering	University of Cincinnati

PROFESSIONAL EXPERIENCE

1998-present	Professor	University of Colorado-Boulder
2014-present	Director	DeRISK Center
2013-present	Director	Undergraduate Environmental Engineering Program, University of Colorado-Boulder
2012- present	Program Coordinator	Graduate Environmental Engineering Program, University of Colorado-Boulder
2000-2010		Center for Drinking Water Optimization
1997-2004	Director	Summers & Hooper, Inc.
1995-2000	Technical Director	University of Cincinnati
1993-1998	Associate Professor	University of Cincinnati
1995	Visiting Fulbright Professor	University of Crete, Greece
1988-1993	Assistant Professor	University of Cincinnati
1988-1990	Program Coordinator	Water, Waste Water and Hazardous Waste Program, University of Cincinnati
1986-1988	Research Associate	Universitat Karlsruhe, Germany
1977-1979	Project Engineer	U.S. EPA, Municipal Environmental Research Laboratory, Cincinnati, OH

HONORS AND SCHOLARLY AWARDS

Walter Hughes Scholarship, University of Cincinnati, 1970-73
Chi Epsilon, 1975
Eugene Carcy Award, Engineering and Science Society of Cincinnati, 1975
Sigma Xi, 1977
Reynolds Fellowship, Stanford University, 1981-82
Marx-Moreno Fellowship, Stanford University, 1981-82, 1985

Academic Achievement Award, Ph.D. Dissertation, American Water Works Association, 1987
Graduate Teaching Award, CEE Department, University of Cincinnati, 1989-90
Research Division Best Paper Award, Journal of the American Water Works Association, 1990
Tau Beta Pi Professor Award, University of Cincinnati, 1991
Academic Achievement Award, MS advisor, American Water Works Association, 1993
Graduate Teaching Award, CEE Department, University of Cincinnati, 1993-1994
USEPA Scientific and Technological Achievement Award, 1994
Best Poster Award, AWWA Research Foundation, 1994
Best Poster Award, AWWA Research Foundation, 1995
Academic Achievement Award, PhD advisor, American Water Works Association, 1995
Senior Fulbright Award, University of Crete, 1995
Research Division Best Paper Award, Journal of the American Water Works Association, 1996
Academic Achievement Award, MS advisor, American Water Works Association, 1996
Academic Achievement Award, PhD advisor, American Water Works Association, 1996
Faculty Achievement Award, University of Cincinnati, 1996
Certificate of Merit, Best Presentation, American Chemical Society, 1996
Research Division Best Paper Award, Journal of the American Water Works Association, 1997
Academic Achievement Award, MS advisor, American Water Works Association, 1998
Academic Achievement Award, MS advisor, American Water Works Association, 1999
Academic Achievement Award, MS advisor, American Water Works Association, 2000
CEAE Department Research Award, University of Colorado 2007
CEAE Department Teaching Award, University of Colorado 2009
CEAE Department Student's Favorite Professor Award, University of Colorado 2010
CEAE Department Service Award, University of Colorado 2011
A.P. Black Award, American Water Works Association, 2013

RESEARCH AND TEACHING INTERESTS

Drinking water quality, treatment and modeling, with special interest in natural organic matter, disinfection by-products, trace organic contaminants and taste & odor as related to activated carbon adsorption, biological treatment, coagulation, filtration, membrane processes, disinfectant behavior and distribution systems. For the last 10 years he has researched water treatment technologies for developing communities including ceramic water filters, slow sand filters and biochar.

BOOKS

- 1) Roberts P.V., Summers R.S., Regli S., Editors. Adsorption Techniques in Drinking Water Treatment, EPA 570/9-84-005, USEPA, Office of Drinking Water, Washington, D.C., (1984):892 pp. Released as a special issue of J. Environ. Pathology, Toxicology and Oncology, 7, 7/8, (1987):1-435.
- 2) Sontheimer H., Crittenden J.C., Summers R.S.: Activated Carbon For Water Treatment, 2nd Edition, DVWG Forschungsstelle, Karlsruhe, Germany: (1988):722pp.
- 3) Clark R.M., Summers R.S., Editors: Strategies and Technologies for Meeting SDWA Requirements, Technomic Publishing Co., Inc., Lancaster, PA (1993):396 pp.

- 4) Chowdhury, Z.K., R.S. Summers, G. P. Westerhoff, B.J. Leto, K.O. Nowack, C.J. Corwin. L.B. Passantino, Technical Editor, Activated Carbon: Solutions for Improving Water Quality, Amer. Water Works Assoc., Denver, CO (2013); 318 pp.

PEER-REVIEWED PUBLICATIONS

Journal Articles

- 1) Roberts, P.V., Summers, R.S.: "Granular Activated Carbon Performance for Organic Carbon Removal," *J. Amer. Water Works Assoc.*, 74(1982):113-118.
- 2) Summers, R.S., Roberts, P.V.: "Simulation of DOC Removal in Activated Carbon Beds," *J. Env. Eng., ASCE*, 110(1)(1984):73-92.
- 3) Roberts, P.V., Cornel, P.K., Summers, R.S.: "External Mass Transfer in Fixed-Bed Adsorption," *J. Env. Eng., ASCE*, 111(6)(1985):891-905.
- 4) Cornel, P.K., Summers, R.S., Roberts, P.V.: "Diffusion of Humic Acid in Dilute Aqueous Solution," *J. Colloid and Interface Sci.*, 110(1) (1986):149-164.
- 5) Cornel, P.K., Sontheimer, H., Summers, R.S., Roberts P.V.: "Sorption of Dissolved Organics from Aqueous Solution by Polystyrene Resins. Part II: External and Internal Mass Transfer," *Chem. Eng. Sci.*, 41(7)(1986):1801-1810.
- 6) Kaastrup, E., Summers, R.S., Roberts, P.V.: "Adsorption Equilibrium of DOC by Activated Carbon and the Influence of Preozonation," *Ozone: Sci. and Eng.*, 8(4)(1986):277-298.
- 7) Roberts, P.V., Goltz, M.N., Summers, R.S., Crittenden, J.C., Nkedi-Kizza, P.: "The Influence of Mass Transfer on Solute Transport in Column Experiments with an Aggregated Soil," *J. Contaminant Hydrology*, 1(1987):375-393.
- 8) Summers, R.S., Roberts, P.V.: "Rate of Humic Substance Uptake during Activated Carbon Adsorption," *J. Env. Eng., ASCE*, 113, 6(1987):1333-1349.
- 9) Summers, R.S., Cornel, P.K., Roberts, P.V.: "Molecular Size Distribution and Spectroscopic Characterization of Humic Substances," *The Sci. of the Total Environ.*, 62(1987):27-37.
- 10) Summers, R.S., Roberts, P.V.: "Activated Carbon Adsorption of Humic Substances. I. Heterodisperse Mixtures and Desorption," *J. Colloid and Interface Sci.*, 122(2)(1988):367-381.
- 11) Summers, R.S., Roberts, P.V.: "Activated Carbon Adsorption of Humic Substances. II. Size Exclusion and Electrostatic Interactions," *J. Colloid and Interface Sci.*, 122(2)(1988):382-397.
- 12) Summers, R.S., Haist, B., Koehler, J., Ritz, J., Zimmer, G., Sontheimer, H.: "The Influence of Background Organic Matter on GAC Adsorption," *J. Amer. Water Works Assoc.*, 81(5) (1989):66-74.

- 13) Crittenden, J.C., Reddy, P.S., Arora, H., Trynoski, J., Hand, D.W., Perram, D.L. and Summers, R.S.: "Predicting GAC Performance With Rapid Small Scale Column Tests," *J. Amer. Water Works Assoc.*, 83(1)(1991):77-87.
- 14) Krovvidy, S., Wee, W.G., Summers, R.S., Coleman J.J.: "An AI Approach for Wastewater Treatment Systems," *Applied Intelligence*, 1(1991):247-261.
- 15) Shukairy, H.M., Summers, R.S.: "The Impact of Preozonation and Biodegradation on the Formation of Disinfection By-Products," *Water Research*, 26(9)(1992):1217-1227.
- 16) Shukairy, H.M., Miltner, R.J., Summers, R.S.: "Control of Disinfection By-Products and Biodegradable Organic Matter Through Biological Treatment," *Revue des Sciences de l'Eau*, 5(1-15)(1992).
- 17) Lytle D.A., Summers, R.S., Sorg, T.J.: "Removal of Beryllium from Drinking Water by Chemical Coagulation and Lime Softening," *J. Water Supply Research and Technology - AQUA*, 41(6)(1992):330-339.
- 18) Miltner R.J., Shukairy, H.M., Summers, R.S.: "Disinfection By-Product Formation and Control by Ozonation and Biotreatment," *J. Amer. Water Works Assoc.*, 84(11)(1992):53-62.
- 19) Summers R.S., Benz, M., Shukairy, H.M., Cummings, L.: "Effect of Separation Processes on the Formation of Brominated Trihalomethanes," *J. Amer. Water Works Assoc.*, 85(1)(1993):88-95.
- 20) Goldgrabe, J.C., Summers, R.S., Miltner, R.J.: "Particle Removal and Head Loss Development in Biological Filters," *J. Amer. Water Works Assoc.*, 85(12)(1993):94-106.
- 21) Cummings, L., Summers, R.S.: "Prediction of Field-scale GAC Control of DBP Formation Using RSSCTs," *J. Amer. Water Works Assoc.*, 86(6)(1994):88-97.
- 22) Shukairy, H.M., Miltner, R.J., Summers, R.S.: "Bromide's Effect on Disinfection By-Product Formation, Speciation and Control: Part 1 Ozonation," *J. Amer. Water Works Assoc.*, 86(6)(1994):72-87.
- 23) Krovvidy, S., Wee, W.G., Suidan, M.T., Summers, R.S., Coleman J.J., Rossman, L.: "SOWAT: Sequence Optimizer for Wastewater Treatment," *IEEE Expert*, 9, (6)(1994):15-20.
- 24) Allgeier, S.C., Summers, R.S.: "Evaluating Nanofiltration for DBP Control with the RBSMT," *J. Amer. Water Works, Assoc.*, 86(3) (1995): 87-99.
- 25) Summers, R.S., Hooper, S.M., Solarik, G., Owen, D.M., Hong, S.: "Bench-Scale Evaluation of GAC for NOM Control," *J. Amer. Water Works Assoc.*, 87(8)(1995): 69-80.

