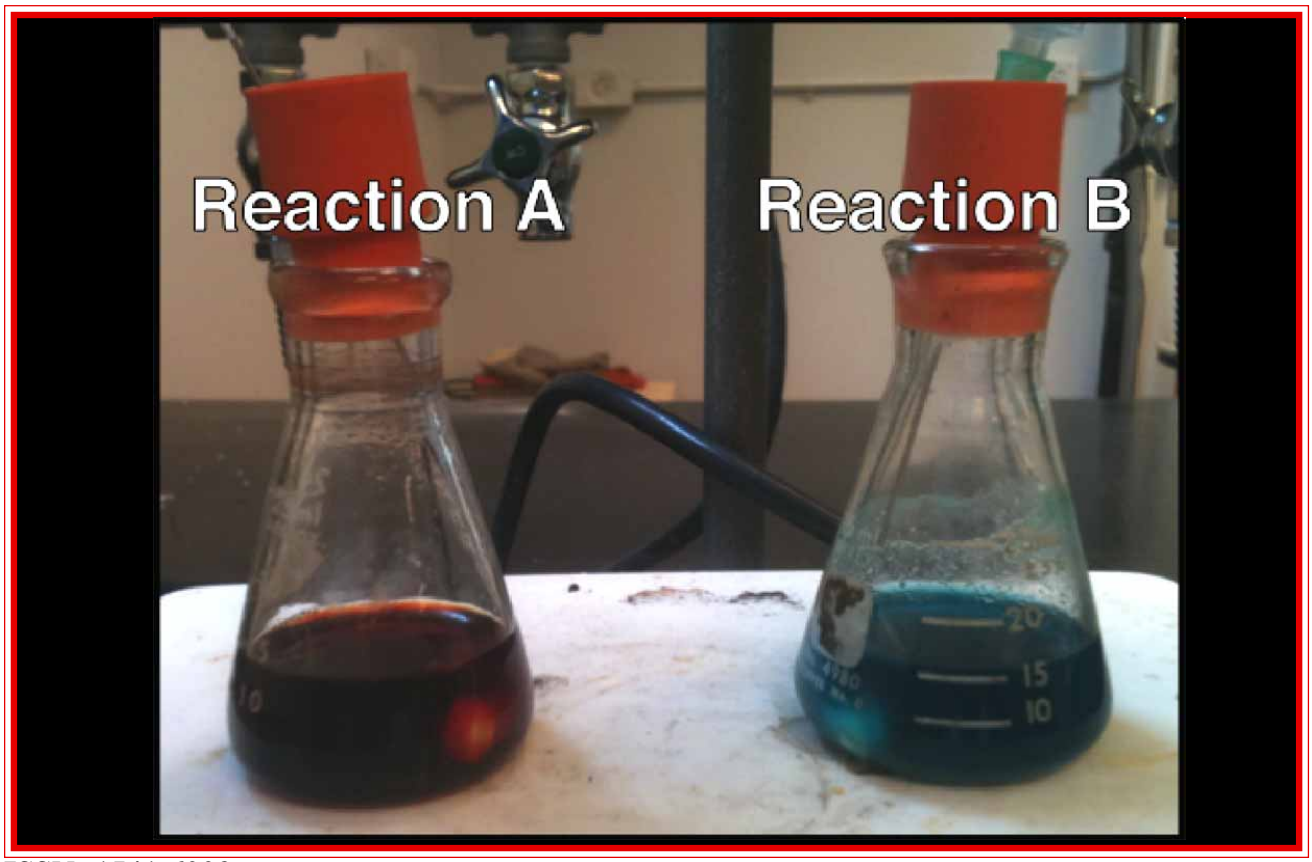
Summer 2012 Volume 11, Number 3

Journal of Undergraduate Chemistry Research



ISSN: 1541-6003

Journal of Undergraduate Chemistry Research JUCR@vmi.edu

Dr. Daniel Y. Pharr Editor
Chemistry Department
Virginia Military Institute
Lexington VA 24450
phone (540-464-7244)
fax (540-464-7261)
email (PharrDY@vmi.edu)

Editoral Board

Dr. John T. Gupton III
Chairman of Chemistry Department at Richmond University, jgupton@richmond.edu

Dr. Christine K. F. Hermann
Professor Radford University, chermann@runet.edu

Dr. Willie L. Hinze
Professor Wake Forest University, hinze@wfu.edu

Dr. Benjamin P. Huddle
Professor Roanoke College, huddle@roanoke.edu

Dr. Frank A. Settle Jr.
Professor Washington and Lee University, settlef@wlu.edu

Dr. Henry D. Schreiber
Chemistry Department at Virginia Military Institute, SchreiberHD@vmi.edu

Dr. Stanton Q. Smith
Chemistry Department at Virginia Military Institute, SmithSQ@vmi.edu

Dr. James E. Turner Sr.
Chairman Biology Department at Virginia Military Institute,TurnerJE@vmi.edu

ACKNOWLEDGMENT
The *Journal of Undergraduate Chemistry Research* wishes to acknowledge the generous support of the VMI Chemistry Department and the Virginia Military Institute for their support of this journal.

