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RESEARCH INTERESTS

Interdisciplinary research from a *Systems Engineering* perspective on the development of *conflict resolution, multiple criteria decision analysis (MCDA), time series analysis* and other *decision-making methodologies* for addressing challenging *system of systems engineering* problems lying at the interface of society, technology and the environment, with applications in *water resources management, hydrology, environmental engineering, energy, sustainable development* and elsewhere. K.W. Hipel is the recipient of 48 academic and professional awards, 39 of which are listed below. His Hirsch Index of 46, i10 Index of 197 and total citations of over 9,400 are excellent for his interdisciplinary fields of research.

NATIONAL AWARDS

Sir John William Dawson Medal from the Royal Society of Canada (2011).
Outstanding Engineering Educator Award from IEEE Canada (2011).
Killam Research Fellowship from the Canada Council for the Arts (2001).
Fellow of the Royal Society of Canada (FRSC) (1998).

PROFESSIONAL ENGINEERING AWARDS

Honorary Diplomate, Water Resources Engineers (Hon.D.WRE) (2013)
Engineering Medal for Research and Development from Ontario Professional Engineers (2010).
Fellow of the Engineering Institute of Canada (FEIC) (2005).
Fellow of the Canadian Academy of Engineering (FCAE) (1997).

INTERNATIONAL AWARDS

Fellow of the American Society of Civil Engineers (2015)
Member, Omega Alpha Association (Systems Engineering Honor Society) (2014)
Group Decision and Negotiation Section Award (2013)
Japan Society for the Promotion of Science (JSPS) Eminent Scientist Award (2012)
Joseph G. Wohl Outstanding Career Award from the IEEE SMC Society (2012)
Honorary Professor of Óbuda University (2012)
World Automation Congress Lifetime Achievement Award (2012)
Honorary Member in the American Water Resources Association (AWRA) (2011).
Water 2010 Lifetime Achievement Award (Presented in Quebec City on July 6, 2010).
Fellow of the International Council on Systems Engineering (FINCOSE) (2007).
Most Active Systems, Man and Cybernetics (SMC) Technical Committee Award (2007).
Icko Iben Award from AWRA (2004).
Norbert Wiener Award from the IEEE SMC Society (2000).
Fellow of the Institute of Electrical and Electronics Engineers (FIEEE) (1996).
Outstanding Contribution Award from the IEEE SMC Society (1995).
Fellow of the American Water Resources Association (FAWRA) (1993).
W. R. Boggess Award from AWRA (1984).

HONOURARY DOCTORATE DEGREES

Doctor Honoris Causa from Obuda University (DrHC) (2013).
Docteur Honoris Causa from École Centrale de Lille (DrHC) (2007).

UNIVERSITY OF WATERLOO AWARDS

Faculty of Engineering Teaching Excellence Award (2013)

Award of Excellence in Graduate Supervision (2008).
University Professor Designation (2007).
Award for Excellence in Research (2002).
Distinguished Teacher Award (1996).

INTERNATIONAL RESEARCH FELLOWSHIPS

Monbusho Kyoto University Visiting Professor Position (May to December, 1999).
Stanley Vineberg Memorial Visiting Professorship (Technion, Israel, January to April, 1999).
Centre National de la Recherche Scientifique (CNRS) Research Fellowship (France, September 1989 to August 1990).
Japan Society for Promotion of Science (JSPS) Fellowship (Kyoto University, January to August, 1984, February to April, 2009).

BEST PAPER AWARDS

2012 Best Publication Award in Environment and Sustainability from the Section on Energy, Natural Resources, and the Environment within the Institute for Operations Research and the Management Sciences (INFORMS) for the paper: Wang, L., Fang, L., and Hipel, K.W., “Basin-wide Cooperative Water Resources Allocation”, *European Journal of Operational Research*, Vol. 190, Issue 3, pp. 798-817, November 2008.

2011 Best Peer-Reviewed Paper for the best paper published in 2010 in the *ASCE Journal of Management in Engineering* for the paper entitled “Attitude-Based Negotiation Methodology for the Management of Construction Disputes” (with S. Yousefi and T. Hegazy), DOI: 10.1061/(ASCE)ME.1943-5479.0000013, Vol. 26, pp. 114-122, July 2010.

Best Paper Award at the “2009 IEEE Toronto International Conference – Science and Technology for Humanity” in the “Symposium on Sustainable Development and Energy Availability” for the paper entitled “Preventing Future Brownfields: Engineering Solutions and Pollution Prevention Policies” (with B. Taylor, L.J. Hipel, L. Fang, and M. Heng), Conference held at Ryerson University, Toronto, Ontario, Canada (September 26-27, 2009).

Best Paper Award at the Eighth International Symposium on the Analytic Hierarchy Process (ISAHP 2005) for the paper entitled “An Effective Approach to Infrastructure Reconstruction of Devastated Countries” (with K.A. Nigim and G.B. Smith), Conference held at the East West Center, University of Hawaii, Honolulu, Hawaii, USA (July 7 to 10, 2005).