- 26) Robertson, J.A., Cromwell, J., Krasner, S., McGuire, M., Owen, D., Regli, S., Summers, R.S.: "The D/DBP Rule: Where did the Numbers Come From?" *J. Amer. Water Works Assoc.*, 87(10) (1995): 46-57.
- 27) Shukairy, H.M., Miltner, R.J., Summers, R.S.: "Bromide's Effect on Disinfection By-Product Formation, Speciation and Control: Part 2 Biotreatment," *J. Amer. Water Works Assoc.*, 87(10) (1995): 71-82.
- 28) Wang, J.Z., Summers, R.S., Miltner, R.J.: "Biofiltration Performance: Part I, Relationship to Biomass," *J. Amer. Water Works Assoc.*, 87(12)(1995): 55-63.
- 29) Miltner, R.J., Summers, R.S., Wang, J.Z.: "Biofiltration Performance: Part II, Effects of Backwashing," *J. Amer. Water Works Assoc.*, 87(12)(1995): 64-70.
- 30) Wang, J., Summers, R.S.: "Biodegradation Behavior of Ozonated Natural Organic Matter in Sand Filters," *Revue des Sciences de l'Eau*, 1, (1996):3-16.
- 31) Summers, R.S., Hooper, S., Shukairy, H., Solarik, G., Owen, D.M.: "Assessing DBP Yield: Uniform Formation Conditions," *J. Amer. Water Works Assoc.*, 88(6) (1996): 80-93.
- 32) Hooper, S.M., Summers, R.S., Solarik, G., Owen, D.M.: "Improving GAC Performance by Optimized Coagulation", *J. Amer. Water Works Assoc.*, 88(8) (1996):107-120.
- 33) Paode, R., Amy, G., Krasner, S., Summers, R.S., Rice, E.: "Formation and Removal of Aldehydes and BOM," *J. Amer. Water Works Assoc.*, 89(6) (1997): 79-93.
- 34) Moll, D.M., Summers, R.S., Breen, A.: "Microbial Characterization of Biological Filters Used for Drinking Water Treatment," *Appl. Environ. Microbiol.*, 64(7) (1998): 2755-2759.
- 35) Speth, T.F., Summers, R.S., Gusses, A.M.: "Nanofiltration Foulants from a Treated Surface Water," *Environ. Sci. & Technol.*, 32 (24) (1998): 3612-3617.
- 36) Moll, D.M., Summers, R.S., Fonseca, A.C., Matheis, W.: "Impact of Temperature on Drinking Water Biofilter Performance and Microbial Community Structure," *Environ. Sci. & Technol.*, 33 (14) (1999): 2377-2382.
- 37) Moll, D.M., Summers, R.S.: "Assessment of Drinking Water Filter Microbial Communities Using Taxonomic and Metabolic Profiles," *Wat. Sci. Technol.*, 39 (7) (1999): 83-89.
- 38) Tryby, M.E., Boccelli, D.L., Koechling, M.T., Uber, J.G., Summers, R.S., Rossman, L.A.: "Booster Chlorination for Managing Disinfectant Residuals," *J. Amer. Water Works Assoc.*, 91 (1) 1999: 95-108.
- 39) Graham, M., Summers, R.S., Simpson, M., MacLeod, B.: "Modeling Equilibrium Adsorption of 2-Methylisobornel and Geosmin in Natural Waters," *Water Research*, 34(8) 2291-2300 (2000).

- 40) Speth, T.F., Gusses, A.M., Summers, R.S.: "Evaluation of Nanofiltration Pretreatments for Flux Loss Control," *Desalination*, 130 (1), 31-44 (2000).
- 41) Fonseca, A.C., Summers, R.S., Hernandez, M.T.: "Comparative Measurements of Microbial Activity in Drinking Water Biofilters," *Water Research*, 35(16) 3817-3824(2001).
- 42) Boccelli, D.L., Tryby M.E., Uber J.G., Summers R.S.: "A Reactive Species Model for Chlorine Decay and TTHM Formation under Rechlorination Conditions," *Water Research*, 37(11) 2654-2666 (2003).
- 43) Seidel, C.J., McGuire, M., Summers,R.S., Via, S.: "Have Utilities Switched to Chloramines?" *J. Amer. Water Works Assoc.* 97 (10), 87-97 (2005).
- 44) Hong, S., Summers R.S.: "Effect of Backwashing on Activated Carbon Adsorption Using the Plug Flow Pore-Surface Diffusion Model," *Korean J. Chem. Eng.*, 23(1), 57-62 (2006).
- 45) Kim, T-U., Drewes J., Summers R.S., Amy G.L.: "Solute transport model for trace organic neutral and charged compounds through nanofiltration and reverse osmosis membranes," *Water Research*, 41(17), 3977-3988 (2007).
- 46) Fonseca, A.C., Summers, R.S., Greenberg, AR., Hernandez, M.T.: "Extra-Cellular Polysaccharides, Soluble Microbial Products, and Natural Organic Matter Impact on Nanofiltration Membranes Flux Decline," *Environ. Sci. Technol.*, 41(7), 2491-2497 (2007).
- 47) Ahn, H., Chae, S., Kim S., Wang, C., Summers, R.S.: "Efficient taste and odour removal by water treatment plants around the Han River water supply system," *Water Science & Technol.*, 55 (5), 103–109 (2007).
- 48) Zachman, B.A., Rajagopalan B., Summers R.S.: "Modeling NOM Breakthrough in GAC Adsorbers Using Nonparametric Regression Techniques," *Environ. Engineering Sci.*, 24(9), 1280-1296 (2007).
- 49) Dickenson, E., Summers, R.S, Croue, J.P., Gallard, H.: "Haloacetic acid and Trihalomethane Formation from the Chlorination and Bromination of Aliphatic beta-Dicarbonyl Acid Model Compounds," *Environ. Sci. Technol.*, 42(9), 3226-3233 (2008)
- 50) Towler, E., Rajagopalan, B., Seidel, C., Summers, R.S.: "Simulating Ensembles of Source Water Quality Using a K-Nearest Neighbor Resampling Approach," *Environ. Sci. Technol.*, 43 (5), 1407-1411 (2009).
- 51) Seidel, C.J., Roberson, J.A., Summers, R.S., Zearley, T., Tang, G.: "Incorporation of Research Plan Results into Regulatory Policy: An Evaluation" *J. Amer. Water Works Assoc.*, 101 (12) 42-56 (2009).
- 52) Beggs, K.M.H., Summers, R.S., McKnight, D.M.: "Characterizing chlorine oxidation of dissolved organic matter and disinfection byproduct formation with fluorescence spectroscopy

and parallel factor analysis," *J. Geophys. Res.*, 114, G04001, doi:10.1029/2009JG001009 (2009).

- 53) Towler, E., Rajagopalan, B., Summers, R.S.: "Using Parametric and Nonparametric Methods to Model TOC, Alkalinity, and pH after Conventional Surface Water Treatment," *Environ. Engineering Sci.*, 26 (9) 1299-1308 (2009).
- 54) Bielefeldt, A.R., Kowalski, K., Summers, R.S.: "Bacterial Treatment Effectiveness of Point-of-Use Ceramic Water Filters," *Water Research*, 43(14), 3559-3565 (2009).
- 55) Zachman, B.A., Summers, R.S.: "Modeling TOC Breakthrough in Granular Activated Carbon Adsorbers," *Journal of Environmental Engineering, ASCE*, 136(2), 205-210 (2010).
- 56) Corwin, C.J., Summers, R.S.: "Scaling Trace Organic Contaminant Adsorption Capacity by Granular Activated Carbon," *Environ. Sc. Technol.*, 44 (14), 5403-5408 (2010).
- 57) Bielefeldt, A. R., Kowalski, K., Schilling, C., Schreier, C., Kohler, A., Summers, R.S.: "Removal of virus to protozoan sized particles in point-of-use ceramic water filters," *Water Research*, 44 (5) 1482-88 (2010).
- 58) Towler, E., Rajagopalan, B., Gilleland, E., Summers, R.S., Yates, D., Katz, R.W.: "Modeling hydrologic and water quality extremes in a changing climate: A statistical approach based on extreme value theory," *Water Resources Research*, 46, W11504, doi:10.1029/2009WR008876, (2010).
- 59) Towler, E., Rajagopalan, B., Summers, R.S., Yates, D., "An approach for probabilistic forecasting of seasonal turbidity threshold exceedance," *Water Resources Research*, 46, W06511, doi:10.1029/2009WR007834 (2010).
- 60) Corwin, C.J., Summers, R.S., "Adsorption and desorption of trace organic contaminants from granular activated carbon adsorbers after intermittent loading and throughout backwash cycles," *Water Research*, 45 (2) 417-26 (2011).
- 61) Beggs, K.M.H., Summers, R.S.: "Character and Chlorine Reactivity of Dissolved Organic Matter from a Mountain Pine Beetle Impacted Watershed," *Environ. Sci. Technol.*, 45 (13), 5717-5724 DOI: 10.1021/es1042436 (2011).
- 62) Towler, E., Raucher, B., Rajagopalan, B., Rodriguez, A., Yates, D., Summers, R.S.: "Incorporating Climate Uncertainty in a Cost Assessment for a New Municipal Source Water," *Journal of Water Resources Planning and Management ASCE*, 138:396-402 doi:10.1061/(ASCE)WR.1943-5452.0000150 (2011).
- 63) Corwin, C. J., Summers, R. S.: "Controlling Trace Organic Contaminants with Granular Activated Carbon Adsorption," *J. Amer. Water Works Assoc.* 104 (1) 43 E36-E47, doi.org/10.5942/jawwa.2012.104.0004 (2012).

- 64) Bielefeldt, A.R., R.S. Summers, and T. Relph. TEC Project Report: National Inventory of Regional Collaboration among Water and Wastewater Utilities. *J. Amer. Water Works Assoc.* doi: 10.5942/jawwa.2012.104.0110, 104 (7), 67-78.
- 65) Zearley, T., Summers, R. S. Removal of Trace Organic Micropollutants by Drinking Water Biological Filters *Environ. Sci. Technol.*, 46(17):9412-9. doi: 10.1021/es301428e (2012).
- 66) Bielefeldt, A.R., M. W. Stewart, E. Mansfield, R.S. Summers, J.N. Ryan. "Effects of chlorine and other water quality parameters on the release of silver nanoparticles from a ceramic surface," *Water Research*. 47(12), 4032-4039 (2013).
- 67) Beggs, K.H.M., Billica, J.A., Korak, J., Rosario-Ortiz, F., McKnight, D.M. and Summers, R.S.: "Spectral evaluation of watershed DOM and DBP precursors," *J. Amer. Water Works Assoc.*, <http://dx.doi.org/10.5942/jawwa.2013.105.0063> 105(4) E173-E188 (2013).
- 68) Towler, E., Rajagopalan, B., Yates, D., Rodriguez, A., Summers, R.S. "Integrated Approach to Simulate Stream Water Quality for Municipal Supply under a Changing Climate," *J. Environ. Eng.*, 139(12), 1432–1440 (2013).
- 69) Summers, R.S., Kim, S.M., Shimabuku, K., Chae, S.H., Corwin, C.J., "Granular activated carbon adsorption of MIB in the presence of dissolved organic matter.," *Water Research*, 47(10),3507-3513 (2013).
- 70) Haagensohn, E., Rajagopalan, B., Summers, R.S., Roberson, A., "Projecting Demand Extremes under Climate Change Using Extreme Value Analysis," *J. Amer. Water Works Assoc.* <http://dx.doi.org/10.5942/jawwa.2013.105.0013>. 105 (2) E40-50 (2013).
- 71) Korak, J.A., A.D. Dotson, R.S. Summers, and F.L. Rosario-Ortiz, "Critical analysis of commonly used fluorescence metrics to characterize dissolved organic matter," *Water Research*, 49 (1) 327-338 (2014).
- 72) Kearns, J.P., L.S. Wellborn, R.S. Summers, and D.R.U. Knappe, "2,4-D adsorption to biochars: Effect of preparation conditions on equilibrium adsorption capacity and comparison with commercial activated carbon literature data." *Water Research*, 62 (1) 20-28 (2014).
- 73) Kearns, J.P., D.R.U. Knappe, and R.S. Summers, "Synthetic organic water contaminants in developing communities: an overlooked challenge addressed by adsorption with locally generated char," *Journal of Water, Sanitation and Hygiene for Development*, 4 (3) 422–436 doi:10.2166/washdev.2014.073 (2014).
- 74) Kennedy, A.M., A.M. Reinert, D.R.U. Knappe, I. Ferrer, and R.S. Summers, "Full- and pilot-scale GAC adsorption of organic micropollutants," *Water Research*, 68 (1) 238-248 (2015).

- 75) Shimabuku, K.K., H. Cho, E. Townsend, F.L.Rosario-Ortiz, R.S. Summers, "Modeling non-equilibrium adsorption of MIB and sulfamethoxazole by powdered activated carbon and the role of dissolved organic matter competition," accepted *Environ. Sci. Technol*, 48 (2015).
- 76) Kearns J, Shimabuku KK, Mahoney RB, Knappe DRU, Summers RS. Meeting multiple water quality objectives through treatment using locally generated char: Improving organoleptic properties and removing synthetic organic contaminants and disinfection byproducts. *Journal of Water Sanitation and Hygiene for Development* (2015).

