

James R. Craig, Ph. D.
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EDUCATION

Ph.D. in Civil, Structural and Environmental Engineering, 2005

University at Buffalo, Buffalo, NY

-Dissertation: "*Reactive contaminant transport modeling using analytic element flow solutions*"

-Advanced graduate certificate in Geographic Information Science

B.S. in Civil Engineering, 1999

Bucknell University, Lewisburg, PA

RESEARCH INTERESTS

Numerical and analytical modelling of environmental systems, with a focus on regional-scale groundwater flow, subsurface heat and solute transport, and surface water hydrology.

- Modelling regional- and local-scale groundwater flow with the analytic element method, extended finite element, and series solution approaches
- Numerical methods, upscaling approaches, and parameterization issues in hydrologic modeling
- Design, modelling, and performance assessment of geoexchange ground loops

Secondary interests include parameter estimation, uncertainty assessment, and integration of Geographic Information Systems (GIS) with environmental models

AWARDS / FELLOWSHIPS

Early Researcher Award (2011)

Awarded by the Ontario Ministry of Research and Innovation to promising researchers in the first five years of their academic career.

IGERT Fellowship in Geographic Information Science (1999-2004)

Interdisciplinary NSF-sponsored Integrative Graduate Education and Research Training fellowship in the field of geographic information science under the supervision of University at Buffalo's National Center for Geographic Information and Analysis

CSEE Departmental Chair's Recognition Award (2004)

For high scholastic achievement and dedication to the Civil, Structural, and Environmental Engineering department of the University at Buffalo

Don Rennie Memorial Award (2002)

For outstanding environmental modeling presentation at the 12th annual Great Lakes Research Consortium Student/Faculty Conference

PEER-REVIEWED PUBLICATIONS

- A1. Nettasana, T.*, **J.R. Craig**, and B.A. Tolson, *Conceptual and numerical model for sustainable groundwater management in the Tha Phra Area, Chi River Basin, Thailand*, in press, Hydrogeology Journal, accepted March 2012
- A2. **Craig, J.R.** and R. Gracie, *Extended finite element modeling of transient leakage in multilayer aquifers*, Advances in Water Resources, doi:10.1016/j.advwatres.2011.04.00, 2011
- A3. Liu, G.*, **J.R. Craig**, and E.D. Soulis, *Applicability of the Green-Ampt infiltration model under non-ideal conditions*, Journal of Hydrologic Engineering, 16(266), 2011
- A4. Soulis, E.D., **J.R. Craig**, V. Fortin, and G. Liu*, *A simple expression for the bulk field capacity of a sloping soil horizon*, Hydrological Processes, 25(1), p112-116, 2011
- A5. Gracie, R. and **J.R. Craig**, *Modeling well leakage in multilayer aquifer systems using the extended finite element method*, Finite Elements in Analysis and Design, doi:10.1016/j.finel.2010.01.006, 2010
- A6. **Craig, J.R.**, G. Liu*, and E.D. Soulis, *Runoff-infiltration partitioning using an upscaled Green-Ampt solution*, Hydrologic Processes, doi:10.1002 / hyp.7601, 2010
- A7. Wong, S.* and **J.R. Craig**, *Series solutions for flow in stratified aquifers with natural geometry*, Advances in Water Resources, 33(1), p48-54, January 2010
- A8. **Craig, J.R.**, *Analytic elements for flow in harmonically heterogeneous aquifers*, Water Resources Research, 45, W06422, doi:10.1029/2009WR007800, 2009
- A9. **Craig, J.R.**, and T. Heidlauf*, *Coordinate mapping of analytical contaminant transport solutions to non-uniform flow fields*, Advances in Water Resources, 32(3), p353-360, March 2009
- A10. **Craig, J.R.**, *Topography-driven flow in stratified sloping and syncline aquifers*, Advances in Water Resources, 31(8), p1066-1073, August 2008
- A11. Rabideau, A.J., **J.R. Craig**, W. Silaviserith, D.M. Flewelling, K. Frederick, M.W. Becker, L.S. Matott, I. Janković, and K. Bandilla, *Analytic element modeling of supraregional groundwater flow I. Concepts and Tools for automated model configuration*, Journal of Hydrologic Engineering 12(1), p83-96, Jan-Feb 2007
- A12. **Craig, J.R.** and A.J. Rabideau, *Finite element modeling of contaminant transport using analytic element flow solution*,. Water Resources Research 42, W10420, doi:10.1029/2005WR004695, 2006
- A13. **Craig, J.R.** and A.J. Rabideau, *Finite difference modeling of contaminant transport using analytic element flow solutions*, Advances in Water Resources 29(7), p1075-1087, July 2006
- A14. Matott, L.S., A.J. Rabideau, and **J.R. Craig**, *Pump-and-treat optimization using analytic element flow models*, Advances in Water Resources 29(5), p760-775, May 2006
- A15. **Craig, J.R.**, I. Janković, and R. Barnes, *The nested superblock approach for regional scale modeling using the analytic element method*, Ground Water, 44(1), p76-80, Jan-Feb 2006
- A16. **Craig, J.R.**, A.J. Rabideau, and R. Suribhatla, *Analytical expressions for the hydraulic design of continuous permeable reactive barriers*, Advances in Water Resources 29(1), p99-111, Jan 2006
- A17. Rabideau, A.J., R. Suribhatla, and **J.R. Craig**, *Analytical models for the design of iron-based permeable reactive barriers*, Journal of Environmental Engineering 131(11), p1589-1597, Nov 2005
- A18. Rabideau, A.J., L.S. Matott, I. Janković, and **J.R. Craig**, M. Becker, *Influence of numerical precision on the calibration of AEM-based groundwater flow models*, Environmental Geology 48(1), p57-67, Jun. 2005

