

**John Andraos**

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<http://www.careerchem.com/MainFrame.html>**EDUCATION**

Ph.D., University of Toronto, Toronto, CANADA; Organic Chemistry 1992  
B.Sc., University of Toronto, Toronto, CANADA; Biochemistry 1987

**PROFESSIONAL EXPERIENCE**

Founder of *CareerChem*, National Directory of Departments of Chemistry in Canada website 2000  
Course Director and Lecturer, York University, CANADA 1999 - present  
[CHEM 3070](#) Industrial and Applied Green Chemistry  
[CHEM 4100](#) Research Project Supervisor  
[CHEM 3021](#) Organic Chemistry III  
[CHEM 4023/CHEM 5030](#) Physical Organic Chemistry  
Visiting Scholar, University of Toronto, CANADA 1997 – 1998  
Junior Research Fellow, The University of Queensland, AUSTRALIA 1995 – 1997  
NSERC Post-doctoral Fellow, University of Ottawa, CANADA 1992 – 1994

**PROFESSIONAL AND SCHOLASTIC HONOURS**

President, SigmaXi University of Toronto Chapter 2004 - 2006  
Vice-President, SigmaXi University of Toronto Chapter 2003  
Nominated and elected to full membership in [Sigma-Xi](#) (U of Toronto Chapter) 1999  
Australian Research Council (ARC) Junior Research Award, [University of Queensland](#) 1996  
University of Queensland Post-doctoral Fellowship 1995 - 1997  
NSERC Post-doctoral Fellow, University of Ottawa 1993 - 1994  
Ontario Graduate Scholarship, University of Toronto 1989 - 1991  
NSERC Post-graduate Fellow, University of Toronto 1987 - 1989

University of Toronto Chemistry Club President	1988 - 1989
Dean's List, University of Toronto	1983 - 1987
NSERC Undergraduate Student Research Award, University of Toronto, <i>Tenured in the laboratory of Prof. J. Bryan Jones</i>	1986
F.E. Beamish Prize in Chemistry, University of Toronto	1985 - 1986
Mary H. Beatty Admission Scholarship, University of Toronto	1983 - 1986
Ontario Youth Medal	1985

## Invited Addresses

### 2008

"Green Chemistry Metrics: Application to Reaction and Synthesis Optimization", Apotex Pharmaceuticals, Inc., April 22, 2008, Brantford, Ontario, CANADA

### 2007

15<sup>th</sup> International Conference on Organic Process Research and Development, "Getting a Grip on Quantifying How Efficient a Synthesis Plan Is For a Given Target Product", San Diego, California, USA, January 8 - 10, 2007

"Getting a Grip on Quantifying How Efficient a Synthesis Plan Is For a Given Target Product", BioVerdant, Inc., San Diego, California, USA, January 11, 2007

"Green Chemistry Principles, Metrics and Industrial Implementation"  
Three day training course given by Scientific Update LLP  
(co-hosted with Dr. Peter L. Spargo)  
Le Centre Sheraton, Montreal, June 19 – 21, 2007

Determining Product Ratios for Kinetic Schemes Without Rate Laws: a new method based on directed graphs, 90<sup>th</sup> CSC Conference and Exhibition, May 26 – 30, 2007, Winnipeg, Manitoba, CANADA (in honour of Prof. A. Jerry Kresge)

Green Chemistry Metrics for Reaction and Synthesis Optimization, Merck & Co., Rahway, NJ, October 16, 2007

University of Toronto, Sigma-Xi invited address, "The "Algebra" of Organic Synthesis: Green Chemistry and Synthesis Optimization", November 22, 2007

### 2006

CIC Chair's Event: Diversity in Chemical Careers Panel Discussion  
"Pursuing an Academic Career in Chemistry", CSC Conference and Exhibition 2006, Halifax, Nova Scotia, CANADA, May 27 – 31, 2006

### 2005

Green Chemistry and Engineering Education Workshop, Chemical Sciences Roundtable, "Green Chemistry: Teaching and Research", National Academies, Washington, D.C., USA, November 7 - 8, 2005 [pdf](#)

**2004**

University of Toronto, Sigma-Xi invited address, "Connections in Science: implications on idea generation and career development", January 22, 2004

87<sup>th</sup> CSC Conference and Exhibition, London, Ontario, "New Paradigms in Teaching and Doing Research in Organic Chemistry", May 31, 2004

**2003**

Concordia University, "Careers in Chemistry: Pursuing Academic Careers in Canada", 6<sup>th</sup> Chemistry and Biochemistry Graduate Research Conference, November 15, 2003

**2000**

York University (York Chemical Society), "Did You Know? A Who's Who of Chemistry", September 22, 2000.

