(Alec) Jay A. Kroll

Department of Chemistry
University of Colorado Boulder
Cristol Chemistry, 215 UCB
Boulder CO 80309

Alec.Kroll@colorado.edu

Education Background

Emory University
- Bachelor of Science in Chemistry, May 2012
- Chemistry Research Highest Honors
- Dr. Susanna Widicus Weaver, Advisor

University of Colorado at Boulder
- Doctorate of Philosophy in Chemistry, December 21, 2017
- Dr. Veronica Vaida, Advisor

Professional Experience

University of Colorado Boulder, August 2019- Present
- Lecturer, Introductory, Environmental, and General Chemistry

Emory University, May 2018 – August 2019
- HHMI Post-Doctoral Fellow, Curriculum Development, Chemistry Unbound
- Post-Doctoral Researcher, Widicus Weaver Group

University of Colorado Boulder, January 2018 – May 2018
- Post Doctoral Researcher

Publications

Refereed Journal Articles

9. **Kroll, Jay A.;** Frandsen, Benjamin N.; Rapf, Rebecca J.; Kjaergaard, Henrik G.; and Vaida, Veronica; "Reactivity of Electronically Excited SO_2 with Alkanes," Journal of Physical Chemistry A, 2018, 122 (39), 7782-7789.

8. **Kroll, Jay A.;** Frandsen, Benjamin N.; Kjaergaard, Henrik G.; and Vaida, Veronica; "Atmospheric Hydroxyl Radical Source: Reaction of Triplet SO_2 and Water," Journal of Physical Chemistry A, 2018 122, (18), 4465-4469.

7. Rapf, Rebecca J.; Perkins, Russell J.; Dooley, Michael R.; **Kroll, Jay A.**; Carpenter, Barry K.; and Vaida, Veronica; "Photo-Initiated Reactions of Lipids by α-Keto Acids in Aqueous Solution," ACS Central Science, 2018, 4 (5), 624-630.

6. Widicus Weaver, Susanna; Laas, Jake C.; Zou, Luyao; **Kroll, Jay A.;** Rad, Mary L.; Hays, Brian M.; Sanders, James; Lis, Darek; Cross, Trevor; Wehres, Nadine; McGuire, Brett A.; Sumner Matthew; "Deep Broadband Spectral Line Surveys of Molecule-Rich Interstellar Clouds," Astrophysical Journal Supplement Series 232:3, September 2017

5. **Kroll, Jay A.**; Hansen, Anne S.; Møller, Kristian; Kjaergaard, Henrick G; and Vaida, Veronica; "Ultraviolet Spectroscopy of Methylglyoxal: Gas Phase Hydration to Form the Geminal Diol," ACS Earth Space Chemistry, 2017, 1 (6), 345–352.

4. Donaldson, James; **Kroll, Jay A.**; Vaida, Veronica; "Gas-phase hydrolysis of triplet SO_2: A Possible Direct Route to Atmospheric Acid Formation," Scientific Reports, July 2016, 6, article 30000.

3. Schrøder, Sidsel D.; Wallberg, Jens H.; **Kroll, Jay A.**; Maroun, Zeina; Vaida, Veronica; and Kjaergaard, Henrick G.; "Intramolecular Hydrogen Bonding in Methyl Lactate," Journal of Physical Chemistry A, August 21, 2015, 119 (37) p. 9692-9702.

2. Reed Harris, Allison E.; Ervens, Barbara; Shoemaker, Richard D.; **Kroll, Jay A.**, Rapf, Rebecca J.; Griffith, Elizabeth C.; Monod, Anne; and Vaida, Veronica; "Photochemical Kinetics of Pyruvic Acid in Aqueous Solution," Journal of Physical Chemistry A, April 11, 2014, 118 (37), p.8505-8516.

1. **Kroll, Jay A.**; Shipman, S.T; and Widicus Weaver S.L.; "The Rotational Spectrum of Methyl Ethyl Ketone in its Ground Vibrational State," Journal of Molecular Spectroscopy, January 2014, Volume 295, p. 52-57.