The ***Journal of Undergraduate Chemistry Research*,** **ISSN: 1541-6003**, is issued quarterly and indexed once per year.Subscriptions price per year U.S.A.: institutional $ 120.00, individual $ 50.00 all other countries US $ 150.00. Claims for missing issues will not be honored after four months of issue date. Duplicate copies may not be sent due to the change of address when the publisher was not notified in a timely manner. The ***Journal of Undergraduate Chemistry Research*** can be contacted via phone (540-464-7244), fax (540-464-7261) or e-mail (JUCR@vmi.edu) through Dr. Daniel Y. Pharr Editor. No responsibility is assumed by this journal, editor, reviewers or sponsors for any injury and/or damage from products, negligence, experiments, instructions or ideas contained in this journal that result in damage to persons or property.

Volume 11, Number 3 **Summer 2012**

Journal of Undergraduate Chemistry Research

ISSN: 1541-6003

CONTENTS

GRANULOCYTE MACROPHAGE COLONY-STIMULATING FACTOR DOES NOT SUPPORT ROLLING OF PROMYELOCYTIC LEUKEMIC CELLS UNDER FLOW
David J. Gee†, L.K. Wright, J. Zimmermann*, K. Cole*, K. Soule* 66

NEW DISCOVERIES IN THE KNOEVENAGEL SYNTHESIS OF 5-ALKYLIDENE MELDRUM'S ACIDS
C.J. McCormick*, J. Hwang, and Daniel J. Swartling† 70

ASYMMETRIC SYNTHESES UTILIZING CROWN ETHERS WITH CHIRAL APPENDAGES AS PHASE TRANSFER CATALYSTS
James R. Blanton† and R.W. Clark* 73

STUDY OF SOLVENT-FREE ASYMMETRIC REDUCTION OF 1-ACETONAPHTHONE
U. Aleknaite*, V. Liu*, K. Thomas*, D. Bourassa*, R. Gurney, and Nancy E. Lee† 78

SOLVENT EFFECTS IN THE FORMATION OF STRYKER'S REAGENT FROM COPPER(II) ACETATE
C. Benjamin*, D. Dean*, P. Lathem*, Q. Perdue*, C. Ward*, Jeremy M. Carr† 81

COMPLETE CONFORMATIONAL ANALYSES OF TETRAFLUOROETHANE-1,2-DIOL, HEXAFLUORO-PROPANE-1,3-DIOL, OCTAFLUORO-*N*-BUTANE-1,4-DIOL, AND DECAFLUORO-*n*-PENTANE-1,5-DIOL
K.C. Martin* and Robert W. Zoellner† 84

EFFECT OF WATER ON THE EXCIMER FLUORESCENCE DECAY RATE CONSTANT OF NAPHTHALENE ON ALUMINA
H.E. Ryan*, S. Lau*, B.B. Bauer*, K.A. Martin and A.M. Nishimura† 90

AROMATIC INTERACTIONS OF NAPHTHYLALANINE IN A TWELVE AMINO ACID PEPTIDE
C.J. Uitvlugt*, J. Sung*, C.M. Mutschler*, D.B. Meyer*, Chad D. Tatko† 94

SPECTROSCOPIC AND COMPUTATIONAL STUDY OF THE METHANOL-CYCLOHEXANE AZEOTROPE
Heather E. Bailey* and Douglas A. Chapman† 98

The *Journal of Undergraduate Chemistry Research* publishes papers of original research performed by undergraduates on all aspects of chemistry including analytical, organic, inorganic, physical, polymers and biochemistry. Articles about laboratory experiments to be used in the teaching of chemistry are not applicable. The *Journal of Undergraduate Chemistry Research* is issued quarterly and indexed once per year by Dr. Daniel Y. Pharr Editor, Chemistry Department, Virginia Military Institute, Lexington, VA 24450. Subscriptions price per year U.S.A.: institutional $ 120.00, individual $ 50.00 all other countries US $ 150.00. Claims for missing issues will not be honored after four months of issue date. Duplicate copies may not be sent due to the change of address when the publisher was not notified in a timely manner. The *Journal of Undergraduate Chemistry Research* can be contacted via phone (540-464-7244), fax (540-464-7261) or e-mail (PharrDY@vmi.edu) through Dr. Daniel Y. Pharr Editor. No responsibility is assumed by this journal, editor, reviewers or sponsors for any injury and/or damage from products, negligence, experiments, instructions or ideas contained in this journal that result in damage to persons or property. **POSTMASTER**: Send change of address to: Journal of Undergraduate Chemistry Research, Dr. Daniel Y. Pharr Editor, Chemistry Department, Virginia Military Institute, Lexington VA 24450.

