

# Marcus A. Juhasz, Ph.D.

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## EDUCATION

Ph.D., Chemistry, University of California, Riverside, 2005

*Dissertation: "Carborane Anions in Superacidity and the Stabilization of Reactive Cations"*

*Advisor: Dr. Christopher A. Reed*

M.S., Chemistry, University of California, Riverside, 2001

B.A., Chemistry (ACS Certified, Minor: Physics), *Cum Laude, Honors in Chemistry*,  
Wittenberg University, 2000

## PROFESSIONAL EXPERIENCE

Current Position: Associate Professor of Chemistry, Whitman College, 2015 - present

Assistant Professor of Chemistry, Whitman College, 2009 - 2015

Visiting Assistant Professor of Chemistry, Allegheny College, 2007 – 2009

Faculty Fellow and Visiting Assistant Professor of Chemistry, Colby College, 2005 – 2007

## HONORS AND AWARDS

A. E. Lange Award for Distinguished Science Teaching, Whitman College, 2015

Demmler Award for Teaching Innovation, Allegheny College, 2008

Outstanding Teaching Assistant, University of California, Riverside, 2001

Chancellor's Distinguished Fellowship, University of California, Riverside, 2000

James T. Gregory Award for Potential in Chemistry Research, Wittenberg University, 2000

Outstanding Organic Chemistry Student Award, Wittenberg University, 1998

University Scholar (highest academic scholarship; Wittenberg University), 1996 – 2000

National Merit Scholarship, 1996

## COURSES TAUGHT/DEVELOPED

*Organic Chemistry I and II*: Sophomore level lecture course

*Organic Lab Techniques I and II*: Sophomore level laboratory course

*General Chemistry*: First year introductory course, lecture and laboratory

*Advanced Methods in Inorganic and Organic Synthesis and Characterization*: Upper level laboratory course focusing on synthetic techniques, multi-step synthesis, organometallic chemistry, handling of air-sensitive materials, and 1d and 2d NMR spectroscopy.

*Physical Organic Chemistry*: A course for upper level students that explores advanced topics in organic chemistry. The course explores a number of molecules that challenge conventional

*Revised November 29, 2021*

limits of bonding, structure, and stability. Other topics include aromaticity, methods for studying reaction mechanisms, reaction intermediates, and computational modeling. A significant portion of the course is based on articles from professional chemistry journals.

*Chemistry Seminar:* A course for upper level students featuring a visiting speaker series, discussions of current topics in chemistry, and professional development workshops. Presenters include alumni and other chemists from academia, industry, and government labs.

### RESEARCH INTERESTS

My research explores molecules built from clusters of boron atoms, known as boranes, and clusters that contain a mix of boron and carbon, known as carboranes. Many applications of these molecules have been predicted, but their use is currently limited because few methods exist for preparing carborane- and borane-based molecules. My research program aims to develop synthetic methods for preparing new borane and carborane-based molecules. Past and ongoing investigations in my lab include cross-coupling reactions of carboranes, an efficient iodination method for boron clusters, and the use of microwave irradiation for preparing new boron clusters. This work employs organic and inorganic synthetic chemistry techniques and is ideal for collaborative research with undergraduate students.

Before coming to Whitman, I worked on the synthesis of the world's strongest acid (over a billion billion times stronger than sulfuric acid) and the development of an NMR spectroscopy-based method for measuring the strength of extremely strong acids. I also studied carbocations, fleeting intermediates in organic chemistry reactions, and isolated the first crystals of a vinyl carbocation—a molecule that had eluded chemists for over 50 years.