PAPERS IN REVIEW

- B1. Ameli, A.*, and **J.R. Craig**, *Simple, accurate, and efficient handling of well boundary condition in radial groundwater flow models*, submitted to Ground Water, 2011

- B2. Rezanezhad, F., J. Price, and **J.R. Craig**, *Movement and adsorption of oil sands process-affected water through dual porosity peat soils: A laboratory experiment*, submitted to Canadian Journal of Soil Science, 2011

PAPERS IN PREPARATION

- B3. A. Snowdon* and **Craig, J.R.**, *Operator splitting errors in distributed hydrological models*, to be submitted to Journal of Hydrology, 2012
- B4. **Craig, J.R.**, and A. Snowdon*, *Raven: A rigorously formalized modular hydrological model*, to be submitted to Environmental Modeling and Software, 2012
- B5. Soulis, E.D., **J.R. Craig**, and G. Liu*, *An approximate semi-analytical solution for unsaturated hillslope drainage*, to be submitted to Water Resources Research, 2012

CONFERENCE PAPERS

- C1. **Craig, J.R.**, and S. Wong*, *Recent advances in series solution methods for groundwater flow simulation*, Modflow and More 2011: Integrated Hydrologic Modeling, Golden, CO, June 5-8, 2011
- C2. Luba, L.D., **J.R. Craig**, C.A. Russell, and T.D. Graham, *Application of the analytic element method for conjunctive water management and impact assessment*, 34th IAHR Biennial Congress, Brisbane, Australia, June 26-July 1, 2011
- C3. **Craig, J.R.**, and W.W. Read, *The future of analytic solution methods for groundwater flow and transport simulation*, Computational Methods in Water Resources (CMWR) 2010 International Conference, Barcelona, Spain, June 21-24, 2010
- C4. Wong, S.*, **Craig, J.R.**, and W.W. Read, *An iterative series solution approach for solving the free-boundary condition in groundwater flow systems*, Computational Methods in Water Resources (CMWR) 2010 International Conference, Barcelona, Spain, June 21-24, 2010
- C5. **Craig, J.R.**, *Combining the strengths of analytic element and finite element methods for mixed-scale simulation modeling*, Modflow and More 2006: Managing Ground-water Systems, Golden, CO, May 22-24, 2006
- C6. **Craig, J.R.**, A.J. Rabideau, and K. Bandilla, *An overview of using analytic element flow solutions for contaminant transport simulation*, 5th International Conference on the Analytic Element Method (ICAEM), Manhattan, KS, May 14-18, 2006
- C7. **Craig, J.R.**, *The area vortex for modeling flow through smoothly heterogeneous aquifers*, 5th International Conference on the Analytic Element Method (ICAEM), Manhattan, KS, May 14-18, 2006
- C8. Sinha, G., W. Silaviserith, **J.R. Craig**, and D.M. Flewelling, *Quantifying the efficacy of multicriteria generalization (MCG) of geospatial data for AEM groundwater modeling*, TIES 2004: The Fifteenth Annual Conference of the International Environmetrics Society / ACCURACY 2004: The Sixth International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences, Portland, ME, Jun. 28 - Jul. 1, 2004
- C9. **Craig, J.R.**, and A.J. Rabideau, *Discretization of analytic element flow solutions for transport simulation*, Computational Methods in Water Resources (CMWR) 2004 International Conference, Chapel Hill, NC, Jun. 13-17, 2004
- C10. **Craig, J.R.**, K. Bandilla, and I. Janković, *Iterative solutions for the analytic element method: Recent computational advances and object-oriented design*, 4th International Conference on the Analytic Element Method (ICAEM), St. Etienne, France, November 20-21, 2003
- C11. **Craig, J.R.**, and A.J. Rabideau, *Linking the analytic element method to reactive contaminant transport models*, Modflow and More 2003, Golden, CO, September 16-19, 2003