GRANULOCYTE MACROPHAGE COLONY-STIMULATING FACTOR DOES NOT SUPPORT ROLLING OF PROMYELOCYTIC LEUKEMIC CELLS UNDER FLOW

Leukocytes and HL-60 leukemic cells both express P-selectin glycoprotein ligand-1 (PSGL-1), a high-affinity ligand to P-selectin. During inflammatory response, P-selectin is upregulated on post-capillary venules and mediates rolling of leukocytes. This response is critical for host survival. HL-60 leukemic cells also roll on P-selectin surfaces and but for the ubiquity of P-selectin/PSGL-1 interactions of normal leukocytes, targeted liposomal delivery systems using selectins would be a potential new approach to anti-cancer therapy. Other HL-60 membrane proteins are less commonly expressed and hence are potential targeting molecules for use in liposomal delivery systems. We tested the granulocyte macrophage colony-stimulating factor receptor (GM-CSFr) for its ability to mediate rolling interactions. HL-60 cells were perfused over GM-CSF or P-selectin surfaces over a range of physiologically relevant wall shear stresses. The cell rolling velocity over P-selectin surfaces was reasonably stable, incurring a 4-6 fold increase in velocity (depending on incubation concentration) while being subjected to an approximate 10-fold increase in shear stress. HL-60 cells did not interact with GM-CSF functionalized surface under any of the incubation concentrations tested leading us to reject the hypothesis that GM-CSF would mediate rolling interactions.

David J. Gee, L. Kate Wright, Jonathan Zimmermann, Kayla Cole, Karen Soule, [1]Department of Mechanical Engineering, Rochester Institute of Technology, 76 Lomb Memorial Drive, Rochester, NY 14623, David_Gee@mail.RIT.edu, [1] Department of Mechanical Engineering, [2]Biological Sciences, [3]Electrical Engineering, [4]Biomedical Engineering, [5]Chemical Engineering, Rochester Institute of Technology, Rochester, NY

NEW DISCOVERIES IN THE KNOEVENAGEL SYNTHESIS OF 5-ALKYLIDENE MELDRUM'S ACIDS

Five known 5-alkylidene Meldrum's acids were synthesized using a room temperature Knoevenagel condensation method previously reported in the literature by increasing the starting material concentration by a factor of five. The series consisted of several products derived from heteroaromatic aldehydes and cyclic ketones, some of which had previously not been synthesized using the lower concentrations in our previously published method. The corresponding products were characterized via ^{1}H and ^{13}C NMR studies. The yield of the reaction performed compared well with reported literature yields that were obtained from more tedious methods, as well as the Knoevenagel condensation method published previously. The results from these experiments have provided some insight into the complexities of the reaction with cyclic ketones.

Casey J. McCormick, Jungwun Hwang, and Daniel J. Swartling, Tennessee Technological University, Department of Chemistry, Foster Hall Room 301, Cookeville, TN 38505-0001

ASYMMETRIC SYNTHESES UTILIZING CROWN ETHERS WITH CHIRAL APPENDAGES AS PHASE TRANSFER CATALYSTS

Asymmetric crown ethers containing a chiral chain were employed in both the reduction of acetophenone using sodium borohydride and the Michael addition of chalcone by diethyl malonate. The chiral appendages were attached to crowns ethers using lactone derivatives of different carbohydrates. Starting materials were chosen such that the catalysts differed either by how far the appendage was placed from the crown ether unit or by the size of the chiral group. Based on the results of the study, the degree of asymmetric induction was sensitive to both the placement of the chiral appendage and the size of the chiral group. For the reduction reactions, the asymmetric induction ranged from 0 to 12 % enantiomeric excess. The catalysts proved to be more effective in the Michael additions where the values ranged from 33 to 72% enantiomeric excesses. In both cases, the most favorable results were from the catalyst that used that largest chiral group closest to the crown moiety.

James R. Blanton and Robert W. Clark, Department of Chemistry, The Citadel, 171 Moultrie Street, Charleston, SC 29409, randy.blanton@citadel.edu

STUDY OF SOLVENT-FREE ASYMMETRIC REDUCTION OF 1-ACETONAPHTHONE

Our results of solvent-free asymmetric reduction of 1-acetonaphthone using sodium borohydride activated by boric acid are reported. Polylactic acid derivatives such as ethyl lactate, lactic acid and partially digested polylactic acid were used as chiral agents which gave some encouraging results. We also explored the ability of chiral acids such as L-tartaric, L-glutamic and L-aspartic acids to activate $NaBH_4$ in place of boric acid in hopes of creating a chiral environment for reduction to occur.