Book Chapters – Peer reviewed

- 1) Summers, R.S., Roberts, P.V.: "Dynamic Behavior of Organics Removal in Full-Scale Granular Activated-Carbon Columns," in Treatment of Water by Granular Activated Carbon, Advances in Chemistry Series No. 202, Editors: M. McGuire and I.H. Suffet, Amer. Chem. Soc., Washington, DC (1983).
- 2) Summers, R.S., Roberts, P.V.: "Behavior of Dissolved Organic Molecular Weight Fractions During Activated Carbon Adsorption," in Fundamentals of Adsorption, Editors: A.L. Myers and G. Belfort, Engineering Foundation and Amer. Inst. Chem. Eng., New York, NY (1984).
- 3) Roberts, P.V., Reinhard, M., Hopkins, G.D., Summers, R.S.: "Advection- Dispersion-Sorption Models for Simulating the Transport of Organic Contaminants," Chap. 23 in Groundwater Quality, Editors: C.H. Ward, W. Giger and P.L. McCarty, John Wiley & Sons, New York, NY (1985).
- 4) Summers, R.S., Fuchs, F., Sontheimer, H.: "The Fate and Removal of Radioactive Iodine in the Aquatic Environment," in Aquatic Humic Substances: Influence on Fate and Treatment of Pollutants, Advances in Chemistry Series No. 219, Editors: I.H. Suffet and P. MacCarthy, Amer. Chem. Soc., Washington, D.C. (1989).
- 5) Summers, R.S., Crittenden, J.C.: "The Use of Mini-Columns for the Prediction of Full-Scale GAC Behavior," in Design and Use of Granular Activated Carbon: Practical Aspects, Amer. Water Works Assoc. Res. Found., Denver, CO (1989).
- 6) Johannsen, K., Summers, R.S., "Adsorption Processes in Water Treatment," in Ullmann's Encyclopedia of Industrial Chemistry, Vol. A28, Water (1996).
- 7) Shukairy, H., Summers, R.S.: "DBP Speciation and Kinetics as Affected by Ozonation and Biotreatment," in Disinfection By-products in Water Treatment, Editors: R.A. Minear and G.L. Amy, CRC Press, Boca Raton, FL (1996).
- 8) Moll, D., Summers, R.S.: "Performance, Biomass and Community Structure Profiles of Biological Rapid Media Filters," in Advances in Slow Sand and Alternative Biological Filtration, Editors: N. Graham and R. Collins, John Wiley and Sons, Chichester, England (1996).

- 9) Koechling, M.T., Shukairy, H.M., Summers, R.S.: "Effect of Ozonation and Biotreatment on Molecular Size and Hydrophilic Fractions of Natural Organic Matter" in Water Disinfection and Natural Organic Matter, Editors: R.A. Minear and G.L. Amy, American Chemical Society, Washington, DC (1996).
- 10) Solarik G., Summers, R.S., Sohn, J., Swanson, W., Chowdhury, Z., Amy, G.: "Extensions and Verifications of the Water Treatment Plant Model for Disinfection By-Product Formation," in Natural Organic Matter and Disinfection By-Products, Barrett, S., Krasner, K. and Amy, G. Editors, ACS Symposium Series 761, American Chemical Society, Washington D.C. (2000).
- 11) Snoeyink, V.L., Summers, R.S., "Adsorption of Organic Compounds," in Water Quality and Treatment, fifth edition, Amer. Water Works Assoc., McGraw-Hill, New York, NY (1998).
- 12) Servais, P., Prevost, M., Laurent, P., Joret, J.C., Summers, R.S., Hamsch, B., Ventresque, C., "Biodegradable Organic Matter in Drinking Water Treatment" in Biodegradable Organic Matter in Drinking Water Treatment and Distribution, M. Prevost, P. Laurent, P. Servais, and J.C. Joret, Editors. Amer. Water Works Assoc., Denver, CO (2005).
- 13) Summers, R.S., Chae, S., Kim, S.M., Ahn, H.W., Biodegradation of MIB and Geosmin in Biological Sand and BAC Filters: Acclimation, Steady-State and Varying Influent Conditions in Recent Progress in Slow Sand and Alternative Biofiltration Processes, Editor(s): Gimbel R., Graham N., Collins M.R. International Water Association, London, UK (2006).
- 14) Metz, D.H., Pohlman, R.C., Vogt, J., Summers, R.S., "Removal of MIB and Geosmin by Full-Scale Biological Sand Filters," in Recent Progress in Slow Sand and Alternative Biofiltration Processes, Editor(s): Gimbel R., Graham N., Collins M.R. International Water Association, London, UK (2006).
- 15) Summers, R.S., Knappe, D.R.U, Snoeyink, V.L., "Adsorption of Organic Compounds by Activated Carbon," in Water Quality and Treatment, sixth edition, Amer. Water Works Assoc., McGraw-Hill , New York, NY (2010).
- 16) Korak, J.A.; Rosario-Ortiz, F.L.; Summers, R.S., "Fluorescence characterization of humic substance coagulation: Application of new tools to an old process," In Advances in the Physicochemical Characterization of Organic Matter; Rosario-Ortiz, F.L., Ed; ACS Symposium Series 1160; American Chemical Society: Washington DC, pp 281-300 (2014).
- 17) Arias, S.A., Summers, R.S. "Fate of Characterized and Uncharacterized Halogenated Organic Matter during Coagulation of Natural Waters with Chlorine or Chlorine Dioxide Application," In Advances in the Physicochemical Characterization of Organic Matter; Rosario-Ortiz, F.L., Ed; ACS Symposium Series 1160; American Chemical Society: Washington DC (2014).

Conference Proceedings – Peer-reviewed

- 1) Bielefeldt, A., Amadei, B., Moeller, W., Pinnell, M., Sandekian, R., Shah, J., Summers, R.S.: Creating an Engineering for Developing Communities Emphasis in Environmental Engineering.

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- 111) Arias M., J. Priestley, J. O'Brien R.S. Summers: "Preoxidation Optimization for DBP Control: A Scale-up Study," Proc. Amer. Water Works Assoc. Water Quality Technology Conference, Philadelphia, PA (2003).
- 112) Dickenson, E., R.S. Summers: "Using Chlorine Exposure (CT) to Predict Trihalomethane Formation," Proc. Amer. Water Works Assoc. Water Quality Technology Conference, Philadelphia, PA (2003).

- 113) DeMers, L., A. Gusses Dugan, R.S. Summers, J. Uber: "Optimization Beyond Turbidity – Fine Tuning the Disinfection Process and Control of Byproduct Formation," Proc. Amer. Water Works Assoc. Water Quality Technology Conference, Philadelphia, PA (2003).
- 114) Arias M., R.S. Summers: "Understanding and Optimizing Chlorine Interactions During Coagulation," Proc. Amer. Water Works Assoc. Conference, Anaheim, CA (2003).
- 115) Fonseca C.A., R. S. Summers, A. Greenberg, M. Hernandez: "Isolating and Modeling Critical Factors Governing Biofouling of Nanofiltration Membranes," Proc. Amer. Water Works Assoc. Membrane Technology Conference, Atlanta, GA (2003).
- 116) Arias M., R.S. Summers: "Effect of TOC on Preoxidation Optimization," Proc. Amer. Water Works Assoc. Conference, Orlando, FL (2004).
- 117) Dickenson, E., R.S. Summers: "Bromide and Prechlorination Effects upon Disinfection By-product Formation within a Chlorine/Chloramine Disinfection Approach," Proc. Amer. Water Works Assoc. Conference, Orlando, FL (2004).
- 118) Seidel, C., M. Carr, R. S. Summers, M. Frey, N. Landi, B. Zachman: "The MIEX Process: A Technology for Removing Inorganic Contaminants," Proc. Amer. Water Works Assoc. Conference, Orlando, FL (2004).
- 119) Work L., R.S. Summers: "Modeling Chlorine-NOM reactions Kinetics with Fluorescence," Proc. Amer. Water Works Assoc. Conference, Orlando, FL (2004).
- 120) Arias M., E. Dickenson, R.S. Summers: "Optimization of Preoxidant and Powdered Activated Carbon Addition," Proc. Amer. Water Works Assoc. Water Quality Technology Conference, San Antonio, TX (2004).
- 121) Arias M., R.S. Summers: "The Formation and Fate of Disinfection Byproducts during Coagulation with Chlorine and Chlorine Dioxide Preoxidation," Proc. Amer. Water Works Assoc. Water Quality Technology Conference, San Antonio, TX (2004).
- 122) Zachman B., R.S. Summers: "The Effect of Water Quality Characteristics and RSSCT Design Parameters on TOC Breakthrough in GAC Columns," Proc. Amer. Water Works Assoc. Water Quality Technology Conference, San Antonio, TX (2004).
- 123) Work L., N. Smith, R.S. Summers: "Practical Modeling of Chlorine and Chloramine Decay in Drinking Water," Proc. Amer. Water Works Assoc. Water Quality Technology Conference, San Antonio, TX (2004).
- 124) O'Brien J.C., R.S. Summers: "Filter Performance: The Effects of ETSW and Preoxidation with Optimal and Suboptimal Coagulation," Proc. Amer. Water Works Assoc. Water Quality Technology Conference, San Antonio, TX (2004).

- 125) Lagerquist J.M., R.S. Summers: "Disinfection Byproduct Control with Chlorine Dioxide and Other Alternative Oxidant Strategies," Proc. Amer. Water Works Assoc. Water Quality Technology Conference, San Antonio, TX (2004).
- 126) Meyer, K.J., Summers, R.S., Westerhoff, P., Metz, D.H. "Biofiltration for Geosmin and MIB Removal," Proc. Amer. Water Works Assoc. Conference, San Francisco, CA (2005).
- 127) Dickenson, E., R.S. Summers, J.P. Croué, H. Gallard: "Fast-Reacting Chlorinated Disinfection By-Product Precursors," Proc. Amer. Water Works Assoc. Conference, San Francisco, CA (2005).
- 128) Zachman, B., R. S. Summers, B. Rajagopalan: "A Model to Predict TOC Breakthrough in Small- and Field-Scale GAC Adsorbers," Proc. Amer. Water Works Assoc. Conference, San Francisco, CA (2005).
- 129) Seidel, P., M. McGuire, R. S. Summers,
S. Via: "
1) Have Utilities Switched to Chloramines? Results from the AWWA Disinfection Practices Survey," Proc. Amer. Water Works Assoc. Conference, San Francisco, CA (2005).
- 130) Kim, S.M., Summers, R.S.: "Control of MIB and Geosmin by Granular Activated Carbon," Proc. Amer. Water Works Assoc. Conference, San Antonio, TX (2006).
- 131) Seidel, C., Summers, R.S., Roberson, A.: "The Safe Drinking Water Act: A Regulatory Development Assessment" Proc. Safe Drinking Water: Where Science Meets Policy Symposium, Carolina Environmental Program, University of North Carolina, Chapel Hill (2006).
- 132) Beggs, K., Zachman, B., Valenti, C. Summers, R.S.: "Predicting Disinfection Byproducts Using Molecular Fluorescence," Proc., Amer. Water Works Assoc. Water Quality Technology Conference, Denver, CO (2006).
- 133) Towler, E., Rajagopalan, B., Summers, R.S, Seidel, C.: "Characterizing Influent Water Quality Across the United States," Proc., Amer. Water Works Assoc. Water Quality Technology Conference, Denver, CO (2006).
- 134) Kang, S., Summers, R.S., Amy, G.: "Removal of Trace Anionic Organic Compounds in Water by Ion Exchange Resins," Proc., Amer. Water Works Assoc. Water Quality Technology Conference, Denver, CO (2006).
- 135) Kim, S.M., Summers, R.S., Ahn, H.: "Development of a Decision Support System for Taste and Odor Control," Proc., Amer. Water Works Assoc. Water Quality Technology Conference, Denver, CO (2007).