ASSOCIATE EDITORSHIPS (Current) (Career total is 21)

1. IEEE Transactions on Systems, Man and Cybernetics: Systems
2. ASCE Journal of Hydrologic Engineering (Board of Advisors)
3. Group Decision and Negotiation
4. Grey Systems: Theory and Application
5. Journal of Environmental Informatics
6. Journal of Systems Science and Systems Engineering

PROFESSIONAL AFFILIATIONS

1. American Water Resources Association (AWRA) (Fellow).
2. Institute of Electrical and Electronics Engineers (IEEE) (Fellow).
3. International Council on Systems Engineering (INCOSE) (Fellow).
4. Canadian Academy of Engineering (CAE) (Fellow).

5. Royal Society of Canada (RSC) (Fellow).
6. American Geophysical Union (AGU).
7. Professional Engineer (PEng) and Member of the Professional Engineers of Ontario (PEO).
8. Ontario Society of Professional Engineers (OSPE).
9. Engineering Institute of Canada (EIC) (Fellow)
10. American Society of Civil Engineers (ASCE).
11. Institute for Operations Research and Management Science (INFORMS)
12. American Association for the Advancement of Science (AAAS)

ACADEMIC APPOINTMENTS AT THE UNIVERSITY OF WATERLOO

Position	Date
University Professor	June 16, 2007 to present
Professor	July, 1985 to June 16, 2007
Associate Professor	July 1, 1981 to June 30, 1985
Assistant Professor	April 1, 1976 to June 30, 1981

DEGREES

PhD in Civil Engineering, University of Waterloo, 1975.

MASc in Systems Design, University of Waterloo, 1972.

BASc in Civil Engineering, University of Waterloo, 1970. (Graduated first in class).

RESEARCH PUBLICATION SUMMARY

(Status as of May 25, 2015)

- (a) **Books** - 4 refereed books have been published.
- (b) **Edited Books** - 12.
- (c) **Refereed Journal Papers** – 281.
- (d) **Discussions, Comments and Replies in Refereed Journals** - 7.
- (e) **Invited Articles in Books, Encyclopedia, and Conference Proceedings** - 168.
- (f) **Refereed Conference Papers** - 98.
- (g) **Technical Reports** - 57.
- (h) **Magazine, Newspaper and Newsletter Articles** - 8.

Research publications under categories (a) to (h) are not directly listed in this document. Instead, representative publications are classified according to research topics.

RESEARCH TOPICS

In this section, relevant refereed journal papers, encyclopedia articles, conference papers and books are categorized according to research topics.

Graph Model for Conflict Resolution

Book

1. Fang, L., Hipel, K.W., and Kilgour, D.M. "Interactive Decision Making: The Graph Model for Conflict Resolution", Wiley, New York, 221 pp., 1993.

Edited Books

1. Hipel, K.W. (Editor), "Conflict Resolution, Volume 1", Eolss Publishers, Oxford, United Kingdom (ISBN-978-1-84826-120-4 (Adobe e-Book), ISBN-978-1-84826-570-7 Library Edition (Hard Cover)) (Earlier versions of the papers appeared in the Encyclopedia of Life Support Systems.), 2009.
2. Hipel, K.W. (Editor), "Conflict Resolution, Volume 2", Eolss Publishers, Oxford, United Kingdom

(ISBN-978-1-84826-121-1 (Adobe e-Book), ISBN-978-1-84826-571-4 Library Edition (Hard Cover)) (Earlier versions of the papers appeared in the Encyclopedia of Life Support Systems), 2009.

Encyclopedia Articles

1. Hipel, K.W., Kilgour, D.M., and Fang, L., "The Graph Model for Conflict Resolution", in Wiley Encyclopedia of Operations Research and Management Science, edited by J.J. Cochran (Editor-in-Chief) with L.A. Cox, P. Keskinocak, J.P. Kharoufeh, and J.C. Smith (Area Editors), Wiley, New York, Vol. 3 of 8, pp. 2099-2111, 2011.
2. Hipel, K.W., Kilgour, D.M., and Fang, L., "Conflict Analysis and Resolution", McGraw-Hill Yearbook of Science and Technology, 2006, McGraw-Hill, New York, pp. 75-77, 2006.
3. Hipel, K.W., "Conflict Resolution", theme overview paper, in Conflict Resolution, Encyclopedia of Life Support Systems (EOLSS), Eolss Publishers, Oxford, United Kingdom, [<http://www.eolss.net>], 2002.
4. Hipel, K.W., "Formal Models for Conflict Resolution and Case Studies", topic overview paper, in Conflict Resolution, Encyclopedia of Life Support Systems (EOLSS), Eolss Publishers, Oxford, United Kingdom, [<http://www.eolss.net>], 2002.