Ugne Aleknaite, Virgnia Liu, Kathleen Thomas, Daisy Bourassa, Richard Gurney, and Nancy E. Lee, Department of Chemistry, Simmons College, 300 The Fenway, Boston, MA,02115, lee@simmons.edu

SOLVENT EFFECTS IN THE FORMATION OF STRYKER'S REAGENT FROM COPPER(II) ACETATE

Stryker's Reagent was prepared according to Yun and Lee's procedure to investigate solvent effects on product formation. Preliminary experiments suggested that the rate of Cu^{2+} consumption was enhanced, relative to toluene, when tetrahydrofuran was used as the solvent. Additional solvent systems resulted in slower rate of Cu^{2+} consumption or were unable to dissolve the starting materials. Observed rate enhancements were further studied by observing the rate of Cu^{+} formation spectroscopically. When the reaction was conducted in tetrahydrofuran, Cu^{+} formation occurred exponentially, giving a maximum concentration under 3 hours, nearly 3 times faster than when the reaction was conducted in toluene.

Caroline Benjamin, Dexter Dean, Paige Lathem, Quintarious Perdue, Chasity Ward, Jeremy M. Carr Department of Chemistry & Biochemistry, Huntingdon College, 1500 E Fairview Avenue, Montgomery, AL 36106, jcarr@huntingdon.edu

COMPLETE CONFORMATIONAL ANALYSES OF TETRAFLUOROETHANE-1,2-DIOL, HEXAFLUORO-PROPANE-1,3-DIOL, OCTAFLUORO-*n*-BUTANE-1,4-DIOL, AND DECAFLUORO-*N*-PENTANE-1,5-DIOL

Complete conformational analyses of tetrafluoroethane-1,2-diol, hexafluoropropane-1,3-diol, octafluoro-*n*-butane-1,4-diol, and decafluoro-*n*-pentane-1,5-diol were carried out at the semiempirical PM3 level of theory. All unique semiempirical minima were reoptimized at the *ab initio* RHF/3-21G(*) level of theory and confirmed at the RHF/6-31G* level of theory. These analyses indicated that helical or semi-helical conformations are prevalent among the lowest-energy conformations of the perfluorodiols as chain-length increases. The analyses also demonstrated that while tetrafluoroethane-1,2-diol exhibited only staggered, zig-zag *gauche*- and *anti*-conformations, helical conformations dominate the lower-energy portions of the conformational manifolds of the longer-chain systems. The fully staggered, zig-zag conformer analogous to the lowest energy conformation of the corresponding hydrocarbon was also present in the conformational manifold of hexafluoropropane-1,3-diol, but did not appear in the conformational manifolds of either octafluoro-*n*-butane-1,4-diol or decafluoro-*n*-pentane-1,5-diol. Compared to the perfluorocarbons, the presence of the α,ω-OH groups significantly altered and enhanced molecular helicity in the perfluoro-α,ω-diols..

Katrina C. Martin and Robert W. Zoellner, Department of Chemistry, Humboldt State University, One Harpst Street, Arcata, California 95521-8299, (707)444-1423, rwz7001@humboldt.edu

EFFECT OF WATER ON THE EXCIMER FLUORESCENCE DECAY RATE CONSTANT OF NAPHTHALENE ON ALUMINA

Laser induced fluorescence decay of the excimer of naphthalene that had been deposited from the vapor phase with and without water on an alumina surface was examined. The fluorescence was found to decay exponentially as two components. The faster of the two is $28 \pm 5\ s^{-1}$ and is independent of the presence of water, whereas the rate constant of longer component increases with the coverage of water, from $3.8 \pm 0.5 \times 10^6\ s^{-1}$ for naphthalene alone and $6.5 \pm 1.0 \times 10^6\ s^{-1}$ when deposited with water.

Hannah E. Ryan, Shanan Lau, Bradley B. Bauer, K.A. Martin and A.M. Nishimura
Department of Chemistry, Westmont College, Santa Barbara, CA 93108
Permanent address: Department of Chemistry, Point Loma Nazarene University, San Diego, CA 92106

AROMATIC INTERACTIONS OF NAPHTHYLALANINE IN A TWELVE AMINO ACID PEPTIDE

A β-hairpin peptide offers an organized display of amino acid side chains. This construct can be used as an epitope mimic to influence large biological complexes. The number of protein-protein interfaces and protein-nucleic acid interactions are continually increasing and are well suited to interference from peptides. Critical for epitope efficacy is a stable conformation. In short peptides this typically requires covalent cyclization or very strong noncovalent interactions. Aromatic-aromatic interactions, particularly between pairs of tryptophan residues, have been shown to yield very stable β-hairpin folds. Introducing unnatural amino acids into a peptide increases bioavailability. Here a short β-hairpin peptide is constructed with cross strand pairs of naphthylalanine. An edge-to-face geometry is adopted, with greater interaction observed between pairs of 1-naphthylalanine.