Book Chapters

Kroll, Jay A. "Belonging and Ability Uncertainty in LGBTQ+ General Chemistry Students." *Teaching-as-Research Projects at CU Boulder A Volume of Projects Done by the Teaching Institute for Graduate Education Research*, edited by Adam J. Blanford and Jason B. Scott, The University of Colorado Boulder Graduate Teacher Program, 2017, pp. 45–56.

Teaching Experience

- Spring 2021
  - Instructor Introductory Chemistry, CHEM 1021, CU Boulder
  - Instructor Environmental Chemistry, CHEM 1031, CU Boulder
  - Instructor General Chemistry Lab for Engineers, CHEM 1221, CU Boulder
- Fall 2020
  - Instructor Introductory Chemistry, CHEM 1021, CU Boulder
- Summer 2020
  - Lecturer General Chemistry 1, CHEM 1113, CU Boulder
  - Lecturer General Chemistry 1 Lab, CHEM 1114, CU Boulder
- Spring 2020
  - Lecturer General Chemistry 2, CHEM 1133, CU Boulder
  - Lecturer Environmental Chemistry 2, CHEM 1031, CU Boulder
  - General Chemistry 1 Labs, CHEM 1114, CU Boulder

- Fall 2019
    - Lecturer Introductory Chemistry, CHEM 1021, CU Boulder
- May 2018-July 2019
    - Chemistry Unbound Post-Doctoral Researcher, Emory University
- Summer 2015
    - Instructor in Environmental Chemistry, Program for Excellence in Academics and Community (PEAC) at the University of Colorado at Boulder
- Large Lecture Courses Taught (100+ students)
    - CHEM 1113, CU Boulder
    - CHEM 1114, CU Boulder
    - CHEM 1021, CU Boulder
- Small Lecture Courses Taught (<50 Students)
    - CHEM 1021 CU Boulder, RAP Section
    - CHEM 1133 CU Boulder, SASC
    - CHEM 1031 CU Boulder
- Course Development
    - CHEM 205, Light and Matter, Emory University
    - CHEM 205 Lab, Light and Matter, Emory University
- Lab Teaching Experience
    - CHEM 1113
    - CHEM 1021
    - CHEM 1031
- Graduate Student Teaching Assistant Experience
    - CHEM 1011, CU Boulder (Fall 2012, 2013, 2014)
    - CHEM 4171, CU Boulder (Spring 2013)

Research Experience

Education Research

- *HHMI Post-Doctoral Fellow in the Chemistry Unbound project at Emory University*
    - Worked with professors at Emory University to develop a course titled "Light and Matter" along with a corresponding laboratory course to introduce chemistry majors to spectroscopic techniques and discuss the theory behind these techniques.
- *Research on Academic Retention (ROAR) Teaching as Research (TAR) fellow in the Teaching Institute for Graduate Education Research (TIGER) at the University of Colorado Boulder*
    - I conducted a pilot study survey asking general chemistry students about their sense of belonging and ability uncertainty (belief in ability to succeed) in chemistry during the summer of 2016 and continued this study in the fall of

2016 with General Chemistry 1 students in order to gain a large enough sample size.
    - Administered the survey to the Fall 2017 General Chemistry and Introductory Major's Chemistry Course at CU Boulder.
    - Analysis of the data is currently under way and manuscripts detailing the results are in preparation.

Laboratory Research

Widicus Weaver Research Group, Emory University
September 2008-July 2012, Undergraduate Researcher
May 2018 – August 2019, Post-Doctoral Fellow

Vaida Research Group, University of Colorado Boulder
November 2012- December 2017 Graduate Student Researcher
January 2018 -May 2018, Postdoctoral Research Assistant

Techniques/Instruments Used:

- Laboratory Direct Absorption Microwave/Submillimeter Spectroscopic Measurements of Rotational Spectra
    - Measurement of spectra in supersonic expansion
    - Measurement of spectra in static and flow cells
- Eximer Laser used for Photodissociation Studies
- Chirped Pulse Fourier Transform Microwave (CP-FTMW) Spectroscopic Measurements of Rotational Spectra
- Observational Astronomy in the Submillimeter Range Using the Caltech Submillimeter Observatory (CSO) for Spectral Measurements of Star Forming Regions
- Spectral Analysis of Broadband Spectral Line Surveys of Star Forming Regions
- Ultra-Violet/Visible Direct Absorption Spectroscopy for the Measurement of Electronic Spectra
- Cavity Ringdown Spectroscopy for the Measurement of OH Overtone Vibrational Spectra
- Fourier Transform Infrared (FTIR) Direct Absorption Spectroscopy for Measurement of Vibrational Spectra