Overviews

1. Hipel, K.W. and Bernath Walker, S., "Conflict Analysis in Environmental Management", Environmetrics, published online in Wiley Online Library on 7 June 2010, DOI: 10.1002/env.1048, Vol. 22, pp. 279-293, 2011.
2. Kilgour, D.M. and Hipel, K.W., "Conflict Analysis Methods: The Graph Model for Conflict Resolution", In Kilgour, D.M. and Eden, C. (Editors), "Handbook of Group Decision and Negotiation", Springer, Dordrecht, The Netherlands, pp. 203-222, 2010.
3. Kilgour, D.M., and Hipel, K.W., "The Graph Model for Conflict Resolution: Past, Present, and Future", Group Decision and Negotiation, Vol. 14, No. 6, pp. 441-460, 2005.
4. Hipel, K.W., Kilgour, D.M., Fang, L., and Li, W., "Resolution of Water Conflicts between Canada and the United States", invited paper published as Section 4.3 in "State-of-the-Art Report on Systems Analysis Methods for Resolution of Conflicts in Water Resources Management", edited by K.D.W. Nandalal and S.P. Simonovic, a Report prepared for the Division of Water Sciences, United Nations Educational, Science and Cultural Organization (UNESCO), Paris, France, pp. 62-75, 2003.
5. Hipel, K.W., Fang, L., and Kilgour, D.M., "Decision Support Systems in Water Resources and Environmental Management", Keynote Paper, Proceedings of the Third International Conference on Water Resources and Environment Research, edited by G.H. Schmitz, held at the Dresden University of Technology, Dresden, Germany, July 22-25, 2002, vol. I, pp. 287-300, 2002.
6. Hipel, K.W., Fang, L., and Kilgour, D.M., "Game Theoretic Models in Engineering Decision Making", invited paper, Journal of Infrastructure Planning and Management, Japan Society of Civil Engineering, No. 470/IV-20, pp. 1-16, July 1993.
7. Hipel, K.W., Radford, K.J., and Fang, L., "Multiple Participant Multiple Criteria Decision Making", IEEE Transactions on Systems, Man, and Cybernetics, Vol. SMC-23, No. 4, pp. 1184-1189, 1993.

Theory

1. Fang, L., Hipel, K.W., and Kilgour, D.M., "Conflict Models in Graph Form: Solution Concepts and their Interrelationships", European Journal of Operational Research, Vol. 41, No. 1, pp. 86-100, 1989.

2. Kilgour, D.M., Hipel, K.W., and Fang, L., "The Graph Model for Conflicts", *Automatica*, Vol. 23, No. 1, pp. 41-55, 1987.

Preference Elicitation

1. Bristow, M., Fang, L., and Hipel, K.W., "From Values to Ordinal Preferences for Strategic Governance", *IEEE Transactions on System, Man, and Cybernetics: Systems*, DOI: 10.1109/TSMC.2014.2308154, published online on April, 15, 2014, Vol. 44, No. 10, pp. 1364-1383, 2014.
2. Ke, Y., Fu, B., De, M., and Hipel, K.W., "A Hierarchical Multiple Criteria Model for Eliciting Relative Preferences in Conflict Situations", *Journal of Systems Science and Systems Engineering*, DOI: 10.1007/s11518-012-5187-0, Vol. 21, No. 1, pp. 56-76, 2012.
3. Ke, Y., Li, K.W., and Hipel, K.W., "An Integrated Multiple Criteria Preference Ranking Approach to the Canadian West Coast Port Congestion Problem", *Expert Systems with Applications*, DOI: 10.1016/j.eswa.2012.02.086, Vol. 39, Issue 10, pp. 9181-9190, August 2012.

Attitudes

1. Bernath Walker, S., Hipel, K.W., and Inohara, T., "Dominating Attitudes in the Graph Model for Conflict Resolution", *Journal of Systems Science and Systems Engineering*, DOI: 10.1007/s11518-012-5198-x, Vol. 21, No. 3, pp. 316-336, 2012.
2. Bernath Walker, S.G., Hipel, K.W., and Inohara, T., "Attitudes and Preferences: Approaches to Representing Decision Maker Desires", *Applied Mathematics and Computation*, DOI: j.amc.2011.11.102, published online since January 11, 2012, Vol. 218, Issue 12, pp. 6637-6647, February 2012.
3. Bernath Walker, S., Hipel, K.W., and Inohara, T., "Strategic Decision Making for Improved Environmental Security: Coalitions and Attitudes in the Graph Model for Conflict Resolution", *Journal of Systems Science and Systems Engineering*, special issue on Strategic Decision Making for Global Security from a Systems Engineering Perspective in the Post-911 Environment, Vol. 18, No. 4, pp. 461-476, 2009.
4. Inohara, T., Hipel, K.W., and Walker, S., "Conflict Analysis Approaches for Investigating Attitudes and Misperceptions in the War of 1812", *Journal of Systems Science and Systems Engineering*, Vol. 16, No. 2, pp. 181-201, 2007.

Fuzzy Preferences

1. Bashar, M.A., Obeidi, A., Kilgour, D.M., and Hipel, K.W., "Modeling Fuzzy and Interval Fuzzy Preferences within a Graph Model Framework", *IEEE Transactions on Fuzzy Systems*, accepted for publication subject to making a minor change on April 13, 2015.
2. Bashar, M.A., Hipel, K.W., Kilgour, D.M., and Obeidi, A., "Coalition Fuzzy Stability Analysis in the Graph Model for Conflict Resolution", *Journal of Intelligent and Fuzzy Systems*, DOI: 10.3233/IFS-141336, accepted for publication on June 11, 2014.
3. Bashar, M.A., Kilgour, D.M., and Hipel, K.W., "Fuzzy Option Prioritization for the Graph Model for Conflict Resolution", *Fuzzy Sets and Systems*, DOI: 10.1016/j.fss.2014.02.11, appeared online on February 26, 2014, Vol. 246, pp. 34-48, 2014.
4. Bashar, Md.A., Kilgour, D.M., and Hipel, K.W., "Fuzzy Preferences in the Graph Model for Conflict Resolution", *IEEE Transactions on Fuzzy Systems*, DOI: 10.1109/TFUZZ.2012.2183603, Vol. 20, No. 4, pp. 760-770, August 2012.
5. Hipel, K.W., Kilgour, D.M., and Bashar, M.A., "Fuzzy Preferences in Multiple Participant Decision Making", *Scientia Iranica, Transactions D: Computer Science & Engineering and Electrical Engineering*, special publication dedicated to the lifelong achievements of Professor Lotfi A. Zadeh, Vol. 18, No. 3(D1), pp. 627-638, June 2011.