Caleb J. Uitvlugt, Jin Sung, Caleb M. Mutschler, Daniel B. Meyer, Chad D. Tatko, DeVries Hall, Calvin College, Department of Chemistry and Biochemistry, Grand Rapids, MI 49546, cdt2@calvin.edu

SPECTROSCOPIC AND COMPUTATIONAL STUDY OF THE METHANOL-CYCLOHEXANE AZEOTROPE

The interactions of the binary azeotrope formed by cyclohexane and methanol are examined through spectroscopic and computational methods. An azeotrope is a solution that essentially behaves like a pure substance and boils at one specific temperature. This research aims to provide a microscopic description of this observed macroscopic phenomenon. Related research is relatively limited with only four published studies at this time. Previously published studies focused on IR and NMR spectroscopy. This research expands the methods to include Raman spectroscopy and theoretical vibrational frequency calculations at the DFT level in order to provide a more complete picture of what is occurring at the molecular level. Spectroscopic data are related to the interactions in the azeotropic mixture by observing how peaks shifted in the IR and Raman spectra as a function of concentration and temperature.

Heather E. Bailey*‡ and Douglas A. Chapman, Southern Oregon University, Deparment of Chemistry, 1250 Siskiyou Blvd., Ashland, OR 97520, chapman@sou.edu, ‡ Stanford University, Department of Chemistry, 333 Campus Drive Mudd Building, Room 121, Stanford, California 94305, baileyh@stanford.edu

INFORMATION FOR AUTHORS

Manuscripts. Manuscripts should be in English, double-spaced type written with 1 inch margins on all sides on $8^1/_2$ x 11 inch paper, of laser printer quality, typed on one side only, using Times or Times Roman size 12 font. All marks, smudges and other imperfections will be copied so that an unblemished clean original copy is a necessity. The manuscript should not exceed 2500 words. SI units and IUPAC nomenclature should be used. Three copies of text and illustrations should be submitted. Authors should keep one copy for themselves. Submission implies that the material has not been published in or submitted to any other journal. Previous oral or poster session presentations should be footnoted. All submissions are subject to review by two or more independent reviewers. Authors may suggest reviewers. All manuscripts are subject to editing. Copyright of the manuscript is transferred to the publisher upon acceptance. **An e-mail copy with an attachment in MS Word should be followed by a hard copy of the figures and tables.**

Title. A separate page, with a brief but informative title that avoids the use of symbols and abbreviations.

Authors. A list of the authors and address of the laboratory, including zip code, where the research was done should be supplied. The undergraduate researchers should be noted with an asterisk, *. The corresponding author should be noted with a dagger or obelisk, †, including telephone number and e-mail address if available. If the corresponding author's address is different from the address where the research was done this address should be supplied as a footnote.

Keywords. A list of up to seven keywords should be supplied.

Abstract. A separate page, with a brief but specific account of the research (50 to 150 words) stressing the importance or novelty of the research.

Introduction. Describes the relationship of the present work with previously published works.

Experimental Section. Contains a detailed description of the experimental apparatus, chemicals and procedures used in the research, sufficient for the repetition of the work by an experienced scientist. Manufacturer's name and location should be given in parenthesis. Any particular safety precautions should be given in detail. Toxic materials and hazardous procedures should be reported as such. Complete details for biological materials should include sources, strain designation number and the culture collection deposit. The scientific name should be presented in this section with an appropriate abbreviation used thereafter.

Results and Discussion. Presentation of the results should be concise and brief. Stress the importance of the findings. Similarly the discussion should not be unnecessarily verbose. Wellknown calculations are unnecessary. Statistical analysis should be used.

Conclusions. Conclusions should only be given if needed for the further interpretation of the results. They should not be a repeat of the abstract.

Acknowledgment. The acknowledgment of outside funding, special materials or special technical assistance is placed here.

References. All references should appear in numerical order in parenthesis in the text and cited at the end of the paper. Use the following format for references:

Journals: first the authors initials followed by the last name, additional authors listed the same way, the title of the journal in italics (for proper abbreviations use the Chemical Abstracts Source Index), the year of publication in bold, the volume number, and the pages.

Example: (1). D.Y. Pharr, P.C. Uden, and S. Siggia. *J. Chrom. Sci.*, **1992**, 30, 124-130.

Books: Use the following format for books: first the authors initials followed by the last name, additional authors listed the same way, in the title of the book in italics and underlined, the volume or edition number, the publisher, city and country of publication and year of publication in parenthesis, followed by the page numbers or chapter.

Example: (2). T.F. Yen, R.D. Gilbert and J.H. Fendler. *Advances in the Applications of Membrane-Mimetic Chemistry*, Plenum Press, New York, USA, (1994) pp. 79-94.

Unpublished Works: Should be referenced as outlined above but identified with the phrase "in press" or "submitted to" before the name of the journal for articles, or publisher for books.

Patents: first the initials followed by the last name of the person who applied for the patent, the country of application, the patent number in bold and the year in parentheses.