- 136) Kerstiens, J., MacPhee, M., Sullivan, L., Bryck, J., Summers, R.S., Cho, H.: "Designing Plants to Meet Taste and Odor Objectives With Inadequate Historical Data," Proc., Amer. Water Works Assoc. Water Quality Technology Conference, Denver, CO (2006).
- 137) Chae, S., Kim, S.M., Ahn, H., Summers, R.S.: "Biofiltration of MIB and Geosmin under Varying Influent Conditions," Proc., Amer. Water Works Assoc. Water Quality Technology Conference, Denver, CO (2006).
- 138) Loveland, J., Seidel, C., Means, E., Pennell, G., Summers, R.S.: "When Even RO Does Not Remove It, Just Add GAC! Bench and Pilot-scale Results for 1,2,3 TCP Control," Amer. Water Works Assoc. Water Quality Technology Conference, Denver, CO (2006).
- 139) Valenti, C.C., Beggs, K., Summers, R.S.: Evaluating DBP Formation in the Distribution System with Hold Studies, Proc. Amer. Water Works Assoc. Conference, Toronto, Ontario, Canada (2007).
- 140) Cho H., Summers, R.S.: MIB Removal by Powdered Activated Carbon: Impact of NOM, Kinetics and Pretreatment, Proc. Amer. Water Works Assoc. Conference, Toronto, Ontario, Canada (2007).
- 141) Kim, S.M., Summers, R.S., Ahn, H.: "Predicting MIB Breakthrough in Granular Activated Carbon Adsorbers," Proc. Amer. Water Works Assoc. Conference, Toronto, Ontario, Canada (2007).
- 142) Zachman, B.A., Summers, R.S., Swanson W.: TOC Breakthrough Models: Practical Application and Case Studies, Proc. Amer. Water Works Assoc. Conference, Toronto, Ontario, Canada (2007).
- 143) Cho, H., Summers, R.S.: Powdered Activated Carbon for Controlling Total Organic Carbon: Application and Model Development, Amer. Water Works Assoc. Water Quality Technology Conference, Charlotte, NC (2007).
- 144) Hill, C.P., Chowdhury, Z.K., Sclimenti, M.J., Krasner, S.W., Summers, R.S., Uber, J.: Occurrence and Control of Disinfection Byproducts in Consecutive Drinking Water Systems, Amer. Water Works Assoc. Water Quality Technology Conference, Charlotte, NC (2007).
- 145) Dani, D., Linden K., Summers R.S., Kim S.M., "Evaluating UV/H₂O₂ for Removal of Taste and Odor," Amer. Water Works Assoc. Water Quality Technology Conference, Charlotte, NC (2007).
- 146) Corwin, C., Cardenas, J., Summers, R.S.: "Micropollutant Control by Activated Carbon Adsorbers: Effect of Backwashing and Pulse Loading," Proc. Amer. Water Works Assoc. Conference, Atlanta, GA (2008).
- 147) Passantino, L., Chowdhury, Z., Summers, R.S., Corwin, C., Bryck, J.: "Overcoming Implementation Challenges for the Stage 2 DBPR: Retrofitting Water Treatment Plants for

- Granular Activated Carbon,” Proc. Amer. Water Works Assoc. Conference, Atlanta, GA (2008).
- 148) Summers R.S., Kim, S.M., Chae, S., Cho, H., Dani, D.: “Process Modeling for MIB and Geosmin Control: Powdered & Granular Activated Carbon, Biological Filtration and Advanced Oxidation (UV/H₂O₂),” keynote address IWA Symposium on Off-Flavours in the Aquatic Environment, Daejeon, Korea, October 5-9th, 2008.
- 149) Kowalski, K., Bielefeldt, A., Summers, R.S.: “Bacterial Growth in Point-of-Use Ceramic Water Filters. Proc. of Institute for the Environment Environmental Symposium: Sustainable and Safe Drinking Water in Developing and Developed Countries: Where Science Meets Policy, edited by Phil Singer. University of North Carolina – Chapel Hill, NC (2008).
- 150) Corwin, C., Parker, A., Summers, R.S.: “Effect of Oxidation of Dissolved Organic Matter on Micropollutant Adsorption by Granular Activated Carbon,” Proc. Amer. Water Works Assoc. Water Quality Technology Conference, Cincinnati, OH (2008).
- 151) Valenti, C., et al.: “Disinfection By-Product Control Strategies in Consecutive Drinking water Systems,” Proc. Amer. Water Works Assoc. Water Quality Technology Conference, Cincinnati, OH (2008).
- 152) Corwin, C., Summers, R.S.: “Assessing the Scalability of Fouling of GAC Adsorbers by Competing Organic Matter,” Proc. Amer. Water Works Assoc. Water Quality and Technology Conference, Seattle, WA, (2009).
- 153) Beggs, K.M.H., Summers, R.S., Billica, J.: “Disinfection By-Product Formation from Dissolved Organic Matter Produced from Pine Beetle Epidemic in Rocky Mountains,” Proc. Amer. Water Works Assoc. Water Quality and Technology Conference, Seattle, WA (2009).
- 154) Bielefeldt, A.R., Summers, R.S., Kohler, A., Kowalski, K.: “Bacteria and Virus Removal in Point-Of-Use Ceramic Water Filters,” Proc. Water Environment Federation Disinfection – International Ceramic Pot Filter Workshop (2009).
- 155) Zearley, T., Summers, R.S.: “Retained Removal Capacity of Biofilters for Trace Micropollutants Degradation during Episodic Influent Events” Proc. of the Amer. Water Works Assoc. Water Quality and Technology Conference, Savannah, GA (2010).
- 156) Panacewicz, L.P., Bielefeldt, A.R., Schulz, C., Summers, R.S., Relph T.: “Enhanced ceramic water filtration system for contaminant removal for households in developing countries,” Proc. of the Amer. Water Works Assoc. Water Quality and Technology Conference, Savannah, GA (2010).
- 157) Stewart, M.W., Bielefeldt, A.R., Mansfield, E., Summers, R.S., Ryan J.N., “Effects of water quality parameters on the release of silver nanoparticles from a ceramic surface using a quartz crystal microbalance,” Proc. of the Amer. Water Works Assoc. Water Quality and Technology Conference, Savannah, GA (2010).

- 158) Ghosh, A., Tang, G., Seidel, C., Hohner, A., Rosario-Ortiz, F., Summers, R.S., Rodgers, M.: "Connecting the Dots: Can Climate Change Influence Algal Blooms that Lead to Disinfection By-Product Formation in Your Drinking Water?" Proc. of the Amer. Water Works Assoc. Water Quality and Technology Conference, Phoenix, AZ (2011).
- 159) Corwin, C., Summers, R.S., Kennedy, A., Cardenas, J., Mastropole, A., Knappe, D.: "Impact of DOC, EBCT, and Pretreatment on the GAC Adsorption of Trace Organic Contaminants," Proc. of the Amer. Water Works Assoc. Water Quality and Technology Conference, Phoenix, AZ (2011).
- 160) Ghosh, A., Acquafredda, S., Seidel, C., Corwin, C., Summers, R.S., Xerxis, M.: "Bench-Scale Testing Pre-Treatment and GAC Synergies for the Scottsdale, Arizona Chaparral WTP," Proc. of the Amer. Water Works Assoc. Water Quality and Technology Conference, Phoenix, AZ (2011).
- 161) Dowdell, K., Zearley, T., Summers, R.S.: "Micropollutant Biodegradation and Adsorption in Biologically Active Drinking Water Filters with Granular Activated Carbon," Proc. of the Amer. Water Works Assoc. Water Quality and Technology Conference, Phoenix, AZ (2011).
- 162) Zearley, T., Summers, R.S.: "Removal of Micropollutants Through Biologically Based Processes," Proc. of the Amer. Water Works Assoc. Water Quality and Technology Conference, Phoenix, AZ (2011).
- 163) Zearley, T., Meyer, S.H., Chae, K., Dowdell, R.S., Summers, R.S.: "Trace Organic Pollutant Degradation in Drinking Water Biological Filters," Proc. of the Amer. Water Works Assoc. Water Quality and Technology Conference, Toronto ON, Canada (2012).
- 164) Kennedy, A., Reinert, R.S., Summers, I., Ferrer, M., Thurman, D.R., Knappe, D.: "Scale-Up of the GAC Adsorption of Trace Organic Compounds," Proc. of the Amer. Water Works Assoc. Water Quality and Technology Conference, Toronto ON, Canada (2012).
- 165) Kennedy, A.M., Summers, R.S.: "Fouling Effects of NOM Size Fractions on the Scale-up of GAC Adsorption." Proc. of the Amer. Water Works Assoc. Annual Conference and Exposition, Denver, CO (2013).
- 166) Korak, J.A.; Dotson, A.D.; Summers, R.S.; Rosario-Ortiz, F.L. Critical Analysis of Commonly Used Fluorescence Metrics. AWWA Water Quality and Technology Conference, Long Beach, CA, November 3-6, 2013.

Reports

- 1) Eberle S.H., Fuchs F., Haberer K., Summers R.S., Sontheimer H.: "Radioaktivkontaminierte Rhowasser bei der Trinkwassergewinnung," Agrar-und Umweltforschung in

Baden-Württemberg, Band 17, Ministerium für Ernährung, Landwirtschaft, Umwelt und Forsten (1986).

- 2) Haist B., Summers R.S., Zimmer G., Baechle A., Weiss H.: "Die Entfernung von organischen Stoffen aus Rheinuferfiltrat durch Aktivkohlenfiltration," Arbeitsgemeinschaft Wasserwerke Bodensee-Rhein (AWBR), Jahresbericht (1987).
- 3) Summers R.S., Hooper S.M., and Hong S.: "ICR Manual for Bench-and-Pilot- Scale Treatment Studies, Part 2: Granular Activated Carbon Precursor Removal Studies," EPA 814-B-96-003, Office of Water, U.S. EPA, Washington, DC (1996).

INVITED TALKS

Invited Presentations

- 1) Amer. Water Works Assoc. Conference, "GAC Seminar", Kansas City, MO, June 14-18, 1987. "Application of European Experiences with Granular Activated Carbon to the United States."
- 2) Amer. Water Works Assoc. Res. Found./U.S. EPA Symposium, "Design and Use of Granular Activated Carbon: Practical Aspects," Cincinnati, OH, May 9-10, 1989. "The Use of Mini-Columns as a Predictive Tool."
- 3) Amer. Water Works Assoc. Res. Found./U.S. EPA Symposium, "The Design and Use of Granular Activated Carbon; Practical Aspects," Cincinnati, OH, May 9-10, 1989. "German Experiences with Granular Activated Carbon."
- 4) 15th International Symposium on Wastewater Treatment and Drinking Water, Montreal, Canada, November 17-19, 1992. "The Impact of Ozonation and Biological Treatment on Disinfection By-Products."
- 5) Lyonnaise des Eaux-Dumez/AWWA Research Foundation, "Natural Organic Matter Workshop," Chamonix, France, September 19-22, 1993. "Biocharacterization of Natural Organic Matter."
- 6) Amer. Water Works Assoc. Water Quality Technology Conference, "Enhanced Coagulation Seminar," Miami, FL, Nov. 7-10, 1993. "TOC Removal as a Predictor of DBP Control."
- 7) Amer. Water Works Assoc. Conference, "Activated Carbon Seminar", New York, NY, June 19-23, 1994. "The Use of RSSCTs to Predict GAC Field-Scale Performance."
- 8) Austrian Gas and Water Works Assoc., "Water Technology Seminar," Vienna, Austria, December 15, 1995. "Drinking Water Disinfection By-Product Formation and Control: The Situation in the U.S.A."