6. Al-Mutairi, M.S., Hipel, K.W., and Kamel, M.S., "Fuzzy Preferences in Conflicts", *Journal of Systems Science and Systems Engineering*, Vol. 17, No. 3, pp. 257-276, 2008.
7. Al-Mutairi, M.S., Hipel, K.W., and Kamel, M.S., "Trust and Cooperation from a Fuzzy Perspective". *Mathematics and Computers in Simulation*, online since April 6, 2007, doi:10.1016/j.matcom.2007.04.006, Vol. 76, pp. 430-446, 2008.

Grey Preferences

1. Kuang, H., Bashar, M.A., Kilgour, D.M., and Hipel, K.W., "Strategic Analysis of a Brownfield Revitalization Conflict Using the Grey-based Graph Model for Conflict Resolution", *EURO Journal on Decision Processes*, DOI: 10.1007/s40070-015-0042-4, accepted for publication on April 8, 2015.
2. Kuang, H., Bashar, M.A., Hipel, K.W., and Kilgour, D.M., "Grey-based Preference in a Graph Model for Conflict Resolution with Multiple Decision Makers", *IEEE Transactions on Systems, Man and Cybernetics: Systems*, DOI: 10.1109/TSMC.2014.2387096, to appear, 2015.

Unknown Preferences

1. Li, K.W., Hipel, K.W., Kilgour, D.M., and Noakes, D.J., "Integrating Uncertain Preferences into Status Quo Analysis with Application to an Environmental Conflict," *Group Decision and Negotiation*, Vol. 14, No. 6, pp. 461-479, 2005.
2. Li, K.W., Hipel, K.W., Kilgour, D.M., and Fang, L., "Preference Uncertainty in the Graph Model for Conflict Resolution", *IEEE Transactions on Systems, Man, and Cybernetics, Part A*, Vol. 34, No. 4, pp. 507-520, 2004.

Preference Robustness

1. Ben-Haim, Y., and Hipel, K.W., "The Graph Model for Conflict Resolution with Information-Gap Uncertainty in Preferences", *Applied Mathematics and Computation*, Vol. 126, pp. 319-340, 2002.

Strength of Preference

1. Xu, H., Hipel, K.W., Kilgour, D.M., and Chen, Y., "Combining Strength and Uncertainty for Preferences in the Graph Model for Conflict Resolution with Multiple Decision Makers", *Theory and Decision*, DOI 10.1007/s11238-009-9134-6, Vol. 69, No. 4, pp. 497-521, 2009.
2. Xu, H., Hipel, K.W., and Kilgour, D.M., "Multiple Levels of Preference in Interactive Strategic Decisions", *Discrete Applied Mathematics*, Vol. 57, pp. 3300-3313, 2009.
3. Hamouda, L., Kilgour, D.M., and Hipel, K.W., "Strength of Preference in Graph Models for Multiple Decision-Maker Conflicts", *Applied Mathematics and Computation*, Vol. 179, pp. 314-327, 2006.
4. Hamouda, L., Kilgour, D.M., and Hipel, K.W., "Strength of Preference in the Graph Model for Conflict Resolution", *Group Decision and Negotiation*, Vol. 13, pp. 449-462, 2004.

Emotions

1. Obeidi, A., Kilgour, D.M., and Hipel, K.W., "Perceptual Stability Analysis of a Graph Model System", *IEEE Transactions on Systems, Man, and Cybernetics, Part A, Humans and Systems*, Vol. 39, No. 5, pp. 993-1006, 2009.
2. Obeidi, A., Kilgour, D.M., and Hipel, K.W., "Perceptual Graph Model Systems", *Group Decision and Negotiation*, special issue on Emotion and Interactive Technology, Vol. 18, No. 3, pp. 261-277, 2009.
3. Obeidi, A., Hipel, K.W., and Kilgour, D.M., "The Role of Emotions in Envisioning Outcomes in Conflict Analysis", *Group Decision and Negotiation*, Vol. 14, No. 6, pp. 481-500, 2005.

Coalitions

1. Inohara, T. and Hipel, K.W., "Coalition Analysis in the Graph Model for Conflict Resolution",

Systems Engineering, Vol. 11, No. 4, pp. 343-359, 2008.

2. Inohara, T. and Hipel, K.W., "Interrelationships among Noncooperative and Coalition Stability Concepts", *Journal of Systems Science and Systems Engineering*, Vol. 17, No. 1, pp. 1-29, 2008.
3. Kilgour, D.M., Hipel, K.W., Peng, X., and Fang, L., "Coalition Analysis in Group Decision Support", *Group Decision and Negotiation*, Vol. 10, pp. 159-175, 2001.