INVITED CONFERENCE PRESENTATIONS

- D1. **Craig, J.R.**, *Extending the applicability of analytical contaminant transport models*, EGU General Assembly 2007, Vienna, Austria, Apr. 15-20, 2007

CONFERENCE PRESENTATIONS –ABSTRACTS ONLY–

- D2. **Craig, J.R.**, A.P. Snowdon, and B.A. Tolson, *Determining the "Why's" of good and bad model performance: comparing hydrological modelling decisions with the Raven framework*. American Geophysical Union, Fall Meeting, San Francisco, California, USA, 5-9 Dec., 2011
- D3. Snowdon, A.P., and **J.R. Craig**, *An upscaling approach for surface boundary conditions in 2-dimensional surface water/ groundwater models*, American Geophysical Union, Fall Meeting, San Francisco, California, USA, 5-9 Dec., 2011
- D4. Quinton, W.L., M. Hayashi, J. Baltzer and **J.R. Craig**. *Runoff from wetland-dominated terrains with thawing permafrost* (Invited). American Geophysical Union, Fall Meeting, San Francisco, California, USA, 5-9 Dec., 2011
- D5. Snowdon, A.P., and **J.R. Craig**, *Validation of an upscaling approach for surface boundary conditions in 2-dimensional surface water/ groundwater models*, 64th CWRA National Conference, St. John's, Newfoundland-Labrador, June 27-30, 2011
- D6. **Craig, J.R.** and A.P. Snowdon, *Development of a robust and flexible semi-distributed hydrological modelling framework: Abstraction and step-wise application*, 64th CWRA National Conference, St. John's, Newfoundland-Labrador, June 27-30, 2011
- D7. Soulis, E.D., **J.R. Craig**, and G. Liu, *A simple yet rigorous approximation of Richards' Equation applied to the soil-water balance*, CGU 2011 Annual Meeting, Banff, Alberta, May 15-18, 2011
- D8. **Craig, J.R.** and A.P. Snowdon, *Redesigning distributed hydrological models to overcome numerical errors*, Water 2010-joint ISSH and ICWRER Symposium, Quebec City, QC, July 5-7, 2010
- D9. Soulis, E.D., G. Liu, and **J.R. Craig**, *Avoiding the field capacity question: Determining retained soil moisture on a hillslope using fundamental soil physics and topography*, 3rd Joint CMOS-CGU Congress, Ottawa, ON, May 31-June 4, 2010
- D10. Jones, E.L., L.F. Leon, R.E. Smith, and **J.R. Craig**, *One- and three-dimensional modeling of nutrient-phytoplankton-zooplankton dynamics in Lake Erie*, ASLO Summer Meeting 2010, Santa Fe, NM, June 6-11, 2010
- D11. Liu, G., E.D. Soulis, and **J.R. Craig**, *An analytical interflow scheme for distributed hydrological models I: Tests in homogenous soil*, ModelCARE 2009: Managing Groundwater and the Environment, Wuhan, China, September 20-23, 2009
- D12. Liu, G., E.D. Soulis, and **J.R. Craig**, *Evaluation of an explicit solution to the Green-Ampt infiltration equation*, ModelCARE 2009: Managing Groundwater and the Environment, Wuhan, China, September 20-23, 2009
- D13. Jones, E.L., L.F. Leon, Y. Zhao, R.E. Smith, and **J.R. Craig**, *Three-dimensional modelling of Walleye nursery habitat in the West Basin, Lake Erie*. IAGLR 2009: 52st Annual Conference for Great Lakes Research, Toledo, OH, May 18-22, 2009
- D14. Snowdon, A.P., and **J.R. Craig**, *Impacts of operation order in hydrological models*. AGU-CGU 2009 Joint Assembly, Toronto, ON, May 24-27, 2009
- D15. Liu, G., **J.R. Craig**, and E.D. Soulis, *Applicability of the Green-Ampt model under non-ideal conditions*. AGU-CGU 2009 Joint Assembly, Toronto, ON, May 24-27, 2009
- D16. Dunning, C., and **J.R. Craig**, and E.D. Soulis, *A methodology for calibrating a WATFLOOD model of the upper South Saskatchewan River*. AGU-CGU 2009 Joint Assembly, Toronto, ON, May 24-27, 2009
- D17. Wong, S., and **J.R. Craig**, *A comparison of series and finite element solutions for flow in multi-layer aquifers with contiguous layers*. AGU-CGU 2009 Joint Assembly, Toronto, ON, May 24-27, 2009