**PROFESSIONAL TEACHING EXPERIENCE**

**York University and University of Toronto**  
Departments of Chemistry, Toronto, CANADA  
Course Director and Lecturer

1999 - present

Lectured honours undergraduate and graduate level courses in mechanistic, synthetic organic, and industrial chemistry (**CHEM 3021/3070/4023/5030** at York, **CHM 1045** at U Toronto) covering topics in organic synthesis, environmental ("green") chemistry methods, industrial process chemistry, reaction optimization, mathematics of kinetic systems, linear free energy relationships, proton transfer reactions, isotope effects, and reaction intermediates; 36 one hour sessions held 3 days a week; enrollment: 10 to 50 students.

- Launched first "green chemistry" course in the Department of Chemistry at York University (**CHEM 3070: Industrial and Applied Green Chemistry**), 2002
- Revised course syllabuses including design of writing assignments and problem sets, design of laboratory experiments complementing lecture material, development of critical skills in oral presentations and literature critiquing.
- Implemented novel pedagogical strategies not found in textbooks including vocabulary listing, flowcharting of concepts, in-class problem solving, and scientist biographical sketching.
- Upgraded and expanded collection of texts in chemistry at Steacie Science Library (contact **Leila Fernandes**, Chemistry Liaison Librarian, Steacie Science Library).
- Developed webpage "**Named Things in Chemistry and Physics**", <http://www.chem.yorku.ca/NAMED/> and <http://www.careerchem.com/NAMED/Homepage.html> as a resource database for important concepts in chemistry and physics (related to chemistry) including original scientific citations, scientific genealogies, and biographical references
- Completed "**The University Teaching Practicum**", 1999 – 2001 (Co-ordinator: **Prof. Pat Rogers**)
- Completed "**TeachTech**" Summer Workshops (Multimedia Resources in Teaching), Summer 1999 (Co-ordinators: Prof. Peggy Keall and Rob Finlayson)
- Launched "Charting a Career in Science in Canada" panel discussions at the University of Toronto as part of SigmaXi U of Toronto outreach programs for undergraduate and graduate students (2004)

## PROFESSIONAL RESEARCH EXPERIENCE

### York University

2000 - present

Department of Chemistry, Toronto, CANADA

#### Research Scientist

- Application of reaction metrics for analysis of organic reactions and total syntheses of organic molecules; optimization of recycling and reagent retrieval protocols; discovery of new multi-component reactions by structural combinatorial techniques; unified mathematical analysis of green metrics; molecular complexity
- Quantification and optimization of dynamic kinetic resolution relevant to stereoselective syntheses of pharmaceuticals and sedatives (thalidomide); advanced mathematical analysis; analytical and numerical solution of systems of differential equations encountered in kinetics problems in homogeneous and heterogeneous chemical systems
- Dynamic NMR studies on novel phthalocyanines relevant to photodynamic therapy and materials science; with **Prof. Cliff Leznoff**
- Development of pedagogical exercises and computer software for 3-D visualization of molecules relevant to the teaching of stereochemistry to undergraduates in years 2 and 3; with **Prof. Walter Whiteley**, Department of Mathematics and Statistics

### University of Toronto

1997 - present

Departments of Chemistry, Toronto, CANADA

#### Visiting Scientist

Kinetic investigation of complex chemical systems in solution and in heterogeneous media

- Unified kinetic methodologies for describing complex kinetic behaviour in matrices, polymers, zeolites, and other restricted media including Kohlrausch-Williams-Watts, Albery-Siebrand, exponential series method (ESM), and maximum entropy method (MEM) analyses.

### The University of Queensland

1995 - 1997

Department of Chemistry, Brisbane, AUSTRALIA

#### Junior Staff Researcher: (with Professor C. Wentrup)

Mechanistic studies of novel thermolytic and photolytic rearrangements of cumulenes by matrix isolation FT-IR spectroscopy and variable temperature NMR.