Evolution of a Conflict

1. Xu, H., Kilgour, D.M., Hipel, K.W., and Kemkes, G., "Using Matrices to Link Conflict Evolution and Resolution within the Graph Model", *European Journal of Operational Research*, Vol. 207, pp. 318-329, 2010.
2. Xu, H., Li, K.W., Hipel, K.W., and Kilgour, D.M., "A Matrix Approach to Status Quo Analysis in the Graph Model for Conflict Resolution", *Applied Mathematics and Computation*, Vol. 212, No. 2, pp. 470-480, 2009.
3. Li, K.W., Kilgour, D.M., and Hipel, K.W., "Status Quo Analysis in the Graph Model for Conflict Resolution", *Journal of the Operational Research Society*, Vol. 56, pp. 699-707, 2005.
4. Li, K.W., Kilgour, D.M., and Hipel, K.W., "Status Quo Analysis of the Flathead River Conflict", *Water Resources Research*, Vol. 40, No. 5, W05S03, doi:10.1029/2003WR002596 (9 pages), 2004.

Hierarchical Conflicts

1. He, S., Kilgour, D.M., Hipel, K.W., and Bashar, M.A., "A Basic Hierarchical Graph Model for Conflict Resolution with Application to Water Diversion Conflicts in China", *INFOR: Information Systems and Operational Research*, Vol. 51, No. 3, pp. 103-119, 2013.
2. He, S., Hipel, K.W., and Kilgour, D.M., "Water Diversion Conflicts in China: A Hierarchical Perspective", *Water Resources Management*, Vol. 28, No. 7, pp. 1823-1837, 2014.

Inverse Graph Model for Conflict Resolution

1. Kinsara, R.A., Petersons, O., Hipel, K.W., and Kilgour, D.M., "Advanced Decision Support System for the Graph Model for Conflict Resolution", *Journal of Decision Systems*, Special Issue on Integrated Decision Support Systems, accepted for publication on March 12, 2015.
2. Kinsara, R.A., Kilgour, D.M., and Hipel, K.W., "Inverse Approach to the Graph Model for Conflict Resolution", *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, DOI: 10.1109/TSMC.2014.2376473, Vol. 45, No. 5, pp. 734-742, 2015.

Policy Analysis

1. Zeng, D-Z., Fang, L., Hipel, K.W., and Kilgour, D.M., "Policy Equilibrium and Generalized Metarationalities for Multiple Decision-Maker Conflicts", *IEEE Transactions on Systems, Man, and Cybernetics, Part A*, Vol. 37, No. 4, pp. 456-463, 2007.
2. Zeng, D-Z., Fang, L., Hipel, K.W., and Kilgour, D.M., "Generalized Metarationalities in the Graph Model for Conflict Resolution", *Discrete Applied Mathematics*, Vol. 154, No. 16, pp. 2430-2443, 2006.
3. Zeng, D.Z., Fang, L., Hipel, K.W., and Kilgour, D.M., "Policy Stable States in the Graph Model for Conflict Resolution", *Theory and Decision*, Vol. 57, pp. 345-356, 2005.

Matrix Representation of the Graph Model.

1. Xu, H., Kilgour, D.M., Hipel, K.W., and McBean, E.A., "Theory and Implementation of Coalition Analysis in Cooperative Decision Making", *Theory and Decision*, DOI: 10.1007/s11238-013-9363-6, Vol. 76, No. 2, pp. 147-171, 2014.
2. Walker, S.B., Hipel, K.W., and Xu, H., "A Matrix Representation of Attitudes in Conflicts", *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, DOI: 10.1109/TSMC.2013.2260536, Vol. 43, No. 6, pp. 1328-1342, November 2013.

3. Xu, H., Kilgour, D.M., Hipel, K.W., and McBean, E.A., "Theory and Application of Conflict Resolution with Hybrid Preference in Colored Graphs", *Applied Mathematical Modelling*, DOI: 10.1016/j.apm.2012.03.009, available online since March 21, 2012, Vol. 37, No. 3, pp. 989-1003, 2013.
4. Xu, H., Kilgour, D.M., and Hipel, K.W., "Matrix Representation of Conflict Resolution in Multiple-Decision-Maker Graph Models with Preference Uncertainty", *Group Decision and Negotiation*, DOI: 10.1007/s10726-010-9188-4, Vol. 20, pp. 755-779, 2011.
5. Xu, H., Kilgour, D.M., and Hipel, K.W., "An Integrated Algebraic Approach to Conflict Resolution with Three-level Preference", *Applied Mathematics and Computation*, available online since January 28, 2010, DOI: 10.1016/j.amc.2010.01.054, Vol. 216, pp. 693-707, 2010.
6. Xu, H., Kilgour, D.M., and Hipel, K.W., "Matrix Representation and Extension of Coalition Analysis in Group Decision Support", *Computers and Mathematics with Applications*, DOI: 10.1016/j.camwa.2010.05.040, Vol. 60, pp. 1164-1176, 2010.
7. Xu, H., Hipel, K.W., Kilgour, D.M., and Chen, Y., "Combining Strength and Uncertainty for Preferences in the Graph Model for Conflict Resolution with Multiple Decision Makers", *Theory and Decision*, published online on February 18, 2009, DOI 10.1007/s11238-009-9134-6, 25 pages, 2009.
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Journal Papers

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Engineering Education

Journal Papers

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2. Fukuyama, K., Okada, N., and Hipel, K.W., “Internationalization of Engineering Education through Exchange Programs”, Journal of the Japanese Society for Engineering Education, Vol. 53, No. 2, pp. 36-42, 2005.