### UNDERGRADUATE RESEARCH ADVISING

Whitman College, 2009 – present

*Collaborative research with twenty-two students on the synthesis of new boron clusters.*

Allegheny College, 2007-2009

*Collaborative work with two students on synthesis of new derivatives of the  $CB_{11}H_{12}^-$  anion.*

Colby College, 2006 - 2007

*Collaborative work with two students on synthesis of new derivatives of the  $CB_{11}H_{12}^-$  anion.*

University of California, Riverside, 2000 – 2005

*Mentored three undergraduate students on the synthesis of carboranes .*

### PUBLICATIONS – PEER REVIEWED JOURNAL ARTICLES

*\*Corresponding author; † Denotes undergraduate student coauthor.*

“Exhaustive Cyanation of the Dodecaborate Dianion: Synthesis, Characterization, and X-Ray Crystal Structure of  $[B_{12}(CN)_{12}]^{2-}$ ” Kamin, A. A., † Juhasz, M. A. *Inorganic Chemistry*, **2020**, 59, 189-192. doi:10.1021/acs.inorgchem.9b03037

“Microwave-assisted iodination: Synthesis of heavily iodinated 10-vertex and 12-vertex boron clusters” Juhasz M. A.,\* Matheson, G. R., † Chang, P. S., † Rosenbaum, A. R., † Juers, D. H., *Synthesis and Reactivity in Inorganic, Metal-Organic, and Nano-Metal Chemistry*, **2016**, 46 (4), 583–588. doi:10.1080/15533174.2014.988819

“A Boron Cluster with a Pair of Carboxylic Acid Groups on Adjacent Borons: Synthesis and Structure of 7,12-(COOH)<sub>2</sub>-CB<sub>11</sub>H<sub>10</sub><sup>-</sup>.” Dwulet, G. E.,<sup>†</sup> Juhasz, M. A.\* *Inorganic Chemistry Communications*, **2015**, *51*, 26–28. doi:10.1016/j.inoche.2014.10.028

“Tetraethylammonium 7,12-Dicyano-1-Carba-*closo*-Dodecaborate” Juhasz, M. A.\*, Juers, D. H., Dwulet, G. E.,<sup>†</sup> Rosenbaum, A. J. <sup>†</sup> *Acta Crystallographica* **2014**, *E70*, o411-o412. doi:10.1107/S1600536814004759.

“Copper-promoted Cyanation of a Boron Cluster: Synthesis, X-ray structure, and Reactivity of 12-CN-*closo*-CHB<sub>11</sub>H<sub>10</sub><sup>-</sup>” Rosenbaum, A. J.,<sup>†</sup> Juers, D.H., Juhasz, M. A.\* *Inorganic Chemistry* **2013**, *52* (19), 10717–10719.

*Featured in the CUR Undergraduate Research Highlights: <http://www.cur.org/highlights/>*

“The Structure of the Strongest Brønsted Acid: The Carborane Acid H(CHB<sub>11</sub>Cl<sub>11</sub>)” Stoyanov, E. S., Hoffmann, S. P. , Juhasz, M., and Reed, C. A.,\* *Journal of the American Chemical Society*, **2006**, *128*, 3160-3161.

“The Strongest Isolable Acid” Juhasz, M., Hoffmann, S., Stoyanov, E. S., Kim, K-C., Reed, C. A.,\* *Angewandte Chemie International Edition*, **2004**, *43*, 5352-5355.

*Featured in a news article in Nature: “World’s Strongest Acid Created,” published online November 16, 2004, <http://www.nature.com/news/2004/041115/full/news041115-5.html>*

“The X-ray Structure of a Vinyl Cation” Müller T.,\* Juhasz M., Reed C. A., *Angewandte Chemie International Edition*, **2004**, *43*, 1543-1546.

### PUBLICATIONS – BOOK CHAPTERS

“Unusually Stable Vinyl Cations” Müller, T., Margraf, D., Syha, Y., Nasiri, H. R., Kaiser, C., Maier, R., Boltres, B., Juhasz, M., Reed, C. A., *A.C.S. Symposium Series*, **2007**, *965*, 51-57.

“Structural and Spectroscopic Evidence for β-SiC Hyperconjugation in Vinyl Cations” Muller, T.; Juhasz, M.; Reed, C. A. *Organosilicon Chemistry VI: From Molecules to Materials* **2005**, *1*, 80.