- Awarded an \$18,000 Australian Research Council grant for Junior Researchers.
- Developed methods of implementing heterogeneous phase reaction modelling techniques involving time-dependent rate constants and distribution analysis using commercially available software packages.
- Discovery of novel heterocumulenes by pyrolysis and photolysis of heterocyclic compounds and study by low temperature FT-IR matrix isolation spectroscopy

### University of Ottawa

1993 - 1994

Department of Chemistry, Ottawa, CANADA

**NSERC Post-doctoral Fellow:** (with Professor J.C. Scaiano)

Mechanistic studies of photochemical reactions by time-resolved laser flash photolysis in solution and in zeolites.

- Developed a GC/MS protocol for the elucidation of reaction mechanism for photoacid generation from sulfonic acid derivatives (with Shipley Co.)
- Developed computational methods for treatment of kinetic data of photochemical reactions in heterogeneous media; generalization of calculation protocols

**University of Toronto**

1987 - 1992

Department of Chemistry, Toronto, CANADA

**Graduate Student and Teaching Assistant:** (with Professor A.J. Kresge)

Investigation of ketene hydration reaction mechanism in aqueous solution by time-resolved flash photolysis and *ab initio* computational methodologies.

- Built and designed \$200,000 laser flash photolysis facility at the University of Toronto shared among 3 research groups with a total of 12 personnel.

**Universität Basel**

1991

Institut für Physikalische Chemie, Basel, **SWITZERLAND****Visiting Doctoral Student:** (with Professor Jakob Wirz)**PROFESSIONAL AFFILIATIONS**[Canadian Society of Chemistry](#) (CSC, 1988 - )[American Chemical Society](#) (ACS, 1988 - )[Inter-American Photochemical Society](#) (IAPS, 1993 - )[Mathematical Association of America](#) (MAA, 1993 - )[Royal Canadian Institute](#) (RCI, 1997 - )[Sigma-Xi](#) (1999 - )

Reviewer for *Journal of the American Chemical Society*, *Journal of Organic Chemistry*, *Organic Letters*, *Journal of Physical Organic Chemistry*, *Journal of Chemical Education*

Executive Board member (2001 – 2004), *Sigma-Xi University of Toronto Chapter*  
Member of Faculty of Pure and Applied Science Council, York University (2002 - )

**SPECIAL SKILLS****COMPUTER PROGRAMS:**

Operating Systems	UNIX; MAC System 7.5; Windows 2000
Programming	TrueBASIC
Word Processing	Word; PowerPoint
Chemical Structures	ChemWindows; ChemDraw

Statistical and Symbolic	Excel; KaleidaGraph; GraFit; SigmaPlot; Mathematica
Computational	GAUSSIAN90; MONSTERGAUSS; CACHe
Internet	Netscape Navigator; Explorer
Databases	CAS-STN, SciFinder Scholar, Beilstein

LANGUAGES: English (fully fluent); French (intermediate reading and writing); Italian and Portuguese (basic reading).

## PUBLICATIONS AND CONTRIBUTIONS

### (A) Refereed Publications

**J. Andraos\***, Kinetic Plasticity and the Determination of Product Ratios for Kinetic Schemes Leading to Multiple Products Without Rate Laws: new methods based on directed graphs, *Can. J. Chem.*, **2008**, 86, 342-357.

**J. Andraos\***, Application of Green Metrics Analysis to Chemical Reactions and Synthesis Plans, in *Green Chemistry Metrics*, (Alexei Lapkin, David C. Constable, eds.), Blackwell Scientific: Oxford, **2008**, in press.

**J. Andraos\***, The Contributions of Solomon F. Acree (1875 - 1957) and the Centennial Anniversary of the Discovery of the Acree-Curtin-Hammett Principle", *The Chemical Educator* **2008**, in press.

**J. Andraos\***, Gauging Material Efficiency, *Canadian Chemical News* **2007**, 59(4), 14 - 17.

**J. Andraos\*** and M. Sayed, On the Use of Green Metrics in the Undergraduate Organic Chemistry Lecture and Practicum to Assess the Material Efficiencies of Organic Reactions, *J. Chem. Educ.* **2007**, 84, 1004 - 1011.