- 9) Amer. Water Works Assoc. Conference., "NOM Seminar", New York, NY, June 19-23, 1994. "Adsorption of Natural Organic Matter and Disinfection By-Precursors."
- 10) Amer. Water Works Assoc. and U.S. EPA, "GAC, Membranes and the ICR: A Workshop on Bench-Scale and Pilot-Scale Evaluations," Cincinnati, OH, March 3-5, 1996. "The Use of GAC to Meet the ICR Requirements: Guidance Manual Review."
- 11) Amer. Water Works Assoc. Conference, "Pathogens and Disinfection By-products: Balancing the Goals Seminar", Toronto, Ontario, Canada, June 23-27, 1996. "Granular Activated Carbon for DBP Precursor Control."
- 12) Southeast Regional Technology Transfer Conference, "Practical Application of Current Research for Public Water Supply," cosponsored by Amer. Water Works Assoc. and Amer. Water Works Assoc. Research Found., Greenville, SC January 23-24, 1997. "GAC Treatment for Natural Organic Matter and DBP Control."
- 13) Amer. Water Works Assoc. Water Quality Technology Conference, "M/DBP Rule Cluster Seminar," Denver, CO, Nov. 8, 1997. "Analyzing the Impacts of Pre-Disinfection through Jar Testing."
- 14) Amer. Water Works Assoc. Water Quality Technology Conference, "New Developments in Characterizing and Monitoring NOM in Water Treatment Seminar," Denver, CO, Nov. 8, 1997. "GAC Adsorption: Preferential Removal of NOM Fractions."
- 15) U.S. EPA Region IV, Georgia Env. Protection Div, and Assoc. of State Drinking Water Administrators, "Advanced Drinking Water Technology Conference," Atlanta, GA, May 3-6, 1998. "Applications of Ozone, Biofiltration and GAC in Water Treatment."
- 16) Amer. Water Works Assoc. Water Quality Technology Conference, Salt Lake City, UT, Nov. 5, 2000. "Using GAC Biofiltration to Meet D/DBP Stage 1 Requirements."
- 17) International Water Association Biological Activated Carbon Filtration Workshop, May 29-31, 2002, Delft University, The Netherlands. "Review of Drinking Water Based Biofiltration Models."
- 18) Amer. Water Works Assoc. Water Quality Technology Conference, November 17, 2010, Savannah, GA, "Biological Drinking Water Treatment."
- 19) Utah Water Quality Alliance: Biological Filtration Workshop, January 20, 2011, Salt Lake City, UT, "Emerging Contaminants Removal in Drinking Water Biofilters," (Zearley, T.)
- 20) 9th Annual U.S. EPA Drinking Water Workshop, Small Drinking Water Systems: Compliance strategies, Sept 11-13, 2012 Cincinnati OH, "Granular Activated Carbon Treatment Fundamentals."
- 21) 2nd International Faecal Sludge Management Conference, Oct 29-31, 2012, Durban, South Africa, "Solar Biochar Toilet."

- 22) RES EAU Water Network Annual Meeting Program, Nov 3-4, 2012, Toronto, ON, Canada, "Treatment Technologies for Small Systems: Innovation and Sustainability."
- 23) Front Range Taste and Odor Workshop, Feb 9, 2012, Erie, CO, "Treatment Options for MIB and Geosmin."
- 24) Aerobic Biological Filtration, Biological Treatment Symposium, Amer. Water Works Assoc. March 29, 2013, Denver, CO.
- 25) A.P.Black Keynote address, Four Decades of Activated Carbon: Consumer, Regulation and Safety Driven, Amer. Water Works Assoc. Annual Conference and Exposition, Denver, CO. June 9-13, 2013.

Invited Lectures and Seminars

- Agricultural University, Wageningen, The Netherlands.
- Societe Lyonnaise des Eaux, Paris, France.
- University of Geneva, Geneva, Switzerland.
- Centre National de la Recherche Scientifique, Nancy, France.
- University of Massachusetts, Amherst, Massachusetts.
- USEPA-ORD-Water Engineering Research Lab., Cincinnati, Ohio.
- Swiss Federal Institute of Water Supply and Water Pollution Control (EAWAG), Zurich, Switzerland
- University of Alberta, Edmonton, Canada.
- Vanderbilt University, Nashville, Tennessee.
- Universitat Karlsruhe, Germany
- University of Cincinnati-Medical Center, Cincinnati, Ohio.
- University of Colorado, Boulder, Colorado
- DVGW Water Technology Center, Karlsruhe, Germany
- University of Crete, Greece
- Universitat fur Bodenkultur, Vienna, Austria
- Colorado School of Mines, Golden, Colorado
- Korean Water Resources Company, Seoul, Korea
- University of New Hampshire

CONFERENCE PRESENTATIONS (Without Proceedings)

- 1) Sigma Xi Research Symposium, University of Cincinnati, April 21, 1977. "A Mathematical Model of Declining Flow Rate Water Filtration."
- 2) Amer. Inst. Chem. Engr. National Meeting, Cleveland, OH, August 29 - September 1, 1982. Roberts P.V., Summers R.S.: "Simulation of TOC Removal in Fixed-Bed Activated Carbon Treatment."

- 3) Fundamentals of Adsorption Conference, Engineering Foundation, Santa Barbara, CA, May 4-9, 1986. Summers R.S., Roberts P.V.: "Diffusion of Humic Substances in Activated Carbon."
- 4) Amer. Water Works Assoc. Conference, Denver, CO, June 22-26, 1986. Cornel P.K., Summers R.S., Roberts P.V.: "Diffusion of Humic Acid in Dilute Aqueous Solution."
- 5) Inter. Humic Substance Soc. Third Inter. Meeting, Oslo, Norway, August 4-8, 1986. Summers R.S., Roberts P.V., Cornel P.K.: "Molecular Size Distribution and Spectroscopic Characterization of Humic Substances."
- 6) Amer. Water Works Assoc. Conference, Kansas City, MO, June 14-18, 1987. Summers R.S., Roberts P.V.: "Activated Carbon Adsorption of Humic Substances: Effects of Molecular Size and Heterodispersity."
- 7) Amer. Water Works Assoc. Conference, Los Angeles, CA, June 18-22, 1989. Summers R.S., Benz M., Hofmann P., Sontheimer H.: "Adsorption of Dissolved Organic Carbon by Activated Carbon: Scale-up, Modeling and Desorption."
- 8) Amer. Water Works Assoc. Water Quality Technology Conference, San Diego, CA, November 11-15, 1990. Summers R.S., Mogren E., Scarpino P., Aieta E.M.: "Assessment of Regrowth Potential by Biodegradable Dissolved Organic Carbon."
- 9) Central State University 10th Annual Science Symposium, Wilberforce, OH, April 11, 1992. Jackson J., Summers R.S.: "The Use of Ultrafiltration to Characterize Organic Matter in Drinking Water."
- 10) 106th Annual AOAC Inter. Meeting, Cincinnati, OH, August 31- September 3, 1992. Green R., Allgeier S., Swertfeger J., Summers R.S.: "Measurement of the Biodegradable Fraction of Low Level Aquatic Organic Carbon."
- 11) General Meeting of the American Society for Microbiology, Las Vegas, NV, May 23-27, 1994. Moll D.M., Summers R.S.: "Microbial Assessment of a Full-Scale Drinking Water Filter Biofilm Community."
- 12) Enhanced Coagulation Research Workshop, Charleston, SC, December 4-6, 1994. Lytle D.A., Dryfuss M.J., Miltner R.J., Schock M.R., Summers R.S.: "An Evaluation of the Secondary Effects of Enhanced Coagulation."
- 13) General Meeting of the Amer. Society for Microbiology, Washington, DC, May 24-28, 1995. Moll, D.M., Summers, R.S.: "Characterization of Microbial Populations from Drinking Water Filters."
- 14) AWWA Membrane Technology Conference, Reno, NV, August 13-16, 1995. Speth, T.F., Fromme, W.R., Summers, R.S. "Evaluation of Membrane Performance and Fouling by Pyrolysis-GC/MS."
- 15) 21st Annual RREL Hazardous Waste Research Symposium, Cincinnati, OH April 4-6, 1995. Speth, T.F., Fromme, W.R., Summers R.S.: "Evaluation of Membrane Performance and Fouling by Pyrolysis-GC/MS."
- 16) Abstracts of the 96th General Meeting of the American Society for Microbiology, New Orleans, LA, May 19-23, 1996. Moll, D., Summers, R. S.: "Drinking Water Filter Microbial Communities: Taxonomic and Functional Changes Due to Differences in Source Water pH."
- 17) Fourth International BOM Conference, Waterloo, Ontario, Canada, June 20-21, 1996. Moll, D.M., Summers, R.S.: "Assessment of the Impact of Operational Parameters on Drinking Water Filter Microbial Communities Using Taxonomic and Metabolic Profiles."
- 18) GAC, Membranes and the ICR: A Workshop on Bench-Scale and Pilot-Scale Evaluations, Cincinnati, OH, March 3-5, 1996. Hooper, S.M., Summers, R.S., Hong, S, Solarik, G., Owen, D.M.: "GAC Performance as Affected by Influent Concentration, Pretreatment and Variability."

- 19) GAC, Membranes and the ICR: A Workshop on Bench-Scale and Pilot-Scale Evaluations, Cincinnati, OH, March 3-5, 1996. Speth, T.F., Allgeier, S.C., Summers, R.S., Swertfeger, J., Mylin, M.L.: "Evaluating Bench-Scale Nanofiltration Studies for Predicting Full-Scale Performance"
- 20) GAC, Membranes and the ICR: A Workshop on Bench-Scale and Pilot-Scale Evaluations, Cincinnati, OH, March 3-5, 1996. Allgeier, S.C., Gusses A.M., Speth, T.F., Westrick J.J., Summers, R.S.: "Verification of the Rapid Bench-Scale Membrane Test and ICR Requirements"
- 21) 212th American Chemical Society National Meeting, Orlando, FL, August 25-29, 1996. Speth, T.F., Summers, R.S., Gusses, A.M.: "Evaluating Membrane Foulants from Conventionally-Treated Drinking Water,"
- 22) IWSA Natural Organic Matter Workshop, Poitiers, France, September 18-19, 1996. Speth, T.F., Summers, R.S., Gusses, A.M. "Evaluating Membrane Foulants from Conventionally-Treated Drinking Water."
- 23) IWSA Natural Organic Matter Workshop, Poitiers, France, September 18-19, 1996. Koechling, M., Summers, R.S., "Ultraviolet Absorbance: A Parameter for Assessing Chlorination Reaction Kinetics."
- 24) 97th General Meeting of the American Society for Microbiology, Miami Beach, FL, May 4-8, 1997. Moll, D., Summers, R. S.: "Ozonation and Backwashing Conditions Impact Microbial Populations in Drinking Water Biofilter".
- 25) 60th Annual Ohio Section Conference - American Water Works Association, Cincinnati, OH, Sept. 22-25, 1998. Speth, T.F., Gusses, A.M., Summers R.S.: "Nanofiltration Pretreatment for Ohio River Water".
- 26) Association of State Drinking Water Administrators Annual Conference, Portland OR (2000). Barrett, J., R.S. Summers, G. Solarik, E. Bissonette, A. Gusses, L. DeMers: "Total System Optimization: A Framework for Optimizing Treatment Performance and System Management."
- 27) Third NSF International Symposium on Small Drinking Water and Wastewater Systems, Washington, DC, April 22-25, 2001. Barrett, J., R. S. Summers, E. Bissonette, L. DeMers, J. Uber: "The Center for Drinking Water Optimization: Maximizing Public Health Protection through Total System Optimization."
- 28) North American Membrane Society Annual Meeting, Lexington, KY, May 17, 2001. Foncesa A. C., M. T. Hernandez, R. S. Summers, A. Greenberg: "Effect of Microbial Cells and Exocellular Polysaccharides on Nanofiltration Membrane Flux Decline."
- 29) RMSAWWA/RMWEA Annual Conference, Angel Fire, NM, September 9-12, 2001. Grooters, S., R. S. Summers, G. Amy: "A Comparison of Microfiltration with Biological Processes as Pretreatment for Colorado River Water Nanofiltration."
- 30) RMSAWWA/RMWEA Annual Conference, Steamboat Springs, CO, September 15-18, 2002, Caufield J., M. Arias, R.S. Summers: "Optimizing Preoxidation for DBP Control and Filter Performance"
- 31) RMSAWWA/RMWEA Annual Conference, Steamboat Springs, CO, September 15-18, 2002 Work L., N. Smith, R.S. Summers: "Short-term Decay and Long-term Chloramine Decay."
- 32) RMSAWWA/RMWEA Annual Conference, Steamboat Springs, CO, September 15-18, 2002 Graziano, N., C. Siedel, B. Tekada, J. McEnroe, R.S. Summers: "An Alternative Approach Using Distribution System Models."
- 33) International Water Association Biological Activated Carbon Filtration Workshop, Delft University, The Netherlands, May 29-31, 2002, Solarik, G., R.S. Summers: "Enhancement of Granular Activated Carbon Performance by Ozonation and Biotreatment."