### CONFERENCE PRESENTATIONS

<sup>†</sup>*Undergraduate student coauthor*

“Synthetic methods for polycyanated boron clusters” Juhasz, M. A., Kamin, A.,<sup>†</sup> Hodis, N. E.,<sup>†</sup> Walters, S. M.,<sup>†</sup> *The International Chemical Congress of Pacific Basin Societies (PacifiChem)*, **2021**, Honolulu, HI, USA. (Accepted for presentation in December 2021)

“Cyanation Methods for Boron Cluster Anions,” Juhasz, M. A., *American Chemical Society National Meeting and Exposition*, **2020**, Philadelphia, PA, USA. (conference cancelled due to COVID-19, presentation published online at <https://doi.org/10.1021/scimeetings.0c00853>)

“Microwave-promoted reactions of the CB<sub>11</sub>- carborane anion,” Juhasz, M. A., *255<sup>th</sup> American Chemical Society National Meeting and Exposition*, **2018**, New Orleans, LA, USA.

“Transition Metal-Promoted Cyanation and Carboxylation of C<sub>2</sub>B<sub>10</sub>, CB<sub>11</sub>, and CB<sub>9</sub> Carboranes,” Juhasz, M. A., *The International Chemical Congress of Pacific Basin Societies (PacifiChem)*, **2015**, Honolulu, HI, USA.

“A convenient route to B-cyanated and B-carboxylated  $CB_9^-$ ,  $CB_{11}^-$ , and  $C_2B_{10}$  carborane clusters,” Juhasz, M. A., *Boron in the Americas (BORAM XIV)*, **2014**, Rutgers University, Newark, NJ, USA.

“Copper-promoted cyanation of the *closo*- $CB_{11}^-$  cluster: Synthesis and reactivity of 12-CN-*closo*- $CHB_{11}H_{10}^-$  and 7,12-(CN) $_2$ -*closo*- $CHB_{11}H_9^-$ ,” Juhasz, M. A., Rosenbaum, A. J.,<sup>†</sup> Juers, D. H., Dwulet, G. E.,<sup>†</sup> Midget, H. R.,<sup>†</sup> *247<sup>th</sup> American Chemical Society National Meeting*, **2014**, Dallas, TX, USA.

“Synthesis and reactions of cyanated derivatives of 1-carba-*closo*-dodecaborate(1-),” Juhasz, M. A., *245<sup>th</sup> American Chemical Society National Meeting*, **2013**, New Orleans, LA, USA.

“Designing Sustainable Peer-led Team Learning (PLTL) Programs to Enhance Student Engagement,” Juhasz, M. A., Murphree, S. S., *Biennial Conference on Chemical Education*, **2008**, Bloomington, IN, USA.

“Optimizing the Least Nucleophilic Anion,” Juhasz, M., Kim K-C., Stasko, D., Reed, C. A., *Boron Americas VIII Conference*, **2002**, Death Valley, CA, USA.

***The following are posters which were coauthored with my research students and presented at professional conferences.***

“Synthesis and characterization of novel heavily-cyanated boron clusters” Kamin, A. A.,<sup>†</sup> Juhasz, M. A., **2020**, *259<sup>th</sup> American Chemical Society National Meeting & Exposition*, Philadelphia, PA, USA

“Development of palladium cross-coupling reactions for  $CB_{11}^-$  carboranes” Raffman, E. T.,<sup>†</sup> Juhasz, M. A., **2020**, *259<sup>th</sup> American Chemical Society National Meeting & Exposition*, Philadelphia, PA, USA

“Synthesis and reactivity of carboxylated  $CB_{11}^-$  carborane anions,” Mendelsohn, W. T.,<sup>†</sup> Dwulet, G. E.,<sup>†</sup> Reed, J. I.,<sup>†</sup> and Juhasz, M. A., “Synthesis and reactivity of carboxylated  $CB_{11}^-$  carborane anions,” **2018**, *255<sup>th</sup> American Chemical Society National Meeting & Exposition*, New Orleans, LA, USA.

“Microwave-assisted syntheses of  $CB_{11}^-$  carborane derivatives,” Shaff, A.B.,<sup>†</sup> Juhasz, M.A., *253<sup>rd</sup> American Chemical Society National Meeting*, **2017**, San Francisco, CA, USA.