Illustrations. Photographs can not be used. Any illustrations should be clear enough to remain legible after reduction to 5 inches wide x 4 inches in height on white paper. Each illustration should be in black and white as a simple graph or line drawing on a separate sheet of paper and camera ready. All illustrations, drawings, text and tables will be scanned into the journal using a digital scanner. All marks, smudges and other imperfections will be copied so that an unblemished clean original copy is a necessity. Omit straight-line graphs that can be described in the text. Refer to the illustrations or drawings using Arabic numerals [Figure 1.] in the order discussed in the paper. Each illustration should have a title and each axis should have a label. Use the same font for these that were used for the text of the paper. The author's name should appear on the reverse side of the illustration.

Figure Legends. Legends should be on a separate sheet of paper using the same font for these that were used for the text of the paper. Each identified by its proper number and then title. The author's name should appear on the reverse side of the figure legend.

Structural Drawings. Authors should use current versions of ChemDraw, ChemIntosh or ChemWindows selecting the preferences "JOC Document" for ChemDraw, and "Reduce 60% JOC Style" for ChemIntosh or ChemWindows.

Tables. There should be no duplication of material in figures and tables. Each table should be typed as text on a separate sheet of paper double-spaced type written with 1 inch margins on all sides on $8^1/_2$ x 11 inch paper, typed on one side only, using Times or Times Roman size 12 font. Refer to the tables using Roman numerals in the order discussed in the paper. Each table should have a title at the top of the table and each column should have a heading. Footnotes in the tables are noted with superscript a, b, c... The author's name should appear on the reverse side.

Equations, Formulas and Abbreviations. Number all equations in consecutive order. Clearly indicate if the equation contains a lower-case L instead of a one or a zero instead of an upper case "O". Use mL for milliliters. Unusual abbreviations require a definition when first used. Decimals are indicated by a point "." rather than a comma.

Author Index Volume 11

Anderson, Stephen
_____, Danielle Mazza, Tiffany Simons, Adam Toth
REDUCING UNSATURATED ORGANIC COMPOUNDS VIA TRANSFER HYDROGENATION USING WILKINSON'S CATALYST AND ISOPROPANOL, (11) 59

Blanton, James R.
_____, Robert W. Clark
ASYMMETRIC SYNTHESES UTILIZING CROWN ETHERS WITH CHIRAL APPENDAGES AS PHASE TRANSFER CATALYSTS, (11) 73

Carr, Jeremy M.
_____, Caroline Benjamin, Dexter Dean, Paige Lathem, Quintarious Perdue, Chasity Ward
SOLVENT EFFECTS IN THE FORMATION OF STRYKER'S REAGENT FROM COPPER(II) ACETATE, (11) 81
Chapman, Douglas A.
_____, Heather E. Bailey
SPECTROSCOPIC AND COMPUTATIONAL STUDY OF THE METHANOL-CYCLOHEXANE AZEOTROPE, (11) 98

Duffy, Norman V. ;
_____, Colin Jack, Michael D. Hoops, Aloysius F. Hepp·
THERMOGRAVIMETRIC ANALYSIS OF *CIS*-DICARBONYLBIS (DITHIOCARBAMATO)IRON(II) COMPLEXES, (11) 11

Estes, Donald;
_____, Lea Blau, Sarah Guigui, and Nili Seleski,
BASE STACKING IN DEOXYOLIGONUCLEOTIDE DUPLEXES, (11) 15

Gee, David J.
_____, L. Kate Wright, Jonathan Zimmermann, Kayla Cole, Karen Soule
GRANULOCYTE MACROPHAGE COLONY-STIMULATING FACTOR DOES NOT SUPPORT ROLLING OF PROMYELOCYTIC LEUKEMIC CELLS UNDER FLOW, (11) 66

Hargittai, Balazs;
_____, Heather L. Rust, KaLynn M. Kline, Heather J. Harteis, Michele R.S. Hargittai,
THE INFLUENCE OF PROLINE ON THE FOLDING OF CONOTOXINS, (11) 34

King, Daniel;
_____, Andy Davisson, Katie Speidel, Jason Stegink,
A COMPUTATIONAL APPROACH TO UNDERSTANDING CROP DISEASE RESISTANCE AND SUSCEPTIBILITY, (11) 20

Law, Neil,A.;
_____, Brendan L. Mitchell, Marcus D. Tuttle, Matthew D. Maynard, Norman V. Duffy,
THERMOGRAVIMETRIC ANALYSIS OF SALICYL-HYDROXAMIC ACID-BASED METALLACROWNS: A NEW TECHNIQUE FOR METALLACROWN CHARACTERIZATION, (11) 4
Lee, Nancy E.
_____, Ugne Aleknaite, Virgnia Liu, Kathleen Thomas, Daisy Bourassa, Richard Gurney,
STUDY OF SOLVENT-FREE ASYMMETRIC REDUCTION OF 1-ACETONAPHTHONE, (11) 78

Ma, Yinfa;
_____, Tiffany Ramsey, Chuan Wang,
REMOVAL EFFICIENCY OF SULFAMETHOXAZOLE IN WATER SAMPLES USING NANOMATERIALS, (11) 27