- 34) RMSAWWA/RMWEA Annual Conference, Grand Junction, CO, September 12-15, 2004, Swanson, W., L. DeMers, R.S. Summers: "Assessing Plant Performance Using the DBP (DBP-CPE) Comprehensive Performance."
- 35) RMSAWWA/RMWEA Annual Conference, Grand Junction, CO, September 12-15, 2004 O'Brien J.C., R.S. Summers, T. Reichenberger, R. Luna: "An Advanced Backwashing Technique to Minimize Filter to Waste."
- 36) International Water Association 7th Symposium on Off-Flavours in the Aquatic Environment, October 2-7th, 2005, Cornwall, ON, Canada, Chae, S.H., S. Kim. K.H. Lee, H.W. Ahn, J.L. Lim, S.M. Kim, R.S. Summers: "Efficient Taste and Odour Removal by Water Treatment Plants around the Han River Water System."
- 37) U.S. EPA's Invited Workshop Optimizing the Design and Interpretation of Epidemiologic Studies to Consider Alternative Disinfectants of Drinking Water, June 2-3, 2005, Raleigh, NC, Dickenson, E., R.S. Summers: "Disinfection By-product Formation under a Chlorine/Chloramine Disinfection Approach."
- 38) Association of Environmental Engineering and Science Professors (AEESP) Research and Education Conference, July 2005, Clarkson University, NY, Environmental Engineering in a Global/Societal Context session. Bielefeldt, A., R.S. Summers, B. Amadei, R. Sandekian. "Engineering for Developing Communities (EDC) Theme Attracts Diverse Student Interest." Abstract published in conference proceedings.
- 39) Mascaro Engineering Sustainability Conference, Pittsburgh, April 10-12, 2005, Bielefeldt A., R.S. Summers, S. Givler, C. Fahlin, K. Medina, K. Kowalski, H. Wright, A. Malhotra, L. Hollenkamp, "Evaluating the Water Treatment Effectiveness of the Filtrón."
- 40) Gordon Research Conference, Drinking Water Disinfection By-Products: Integrating Occurrence and Formation, Exposure, Toxicity, and Epidemiology, August 13-18, 2006 South Hadley, MA, Scilimenti M.J., Chowdhury Z., Scilimenti M., Summers R.S., Uber J., Krasner S.: "An Assessment of Occurrence and Exposure to DBPs in Consecutive Systems" .
- 41) USEPA's People, Prosperity and Plant Conference, May 8-10, 2006 Washington DC, Shah J., Cornejo-Warner P., Bielefeldt A., Summers R.S.: "Sustainability of Filtrón for Microbial Disinfection."
- 42) Water Environment Federation Disinfection International Ceramic Pot Filter Workshop. March 1, 2009, Atlanta, GA, Bielefeldt, A.R., R.S. Summers, A. Kohler, and K. Kowalski, "Bacteria and Virus Removal in Point-Of-Use Ceramic Water Filters."
- 43) AWWA Water Quality Technology Conference, Nov. 15-18, 2009, Seattle, WA, Bielefeldt, Angela R., R. Scott Summers, A. Kohler, K. Kowalski, "Performance Evaluation of Point-of-Use Ceramic Water Filters."
- 44) Oklahoma University International WaTER (Water Technologies for Emerging Regions) Conference. Oct. 26-27, 2009 Norman, OK, Kohler, A., S. Soundarajan, M. Stewart, R.S. Summers, A. Bielefeldt, "Impact of Silver on Long-term Disinfection by Point-of-Use Ceramic Water Filters."
- 45) 12th Annual Colloquium on International Engineering Education. Oct. 22-25, 2009, Ames, IA, Bielefeldt, Angela R., B. Amadei, R. Sandekian, R.S. Summers, K. Linden, "Engineering for Developing Communities Program: Education for Sustainable Development."
- 46) Gordon Research Conference on Drinking Water Disinfection By-Products, 2009, Mount Holyoke, MA, Beggs, K.M.H., R.S. Summers, "Tracking DBP precursors in the watershed using fluorescence spectroscopy."

- 47) AWWA Research Symposium Emerging Organic Contaminants, Feb 12-12, 2009, Austin, TX, Thurman, E. M., I. Ferrer and R.S. Summers, "Trace Micropollutant Removal by Field-Scale Anthracite and GAC Biofilters."
- 48) CA-NV AWWA – 90th Anniversary Fall Conference, October 6, 2010, Sacramento, CA, Zearley, T.L., Summers, R.S., "Trace Micropollutant Removal by Granular Activated Carbon and Biofilters."
- 49) International Water Associations – Leading Edge Technology Conference, June 1, 2010, Phoenix, AZ, Zearley, T.L., Summers, R.S., "Micropollutant Removal in Drinking Water Biofilters: Critical Issues."
- 50) International DOM Spectroscopy Workshop, May 19-21, 2010, Granada, Spain, Beggs, K.M.H., R.S. Summers, "Watershed specific PARAFAC models for assessing coagulation and formation of disinfection byproduct formation." (poster)
- 51) Amer. Chem. Soc. National Meeting, August 2011, Denver, CO, Zearley, T., K. Dowdell, R.S. Summers: "Long-term Trace Organic Pollutant Biodegradation and Adsorption in Drinking Water Biological Activated Carbon Filters."
- 52) Amer. Chem. Soc. National Meeting, August 2011, Denver, CO, Kearns, J., K. Shimabuku, L. Wellborn, D.R.U. Knappe, R.S. Summers: "Biochar production for use as low-cost adsorbents: Applications in drinking water treatment serving developing communities."
- 53) RMSAWWA/RMWEA Annual Conference, September 12-15, 2011 Loveland, CO, Corwin, C. R.S. Summers: "GAC Performance for the control of DBPs, Taste & Odor, and Trace Organic Contaminants."
- 54) Institute for the Environment Environmental Symposium: Sustainable and Safe Drinking Water in Developing and Developed Countries: Where Science Meets Policy, Oct 2011, Chapel Hill, NC, Kearns, J., B. Nyer, E. Mansfield, H. McLaughlin, D. Rutherford, D. Knappe, R.S. Summers: "Top-Lit-Up-Draft (TLUD) Cookstove Biochar: Appropriate Technology for Sustainable Low-Cost Household Clean Energy, Water Treatment, Agronomic Enhancement, and Distributed CO₂ Sequestration." (poster)
- 55) Amer. Water Works Assoc. Water Quality and Technology Conference, Nov 12-18, 2011, Phoenix, AZ, Hohner, A., A. Khan, D. McKnight, R.S. Summers, Fernando Rosario-Ortiz: "The Role of Nutrient Levels and Algae on DBP Formation in Colorado Watersheds: Implications for Source Water Quality Management."
- 56) Amer. Water Works Assoc. Annual Exposition and Conference, June 10-14, 2012, Dallas, TX. Reinert, R.S., D.R.U. Knappe, A. Kennedy, R.S. Summers, "Comparing Scale-Up Approaches To Predict Granular Activated Carbon Adsorber Performance For Micropollutant Removal."
- 57) America Chemical Society Rocky Mountain Regional Meeting Oct. 19, 2012, Denver CO. Mahoney, R.B., J. Kearns, R.S. Summers: "Chlorine residual control using biochars to facilitate sustained safe water consumption."
- 58) America Chemical Society Rocky Mountain Regional Meeting Oct. 19, 2012, Denver CO. Kearns, J., K. Shimabuku, L. Wellborn, D.R.U. Knappe, R.S. Summers: "Chemical contamination using charcoal /biochar."
- 59) Corwin, C. J. and Summers, R. S. "New Directions for GAC in Water Treatment," Amer. Water Works Assoc. Annual Conference and Exposition, Denver, CO. June 9-13, 2013.
- 60) Kearns, K., Shimabuku, K., Mahoney, R., Knappe, D., Summers R.S., Biochar for water pollution control North American Biochar Symposium, University of Massachusetts, Amherst, MA October 2013.

- 61) Kearns, K., Shimabuku, K., Mahoney, R., Noikaew, R., Niamjan, S., Reents, N., Mansfield, E., Rutherford, D., McLaughlin, H., Knappe, D., Summers R.S., Problematic organic compound sorption/desorption by biochars produced from traditional kiln and low-cost gasifier systems: Applications in sustainable decentralized water treatment for developing communities. American Chemical Society, Division of Environmental Chemistry New Orleans, LA, April 2013.
- 62) Kempisty, D., Summers, R.S., - Removal of Volatile Organic Compounds (VOCs) from Groundwater to sub- $\mu\text{g/L}$ levels using Granular Activated Carbon, Amer. Water Works Assoc. Annual Conference and Exposition, Denver, CO. June 9-13, 2013.
- 63) Kempisty, D., Summers, R.S., The Effect of Background Matrix and Competition of GAC Adsorption of Carcinogenic VOCs in Natural Waters, Amer. Water Works Assoc. Water Quality and Technology Conference, Long Beach, CA, November 3-6, 2013.
- 64) Kennedy, AM, RS Summers. 2013. "Fouling Effects of NOM Size Fractions on the Scale-up of GAC Adsorption." Proceedings of the American Water Works Association Annual Conference and Exposition, Denver, CO.
- 65) Korak, J.A.; Rosario-Ortiz, F.L.; Summers, R.S. Removal of DBP Precursors Using Coagulation. Amer. Water Works Assoc. Annual Conference and Exposition, Denver, CO. June 9-13, 2013.
- 66) Korak, J.A.; Dotson, A.D.; Summers, R.S.; Rosario-Ortiz, F.L. Critical Analysis of Commonly Used Fluorescence Metrics. Amer. Water Works Assoc. Water Quality and Technology Conference, Long Beach, CA, November 3-6, 2013.
- 67) Korak, J.A.; Rosario-Ortiz, F.L.; Summers, R.S.; Framework for using fluorescence spectroscopy to evaluate changes in organic matter. 245th ACS National Meeting. New Orleans, LA, April 7-11, 2013
- 68) Samson, C., Summers, R.S, Balaji, R., Determining Influent TOC Thresholds for Meeting Stage 2 D/DBP Rule, Amer. Water Works Assoc. Annual Conference and Exposition, Denver, CO. June 9-13, 2013.
- 69) Samson, C., Summers, R.S, Balaji, R., Modeling the Impact of Climate Change on TOC Threshold Exceedances for Meeting DBP Regulations, Amer. Water Works Assoc. Water Quality and Technology Conference, Long Beach, CA, November 3-6, 2013.
- 70) Samson, C., Summers, R.S, Balaji, R., Modeling TOC Threshold Exceedances for Meeting DBP Drinking Water Regulations under the Impact of Climate Change , ASA, CSSA, & SSSA International Annual Meetings Tampa, FL, November 4, 2013
- 71) Shimabuku, K., Townsend, E., Summers, R.S., Rosario-Ortiz, F. The Influence of DOM Characteristics on MIB, Sulfamethoxazole, and DOM Control With Powdered Activated Carbon Amer. Water Works Assoc. Annual Conference and Exposition, Denver, CO. June 9-13, 2013.
- 72) Zearley, T.L., Kennedy, A., Cardenas, J., Summers, R.S., 2013 "Biological GAC Filtration and Micropollutants: Design and Operational Guidelines" Amer. Water Works Assoc. Annual Conference and Exposition, Denver, CO. June 9-13, 2013.
- 73) Zearley, T.L., Summers, R.S., 2013 "Biofiltration of Organic Compounds Under Challenging Conditions" Amer. Water Works Assoc. Annual Conference and Exposition, Denver, CO. June 9-13, 2013.
- 74) Zearley, T.L., Dowdell, K.S., Shimabuku, K., Summers, R.S., 2013 "Biodegradation and Attenuation of Trace Organic Contaminants in Biological Drinking Water Filters" AWWA-Biological Treatment Symposium, March 29, 2013, Denver, CO.