“Synthesis and characterization of novel boron cluster carboxylic acids,” Dwulet, G. E.<sup>†</sup> and Juhasz, M. A., “Synthesis and characterization of novel boron cluster carboxylic acids,” **2015**, *249<sup>th</sup> American Chemical Society National Meeting & Exposition*, Denver, CO, USA.

“Microwave-Promoted Synthesis of Heavily Iodinated 10 and 12 Vertex Boron Clusters,” Matheson, G. R.<sup>†</sup> and Juhasz, M. A., “Microwave-Promoted Synthesis of Heavily Iodinated 10 and 12 Vertex Boron Clusters,” **2015**, *249<sup>th</sup> American Chemical Society National Meeting & Exposition*, Denver, CO, USA.

“Iodination and MWI Cyanation of *Closo*-Dodecaborate(2-) and *Closo*-1,2-Dicarbododecaborate,” Midget, H. R.<sup>†</sup> and Juhasz, M. A., “Iodination and MWI Cyanation of *Closo*-Dodecaborate(2-) and *Closo*-1,2-Dicarbododecaborate,” **2015**, *249<sup>th</sup> American Chemical Society National Meeting & Exposition*, Denver, CO, USA.

“Investigation into the Mono-halogenation, Radio-halogenation, Functionalization, and Multi-Halogenation of CB<sub>9</sub> Monocarbon Carborane Clusters,” Vorauer, C. R., † Juhasz, M. A., and Wilbur, D. S., “Investigation into the Mono-halogenation, Radio-halogenation, Functionalization, and Multi-Halogenation of CB<sub>9</sub> Monocarbon Carborane Clusters,” **2015**, *249th American Chemical Society National Meeting & Exposition*, Denver, CO, USA.

“Microwave-assisted cyanation and derivatization of *closo*-CB<sub>11</sub> carboranes,” Dwulet, G. E., † Juhasz, M. A., Rosenbaum, A. J., † Midget, H. R., † *247th American Chemical Society National Meeting*, **2014**, Dallas, TX, USA.

“Microwave-assisted iodination of 1-carba-*closo*-dodecaborate(1-): An improved synthesis of CB<sub>11</sub>H<sub>6</sub>I<sub>6</sub><sup>-</sup> and CB<sub>11</sub>HI<sub>11</sub><sup>-</sup>,” Chang, P. S., † Rosenbaum, A. J., † Juhasz, M. A., *245th American Chemical Society National Meeting*, **2013**, New Orleans, LA, USA.

“Microwave initiated Pd-catalyzed coupling reactions of the 1-carba-*closo*-dodecaborate(1-) anion,” Neff-Mallon, N., † Juhasz, M. A., *243rd American Chemical Society National Meeting*, **2012**, San Diego, CA, USA.

#### INVITED LECTURES AND NON-CONFERENCE PRESENTATIONS

“New Synthetic Chemistry for Boron Clusters,” Juhasz, M. A., University of Idaho Chemistry Department Seminar, March 3, 2015.

“The Story of B: New Chemistry with Polyhedral Boron Clusters,” Juhasz, M. A., Whitman College Faculty Forum, December 3, 2014.

“The B Next Door: Developing New Chemistry with Clusters of Element 5,” Juhasz, M. A., Whitman College Chemistry Department Seminar, September 19, 2014.

“Boron Clusters for Medicine, Materials, and Catalysts: Synthesis and Reactivity of New CB<sub>11</sub>-based Molecules,” Juhasz, M. A., Eastern Washington University Chemistry Department Seminar, February 13, 2014.

“The Chemistry of Food,” Juhasz, M. A., HHMI-Whitman College Science Outreach Program, January 29, 2011.