**J. Andraos\*** and J. Izhakova, Perspectives on the Application of Green Chemistry Principles to Total Synthesis Design, *Chimica Oggi/The International Journal of Industrial Chemistry and Biotechnology*, November/December **2006**, 24(6, Supp.), 31 - 36 (invited article). [pdf](#)

**J. Andraos\***, On Using Tree Analysis to Quantify the Material, Input Energy, and Cost Efficiencies of Simple and Complex Synthesis Plans and Networks: toward a blueprint for quantitative total synthesis and green chemistry, *Org. Process Research & Development* **2006**, 10, 212 - 240. [pdf](#)

**J. Andraos\***, Reaction Intermediates in Organic Chemistry: The "Big Picture", *Can. J. Chem.* **2005**, 83, 1415 - 1431 [pdf](#) [S1-S4](#), [S5](#), [S6](#)

**J. Andraos\***, Scientific Genealogies of Physical Organic and Mechanistic Chemists, *Can. J. Chem.* **2005**, 83, 1400 – 1414 [pdf](#) [S1](#)

**J. Andraos\***, Unification of Reaction Metrics for Green Chemistry II: Evaluation of Named Organic Reactions and Application to Reaction Discovery, *Org. Process Research & Development.* **2005**, 9, 404 – 431 [pdf](#)

**J. Andraos\***, Unification of Reaction Metrics for Green Chemistry: Applications to Reaction Analysis, *Org. Process Research & Development* **2005**, 9, 149 – 163 [pdf](#) [corr](#)

S. Ebner, B. Wallfisch, **J. Andraos**; I. Aitbaev, M. Kiselewsky, P.V. Bernhardt, G. Kollenz, C. Wentrup, N-aminopyrroledione-hydrazoketene-pyrazolium oxide-pyrazolone rearrangements and pyrazolone tautomerism, *Org. Biomol. Chem.* **2003**, 1, 2550 – 2555 [pdf](#)

**J. Andraos\***, The Quantification and Optimization of Dynamic Kinetic Resolution, *J. Phys. Chem. A* **2003**, 107, 2374 – 2387 [pdf](#)

N. Bhardwaj, **J. Andraos**, C.C. Leznoff, The Syntheses and NMR Studies of Hexadeca- and Octaneopentoxypthalocyanines, *Can. J. Chem.* **2002**, 80, 141 – 147 [pdf](#)

N.C. deLucas, J.C. Netto-Ferreira, **J. Andraos**, J.C. Scaiano, Nucleophilicity toward Ketenes: Rate Constants for Addition of Amines to Aryl Ketenes in Acetonitrile Solution, *J. Org. Chem.* **2001**, 66, 5016 – 5021 [pdf](#)

**J. Andraos** and A.J. Kresge, Correlation of Rates of Uncatalyzed and Hydroxide-Ion Catalyzed Ketene Hydration. A Mechanistic Application and Solvent Isotope Effects on the Uncatalyzed Reaction, *Can. J. Chem.* **2000**, 78, 585 [pdf](#)

**J. Andraos\***, Bimolecular Kinetics at Low Temperatures Using FT-IR Matrix Isolation Spectroscopy: Some Caveats. Thermokinetic Parameters for the Reaction of Fulvenones with Pyridine in Pyridine Matrices, *J. Phys. Chem. A.* **2000**, 104, 1532 – 1543 [pdf](#)

X. Ye, **J. Andraos**, H. Bibas, M.W. Wong, and C. Wentrup, Mesoions and ketene valence isomers. Pyrrolo [1,2-  ]pyridiniumolates and (2-pyridyl)carbonylketenes, *J. Chem. Soc. Perkin I* **2000**, 401 – 406 [pdf](#)

**J. Andraos\***, E. Lathioor, and W. Leigh, Simultaneous pH-Rate Profiles Applied to the Two Step Consecutive Sequence A  $\rightarrow$  B  $\rightarrow$  C: A Theoretical Analysis and Experimental Investigation, *J. Chem. Soc. Perkin 2 Trans.*, **2000**, 365 – 374 [pdf](#)

**J. Andraos\***, A Streamlined Approach to Solving Simple and Complex Kinetic Systems Analytically, *J. Chem. Educ.* **1999**, 76, 1578 – 1583 [pdf](#)

**J. Andraos\***, The Problem of Distinguishability of Rate Constants in the Two Step Consecutive Sequence A  $\rightarrow$  B  $\rightarrow$  C, *Can. J. Chem.* **1999**, 77, 565 – 576 [pdf](#)

**J. Andraos**, Y. Chiang, S.J. Eustace, A.J. Kresge, S.W. Paine, V.V. Popik, and K. Sung, Solvent Isotope Effect on the Hydroxide-Ion Catalyzed Hydration of Ketenes in Aqueous Solution, *Can. J. Chem.* **1999**, 77, 459 – 462 [pdf](#)