McClure, Mark
_____, Sandra Buffkin
ASSIGNMENT OF ^{1}H AND ^{13}C RESONANCES IN α-*cis* $[Co(ampy)_2(NO_2)_2]NO_3$, (11) 63
Mushrush, George W.;
_____, Quyen DeRoule, Nelson Castillo, Michele Lussos, Carolyn Nguyen, Hoang O. Nguyen, Jessica Sheen, Worknesh Terkik, Phung Vo,
STORAGE STABILITY AND LUBRICITY OF SOY, CORN AND CANOLA-DERIVED BIODIESEL BLENDED WITH PETROLEUM-DERIVED DIESEL, (11) 30

Nishimura, A.M.
_____, Hannah E. Ryan, Shanan Lau, Bradley B. Bauer, , K.A. Martin and
EFFECT OF WATER ON THE EXCIMER FLUORESCENCE DECAY RATE CONSTANT OF NAPHTHALENE ON ALUMINA, (11) 90

Pharr, Daniel Y.,
_____, Aaron Hickman
ENHANCEMENT EFFECTS OF SURFACTANTS ON THE DC PLASMA ANALYSIS OF P-BLOCK ELEMENTS, PART I: GALLIUM AND INDIUM, (11) 54

Santiago, Manuel F.
_____, Mallory L. Hacker, and Cara A. Clouse
PYRIMIDINE DEGRADATION IN PSEUDOMONAS MENDOCINA ATCC 25411, (11) 45
Schreiber, Henry D.;
_____, Timothy V. Johnson,
CHEMICAL CONTROL OF PAPERWHITE (*NARCISSUS TAZETTA* cv. ZIVA) GROWTH AND FLOWERING, (11) 1
_____, Andrew H. Jones, Amy M. Swink, Corinne M. Lariviere, and Taylor D. Godsey
SPECTROPHOTOMETRIC CHARACTERIZATION OF ALUMINUM-ANTHOCYANIN COMPLEXES IN A MODEL SYSTEM FOR FLORAL COLORATION, (11) 37
Siderhurst, Matthew S;
_____, Allison E. Glick and Roman J. Miller
METHOD DEVELOPMENT FOR ELEMENTAL ANALYSIS OF FOLIAR BLUEBERRY (*VACCINIUM CORYBOSUM* L.) SAMPLES, (11) 24
Swartling, Daniel J.
_____, Casey J. McCormick, Jungwun Hwang,
NEW DISCOVERIES IN THE KNOEVENAGEL SYNTHESIS OF 5-ALKYLIDENE MELDRUM'S ACIDS, (11) 70

Tatko, Chad D.
_____, Caleb J. Uitvlugt, Jin Sung, Caleb M. Mutschler, Daniel B. Meyer,
AROMATIC INTERACTIONS OF NAPHTHYLALANINE IN A TWELVE AMINO ACID PEPTIDE, (11) 94

Wade, Edmir O.
_____, Joseph J. Kawa
DEVELOPMENT OF A DITHIEPIN FRAMEWORK FOR NOVEL HOST MOLECULES, (11) 49

Zoellner, Robert W.
_____, Katrina C. Martin
COMPLETE CONFORMATIONAL ANALYSES OF TETRAFLUOROETHANE-1,2-DIOL, HEXAFLUORO-PROPANE-1,3-DIOL, OCTAFLUORO-*n*-BUTANE-1,4-DIOL, AND DECAFLUORO-*n*-PENTANE-1,5-DIOL, (11) 84

Keyword Index Volume 11

5-alkylidenemalonates, (11) 70
α-conotoxins, (11) 34
Agricultural model, (11) 24
Alcohol, (11) 1
Aluminum, (11) 37
2-(aminomethyl) pyridine, (11) 63
Ampy, (11) 63
Anisotropic effect, (11) 94
Anthocyanidin, (11) 37
Anthocyanin, (11) 37
Aromatic interaction, Peptide, (11) 94
Asymmetric, (11) 78
Asymmetric induction, (11) 73
Azeotrope, (11) 98

Base stacking, (11) 15
β-hairpin, (11) 94
Biodiesel, (11) 30
Bluing, (11) 37

Canola oil, (11) 30
Chiral, (11) 78
Chiral crown ether, (11) 73
Cobalt(III), (11) 63
Computational, (11) 20
Conformational analysis, (11) 84
Copper, (11) 4
Copper(I) hydride, (11) 81
Corn oil, (11) 30
Cyclic ketones, (11) 70
Cyclohexane, (11) 98

DC Plasma, (11) 54
Decafluoro-*n*-pentane-1,5-diol, (11) 84
Decay rate constants, (11) 90
Degradation, (11) 45
Deposition, (11) 90
DFT, (11) 98
Disulfide bridges, (11) 34
Dithiepins, (11) 49
Dithiocarbamate, (11) 11
DNA stability, (11) 15