#### GRANTS AND FUNDING

National Science Foundation—Research At Undergraduate Institutions Grant, 2018 – 2022  
*PI, “RUI: New Synthetic Methods for CB<sub>11</sub> Carboranes,” \$240,000 over 3 years, includes a one-year no-cost extension of funding*

Arnold and Mabel Beckman Foundation—Beckman Scholars Program, 2019-2021  
*Co-PI, \$104,000 over 3 years*

Whitman College Perry Research Award, 2016  
*PI, “New Synthetic Methods for CB<sub>11</sub>-Based Boron Clusters,” \$8500*

Murdock College Research Program for Natural Sciences, 2015 – 2019  
*PI, “New synthetic methodologies for CB<sub>11</sub>, CB<sub>9</sub> and C<sub>2</sub>B<sub>10</sub> carboranes,” \$72,000 over 3 years*

Whitman College Perry Research Award, 2013  
*PI, “Boron clusters for drugs and advanced materials: new derivatives of 1-carba-*closo*-dodecaborate(1-),” \$8500*

Whitman College Perry Research Award, 2012

*PI, "Development of cyanation methods for 1-carba-closo-dodecaborate(1-)," \$8500*

Whitman College Perry Research Award, 2011

*PI, "Microwave-Initiated Kumada Coupling Reactions of the 1-Carba-closo-dodecaborate(1-) Anion," \$8500*

National Science Foundation—Major Research Instrumentation Grant, 2009 – 2012

*Co-PI, "MRI: Acquisition of a 400 MHz NMR Spectrometer for Undergraduate Research and Research Training," \$389,000 over 3 years*

M.J. Murdock Charitable Trust Start-up Grant, 2009 – 2011

*PI, \$25,000 over 2 years*

Demmler Award for Teaching Innovation, Allegheny College, 2008

*PI, "Developing Investigative Computer-Based Modeling Activities for Organic Chemistry," \$6000 grant awarded to support the development of chemistry modeling exercises*

#### PROFESSIONAL SOCIETY MEMBERSHIPS AND RECENT PROFESSIONAL SERVICE

American Chemical Society (ACS), 2001 – present

Council on Undergraduate Research (CUR), 2009 – present

Sigma Xi: The Scientific Research Society, 2014 – 2017

Article reviewer for *Inorganic Chemistry*, *Tetrahedron Letters*, *Journal of Chemical Education*, *The Chemical Educator*

Grant proposal reviewer for National Science Foundation proposals

External reviewer for tenure/promotion at peer institutions

#### RECENT ACADEMIC SERVICE (SINCE FALL 2014)

Chemistry Department Chair, 2018 – 2019

Beckman Scholars Program Committee, 2018 – present

Faculty Personnel Committee, 2015 – 2017 (Chair for 2017 – 2018)

Center for Teaching and Learning Steering Committee, Spring 2016

Presidential Installation Committee, 2015

ASID Committee, 2014 – 2015

Chemistry Department Webmaster, 2016 – 2017

Assessment Committee, 2014 – 2015

Goldwater Scholarship, Faculty Representative 2015 – 2016

Chemistry Faculty Search Committees (2 Tenure Track, 3 Visiting), 2014 – 2018

#### RECENT COMMUNITY OUTREACH AND NONACADEMIC SERVICE

Whitman College Cycling Team Faculty Adviser, 2009 – 2018

Tour of Walla Walla Planning Committee, 2010 – present

Walla Walla 2020, Energy and Sustainability subcommittee, 2015

Whitman College International Student Friendship Family, 2013 – 2018

Whitman College Service Saturdays: Volunteer, 2014 – 2015

#### ADDITIONAL SKILLS AND INTERESTS

Synthetic Organic and Inorganic Chemistry skills, with extensive experience handling highly reactive air- and moisture-sensitive compounds using a glovebox and Schlenk techniques. Experienced in microwave-assisted synthesis.

Extensive experience with installation and maintenance of computers running chemistry software on Windows, Macintosh, and Linux platforms. Experience with various chemistry modeling and visualization software packages, including Gaussian, Spartan, GAMESS, ChemOffice, ChemDoodle, WebMO, PCModel, Pymol, and JMol.

Experience with a variety of chemistry instrumentation. Instruments and techniques specifically used in research and teaching have included multinuclear 1d and 2d NMR, X-ray crystallography, FTIR, GC, GC-MS, HPLC, ICP-AES, MALDI-TOF MS, LC-MS, and TGA, as well as a number of benchtop probes interfaced to computers using Vernier data acquisition software.