RESEARCH SUPERVISION

To date, K.W. Hipel has supervised or co-supervised 30 Ph.D. and 47 Master's students who have successfully completed their graduate degrees and now hold meaningful employment in industry, academia and government. Usually, Hipel is mentoring about a dozen researchers consisting of PhD and Master’s students as well as a Post-Doctoral Fellow and Visiting Scholars. Additionally, he has supervised about 100 Japanese graduate exchange students from three universities in Japan as well as almost 50 Post-Doctoral Fellows and Visiting Scholars. He is the recipient of the **Award of Excellence in Graduate Supervision** from the University of Waterloo.

RESEARCH FUNDING

Since 1976, K.W. Hipel has continuously held a Natural Sciences and Engineering Research Council (NSERC) of Canada Discovery Grant including the current one entitled “Systems Engineering Approaches to Sustainable Environmental Management”. He was the Principal Investigator for the NSERC Strategic Project Grant entitled “Systems Engineering Approaches for Brownfield Redevelopment” (2006-2009), Project Leader for Centre for International Governance (CIGI)/Faculty of Engineering (FOE) Research Grant to carry out interdisciplinary research in the area of “Multiple Participant – Multiple Objective Decision Making in International Governance” (2005-2013), Project Leader for a research topic within a Canadian Water Network Grant (2001-2005), Co-Investigator of two Aquanet research grants within the Networks of Centres of Excellence in Canada, dealing with risk management in aquaculture (2002-2004), Team Leader for a Tri-Council Eco-Research Grant (1993-1996), and holder of many other types of research grants and contracts.

KEYNOTE ADDRESSES

Since 1985, K.W. Hipel has presented twenty-six keynote addresses at international conferences held in Japan, Hungary, Brazil, Germany, Tunisia, Sweden, the USA, India, Spain, Portugal, Macau and Canada.

EXTERNAL EXAMINER

External examiner for PhD and Master's theses for universities in the United States, France, South Africa, The Netherlands, India, Hong Kong and Canada.

TEACHING

Basic engineering, mathematics, optimization, conflict analysis and workshop courses at the undergraduate level. Time series modelling and conflict resolution at the graduate level. Courses were well received and consistently were given high ratings by the students. In recognition of the high quality of his teaching, Hipel is recipient of the **Distinguished Teacher Award** and the **Faculty of Engineering Teaching Excellence Award** from the University of Waterloo, as well as the 2011 **Outstanding Engineering Educator Award** from IEEE Canada.

CONSULTING

Carried out consulting activities on behalf of organizations that include the International Joint Commission (mandated by the 1909 Boundary Waters Treaty between Canada and the United States), Environment Canada, Japan Institute of Construction Engineering, United States Air Force, a US intelligence agency, Ontario Ministry of the Environment and Energy, Department of National Defense (Canada), Acres International Limited, and electrical utilities that include Southern California Edison in the US, Eletrobras in Brazil and Ontario Hydro in Canada. Hipel is an active member of the energy task force within the Canadian Academy of Engineering.

ROYAL SOCIETY OF CANADA

Since being elected **Fellow** of the Royal Society of Canada (RSC) in 1998, K.W. Hipel has been highly involved in RSC activities. Currently, Hipel is *President* (November 15, 2013 to November 2015) of the Academy of Science, has served as *President-Elect* for one year (November 17, 2012 to November 15, 2013), and will hold the post of *Past-President* (November 2015-November 2016). During 2013, he was *Chair* of the Academy of Science Awards Committee. Hipel served as *Vice President* of the Academy of Science (Academy III) for two years (2007-2009) and was *Member* of the Nominations Committee of Academy III (2004-2007), Committee for the Selection of New Fellows in the Applied Science and Engineering Division (2010), Academy III Committee for the Selection of New Fellows (2007-2009), Academy III Executive (2007-2009), Royal Society of Canada Council (2007-2009), and many other committees. Hipel organized and chaired with Bruce Mitchell a one-day Southwest Ontario Regional Symposium of the Royal Society of Canada on the topics “Collaborative Partnerships and Connecting Research with the Community”, which took place in Waterloo on Thursday, April 27, 2006 at the Centre for International Governance and the Perimeter Institute for Theoretical Physics for the morning and afternoon sessions, respectively. Since 2005, K.W. Hipel has represented the Royal Society of Canada at activities of the Focal Points of National Water Programmes of the Inter American Network of Academies of Science (IANAS) at meetings held in Bogota (2005), Santa Domingo (2008), Managua (2009) and Buenos Aires (2010). He wrote with Andrew Miall and Dan Smith a white paper on water entitled “Water Resources in Canada: A Strategic Viewpoint” for the IANAS project (2011). Hipel has been *Member* of the Program Committee for three annual one-day symposia of the RSC: “Water in Canada and the World: Rising Tensions in the 21st Century: Issues and Solutions” (2006); “The Universe and our Place in It”, to celebrate the International Year of Astronomy (2009); and “Canadian Marine Biodiversity: Indispensable Resource, Unprecedented Opportunities, Unequivocal Responsibilities” (2015). At the 2006 yearly symposium,

Hipel presented the invited paper “Conflict Management”. Hipel is the recipient of the **Sir John William Dawson Medal** (2012) from the RSC for his interdisciplinary research.