**J. Andraos\***, How Mathematics Figures in Chemistry: Some Examples, *J. Chem. Educ.* **1999**, 76, 258 – 267 [pdf](#)

**J. Andraos**, G.G. Barclay, D.R. Medeiros, M.V. Baldovi, J.C. Scaiano, and R. Sinta, Model Studies on the Photochemistry of Phenolic Sulfonate Photoacid Generators, *Chem. Mater.* **1998**, 10, 1694 – 1699 [pdf](#)

J. Finnerty, **J. Andraos**, Y. Yamamoto, M.W. Wong, and C. Wentrup, A Facile 1,3-Shift of Chlorine in a Chlorocarbonylketene, *J. Am. Chem. Soc.* **1998**, 120, 1701 – 1704 [pdf](#)

**J. Andraos**, Y. Chiang, A.J. Kresge, and V.V. Popik, Flash Photolysis of 10-Diazo-9(10*H*)-phenanthrenone in Aqueous Solution. Hydration of Fluorenylidene ketene and the Fluorene-9-carboxylic Acid Keto-Enol System, *J. Am. Chem. Soc.* **1997**, 119, 8417 – 8424 [pdf](#)

N.C. deLucas, J.C. Netto-Ferreira, **J. Andraos**, J. Luszyk, B.D. Wagner, and J.C. Scaiano, Reactivity of Fluorenylidene ketene Towards Amines: A Laser Photolysis Study with Ultraviolet and Infrared Detection, *Tetrahedron Lett.* **1997**, 38, 5147 – 5150 [pdf](#)

G.G.H. Qiao, **J. Andraos**, and C. Wentrup, Reactivity of Ketenes in Matrices: Direct Observation of Ketene-Pyridine Ylides, *J. Am. Chem. Soc.* **1996**, 118, 5634 – 5638 [pdf](#)

**J. Andraos\***, On the Propagation of Statistical Errors for a Function of Several Variables, *J. Chem. Educ.* **1996**, 73, 150 – 154 [pdf](#)

**J. Andraos**, A.J. Kresge, and N.P. Schepp, The Hydration of Mesitylketene in Aqueous Solution: Detection of Acid Catalysis for an Aromatic Ketene, *Can. J. Chem.* **1995**, 73, 539 – 543 [pdf](#)

J.C. Scaiano, N.C. deLucas, **J. Andraos**, and H. Garcia, Determination of the Distance for Triplet Energy Transfer in the Faujasite NaY, *Chem. Phys. Lett.* **1995**, 233, 5 – 8 [pdf](#)

N.C. deLucas, **J. Andraos**, J.C. Netto-Ferreira, and J.C. Scaiano, Laser Flash Photolysis Study of the Reactivity of alpha-Ketenylbenzocyclobutenone with Water and Alcohols, *Tetrahedron Lett.* **1995**, 36, 677 – 680 [pdf](#)

**J. Andraos**, Y. Chiang, A.S. Grant, H.X. Guo, and A.J. Kresge, The pK<sub>a</sub> of an Acetylenic Amine, N-(pentafluorophenyl)-2-phenylethynamine, Ionizing as an Acid in Aqueous Solution, *J. Am. Chem. Soc.* **1994**, 116, 7411 – 7412 [pdf](#)

**J. Andraos**, A.J. Kresge, and V.V. Popik, Kinetics and Mechanism of the Isomerization of 1*H*-Indene-1-carboxylic Acid to 1*H*-Indene-3-carboxylic Acid in Aqueous Solution and Determination of their Keto-Enol Equilibrium Constants for the Keto and Enol Forms. Implication on the Photolysis of Diazonaphthoquinones, *J. Am. Chem. Soc.* **1994**, 116, 961 – 967 [pdf](#)

**J. Andraos**, Y. Chiang, A.J. Kresge, I.G. Pojarlieff, N.P. Schepp, and J. Wirz, The alpha-Cyano-alpha-phenylacetic Acid Keto-Enol System. Flash Photolytic Generation of the Enol in Aqueous Solution and Determination of the Keto-Enol Equilibrium

Constants and Acid Dissociation Constants Interrelating all Keto and Enol Forms in that Medium, *J. Am. Chem. Soc.* **1994**, 116, 73 – 81 [pdf](#)

**J. Andraos**, Y. Chiang, C.H. Huang, A.J. Kresge, and J.C. Scaiano, Flash Photolytic Generation and Study of Ketene and Carboxylic Acid Enol Intermediates Formed by the Photolysis of Diazonaphthoquinones in Aqueous Solution, *J. Am. Chem. Soc.* **1993**, 115, 10605 – 10610 [pdf](#)