- D18. Nettasana, T., **J.R. Craig**, B.A. Tolson, and J. Sykes, *The development of multiple conceptual models for the high risk saline water upconing area in the Chai River Basin, Thailand*. AGU-CGU 2009 Joint Assembly, Toronto, ON, May 24-27, 2009
- D19. Soulis, E.D., **J.R. Craig**, G. Liu, and V. Fortin, *Modelling IP3 watersheds: Determining retained soil moisture using both field capacity and topography*, AGU-CGU 2009 Joint Assembly, Toronto, ON, May 24-27, 2009
- D20. **Craig, J.R.**, *Semi-analytical solutions for flow in heterogeneous media represented using pilot points*. AGU-CGU 2009 Joint Assembly, Toronto, ON, May 24-27, 2009
- D21. Soulis, E.D., **J.R. Craig**, G. Liu, and V. Fortin, *IP3 watersheds: Determining retained soil moisture using both field capacity and topography*, EGU General Assembly 2009, Vienna, Austria, April 19-24, 2009
- D22. **Craig, J.R.**, and A.P. Snowdon, *Upscaling threshold non-linearities in distributed surface water models*. AGU Fall Meeting 2008, San Francisco, CA, Dec 15-19, 2008
- D23. Snowdon, A.P. and **J.R. Craig**, *An investigation of operator splitting errors in surface water models*. AGU Fall Meeting 2008, San Francisco, CA, Dec 15-19, 2008
- *2008 AGU Fall Meeting Outstanding Student Paper Award (Hydrology Section)**
- D24. Wong, S., and **J.R. Craig**, *Addressing normal fault stratification in series solutions for multilayer groundwater flow*. AGU Fall Meeting 2008, San Francisco, CA, Dec 15-19, 2008
- D25. **Craig, J.R.**, and A.P. Snowdon, *Upscaling threshold behaviour in distributed surface water models*. IP3 Fall Workshop 2008, Whitehorse, Yukon, Nov 12-13, 2008
- D26. Soulis, E.D., G. Liu, **J.R. Craig**, and V. Fortin, *Update on IP3 soil water budget: Verification of a revised analytical soil moisture parameterization scheme*. IP3 Fall Workshop 2008, Whitehorse, Yukon, Nov 12-13, 2008
- D27. Soulis, E.D., G. Liu, and **J.R. Craig**, *Update on IP3 soil water budget: Progress towards an analytical solution for shallow aquifers*, IP3 Fall Workshop 2008, Whitehorse, Yukon, Nov 12-13, 2008
- D28. Snowdon, A.P., and J.R. Craig, *RAVEN: A rigorous numerical approach toward distributed surface water modelling*, IP3 Fall Workshop 2008, Whitehorse, Yukon, Nov 12-13, 2008
- D29. **Craig, J.R.**, and S. Wong, *Three-dimensional series solutions for regional multi-layer flow in sloping aquifers*, Computational Methods in Water Resources (CMWR) XVII Conference, San Francisco, CA, Jul. 6-10, 2008
- D30. Wong, S., and J.R. Craig, *A series solution for multi-layer aquifers with natural geometry*, Computational Methods in Water Resources (CMWR) XVII Conference, San Francisco, CA, Jul. 6-10, 2008
- D31. Dunning, C., E.D. Soulis, and **J.R. Craig**, *Using precipitable water vapour data for hydrologic modeling of the Red Deer, Bow, and Oldman River basins*, GEOIDE 10th Annual Scientific Conference, Niagara Falls, ON, May 28-30, 2008
- D32. Jones, E.L., L.F. Leon, R.E.H. Smith, **J.R. Craig**, and H.J. Carrick, *Three-dimensional modelling of lake-wide nutrient and chlorophyll dynamics in Lake Erie using ELCOM-CAEDYM*, IAGLR 2008: 51st Annual Conference for Great Lakes Research, Peterborough, ON, May 19-23, 2008
- D33. Soulis, E. D., **J.R. Craig**, and G. Liu, *Modelling IP3 watersheds: Determining retained soil moisture using both field capacity and topography*, Canadian Geophysical Union Conference, Banff, AB, May 11-14, 2008
- D34. **Craig, J.R.**, *Coordinate mapping of analytical transport solutions to non-uniform flow fields*, AGU Fall Meeting 2007, San Francisco, CA, Dec. 10-14, 2007
- D35. Kraemer, S. R., M. Bakker, and **J.R. Craig**, *An open-source community web site to support groundwater model testing*, AGU Fall Meeting 2007, San Francisco, CA, Dec. 10-14, 2007