Edge-to-face orientation, (11) 94
EIE, easily ionized elements, (11) 54
Ethanol, (11) 1
Excimer, Fluorescence, (11) 90

Flowers, (11) 1
Flower color, (11) 37
Foliar micronutrients, (11) 24
Fuel Lubricity, (11) 30

Gallium, (11) 54
Granulocyte macrophage colony-stimulating factor (GM-CSF), (11) 66

Hartree-Fock, (11) 84
Heteroaromatic aldehydes, (11) 70
Hexafluoropropane-1,3-diol, (11) 84
High Performance Liquid Chromatography, (11) 27
HL-60, (11) 66
Host Molecules, (11) 49
Hydrophobic effect, (11) 15

Indium, (11) 54
Inhibitor Protein, (11) 20
IR, (11) 98
Iron, (11) 11
Isopropanol, (11) 59

Knoevenagel condensation, (11) 70

Laser induced fluorescence, LIF, (11) 90
Lifetimes, (11) 90

Meldrum's acid, (11) 70
Melting temperature, (11) 15
Metal carbonyl, (11) 11
Metallacrown, (11) 4
Metallamacrocyle, (11) 4
Methanol, (11) 98
Methyl Esters, (11) 30
Michael addition, (11) 73
Middle Distillate, (11) 30
Molecular Modeling, (11) 20

Nano-materials, (11) 27
Naphthalene, (11) 90
Nearest-neighbor (NN), (11) 15
NMR, (11) 63

Octafluoro-*n*-butane-1,4-diol, (11) 84
Organic blueberry farm, (11) 24
Organo-sulfur, (11) 49

Paperwhites, (11) 1
Parallel plate flow chamber, (11) 66
Phase transfer catalyst, (11) 73
Polygalacturonase, (11) 20
Prochiral reduction, (11) 73
Proline, (11) 34
Protein folding, (11) 34
Pseudomonas mendocina, (11) 45
Pyrimidine, (11) 45

Raman, (11) 98
Reaction rate, (11) 81
Reduction, (11) 59, (11) 78
Ring expansion, (11) 49

Salicylhydroxamic acid, (11) 4
Sodium borohydride, (11) 78
Solid state, (11) 78
Solvent, (11) 81
Solvent free, (11) 78
Soybean oil, (11) 30
Stems, (11) 1
Stryker's reagent, (11) 81
Sulfamethoxazole, (11) 27
Surfactants, (11) 54

Tetrafluoroethane-1,2-diol, (11) 84
Thermogravimetric Analysis, (11) 4, (11) 11
Transfer hydrogenation, (11) 59

Vaccinium corymbosum L., (11) 24
Van't Hoff analysis, (11) 15

Water, (11) 90
Wilkinson's catalyst,(11) 59

Journal of Undergraduate Chemistry Research

ISSN: 1541-6003 JUCR@vmi.edu
http://www.vmi.edu/show.aspx?tid=36955&id=2156&ekmensel=8f9c37c3_156_160_2156_2

Departmental or personal credit cards accepted through PayPal at our web site.

The ***Journal of Undergraduate Chemistry Research*** is a peer review journal published quarterly with papers of original research performed by undergraduates.

The ***Journal of Undergraduate Chemistry Research*** publishes papers of original research performed by undergraduates on all aspects of chemistry including analytical, organic, inorganic, physical, polymers and biochemistry. Articles about laboratory experiments to be used in the teaching of chemistry are not appropriate. Authorship may be by the student or their professor.

Back Issues: Limited Supply (specify desired volume and issue) $15.00

Subscriptions:

INSTITUTIONAL RATE: $ 120.00 per year

INDIVIDUAL RATE: $ 50.00 per year

ALL OTHER COUNTRIES: US $ 150.00 per year

Make checks payable to VMIRL, or VMI Research Laboratories.

Submit manuscripts and subscriptions to:

Journal of Undergraduate Chemistry Research
Dr. Daniel Y. Pharr Editor or to pharrdy@vmi.edu
Chemistry Department
Virginia Military Institute
Lexington VA 24450

ACKNOWLEDGMENT

The **Journal of Undergraduate Chemistry Research** wishes to acknowledge the generous support of the Virginia Military Institute and the VMI Chemistry Department.

The *Journal of Undergraduate Chemistry Research* is issued quarterly and indexed once per year. Claims for missing issues will not be honored after four months of issue date. Duplicate copies may not be sent due to the change of address when the publisher was not notified in a timely manner. The *Journal of Undergraduate Chemistry Research* can be contacted via phone (540-464-7244), fax (540-464-7261) or e-mail (PharrDY@vmi.edu) through Dr. Daniel Y. Pharr Editor. Manuscripts will be accepted through e-mail or fax but a hard copy of figures and tables should be sent to the editor. No responsibility is assumed by this journal, editor, reviewers or sponsors for any injury and/or damage from products, negligence, experiments, instructions or ideas contained in this journal that result in damage to persons or property.

VIRGINIA MILITARY INSTITUTE