A.D. Allen, **J. Andraos**, A.J. Kresge, M.A. McAllister, and T.T. Tidwell, Direct Observation and Reactivity of Transient Ketenes Generated by Flash Photolysis, *J. Am. Chem. Soc.* **1992**, 114, 1878 – 1879 [pdf](#)

**J. Andraos**, A.J. Kresge, and P.A. Obraztsov, Solvent and Secondary Substrate Isotope Effects on the Acid-Catalyzed Ketonization of Acetophenone Enol in Aqueous Solution, *J. Phys. Org. Chem.* **1992**, 5, 322 – 326 [pdf](#)

**J. Andraos** and A.J. Kresge, The Mechanism of the Reaction of Diphenylketene with Bases in Aqueous Solution: Nucleophilic Attack Versus General Base Catalysis of Ketene Hydration, *J. Am. Chem. Soc.* **1992**, 114, 5643 – 5646 [pdf](#)

**J. Andraos** and A.J. Kresge, Flash Photolytic Generation and Study of Ketenes: Acid-Catalyzed Hydration in Aqueous Solution, *J. Photochem. Photobiol. A: Chem.* **1991**, 57, 165 – 173 [pdf](#)

**J. Andraos\*** and A.J. Kresge, Protonation and Hydration of Hydroxyketene, *J. Mol. Struct. (THEOCHEM)* **1991**, 233, 165 – 184 [pdf](#)

**J. Andraos\***, A.J. Kresge, M.R. Peterson, and I.G. Czismadia, Carboxylic Acid Enols from the Hydration of Ketenes: A Theoretical Investigation, *J. Mol. Struct. (THEOCHEM)* **1991**, 232, 155 – 177 [pdf](#)

### Non-referred Publications

**J. Andraos**, Speaking Up, *Chem. Eng. News* **1997**, 75(28), 85.

**J. Andraos**, Filling the Gap, *Canadian Chem. News* **2002**, 54(2), 26

**J. Andraos**, Nobel Breeding Ground, *Chem. Eng. News* **2002**, 80(40), 4.

### Electronic Publications

**J. Andraos**, Named Things in Chemistry and Physics, <http://www.chem.yorku.ca/NAMED> (launched 2000) and <http://www.careerchem.com/NAMED/Homepage.html> (launched 2003)

**J. Andraos**, 2001 Directory of Departments of Chemistry and Chemical Engineering in Canada, <http://careerchem.com> (launched 2001)

**J. Andraos**, Choosing Advisors for Careers in Academia and Industry, <http://www.nextwave.org>

### (B) Conference Presentations (oral, unless otherwise indicated)

J. Andraos, "Kinetic Plasticity and Product Ratios Without Rate Laws: new methods based on directed graphs", presented at the 35<sup>rd</sup> Ontario-Quebec Physical Organic Chemistry Mini-Symposium in Memoriam of Prof. Keith Yates, November 9 - 11, **2007**, University of Waterloo, Waterloo, CANADA.

J. Andraos, "Linking Synthetic Elegance, Material Efficiency, and Green Chemistry Principles for Synthesis Design and Analysis", 90<sup>th</sup> CSC Conference and Exhibition, May 26 – 30, **2007**, Winnipeg, Manitoba, CANADA

J. Andraos, "Getting a Grip on Quantifying How Efficient a Synthesis Plan is for a Given Target", presented at the International Symposium on Green Chemical Processes for Pharmaceuticals and Fine Chemicals, October 20 - 22, **2006**, McGill University, Montreal, CANADA

J. Andraos and M. Sayed, "On the Use of Green Metrics in the Undergraduate Organic Chemistry Practicum to Assess Material Efficiencies of Organic Reactions", presented at the 89<sup>th</sup> CSC Conference and Exhibition, May 27 - 31, **2006**, Halifax, Nova Scotia, CANADA

J. Andraos, "On Using Tree Analysis to Quantify the Material, Input Energy, and Raw Material Cost Throughput Efficiencies of Simple and Complex Synthesis Plans and Networks", presented at the 89<sup>th</sup> CSC Conference and Exhibition, May 27 - 31, **2006**, Halifax, Nova Scotia, CANADA (poster)

J. Andraos, "Careers in Chemistry: Pursuing Academic Positions in Canada", a workshop presented at the 89<sup>th</sup> CSC Conference and Exhibition, May 27 - 31, **2006**, Halifax, Nova Scotia, CANADA

J. Andraos, "Recent Advances in the Determination of Kinetic Parameters in Heterogeneous Media: what we have been doing wrong!", presented at the 33<sup>rd</sup> Ontario-Quebec Physical Organic Chemistry Mini-Symposium, November 11 - 13, **2005**, McMaster University, Hamilton, CANADA.