IEEE ACITVITIES

Hipel has served members of the IEEE Systems, Man and Cybernetics (SMC) Society through activities such as being an elected member of the Board of Governors for a total of twelve years since 1990, Vice President of Publications (1998-1999), Associate Editor of the IEEE SMC Transactions since 1990, Chair of the Strategic Opportunities and Initiatives Committee (2004-2005), member of the Strategic Planning Task Force (2004-2005), member of the Executive Committee (2004-2005, 1998-1999), member of the International Program Committee for all annual IEEE SMC Conferences since 1991, organizer of sessions on Conflict Resolution at all of the annual IEEE SMC Conferences since 1991, General Co-Chair of the 2009 IEEE International Conference on SMC held in San Antonio, Texas, member of the IEEE SMC Fellow Selection Committee (2013, 2012, 2011, 2010, 2008, 2007, 1998, 1997), and, since 2005, Co-Chair of the Technical Committee on Conflict Resolution for which he jointly received the **Most Active SMC Technical Committee Award** (2007). On October 8, 2007, Hipel delivered the opening keynote address entitled “Competition and Cooperation in Societal and Technological Systems of Systems”, at the 2007 IEEE International Conference on Systems, Man and Cybernetics held at the Delta Centre-Ville, Montreal, Quebec, Canada. In collaboration with highly regarded IEEE SMC colleagues, Hipel was a co-author of the paper: Hipel, K.W., Jamshidi, M.M., Tien, J.J., and White III, C.C., “The Future of Systems, Man and Cybernetics: Application Domains and Research Methods”, IEEE Transactions on Systems, Man, and Cybernetics, Part C, Applications and Reviews, Vol. 37, No. 5, pp. 726-743, 2007. The four authors of this paper also participated in two panel sessions on this topic held at the 2006 and 2007 Annual IEEE SMC Conferences. Hipel was a member of the Panel Discussion on “Are the Fields of Systems, Man, and Cybernetics Mature Enough for the Challenges of the Cyber World” which was held on October 15, 2013 as part of the 2013 IEEE International Conference on Systems, Man, and Cybernetics, held at the Midland Hotel, Manchester, United Kingdom, October 13 to 16, 2013. Hipel was a member of the Panel Session called “The 2012 Norbert Wiener Summit”, which was held on October 16, 2012 as part of the 2012 IEEE International Conference on Systems, Man, and Cybernetics, held in Seoul, Korea, October 14 to 17, 2012. He was a member and organizer of the panel discussions on “Systems, Man and Cybernetics Methods: A Review and Discussion” held on October 11, 2011 as part of the 2011 IEEE International Conference on Systems, Man and Cybernetics, held at the Hilton Anchorage Hotel in Anchorage, Alaska, from October 9 to 12, 2011. Additionally, Hipel was a member and organizer of the panel discussion “Infrastructure System of Systems: Opportunities for Renewal and Growth” which took place on Wednesday October 14, 2009, at the 2009 IEEE International Conference on Systems, Man and Cybernetics held at the Hyatt Regency Riverwalk, San Antonio, Texas, USA, from October 11 to 14, 2009. Finally, Hipel presented lectures around the globe within the Distinguished Lecturer Program of the IEEE SMC Society (2008 to 2011) and continues to do so as an IEEE Fellow. Hipel was elected **Fellow** of IEEE in 1996 and is the recipient of the **Joseph G. Wohl Outstanding Career Award** (2012) and **Norbert Wiener Award** (2000) from the IEEE SMC Society.

GROUP DECISION AND NEGOTIATION

K.W. Hipel has been an active participant in activities of a society called Group Decision and Negotiation (GDN) since it was founded by Professor Mel Shakun of the Stern School of Business at New York University in the early 1990s. In fact, Dr. Shakun discussed the idea of having a journal called GDN with Hipel at the IFORS (International Federation of Operational Research Societies) 90, 12th Triennial Conference on Operations Research, held in Athens, Greece, from June 25 to 29, 1990. GDN is now a Section of INFORMS (Institute for Operations Research and the Management Sciences) within which the journal called GDN is published by Springer. Hipel has been an *Associate Editor* with the journal GDN since it was launched in January 1992; written many *papers* for publication in

GDN and encouraged both experts and students to do likewise; been a *Member* of the Organizing Committee and helped to organize and chair special sessions for many GDN Conferences [2002 (Perth, Australia), 2005 (Vienna, Austria), 2006 (Karlsruhe, Germany), 2007 (Mont Tremblant, Quebec, Canada), 2008 (Coimbra, Portugal), 2009 (Toronto, Ontario, Canada), 2012 (Recife, Brazil), 2013 (Stockholm, Sweden) and 2014 (Toulouse, France)]; been a *Guest Editor* of three issues of GDN (2009, 2005, 1994); Member of three *Panel Sessions* at GDN conferences (2008, 2007, 2006); delivered *Keynote Addresses* on “Strategic Investigations of Water Conflicts in the Middle East” at GDN 2012 in Brazil, and “Tackling Climate Change: A System of Systems Engineering Perspective” at GDN 2013 in Sweden; been an *Advisor* at Doctoral Consortiums at GDN 2008 and also GDN 2013 in which he provides research guidance to PhD students from around the globe who present their research as special sessions of GDN conferences. Hipel was the recipient of the **2013 Group Decision and Negotiation Section Award** for “outstanding contributions to research in the field of Group Decision and Negotiation (GDN) and/or outstanding contributions to the GDN Section.”