- 75) Zearley, T.L., Dowdell, K.S., Shimabuku, K., Summers, R.S., 2013 "Impacts of Nitrification on Organic Micropollutant Removal in Drinking Water Biological Filters" AWWA-Biological Treatment Symposium, March 29, 2013, Denver, CO.

TEACHING AND RESEARCH GRANTS AND CONTRACTS

He has been the PI or coPI of over 40 research projects (>\$8 million) sponsored by a wide range of agencies including Water RF (AWWARF), EPA-ORD, EPA-OGWDW, Bureau of Reclamation, Bill & Melinda Gates Foundation, NOAA and NSF and state and local municipalities (OH, CO, CA, AZ, KY, NY, IN, ND, NM, FL).

Current Projects

- 1) Watershed Analysis of Dissolved Organic Matter and Control of DBPs, Water Research Foundation, \$160,000, 6/1/09-6/30/13.
- 2) Evaluation of Available Scale-Up Approaches for the Design of GAC Contactors, Water Research Foundation, \$350,000, 6/1/10-6/30/13.
- 3) Decision Support Tool to Reduce Exposure of EDCs and PPCPs to Drinking Water Consumers Water Research Foundation (sub), \$30,000, 3/1/12-6/31/13.
- 4) Henry's Law and Freundlich Adsorption Constants for VOCs, Water Research Foundation, \$100,000, 1/1/13 - 12/31/14, D. Knappe (PI), R.S. Summers (coPI).
- 5) Solar Biochar Tiolet, Bill & Melinda Gates Foundation, \$750,000, /1/12- 12/30/13, K. Linden (PI), R.S. Summers (coPI).

STUDENTS ADVISED

Post-Doctoral Fellows

- 1) Dr. Mathias Benz, 1990 - 1992
- 2) Dr. Klaus Johansen, 1993
- 3) Dr. Hiba Shukairy, 1995
- 4) Dr. Seongho Hong, 1996
- 5) Dr. Seonha Chae, 2006
- 6) Dr. Kate Beggs, 2010
- 7) Dr. Chris Corwin, 2011

Doctoral Students

- 1) Hiba Shukairy (1994)
The Control of Disinfection By-Product Formation By Ozonation and Biotreatment
- 2) Jack Wang (1994)
The Assessment of Biodegradation Kinetics of Natural Organic Matter in Drinking Water Biofilters
- 3) Seongho Hong (1995)
Activated Carbon Adsorption of Organic Matter: Backwashing, Desorption and Attenuation
- 4) Thomas Speth (1998)
Evaluation of Nanofiltration Foulants from Treated Surface Waters
- 5) Debbie Moll (1998)
Microbial Community Structure Analysis of Drinking Water Biofilters

- 6) Margaret Koechling (1998)
Assessment and Modeling of Chlorine Reactions with Natural Organic Matter
- 7) Joydeep Mukhejee (1999)
Evaluation of Virus Removal during Direct Filtration
- 8) A. Cristina Fonesca (co-advised) (2002)
Biofouling of Nanofiltration Membranes and In-Situ Biofilm Detection
- 9) Principal Dissertation Advisor for Miguel Arias (2005)
- 10) Principal Dissertation Advisor for Chad Seidel (2006)
- 11) Principal Dissertation Advisor for Eric Dickenson (2005)
- 12) Principal Dissertation Advisor for Soo M. Kim (2006)
- 13) Principal Dissertation Advisor for Lori Work (2006)
- 14) Principal Dissertation Advisor for Sukhyung Kang (2009)
- 15) Principal Dissertation Advisor for Chris Corwin (2010)
- 16) Principal Dissertation Advisor for Kate Beggs (2010)
- 17) Principal Dissertation Co-Advisor for Erin Towler (2010)
- 18) Principal Dissertation Advisor for Thomas Zearley (2012)
- 19) Principal Dissertation Co-Advisor for Julie Korak (2013)
- 20) Principal Dissertation Advisor for David Kempisty (2014)
- 21) Principal Dissertation Advisor for Anthony Kennedy (2014)
- 22) Principal Dissertation Advisor for Josh Kearns (in progress)
- 23) Principal Dissertation Advisor for David Sparkman (in progress)
- 24) Principal Dissertation Advisor for Kyle Shimabuku (in progress)
- 25) Principal Dissertation Co-Advisor for Carleigh Samson (in progress)
- 26) Principal Dissertation Advisor for P. Leigh Gilmore (in progress)
- 27) Principal Dissertation Advisor for Kyle Thompson (in progress)

Master of Science (with thesis)

- 1) J. Ritz (1987)
Adsorptive Entfernung von aliphatischen und aromatischen Spurenverunreinigungen aus Rheinuferfiltrat (Universität Karlsruhe)
- 2) J. Koehler (1988)
Untersuchungen zur adsorptiven Entfernung von aliphatischen Spurenverunreinigungen (Universität Karlsruhe)
- 3) M. Koechling (1992)
Untersuchungen zur Wirkungsweise eines kombinierten Prozesses Anionenaustauscherharz und Aktivkohle zur Trinkwasseraufbereitung (Universität Karlsruhe)
- 4) P. Namuduri (1990)
Response of Granular Activated Carbon Adsorbers Subjected to Shock Loadings
- 5) E. Mogren
Winter 1989 - Fall 1990
Measurement of Biodegradable Dissolved Organic Carbon in Drinking Water
- 6) E.J. Tollett (Pickford)
Fall 1988 - Spring 1991
Development of a Screening Test for Spill Impact on a Wastewater Treatment Plant
- 7) D. Lindberg (co-advised)
Fall 1989 - Fall 1991
The Impact of Size Distribution and Fines Concentration on the Flow Properties of Granular Activated Carbon Slurries
- 8) D. Lytle
Winter 1990 - Summer 1991

- Removal of Beryllium from Drinking Water by Coagulation and Lime Softening
- 9) S. Palepu Fall 1988 - Winter 1992
Effect of the Background Matrix in the Ohio River Water on Granular Activated Carbon Adsorption of Specific Organic Compounds
- 10) T. Solomon Fall 1989 - Winter 1992
The Use of Pretreatment Processes to Reduce Ultrafiltration Membrane Fouling
- 11) L. Cummings Fall 1989 - Fall 1992
Activated Carbon Adsorption of Disinfection By-Product Precursors and Natural and Synthetic Organic Compounds
- 12) B. Joslyn Fall 1989 - Fall 1992
Control of Disinfection By-Product Precursors by Ozonation, Biofiltration and Carbon Adsorption
- 13) J. Goldgrabe Fall 1990 - Fall 1992
Particle Counting as a Method of Evaluating Biological and Conventional Filter Performance
- 14) C. Shrive Summer 1990 - Spring 1993
The Effect of Preoxidation on Granular Activated Carbon Adsorption Capacity and Attenuation of Spills
- 15) J. Jackson Summer 1991 - Summer 1993
The Impact of Drinking Water Treatment Processes on the Molecular Size of Organic Matter
- 16) S. Allgeier Summer 1993 - Spring 1995
Bench-Scale Evaluation Nanofiltration: Organic Solute Rejection and Control of Disinfection By-products
- 17) D. Metz Fall 1983 - Spring 1995
The Assessment of Prezonation, Biotreatment and GAC Adsorption of DBP Precursors and Ozone DBPs Using the Rapid Small-Scale Column Test
- 18) M. Dryfuse Summer 1993 - Spring 1995
An Evaluation of Conventional and Optimized Coagulation for NOM Removal
DBP Control on Bulk and Fractionated Waters
- 19) J. Swertfeger Fall 1991 - Winter 1996
Biological Degradation of Ozone By Products During Drinking Water Treatment
- 20) S. Hooper Fall 1992 - Summer 1996
Granular Activated Carbon Adsorption of Natural Organic Matter and Disinfection By Product Control: Impact of Optimized Coagulation Pretreatment
- 21) G. Solarik Fall 1993 - Winter 1997
NOM Removal and DBP Control by GAC: Optimization and the Impact of Ozonation and Biotreatment
- 22) M. Graham Fall 1994 - Winter 1997
Optimization of Powdered Activated Carbon Use in Water Treatment
- 23) W. Mathis (co-advised) Fall 1996 - Fall 1997
The Influence of Drinking Water Treatment on Chlorine Decay Kinetics (University of Karlsruhe, Germany)
- 24) R. B. Green Fall 1990 - Spring 1998
Application of Lipid Analysis Techniques to the Study of Biomass in the Biodegradable Dissolved Organic Carbon Assay

- 25) W.M. Jr. Wulfeck Fall 1990 - Spring 1998
Control of DBP Formation Using Retrofitted GAC Filter-Adsorbers and Ozonation
- 26) A. Gusses Summer 1995 - Spring 1998
Verification and Use of the Rapid Bench-Scale Membrane Test
- 27) N. Dugan Fall 1995 - Spring 1998
Evaluation and Modeling of the Influences of Ozonation and pH on the Biological Utilization of NOM
- 28) L. Ollier Fall 1995 - Spring 1998
Microbial and Particulate Control Under Conventional and Enhanced Coagulation
- 29) R. Smith (co-advised) Fall 1995 – Spring 1999
Initial Breakthrough of Spores, Heterotrophic Plate Counts, Turbidity and Particle Counts as affected by Backwashing
- 30) D. Boccelli (co-advised) Fall 1996 – Fall 1999
Booster Disinfection: Bulk Decay Kinetics, By-Product Formation and Model Development
- 31) A. Rajbhandari Fall 1997- Fall 2000
Impact of Treatment, Free Chlorine Contact Time and Dose on Chloramine Decay
- 32) C. Seidel Fall 1998- Spring 2000
Understanding Disinfection Byproduct Behavior in Water Distribution Systems
- 33) S. Grooters (co-advised) Fall 1998- Fall 2000
A Comparison of Microfiltration with Biological Processes as Pretreatment for Nanofiltration
- 34) J. Burland Fall 1998- Fall 2000
Optimization of Dual Coagulants on Low Alkalinity Surface Waters
- 35) Principal Thesis Advisor for N. Smith (Cannon) (2004)
- 36) Principal Thesis Advisor for J. O'Brian (Caufield) (2004)
- 37) Principal Thesis Advisor for J. Lagerquist (Priestley) (2004)
- 38) Principal Thesis Advisor for B. Zachman (2005)
- 39) Principal Thesis Advisor for K. Meyer (2006)
- 40) Principal Thesis Advisor for H. Cho (2007)
- 41) Principal Thesis Advisor for E. Towler (2008)
- 42) Principal Thesis Advisor for C. Valenti (2008)
- 43) Principal Thesis Co-Advisor for K. Kowalski (2008)
- 44) Principal Thesis Co-Advisor for A. Kohler (2009)
- 45) Principal Thesis Advisor for J. Cardenas (2011)
- 46) Principal Thesis Co-Advisor for E. Haagenson (2012)
- 47) Principal Thesis Advisor for K. Dowdell (2012)
- 48) Principal Thesis Advisor for H. Lee (2013)
- 49) Principal Thesis Advisor for E. Townsend (2014)
- 50) Principal Thesis Advisor for T. Daugherty (2014)