J. Andraos, "Careers in Chemistry: Pursuing Academic Positions in Canada", a workshop presented at the 87<sup>th</sup> CSC Conference and Exhibition, May 29 - June 1, **2004**, London, Ontario, CANADA

J. Andraos, "Named Things in Chemistry: A New On-line Database for Research and Teaching", presented at the 87<sup>th</sup> CSC Conference and Exhibition, May 29 - June 1, **2004**, London, Ontario, CANADA

J. Andraos, "Unification of Reaction Metrics: applications to reaction analysis and reaction discovery", presented at the Canada-US Joint Workshop on Innovative Chemistry in Clean Media, May 20 - 21, **2004**, McGill University, Montreal, Quebec, CANADA (poster)

J. Andraos and Shau-Wei Tsai, "The Effect of Optically Pure and Impure Catalysts on the Efficiency of Dynamic Kinetic Resolution", presented at the 31<sup>st</sup> Ontario-Quebec Physical Organic Chemistry Mini-Symposium, November 7 - 9, **2003**, University of Toronto, Toronto, CANADA.

J. Andraos, "Careers in Chemistry: Pursuing Academic Positions in Canada", a workshop presented at the 39<sup>th</sup> IUPAC Congress and 86<sup>th</sup> CSC Conference and Exhibition, August 10 – 15, **2003**, Ottawa, CANADA

J. Andraos, "Assessing Worst Case Scenarios for Organic Reactions using Minimum Atom Economy and Maximum Environmental Impact Factor as Metrics, presented at the 39<sup>th</sup> IUPAC Congress and 86<sup>th</sup> CSC Conference and Exhibition, August 10 – 15, **2003**, Ottawa, CANADA

J. Andraos, "Careers in Chemistry: Pursuing Academic and Industrial Careers in Canada", a workshop presented at the 85<sup>th</sup> CSC Conference and Exhibition, June 1 - 6, **2002**, University of British Columbia, Vancouver, CANADA

J. Andraos, "Named Things in Chemistry: A New On-line Database", presented at the 85<sup>th</sup> CSC Conference and Exhibition, June 1 - 6, **2002**, University of British Columbia, Vancouver, CANADA (poster)

J. Andraos, "The Canadian Chemistry Genome Project", presented at the 85<sup>th</sup> CSC Conference and Exhibition, June 1 - 6, **2002**, University of British Columbia, Vancouver, CANADA (poster)

J. Andraos, "The Quantification and Optimization of Dynamic Kinetic Resolution", presented at the 85<sup>th</sup> CSC Conference and Exhibition, June 1 - 6, **2002**, University of British Columbia, Vancouver, CANADA

J. Andraos, "The Effect of Temperature on Curtin-Hammett Kinetic Schemes and Other Problems", presented at the 85<sup>th</sup> CSC Conference and Exhibition, June 1 - 6, **2002**, University of British Columbia, Vancouver, CANADA

J. Andraos, "Recent Advances in the Determination of Kinetic Parameters in Heterogeneous Media", presented at the 85<sup>th</sup> CSC Conference and Exhibition, June 1 - 6, **2002**, University of British Columbia, Vancouver, CANADA (poster)

J. Andraos, "Physical Organic Chemistry in Canada: A Genealogy of People and Ideas", presented at the 29<sup>th</sup> Ontario-Quebec Physical Organic Chemistry Mini-Symposium, November 2 - 4, **2001**, York University, Toronto, CANADA. (poster)

J. Andraos, "The Quantification and Optimization of Dynamic Kinetic Resolution", presented at the 29<sup>th</sup> Ontario-Quebec Physical Organic Chemistry Mini-Symposium, November 2 - 4, **2001**, York University, Toronto, CANADA.

J. Andraos and S. Paramanatham, "Connections Between Dynamic Kinetic Resolution and the Curtin-Hammett Principle", presented at the 11<sup>th</sup> Quebec-Ontario Mini-Symposium in Synthetic and Bio-Organic Chemistry, November 10 – 12, **2000**, York University, Toronto, CANADA.