- D36. Tolson, B.A., **J.R. Craig**, and M.A. Esfahani, *Incorporating search history into the Dynamically Dimensioned Search (DDS) optimization algorithm*, AGU Fall Meeting 2007, San Francisco, CA, Dec. 10-14, 2007
- D37. **Craig, J.R.**, *Handling continuous and singular parameter fields in mixed finite element-analytic element models of flow and transport*, ModelCARE 2007: Calibration and Reliability in Groundwater Modeling, Copenhagen, Denmark, Sept. 9-13, 2007
- D38. **Craig, J.R.**, *Topography-driven flow in a stratified sloping aquifer: A general semi-analytical solution*, AGU Fall Meeting 2006, San Francisco, CA, Dec. 11-15, 2006
- D39. **Craig, J.R.**, A.J. Rabideau, M.W. Becker, K. Bandilla, D.M. Flewelling, K.C. Fredrick, I. Jankovic, L.S. Matott, and W. Silaviserith, *Development of a regional-scale groundwater modeling system for research, education, and outreach*, 2005 AEEESP Research and Education Conference, Potsdam, NY, July 24-27, 2005
- D40. **Craig, J.R.**, A.J. Rabideau, and L.S. Matott, *Optimal mesh generation for AEM-based transport simulators*, AGU Fall Meeting 2004, San Francisco, CA, Dec. 13-17, 2004
- D41. **Craig, J.R.**, G. Sinha, D.M. Flewelling, W. Silaviserith, and A.J. Rabideau, *Automated geographic simplification tools for development of regional scale groundwater models*. AGU Fall Meeting 2003, San Francisco, CA, Dec. 8-12, 2003
- D42. Janković, K. Bandilla, **Craig, J.R.**, and A.J. Rabideau, *Role of the analytic element method in regional-scale GIS-based modeling of groundwater flow and transport*. AGU Fall Meeting 2003, San Francisco, CA, Dec. 8-12, 2003
- D43. **Craig, J.R.**, A.J. Rabideau, and I. Janković, *Visual Bluebird: software for teaching groundwater modeling and potential flow to undergraduate students*. Frontiers in Assessment Methods for the Environment (FAME), Minneapolis, MN, August 10-13, 2003
- D44. **Craig, J.R.**, and A.J. Rabideau, *Vertically-averaged contaminant transport with the streamline method in near-surface aquifers*. Spring 2003 EGU-AGU-EGS Joint Assembly, Nice, France, April 7-11, 2003
- D45. **Craig, J.R.**, and A.J. Rabideau, *Reducing dependence upon "the Grid": a framework for contaminant transport modeling using analytic flow solutions*. AGU Fall Meeting 2002, San Francisco, CA, December 6-10, 2002
- D46. **Craig, J.R.**, and I. Janković, *An overview of the object-oriented iterative model for the analytic element method*. AGU Spring Meeting 2002, Washington D.C., May 28-31, 2002
- D47. **Craig, J.R.**, I. Janković, and A.J. Rabideau, *Modeling groundwater/surface water interaction with the analytic element method*. 12th annual Great Lakes Research Consortium Student/Faculty Conference, Syracuse, NY, March 15-16, 2002
- D48. **Craig, J.R.**, I. Janković, and R. Barnes, *Accommodating multi-scale analytic element models with the nested superblock approach*. AGU Fall Meeting 2001, San Francisco, CA, December 10-14, 2001

RESEARCH GRANTS

NSERC Discovery Grant, Individual (PI), \$120 000 (100%)

Hybrid numerical-analytical methods for subsurface flow simulation, 2012-2017

Carbon Management Canada, (Co-PI with D. Krewski/M. Fall (U Ottawa), J. Nathwani/R.

Gracie/L.S. Matott/M. Dusseault (U Waterloo) and J. Arvai (U Calgary)), \$930 000 (5%)

Risk assessment and management of carbon capture and storage in a Canadian context, 2011-2014

Early Researcher Award (ERA), Ontario Ministry of Research and Innovation (PI), \$150 000 (100%)

Assessing the vulnerability and environmental impact of pumping wells near wetlands and streams, 2011-2016

Ontario Centres of Excellence (OCE) Technical Problem Solving (TPS) Grant (PI), \$23 345 (100%)

Improving accessibility of geothermal energy for urban and residential users, 2010-2012

Partner: NextEnergy, Inc.

Environment Canada, Contribution Program, (Co-PI with B.A. Tolson), \$170 000 (45%)
Dealing with heterogeneity in distributed hydrological models and atmospheric land surface schemes, 2010-2012

NSERC Discovery Grant, Individual (PI), \$114 000 (100%)
Mixed local and regional-scale groundwater flow modeling, 2006-2012

INDUSTRY-MATCHED SCHOLARSHIP FUNDING SECURED

NSERC IPS-1 MASc. Scholarship for Simon Haslam (NextEnergy, Inc.), \$42 000

NSERC IPS-1 MASc. Scholarship for Richard Simms (NextEnergy, Inc.), \$42 000

NSERC IPS-2 Ph.D. Scholarship for Andy Snowdon (AquaResource, Inc.), \$114 000

TEACHING EXPERIENCE

University of Waterloo

Advanced Mathematics (ENVE 321)
 Advanced Mathematics for Environmental Engineering (CIVE 673)
 Contaminant Transport (EnvE 573)
 Differential Equations (EnvE 223)
 Digital Computation (CivE 121)
 GIS applications in Civil Engineering (CIVE 497/770)