Senior Theses - University of Karlsruhe:

- 1) V. Peinecke, 1987
Untersuchen zum Scale-up von Adsorptionsanlagen zur Entfernung von Spurenverunreinigungen

- 2) P. Hofmann, 1988
Awendung des Scale-up auf die Adsorption von Huminstoffen an Aktivkohle
- 3) T. Wolf, 1988
Einfluss der Vorbeladung von Aktivkohle mit verschieden vorbehandeltem Rheinferfiltrat auf das Adsorptionsgleichgewicht von chlorierten Kohlenwasserstoffen

Senior Projects - University of Cincinnati:

- 1) A. Krammer, 1992
Influence of Flocculation on Powdered Activated Carbon Adsorption
- 2) S. Allgeier, 1993
Determination of the Biodegradable Dissolved Organic Carbon Fraction in Drinking Water
- 3) M. Tryby, 1993
Removal of TOC and DBP Precursors by Jar Tests
- 4) T. Brown, 1994
Impact of Coagulation on Ozonation and Biotreatment of NOM and DBP Precursors
- 5) L. Ollier, 1994
Impact of Coagulation on Ozonation and Biotreatment of NOM and DBP Precursors
- 6) N. Dugan, 1995
Chlorine Decay Kinetics
- 7) B. Barth, 1995
Fractionation of Natural Organic Matter
- 8) V. Hatcher, 1997
Simplified BDOC Test Parameters
- 9) A. Rajbhandari, 1997
Chlorine Decay Kinetics of NOM Fractions
- 10) A. Driedger, 1998
Impact of pH on Chlorine Residuals in Distribution Systems
- 11) P. Parikh, 1998
Impact of Contact Time on Biodegradation of NOM
- 12) R. Isabel, 1999
Impact of Treatment on Chlorine Decay Kinetics
- 13) M. Anzek, 1999
Impact of Operating Conditions on Chlorine Decay Kinetics

SERVICE

National Committees

- American Water Works Association
 Water Science and Research Division – 2004-2010 Trustee
 Organics Research Committee - past
 Membrane Research Committee - past
 University Student Activities Committee -past
 Water Quality and Technology Conference Planning Committee – 2007-2010
 Activated Carbon Committee – current

Biological Drinking Water Treatment Committee - current
Association of Environmental Engineering Professors
Education Committee - past
Diversity Committee - past
Awards Committee - Chairperson 1994 - 1997

Expert Panels

Water Research Foundation (Amer. Water Works Assoc. Research Foundation)
Research Advisory Council, 1996 - 2001, liaison for M/DBP Research Council
Research Needs Assessment Panels

1989-1990	Activated carbon adsorption
1990	Biological treatment of drinking water
1997	Methods for assessing biological regrowth
1998	NOM in drinking waters
1999	Distribution systems

Technical Advisory Committees

2012-present Biofiltration Focus Area

Unsolicited Proposal Review Committee – 2007-2009

Project Advisory Committees

1992-1995	An Immobilized Biofilm Reactor for the Measurement of Biodegradable Organic Matter in Drinking Water
1994-1999	The Investigation of RO and NF Membrane Processes for Removing Organic Contaminates
1997 –1998	Evaluation of Soil Aquifer Treatment for Drinking Water Reuse

U.S. EPA/ Amer. Water Works Assoc. Research Foundation M/DBP Research Council
Research Advisory Committee, 1996 - 2001, chair
Future Research Priority Workshop, 2001

U.S. EPA/ Amer. Water Works Assoc., review of Stage 2 D/DBP Rule Initial Distribution System Guidance Manual, 2001

U.S. EPA Information Collection Rule Data Analysis Technical Work Group, 1998-2000

U.S. EPA Information Collection Rule Treatment Studies Technical Work Group, 1998-2000

AWWA VOC Workshop, 2011

General Conference Organizing Committees

Design and Use of Granular Activated Carbon, AWWARF/USEPA Symposium
Cincinnati, OH, May 9-10, 1989.

Annual Conference Amer. Water Works Assoc., Cincinnati, OH, June 17-20, 1990.

GAC, Membranes and the ICR: A Workshop on Bench-Scale and Pilot-Scale Evaluations,
Amer. Water Works Assoc. and U.S. EPA, Cincinnati, OH, March 3-5, 1996.

4th International Slow Sand and Alternative Biological Filtration Conference, IWW
Institute, Mulheim an der Ruhr, Germany, Program Advisory Panel, May 3-5, 2006.

Conference Planning Committee, Amer. Water Works Assoc. Water Quality Technology,
2006 – 2010

Biotreatment Symposium, Amer. Water Works Assoc., Denver, CO, March 28-29, 2013.

5th International Slow Sand and Alternative Biological Filtration Conference, May 3-5, 2014.

Local Committees

Cincinnati State Technical and Community College, Env. Eng. Technical Advisor Committee, 1994

Cincinnati Water Works Advisory Committee, 1996 – 1998

Front Range Drinking Water Consortium, Founding member, 1999-present

University Committees

University of Cincinnati

Graduate Faculty, 1988 - 1998

Earth Day 1990 Organizing Committee, 1990

Environmental Studies Program Organizing Committee, 1990 - 1995

U.S. EPA/U.C. Minority Mentoring Program, mentor one high school student each summer for six weeks, 1991 - 1997

International Planning Council, 1996 - 1998

Language Mission Project, 1996 - 1998

Link-to-Excellence Program, 1997 - 1998

Search Committee for Director of the Institute for Global Studies and Affairs, 1997

University of Colorado

College Committees

University of Cincinnati

USEPA Test and Evaluation Facility Technical Advisory Committee, 1988 - 1989

Hazardous Waste Research Center Steering Committee, 1988

Awards Committee, 1991

International Engineering Program Operations Committee, 1991 - 1998

Emerging Ethnic Engineers Minority Mentoring Program, 1992 - 1993, National Science Foundation funded program

Inquisitive Women Program, 1995 - 1997, high school/ junior high school outreach program

Enrollment Management, 1996 - 1998

University of Colorado

Environmental Engineering Undergraduate (EVEN) Program Faculty 1998-present

First-level Promotion and Tenure Review 2003- 2007

Departmental Committees

University of Cincinnati

Coordinator, Water, Wastewater and Haz. Waste Graduate Program, 1988 - 1998

Chairperson, Search Committee for Professor in Environmental Engineering, 1989

Chairperson, Search Committee for Professor in Environmental Engineering, 1990

Senior Class Advisor,

Class of 1992, 1997, and 2000

CO-OP Job Team, 1992 - 1995

Member Curriculum Committee, 1993 - 1998

University of Colorado

Personnel Committee, 1998-present
Graduate Committee, 2000-2003, Chair 2008-2012
Facilities Committee, 2002-2004
Executive Committee, 2004-2007
Environmental Engineering Graduate Program Coordinator, 2000-2012

PROFESSIONAL AFFILIATIONS

American Water Works Association
American Society of Civil Engineers
Association of Environmental Engineering and Science Professors
Professional Registration, Engineer-In-Training, State of Ohio

REVIEWER

Journals

Environmental Science and Technology
Journal American Water Works Association
Journal Environmental Engineering (ASCE)
Journal Water Environment Federation
Water Research (IWA)
Aqua (IWA)
Ozone: Science and Engineering (IOA)
Revue des Sciences de l'Eau

Proceedings/Books

Advances in Chemistry - American Chemical Society
Activated Carbon Technology
American Water Works Assoc. Research Foundation

Proposals

American Water Works Assoc. Research Foundation
National Science Foundation
Natural Sciences and Engineering Research Council of Canada
US Environmental Protection Agency

Invited External Ph.D. Committees

Fabien Thomas, Universite de Nancy, Nancy, France, 10/87
Mathias Benz, Universitat Karlsruhe, Karlsruhe, Germany, 12/89
Robert Andrews, University of Alberta, Edmonton, Canada, 3/90

CONSULTING ACTIVITY

He served as the technical director of Summers & Hooper, Inc. (1995-2000) and oversaw 20 bench and pilot scale GAC treatment studies, including 12 for the USEPA-ICR. He also has served as a consultant on over 60 treatment studies for drinking water utilities.

1987-1994 Montgomery Watson (James A. Montgomery), Consulting Engineers Inc.

1990 Radian Corporation, Milwaukee, WI.

1990 University of Colorado, AWWA Research Foundation Project RFP#603

1990-1994 Kenton County Water District (KY)

1991 Jordan, Jones and Goulding

1991 Manatee County Public Works Dept., Bradenton, FL and American Norit Company

1992 City of Raleigh (NC)

1992-1994 RESOLVE Inc., Washington DC. Technical consultant to the Disinfection By-Products Negotiated Rulemaking Committee. Committee is to reach a regulations consensus on the Disinfection/ Disinfection By-Product Rule of the SDWA.

1992-1993 Camp, Dresser and McKee, Inc.

1993-1996 Environment Engineering and Technology, Inc., AWWA Research Foundation

1993-1995 Jones, Day, Reavis and Pogue

1994 University of New Hampshire, New York City Project

1994 Procter & Gamble

1995-2001 Malcolm Pirnie, Inc. California Urban Water Utilities, Expert Panel on the Bay Delta Water Quality

1996-2001 RESOLVE Inc., Washington DC. Technical consultant to the U.S. EPA Microbial/Disinfection By-Products Federal Advisory Committee. Committee is to reach consensus on elements of the Disinfection/ Disinfection By-Product Rule and Interim Enhanced Surface Water Treatment Rule of the SDWA

1997 Hagler Baily, AWWA Research Foundation Project

1997-1998 ICI, Development of Enhanced Coagulation Guidance Manual and M/DBP Cost and Technologies Manual

1998 Hazen and Sawyer, Inc.

1999 John Carrollo Engineers, Inc.

2000 Black and Veatch, Inc.

2000-2003 Water Evaluation Lab, Inc.

2001 RESOLVE, Inc., consultant to the USEPA's National Drinking Water Advisory Council Arsenic Cost Working Group

2003-2010 Montgomery Watson Harza, Inc. – Solano County, CA

2003 Camp, Dresser and McKee, Inc., S.F. Bay Area Water Users Association,

2005 USEPA, Lead and Copper Rule Workshops, facilitator

2006-2008 RESOLVE Inc., Washington DC. Technical consultant to the U.S. EPA Total Coliform Rule/Distribution System Advisory Committee

2009-2011 Malcolm Pirnie, Inc., California Urban Water Utilities, Expert Panel on the Bay Delta Water Quality

2009-2010 Horsley Witten Group, Review of USEPA Cost Models

2009-2011 Malcolm Pirnie, Inc., Washington Aqueduct Future Treatment Alternatives Study, Stakeholder Workshops