---

Awards

- September 2016 – May 2017: Awarded a CU Center for the Study of Origins Research Assistantship
- April, 2015: Awarded the John B. Ekeley Graduate Award from the Department of Chemistry and Biochemistry at the University of Colorado at Boulder
- Spring, 2014: Awarded a Graduate School Student Travel Grant from the University of Colorado at Boulder

- August, 2013: Awarded the General Chemistry Graduate Teaching Excellence Award for my work teaching Environmental Chemistry in the undergraduate Chemistry and Biochemistry Program for the 2012-2013 academic Year
- August, 2011: Awarded Honorable Mention Prize in the Summer Undergraduate Research at Emory (SURE) Poster Session
- May, 2011: Awarded the William Jones Scholarship from the Emory University Department of Chemistry
- Spring, 2011: Awarded a Summer Undergraduate Research at Emory (SURE) Fellowship
- September, 2010: Awarded Alternate Prize in the 2009 Herty Medal Undergraduate Research Symposium
- Spring, 2010: Awarded a Summer Undergraduate Research at Emory (SURE) Fellowship
- Spring, 2010: Awarded a Scholarly Inquiry and Research at Emory (SIRE) travel grant
- May, 2009: Awarded the Emory Chemistry Early Career Research Grant
- Spring, 2009: Recipient of a Summer Undergraduate Research at Emory (SURE) Fellowship
- Fall 2007: Awarded the rank of Eagle Scout in the Boy Scouts of America

---

Conference Presentations

Talks -First/Presenting Author

18. **Kroll, Jay A.**, Zinga, Samuel, and Widicus Weaver, Susanna; "Spectral Analysis of a Methylamine and Ozone Mixture." *74th Meeting of the International Symposium on Molecular Spectroscopy* June 18th, 2019.

17. **Kroll, Jay A.** and Plath, Kathryn L., "Effects of Gender and Sexual Orientation on Belonging Uncertainty in General Chemistry." 25th Biennial Conference on Chemical Education, July 31st, 2018

16. **Kroll, Jay A**. and Vaida, Veronica; "Reaction Rates and Mechanism for the Reaction of Electronically Excited Sulfur Dioxide with Alkanes." *73rd Meeting of the International Symposium on Molecular Spectroscopy* June 22nd, 2018.

15. **Kroll, Jay A.** and Vaida, Veronica; "Reaction Rates and Mechanism for the Reaction of Electronically Excited Sulfur Dioxide with Alkanes." *255th American Chemical Society Meeting and Exposition*, March 20th, 2018.

14. **Kroll, Jay A.** and Vaida, Veronica; "Photochemical Formation of Sulfur-Containing Aerosols" *72nd Meeting of the International Symposium on Molecular Spectroscopy* June 23rd, 2017.

13. **Kroll, Jay A.**, Hansen, Anne S., Møller, Kristian; Kjaergaard, Henrick G; and Vaida, Veronica; "Ultraviolet Study of the Gas Phase Hydration of Methylglyoxal to Form the Geminal Diol," *72nd Meeting of the International Symposium on Molecular Spectroscopy* June 19th, 2017.

12. **Kroll, Jay A.** "We're Not the Only Rock in This Here Solar System," *Astrobiology Graduate Conference*, June 7th, 2017

11. **Kroll, Jay A.** Plath, Kathryn L; **"**Effects of Gender and Sexual Orientation on Belonging Uncertainty in General Chemistry," *4th Western States Chemical Education Group Conference,* April 22nd, 2017

10. **Kroll, Jay A.**; Plath, Kathryn L; **"**Effects of Gender and Sexual Orientation on Belonging Uncertainty in General Chemistry," *253rd American Chemical Society Meeting and Exposition,* April 3rd, 2017.

9. **Kroll, Jay A.;** Donaldson, D. James; Vaida; "Photon Induced Aerosol Formation in Planetary Atmospheres: Photochemical Hydration of Sulfur Dioxide" *252nd American Chemical Society Meeting and Exposition,* August 24th, 2016.