University at Buffalo

Civil Engineering Applications of GIS (CIE 507)
 Modern Methods of Engineering Computation (EAS 451)
 Introduction to Environmental Engineering (CIE 440) [Co-Instructor]

GRADUATE STUDENT SUPERVISION (CURRENT STUDENTS)

1. Wong, S., Civil and Environmental Engineering (Ph.D.)
 “Series solution methods for regional groundwater systems with natural stratigraphy”
 (co-advisor: Dr. J. Sykes*)
2. Nettasana, T., Civil and Environmental Engineering (Ph.D.)
 “Conceptual model uncertainty in the management of the Chi River Basin, Thailand”
 (co-advisors: Dr. B. Tolson, Dr. J. Sykes*)
3. Snowdon, A.P., Civil and Environmental Engineering (PhD.)
 Upscaling groundwater-surface water fluxes
 (co-advisor: Dr. E.D. Soulis*)
4. Ameli, A.A., Civil and Environmental Engineering (Ph.D.)
 Numerical-analytical modeling of groundwater surface water interactions
5. Simms, R., Civil and Environmental Engineering (MASc.)
 An extended finite element code for heat transport in horizontal geothermal loop systems
6. Haslam, S., Civil and Environmental Engineering (MASc.)
 Improved design of horizontal geothermal loop systems
7. Princz, D., Civil and Environmental Engineering (MASc.)
 “Using a model evaluation workflow to investigate the influence of parameter granularity in surface water models”
 (co-advisor Dr. E.D. Soulis)
8. Sheffield, P. Civil and Environmental Engineering (MASc.)
 Groundwater modelling and Parameter estimation

GRADUATE STUDENT SUPERVISION (FORMER STUDENTS)

1. Jones, E.L., Biology/Civil and Environmental Engineering (MASc. 2011)
 “Ecological modelling of Lake Erie : Sensitivity analysis and simulation of nutrient, phytoplankton, and zooplankton dynamics” (co-advisor: Dr. R. Smith)

2. Huo, C., Civil and Environmental Engineering (MASC., 2010)
“Mathematical simulation of a dipole delivery system for in situ remediation”, (co-advisor: Dr. N.R. Thomson)
3. Liu, G., Civil and Environmental Engineering (Ph.D., 2010)
“Improved interflow and infiltration algorithms for distributed hydrological models”,
(co-advisor: Dr. E.D. Soulis)
4. Snowdon, A.P., Civil and Environmental Engineering (MASC., 2010)
“Improved numerical methods for distributed hydrological models”
5. Dunning, C., Civil and Environmental Engineering (MASC., 2009)
“Hydrologic modeling of the Upper South Saskatchewan River Basin: Multi-basin calibration and gauge de-clustering analysis”, (co-advisor: Dr. E.D. Soulis)

AWARDS TO GRADUATE STUDENTS

1. 2008 AGU Fall Meeting Outstanding Student Paper Award (Hydrology Section) [A.P. Snowdon]

OTHER HQP SUPERVISION

1. Paya, Karol, Co-op Research Assistant (Winter 2012) [co-supervisor: B.A. Tolson]
GIS analysis for hydrological modelling support; assembly of a Great lakes watershed database
2. Hillier, C., Geo. Eng. 4th year design project advisee (2011-2012)
Project title: “A water supply system for Finse, Norway”
3. Stonebridge, G., Undergraduate Research Assistant (Fall 2011)
Benchmarking, testing, and application of hydrological simulation models
4. Sprakman, S., Research Assistant (Spring 2011)
Preparation of technical documentation for hydrological simulation model
5. Pearson, S., Undergraduate Research Assistant (Spring 2011)
Hydrological model preprocessor development
6. Ranjram, M., Undergraduate Research Assistant (Spring 2011)
Representational software for layered stratigraphic systems
7. Khedr, A., Undergraduate Research Assistant (Winter 2011)
Development of statistical output modules for surface water modelling software
8. Arlos, M., J. Chan, K. Chan, and H. Lo, Env. Eng. 4th year design project advisees (2010-2011)
Project title: “TCE and PHC groundwater remediation alternatives for Simmons Lake Gas Station”
9. Zhang, Bo, Visiting Scholar (2010)
Research into topography-based hydrologic modeling
10. Snowdon, A.P., Research Assistant (Winter 2010)
Hydrologic algorithm development and design
11. Chen, W., Undergraduate Research Assistant (Winter 2010) [co-supervisor: L.S. Matott]
Optimization software development to handle netCDF and MS Access formats
12. Haslam, S., Geological engineering 4th year design project advisee (2009-2010)
Project title: “Design of a culvert system for Too Much Gold creek in Whitehorse, Yukon”
13. Haslam, S., Undergraduate Research Assistant (Winter 2009)
Analysis of flow bypassing in single well reactive dipole flow tests
14. Chung, S., A. Mohino-Barrie, and N. Nalliah, Environmental/Civil engineering 4th year design project advisees (2008-2009)
Project title: “Prioritization of borehole capping in the Great Artesian Basin, Australia”
15. Simms, R., Undergraduate Research Assistant (Winter 2008)
Software and algorithm development for groundwater flow, contaminant transport, and distributed surface water modeling
16. Chevalier, L., R. Reaume, and A. Tymec, Env. Eng. 4th year design project advisees (2007-2008)
Project title: “Optimization of sorption liners in landfill design”
17. De Laplante, N., Geological engineering 4th year design project advisee (2007-2008)
Project title: “Optimization of remediation response functions for an MTBE contaminated aquifer”