J. Andraos, E.C. Lathioor, and W.J. Leigh, "The Problem of Distinguishability of Rate Constants in the Two Step Consecutive Sequence: A  $\rightarrow$  B  $\rightarrow$  C. Application to Simultaneous pH-Rate Profiles", presented at the 82nd Canadian Society for Chemistry Conference and Exhibition, May 30 – June 2, **1999**, Toronto, Ontario, CANADA. (poster)

J. Andraos, "The Relevance and Usefulness of Mathematics in Chemistry Education: Illustrated Examples", presented at the 15th Biennial Conference on Chemical Education, August 9 - 13, **1998**, University of Waterloo, Waterloo, Ontario, CANADA.

J. Andraos, C. Wentrup, and G.G.H. Qiao, "Thermokinetics of Bimolecular Reactions in Low Temperature Matrices: Simple Kinetic Models and their Implication on Arrhenius and Eyring Analyses", presented at the 81st CSC Conference and Exhibition, May 31 - June 4, **1998**, Whistler, British Columbia, CANADA.

J. Andraos, "The Relevance and Usefulness of Mathematics in Chemistry Education: Illustrated Examples", presented at the 81st CSC Conference and Exhibition, May 31 - June 4, **1998**, Whistler, British Columbia, CANADA. (poster)

G.G. Barclay, J. Andraos, R.F. Sinta, and J.C. Scaiano, "Photoacid Generators Based on Pentafluorobenzylsulfonate Esters", presented at the 10th International Conference on Photopolymers and the 5th International Conference on Polyimides, October 30 - November 4, **1994**, Ellenville, New York, USA.

J. Andraos, N.C. deLucas, H. Garcia, and J.C. Scaiano, "A Simple Distribution Analysis Approach for the Interpretation of Reaction Dynamics in Microheterogeneous Systems. Application to Triplet Energy Transfer in NaY Zeolites", presented at the 21st Ontario-Quebec Physical Organic Minisymposium, November 12 - 14, **1993**, Ottawa, Ontario, CANADA. (poster)

J. Andraos, N.C. deLucas, and J.C. Scaiano, "Generation of Ketene Ylide Intermediates in Acetonitrile Solution", presented at the 21st Ontario-Quebec Physical Organic Minisymposium, November 12 - 14, **1993**, Ottawa, Ontario, CANADA. (poster)

J. Andraos, Y. Chiang, G.H. Xun, and A.J. Kresge, "Generation and Hydration of N-(pentafluorophenyl)-2-phenylethylamine", presented at the 21st Ontario-Quebec Physical Organic Minisymposium, November 12 - 14, **1993**, Ottawa, Ontario, CANADA. (poster)

J. Andraos, J.C. Netto-Ferreira, N.C. deLucas, and J.C. Scaiano, "The Reactivity of  $\alpha$ -Ketenylbenzocyclobutenone", presented at the 16th International Conference on Photochemistry, August 1 - 6, **1993**, University of British Columbia, Vancouver, British Columbia, CANADA. (poster)

J. Andraos, J.C. Scaiano, A.J. Kresge, and C.G. Huang, "The Characterization of Ketene and Ketene Hydrate Intermediates from Photolysis of o-Diazonaphthoquinones in Aqueous Solution", presented at the 20th Ontario-Quebec Physical Organic Minisymposium, October 30 - November 1, **1992**, McGill University, Montreal, Quebec, CANADA. (poster)

J. Andraos, Y. Chiang, A.J. Kresge, N.P. Schepp, J. Wirz, and I.G. Pojarlieff, "Equilibria in the Phenylcyanoacetic Acid Keto-Enol System", presented at the Toronto International Conference on Organic Reactive Intermediates (TICORDI), July 30 - August 1, 1992, University of Toronto Scarborough Campus, Toronto, Ontario, CANADA and at the 11th International Conference on Physical Organic Chemistry, August 2 - 7, **1992**, Ithaca College, Ithaca, New York, USA.

J. Andraos and A.J. Kresge, "Hydration of Ketenes: General Base Catalysis or Nucleophilic Addition?", presented at the 18th Ontario-Quebec Physical Organic Minisymposium, November 9 - 11, **1990**, Queen's University, Kingston, Ontario, CANADA.

J. Andraos, M.R. Peterson, and A.J. Kresge, "Carboxylic Acid Enols from the Hydration of Ketenes", presented at the Second World Congress of Theoretical Chemists (WATOC), July 8 - 14, **1990**, Toronto, Ontario, CANADA. (poster)