8. **Kroll, Jay A.;** Donaldson, D. James; Vaida, Veronica; "Photochemical Formation of Aerosol in Planetary Atmospheres: Photon and Water Mediated Chemistry of Sulfur Dioxide" *Astrobiology Graduate Conference*, July 25, 2016.

7. **Kroll, Jay A.**; Axson, Jessica L.; Vaida, Veronica; Gas Phase Hydration of Methylglyoxal to Form the Gemdiol." *71st Meeting of the International Symposium on Molecular Spectroscopy*, June 21, 2016.

6. **Kroll, Jay A**.; Donaldson, D. James; Vaida, Veronica; "Photochemical Formation of Aerosol in Planetary Atmospheres: Photon and Water Mediated Chemistry of SO2." *71st Meeting of the International Symposium on Molecular Spectroscopy*, June 21, 2016.

5. **Kroll, Jay A.;** Vaida, Veronica; "Photon and Water Mediated Sulfur Oxide and Acid Chemistry in the Venusian and Earth Atmospheres." *CU Boulder Ion/gas phase Super Group Meeting*. October 20th, 2015.

4. **Kroll, Jay A**.; Vaida, Veronica; "Photon and Water Mediated Sulfur Oxide and Acid Chemistry in the Venusian Atmosphere," *Astrobiology Graduate Conference*, July 20th, 2015.

3. **Kroll, Jay A.**; Vaida, Veronica; "Photon and Water Mediated Sulfur Oxide and Acid Chemistry in the Atmosphere of Venus," *69th Meeting of the International Symposium on Molecular Spectroscopy*, June 20, 2014.

2. **Kroll, Jay A.**; Shipman, Steven T.; Widicus Weaver, Susanna L.; "Laboratory Study of the Rotational Spectrum of 2-Butanone," *67th Meeting of the International Symposium on Molecular Spectroscopy*, June 21, 2012

1. **Kroll, Jay A.**; Shipman, Steven T.; Widicus Weaver, Susanna L.; "The Laboratory and Observational Study of 2-Butanone as a test for organic chemical complexity in various interstellar physical environments," *66th Meeting of the International Symposium on Molecular Spectroscopy*, June 23, 2011

Posters - First/Presenting Author

16. **Kroll, Jay A.**; Zinga, Samuel; Widicus Weaver, Susanna L.; "Spectral Analysis of a Methylamine and Ozone Mixture: A Study to Aid in the Detection of Glycine Precursors in the Interstellar Medium," *Astrobiology Graduate Conference*, July 24th, 2019.

15. **Kroll, Jay A**.; Vaida, Veronica; "Sunlight Driven Reactions of SO_2 with Organic Molecules," *Astrobiology Graduate Conference*, June 5th, 2018.

14. **Kroll, Jay A.** and Vaida, Veronica; "Photochemical Formation of Sulfur-Containing Aerosols" *Gordon Research Conference Climate Engineering*, July 24th, 2017

13. **Kroll, Jay A.** and Vaida, Veronica; "Photon Induced Aerosol Formation: Photochemically Driven Reactions of Sulfur Dioxide with Water and Organics" *253rd American Chemical Society Meeting and Exposition*, April 5th, 2017.

12. **Kroll, Jay A.**; Donaldson, D. James; Vaida, Veronica; "Photon Induced Aerosol Formation in Planetary Atmospheres: Photochemical Hydration of Sulfur Dioxide" *Towards a Molecular Understanding of Aerosols,* August 30th 2016.

11. **Kroll, Jay A.**; Donaldson, D. James; Vaida, Veronica; "Photon Induced Aerosol Formation in Planetary Atmospheres: Photochemical Hydration of Sulfur Dioxide" *CIRES Rendezvous*, May 13th 2016.

10. **Kroll, Jay A.**; Vaida, Veronica; "Photon and Water Mediated Sulfur Oxide and Acid Chemistry in Planetary Atmospheres*" 249th American Chemical Society Meeting and Exposition*, March 2015.

9. **Kroll, Jay A.**; Vaida, Veronica; "Effects of Water on Sulfur Chemistry in Planetary Atmospheres: Using Venus as a Natural Laboratory" *247th American Chemical Society Meeting and Exposition,* March 2014.