18. Zheng, Y., Geological engineering 4th year design project advisee (2007-2008)
Project title: "Design of a data calibration and reduction system for dynamically-tuned gyroscopes"
19. Labalestra, J., Geological engineering 4th year design project advisee (2007-2008)
Project title: "Non-destructive hydroelectric power generation"
20. Heidlauf, T., Visiting Scholar/Intern (Summer 2007)
Software and method development for groundwater flow and contaminant transport in conjunction with Waterloo Hydrogeologic, Inc., a Schlumberger Company
21. Zhu, P., Co-op Research Assistant (Winter 2006)
Developed a library of analytical contaminant transport solutions in C++
22. Dunning, C., and S. Mathew, Environmental engineering 4th year design project advisee (2005-2006)
Project title: "A pipe network modelling code"

RELATED PROFESSIONAL EXPERIENCE

- 2005 **Senior Research Associate**, CSEE Dept., University at Buffalo, Buffalo, NY
Developed and implement approaches for linking reactive contaminant transport models to analytic element flow solutions, developed batch reaction modules for simulation of reactive transport.
- 2004 **Research Assistant**, CSEE Dept., University at Buffalo, Buffalo, NY
Gathered data and developed a regional groundwater model of the entire Susquehanna Basin and participated in distributing Grid-based calibration models across universities in the northeast US.
- Curriculum Consultant**, National Center for Geographic Information and Analysis, Buffalo, NY
Developed a comprehensive educational program to fulfill mathematics proficiency requirements for in the NSF-funded IGERT program in geographic information science.
- Research Assistant**, Environment and Society Institute, Buffalo, NY
Developed databases and managed web sites for an interdepartmental university research institute.
- 2000 **Research Assistant**, University at Buffalo, Buffalo, NY
Investigated application of parallel computing and object-orientation to regional scale groundwater software. Implemented genetic algorithms for optimization of pump and treat remediation strategies.
- 1997-8 **Draftsman/Architectural Assistant**, Catapano Engineering, P.C. Permit Research, Melville, NY
Designed, revised, and edited architectural, structural, electrical, and mechanical plans using AutoCAD.

PROFESSIONAL SHORT COURSES

- Craig, J.R.**, *Conceptual groundwater model development with the Analytic Element Method*, Short course for groundwater practitioners, S.S. Papadopulos & Associates, Bethesda, MD, August 6-7, 2009
- Craig, J.R.**, (primary instructor), A.J. Rabideau, I. Janković, and L.S. Matott, *Modeling regional groundwater flow with the Analytic Element Method: Source water assessment and GIS*, Short course for groundwater practitioners (1.6 CEUs), University at Buffalo, June 28-29, 2004

SEMINARS

- Craig, J.R.**, *Developing trustworthy hydrological models*, NRC- Canadian Hydraulics Centre brown bag seminar series, Invited, May 12, 2011
- Craig, J.R.**, *Analytical models of porous media flow in heterogeneous media (an engineer's hobby problem)*, University of Waterloo Applied Mathematics Seminar Series, November 18, 2010
- Craig, J.R.**, *Pseudoanalytic function theory and its potential application to groundwater flow problems*, Invited seminar, James Cook University, August 22, 2008
- Craig, J.R.**, *Regional groundwater modeling: Meeting the computational challenge*, Invited seminar, University of Waterloo, July 8, 2004
- Craig, J.R.**, *Advances in regional groundwater modeling*, Invited seminar, Drexel University, March 16, 2004

INTERNAL SERVICE

- Member, Curriculum Renewal Committee**, Dept. of Civil and Environmental Engineering, 2011-

Member, Vision 2015 Planning Committee, Dept. of Civil and Environmental Engineering, 2010-2011

Chair, Communications Committee, UW Water Institute, 2010-

Member, Strategic Planning Committee, UW Water Institute, 2009-

Organizer, World Water Day Graduate Research Fair 2012, UW Water Institute, 2011-2012