INTERNATIONAL ACADEMIC PROJECTS

K.W. Hipel has been extremely busy in organizing and participating in numerous international activities. For example, Hipel is the Co-founder and Director of the Exchange Programs between the University of Waterloo and the Tokyo Institute of Technology in Japan (December 2006 to present), Kyoto University in Japan (November 26, 1992 to present), Tottori University in Japan (November 16, 1987 to present), and Nanjing University of Aeronautics and Astronautics in China (December 2009 to present). More than 210 Canadian and foreign students have participated in these exchange programs. He organized and edited 10 special issues of journals on a range of different topics and was the Honourary Theme Editor for “Conflict Resolution” which is part of the “Encyclopedia of Life Support Systems (EOLSS): Water, Energy, Environment, and Food and Agriculture”. He has been an Associate Editor with 21 journals and been highly active in many professional organizations such as the American Water Resources Association and IEEE. In 2004, Hipel was the External Examiner of the academic activities of the Disaster Prevention Research Institute (DPRI) of Kyoto University, Japan, while during the fall of 1996 he carried out an academic review of the Faculty of Engineering, Tottori University, Tottori, Japan. Over a 12-year period, Hipel participated in the China/Canada Management Program via the supervision of Chinese PhD students and delivering short course and seminars in China. Throughout his career, Hipel has regularly presented leading-edge research seminars and short courses around the globe with a focus on Japan and China.

CONFERENCE ORGANIZATION

K.W. Hipel has been the Chair or Co-Chair and main organizer of four international conferences (1978, 1992, 1993, and 2006) and been an active member of the scientific planning committee of more than 50 other conferences, many of which involved the planning and chairing of special tracks of sessions. For example, in 1993, he organized and chaired the international conference on "Stochastic and Statistical Methods in Hydrology and Environmental Engineering: An International Conference in Honour of Professor T.E. Unny", which was held at the University of Waterloo from June 21-23, 1993. This constituted the first of a sequence of conferences subsequently held in Kyoto (1996), Brisbane (1999), Dresden (2002), Adelaide (2008), Quebec City (2010) and Koblenz (2013). These ongoing conferences are now called the International Conferences on Water and Environment Research (ICWRER), for which Hipel is Chair of the ICWRER Steering Committee. The next ICWRER conference will be held in Kyoto from June 6th to 9th, 2016. Hipel is the recipient of the **Water 2010 Lifetime Achievement Award** which he was presented at ICWRER 2010 in Quebec City. Since 1991, Hipel has helped to organize and chair special tracks of sessions on “Conflict Resolution” at the annual international conferences of the IEEE Systems, Man, and Cybernetics Society.

INSTITUTE AND GROUP MEMBERSHIPS AT THE UNIVERSITY OF WATERLOO

K.W. Hipel is Coordinator of the Conflict Analysis Group which he founded in 1976 and a member of The Water Institute, Waterloo Institute for Complexity and Innovation (Founding Member, Member of the Executive Committee for a three-year term starting in October, 2011), Waterloo Institute for Sustainable Energy, and Social Innovation Generation (Associate Faculty Member since April, 2010).

ADMINISTRATIVE DUTIES, UNIVERSITY OF WATERLOO

For almost four decades, K.W. Hipel has served his colleagues in numerous capacities at the departmental, faculty and university levels. For instance, he served as Chair of the Department of Systems Design Engineering for two terms, Chair of Faculty Council and Assembly, Senator for 18 years, Governor for 9 years, and Chair of the Compensation and Salary Steering Committee. He has been a Member of numerous committees such as the Promotion and Tenure Committees at the both the Departmental and Faculty levels, Presidential Nominating Committee (2010-2011), Senate Nominating Committee for Honourary Degrees for 11 years, and Awards Nomination Committee at both the Faculty and University levels.

RENISON UNIVERSITY COLLEGE

K.W. Hipel was Chair of the Board of Governors at Renison University College for a two-year period (May 1, 2011 to May 14, 2013), was Vice Chair for four years (May 1, 2007 to April 30, 2011) and a member of the Board for 18 years. He is now serving as Past Chair on the Board of Governors (May 14, 2014 to December 31, 2015). Other posts which Hipel held include being Chair (May 1, 2011 to May 14, 2013), Vice Chair (May 1, 2007 to April 30, 2011), and Member of the Executive Committee of the Board of Governors (May 1, 2005 to April 14, 2007); Chair (May 1, 2005 to April 30, 2011), and previously a Member, of the Board of Governors Personnel Committee (2000 to April 30, 2005); and Member (ex officio, May 1, 2007 to May 14, 2013) of the Finance Committee of the Board of Governors. Furthermore, he has been a Member of the East Asian Festival Planning Committee since the festival was founded in 1994 and held on a yearly basis until the present time.

May 25, 2015