8. **Kroll, Jay A.**; Shipman, Steven T.; Widicus Weaver, Susanna L.; "Using Methyl Ethyl Ketone as a Test for the Chemical Complexity of the Interstellar Medium" *Summer Undergraduate Research at Emory Poster Session*, Emory University, 2011.

7. **Kroll, Jay A.**; Shipman, Steven T.; Widicus Weaver, Susanna L.; "Laboratory and Observational Studies of Methyl Ethyl Ketone" *280th International Astronomical Union Symposium*, Molecular Universe, June 2011

6. **Kroll, Jay A.** and Widicus Weaver, Susanna L., "Submillimeter Molecular Spectroscopy and the Search for Complex Organics in the Interstellar Medium" *Summer Undergraduate Research at Emory Poster Session*, Emory University, 2010.

5. **Kroll, Jay A.** and Widicus Weaver, Susanna L., "Submillimeter Molecular Spectroscopy and the Search for Complex Organics in the Interstellar Medium" *2010 Herty Medal Undergraduate Research Symposium*, Morehouse College, 2010.

4. **Kroll Jay A.**; Radhuber Mary L.; Widicus Weaver Susanna L., "Spectroscopy of prebiotic molecules formed from O(^{1}D) insertion reactions." *Dust and Ice: Their Roles in Astrophysical Environments*, University of Georgia, 2010.

3. **Kroll, Jay A.** and Widicus Weaver, Susanna L., "O(^{1}D) Insertion and THz Spectral Analysis of Astrochemically Relevant Molecules." *Emory SURE Poster Presentation*, 2009

2. **Kroll, Jay A.** and Widicus Weaver, Susanna L., "O(^{1}D) Insertion for Production of Astrochemically Relevant Molecules." *HMURS 2009 Undergraduate Poster Symposium*, 2009

1. Anderson, Thomas A.; **Kroll, Jay A.**; Widicus Weaver, Susanna L.; "Spectroscopy of Prebiotic Molecules Formed from O(^{1}D) Insertion Reactions" *2009 Center for Chemistry in the Universe,* 2009

Related Experience, Outreach, and Service

- Presenter for CU Inclusive Communities of Practice, October 20, 2020
- Presenter for Boulder Nerd Nite outreach event, October 14, 2019
- Organizer for the Astrobiology Graduate Conference, July 2019
- Discussion Panelist for Equity in STEM for All Genders course taught by Dr. Stephanie Nezz, December 6th, 2018.
- Session Chair at the 73rd Meeting of the International Symposium on Molecular Spectroscopy, June 2018.
- Organizer for the Astrobiology Graduate Conference, June 2018
- Scientist Pen Pal with middle school students at the Denver Language School, Spring 2018
- Organizer and Session Chair at the Astrobiology Gradate Conference, June 2017
- CU Center for the Study of Origins - *Interdisciplinary Project combining Humanities and Sciences Research on Origins Questions, Organized by Professor Carol Cleland*
    - Participated as a graduate student member Fall 2015-Spring 2016
    - Participated as a Research Assistant awardee Fall 2016-Spring 2017.
- CU Astrobiology Journal Club
    - Member 2014 – December 2017
- CU Education Research Journal Club
    - Member Fall 2014-December 2017
    - Co-Organizer Spring 2016-May 2017
- Organizer for the Astrobiology Graduate Conference, June 2016
- Corden Pharma Colorado Regional Science Fair Spring 2016
    - Volunteer Science Fair Judge for High School Chemistry Projects
    - Volunteer Head Judge for Junior High School Chemistry Projects
- Science Discovery Teen Café -April 13th, 2016
    - Volunteer for the "Science Speed Dating" night for the Science Discovery Teen Café
    - Met with local high school students for short, small group question and answer sessions about my research and experience in college and graduate school.
- Research Meet and Greet – December 1, 2016
    - Met with chemistry majors enrolled in General Chemistry to discuss my experiences doing research during my undergraduate career and my experiences applying for graduate school.
- Unit Field Trip Program– Logan School for Creative Learning - January 13, 2017
    - Met with middle school students from the Logan School for Creative Learning to discuss their interests in astrobiology. Provided a lab tour and discussion of the techniques used in the Vaida Lab to study early earth and prebiotic chemistry.