Associate Chair of Computing, Dept. of Civil and Environmental Engineering, 2008-

Coordinator, Environmental Modelling and Analysis Group, Dept. of Civil and Environmental Engineering, 2008-

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Organizer, World Water Day Graduate Research Fair 2011, UW Water Institute, 2011

Enviro/Geo 4A Class Professor, Dept. of Civil and Environmental Engineering, Fall 2010

Coordinator, Environmental Lab Space Assessment, Dept. of Civil and Environmental Engineering, 2009

Environ. Seminar Series Coordinator, Dept. of Civil and Environmental Engineering, 2007-2009

Explorations / March Break Open House Departmental Representative, Faculty of Engineering, 2008-2009

Graduate Open House Coordinator, Dept. of Civil and Environmental Engineering, 2007-2008

Sandford Fleming Foundation Technical Speaking Competition Coordinator, Faculty of Engineering, 2006-2008

Member of Engineering Faculty Council, Faculty of Engineering, 2007-2008

Civil 2B Class Professor, Dept. of Civil and Environmental Engineering, Spring 2007

Representative to the Mathematics Faculty Council, Faculty of Engineering, 2006-2007

ExpecTAtions Faculty Mentor, Dept. of Civil and Environmental Engineering, 2006

EXTERNAL SERVICE

Conference Session Co-Chair, *Translating watersheds into trustworthy hydrological models*, AGU Fall Meeting 2011, San Francisco, CA, Dec. 5-9 2011

Conference Organizing Committee Member, 6th Intl. Conference on the Analytic Element Method (ICAEM), Golden, CO, May 2013

Conference Session Co-Chair, *Analytical and semi-analytical models of subsurface flow and transport*, AGU Fall Meeting 2007, San Francisco, CA, Dec. 10-14 2007

Conference Technical Committee Member, 5th Intl. Conference on the Analytic Element Method (ICAEM), Manhattan, KS, May 14-18, 2006, Spring 2006

Peer Reviewer (Manuscripts): Water Resources Research, Advances in Water Resources, Journal of Hydrology, Ground Water, Journal of Contaminant Hydrology, Hydrological Sciences Journal, Journal of Hydraulic Engineering, Journal of Environmental Engineering, Journal of Hydrologic Engineering, Hydrogeology Journal, Computers in Geotechnics, Computers and Geosciences, Journal of Environmental Engineering and Science, Journal of Hazardous Materials, Open Hydrology Journal; Quarterly Journal of Mechanics and Applied Mathematics; Mathematical Problems in Engineering

Peer Reviewer (Grant Proposals): Canada Foundation for Innovation (CFI), Qatar National Research Fund (QNRF), NSERC Discovery Grant Program

SOFTWARE

Craig, J.R., and L.S. Matott, **VISUAL AEM 1.0**: A Windows-based graphical user interface for analytic element modeling of groundwater flow and transport, post processing, and analysis. (2008)

Craig, J.R., and A.P. Snowdon, **RAVEN 0.9**: An object-oriented formalized numerical model of distributed hydrology at catchment and sub-catchment scales. (2008-2011)

Craig, J.R., BLUEBIRD 3.31: Object-oriented library for analytic-based modeling of multi-layer groundwater flow in heterogeneous aquifers with particle tracking and surface water interaction modules (2000-2010).

Craig, J.R., CARDINAL 2.0: Object-oriented library for analytical and numerical 2D multi-species aqueous solute transport modeling using analytic element flow solutions from the Bluebird library. (2001-2010)

Craig, J.R., RXNLIB 0.8: Object-oriented library for simulation of multi-species aqueous batch reactions, equilibrium and non-equilibrium sorption. Currently includes modules for generic Cation Exchange and parent-daughter decay, and a variety of sorption and partitioning models. (2004-2007)

L.S. Matott, **Craig, J.R.**, Tolson, B.: **OSTRICH DDS MODULE:** Dynamically-dimensioned search optimization algorithm module for multi-engine optimization software OSTRICH (2007)

Craig, J.R., DIPOLE3D 1.0: Numerical implementation of a three-dimensional analytical solution for a single-well dipole flow field with particle tracking (2009)

PROFESSIONAL AFFILIATIONS

Member, American Geophysical Union (AGU)
Member, Canadian Geophysical Union (CGU)
Member, National Ground Water Association (NGWA)
Member, Chi Epsilon Honor Fraternity
Collaborator, IP3 Research Network
Member, the Water Institute at UW
Member, Waterloo Institute for Sustainable Energy (WISE)
Member, Canadian Geothermal Research Council (CanGRC)

HOBBIES

In addition to my love for teaching and research, I am a father and husband, a musician (I play electric bass, acoustic guitar, and jazz cello), an illustrator (primarily with pen and ink), an avid reader of historical fiction, and a lover of the New York Times Sunday crossword puzzle.